Reading Material
For Official Use only

ORIENTATION TRAINING TO NEWLY RECRUITED ASSISTANT PROFESSOR CADRE SCIENTISTS OF ANGRAU

ORIENTATION & REFRESHER TRAINING UNIT
DEPARTMENT OF AGRICULTURAL EXTENSION
COLLEGE OF AGRICULTURE, RAJENDRANAGAR
ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY
HYDERABAD - 500 030

JULY 2002

Reading Material
For Official Use only

ORIENTATION TRAINING TO NEWLY RECRUITED ASSISTANT PROFESSOR CADRE SCIENTISTS OF ANGRAU

G16810
290

ORIENTATION & REFRESHER TRAINING UNIT
DEPARTMENT OF AGRICULTURAL EXTENSION
COLLEGE OF AGRICULTURE,RAJENDRANAGAR
ACHARYA NG RANGA AGRICULTURAL UNIVERSITY
HYDERABAD-500 030

JULY 2002

ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY
Rajendranagar, Hyderabad - 500 030

Phones Off : 4015035
Res : 7752233, 7750631
Grams : 'AGRIVARSITY'
Fax : 91-040-4015031
E-mail : Vc_angrau@yahoo.com

Dr. I.V. SUBBA RAO
VICE-CHANCELLOR

FOREWORD

The establishment of Agricultural Universities, in different states, represent a distinct land mark in the history of Agricultural education in India. This has resulted in the creation of one of the largest systems of Agricultural Universities in the world in less than three decades. Though many of these Universities have been established on the campuses of the existing agricultural colleges, the rapidity with which these academic institutions have transformed into fulfledged service oriented universities is something unique without a parallel anywhere, perhaps, in the world. These universities were established on the cardinal principle of integrating teaching, research and extension education.

The mandate of agricultural universities enable them to have jurisdiction in the matter of education in the broad areas of agriculture covering crop science, veterinary and animal science, home science, agricultural engineering, fisheries and forestry with teaching, research and field extension wings.

There is no denying the fact that 'Human Resource' is vital for the effective functioning of any organisation. Notwithstanding this, the human asset never found a place in the balance sheet as a distinct entity of any organisation and agricultural universities are no exception to this general phenomenon. Infact, human resource is such an important aspect of institutional function and development that may well determine the success or failure of the institution. Therefore, faculty upgradation and development of the capabilities of faculty to accomplish their assigned tasks, effectively, with high degree of efficiency and confidence must be considered on priority.

Faculty up-gradation in agricultural universities, as compared to traditional universities, is beset with specific problems because, the faculty of agricultural universities are expected to perform multifunctional roles of teaching, research, farm management, animal health clinics, extension activities etc. It is not uncommon to find a single teacher in agricultural university performing all or several of these functions simultaneously. Therefore, the mechanism and procedures

of faculty upgradation are not as simple as those prevalent in traditional universities, where faculty is largely involved in teaching, and to a limited extent in conducting research mostly through post-graduate students. There is, therefore, a need to evolve an appropriate mechanism for faculty upgradation in agricultural university.

The Acharya N. G. Ranga Agricultural University has taken up this onerous task of training their faculty engaged in teaching, research and extension with a prime objective of updating and refining the teaching, research and communicative skills of scientists through induction, inservice and refresher training programmes. The beginning of such an exercise is the 'Orientation Training' to its young scientists. It will be followed by other refresher training programmes in due course of time.

The reading material, in your hand, which will be supplied to the young scientists soon after the training, for use as reference material, is largely a complication of articles written by experts. I am hopeful that the reading material will serve as a guide to the young scientists in refining and sharpening their skills in teaching, research and field extension.

I compliment Dr B V.Sudershan Rao, Professor and Head of Orientation and Refresher Training Unit (O & RT), and Head of Agricultural Extension Department, College of Agriculture, Rajendranagar, for his efforts in brining out this reading material. The staff who have assisted him in this task deserve special appreciation.

July, 2002

I.V. SUBBA RAO
Vice-Chancellor.
Rajendranagar

Phones Off : (040) 4015326
Res : (040) 4013120
Fax : 91-040-4015326
E-mail : root@apau.ren.nic.in
Grams : 'Agrivarsity'

ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY
ADMINISTRATIVE OFFICE, RAJENDRANAGAR, HYDERABAD - 500 030

Dr. A. SATYANARAYANA
Director of Extension

PREFACE

Training has gained wide acceptability for upgrading the professional competence of personnel in an organisation. In orfer to be successful, training needs have to be meticulously assessed, training plans have to be carefully developed, designed, efficiently implemented and objectively evaluated.

Human resource development is one of the core concern of Acharya N.G. Ranga Agricultural University. It has two phases; the first one 'orientationtraining' in which the emphasis is on preparing the newly recruited personnel towards the organisational needs and goals and the roles and responsibilities of the individual towards the achievement of organisational goals. The next phase is 'refresher training' which is essentially a process of upgrading the communication and technical skills of the personnel in tune with the changing agricultural and allied field scenario. The present training which the O & RT Unit is organising is the first one - the orientation training to the newly recruited Assistant Professor cadre personnel in the fields of teaching, research and field extension in the university.

The reading material produced by the O & RT Unit for the purpose is the compilation of articles exclusively written by the experts in the field. It covers the areas like; teaching, research, field extension, administration, personnel, labour, stores, financial management etc. I hope it will serve as a useful reference material for the young scientists.

I commend the efforts of Dr. B.V. Sudershan Rao, Professor & Head, O & RT Unit and Head, Department of Agricultural Extension, College of Agriculture, Rajendranagar and his colleagues in bringing out this volume. Suggestions for improvement is most welcome.

July, 2002
Rajendranagar.

(A. SATYANARAYANA)

ACKNOWLEDGEMENT

The O & RT Unit, ANGRAU would like to express its deep sense of gratitude to Padmasri Dr. I.V.Subba Rao, Vice-Chancellor, Acharya N.G. Ranga Agricultural University, Rajendranagar under whose able guidance and encouragement, the orientation training to ANGRAU young Scientists are takenup. The unit is also thankful for his thought provoking article entitled "Faculty upgradation and Human Resource Development" which finds a prominent place in this volume.

The unit is deeply indebted to Dr R.S.Paroda, Former Director General, ICAR, New Delhi. Dr. S.L.Mehta Former D.D.G (Edu), ICAR, Dr. S.S.Magar, Director of Instructions and Dean, MPKV Rahuri for their valuable articles.

Our heartful thanks to the Deans of the faculties, Registrar, Directors, and all the other university officials for their articles as well as for their wise counsel and guidance.

The O & RT Unit express its gratitude to Dr. A. Satyanarayana, Director of Extension, ANGRAU for his timely help, suggestions and guidance in both conduct of training as well as in shaping this reading material.

To all the experts who have contributed articles to this volume, the unit expresses its greatful thanks.

The unit acknowledges the efforts put in by Dr. Ch. Venugopal Reddy, Assistant Professor and other colleagues of the Department of Agricultural Extension, College of Agriculture, Rajendranagar in proof reading the articles of this volume and conduct of training programmes.

The unit compliments the effort put in by Mr. Mohit in desk top printing of the articles.

Our thanks to the Principal Agricultural Information Officer and the Press staff of ANGRAU who have done their best in designing and printing the presented volume of reading material.

To all those who have helped, the unit expresses its gratitudes.

The O & RT unit also thanks all the participants who have undergone training.

Suggestions for improvement, that could be included in the future prints of the reading material, are most welcome.

July, 2002

B.V. SUDERSHAN RAO
Professor & Head
O & RT Unit,
Department of Agricultural Extension,
College of Agriculture

CONTENTS

S.No.	Topic	Author	Page No.
	Foreword	Dr. I.V. Subba Rao	
	Preface	Dr. A. Satyanarayana	
	Acknowledgement	Dr. B.V. Sudershan Rao	
	INTRODUCTORY TOPICS		
1.	Agricultural Human Resource Development in India-Present concerns and future strategy	Dr. R.S. Paroda	1
2.	Facutly upgradation and Human Resource Development	Dr. I.V. Subba Rao	9
3.	Agricultural Manpower Planning	Dr. S.S. Magar	25
4.	Higher Education in Agriculture	Dr. S.L. Mehta	39
5.	Historical background of Agricultural Education in India	Dr. P. Raghavulu	48
6.	Integration of Teaching Research and Extension in Agricultural Universities	Dr. N. Sreerama Reddy	58
7.	ANGRAU-Mandate and Functions	Dr. S. Raghuvardhan Reddy	67
	INSTRUCTIONAL TECHNOLOGY		
8.	Educational Technology-the need of the day for effective teaching	Dr. B.V. Sudershan Rao	84
9.	Teaching - Learning : Concepts, Process and Principles	Dr. B.V. Sudershan Rao	91
10.	Course outline	Dr. M. Sudershan Reddy	114
11.	Lesson Planning	Dr. G.V. Narayana Reddy	124
12.	How to plan and present Lectures and Practicals	Dr. B.V. Sudershan Rao	136
13.	Student Evaluation and Question Banking	Dr. M. Sudershan Reddy	145
14.	Performance Appraisal of Teachers	Dr. B.V. Sudershan Rao	154
15.	Computers in Education	Dr. K.M. Reddy	170

S.No.	Topic	Author	Page No.
	RESEARCH		
16.	Research wings of ANGRAU	Dr. A. Padma Raju	184
17.	Conduct of Onfarm and other trails	Dr. V. Raja	205
18.	Statistical Aanalysis of Research Data	Dr. B.S. Kulkarni	221
	FIELD EXTENSION		
19.	Extension Services of ANGRAU	Dr. A. Satyanarayana	243
20.	Formulation of Technical Programmes and Presentation	Dr. P. Gidda Reddy	276
21.	Preperation and Presentation of Technical Reports	Dr. P. Punna Rao	288
	MANAGEMENT		
22.	Management - meaning, components	Dr. P. Maruthi Ram	298
23.	Recruitment, Training and placement	Dr. P. Maruthi Ram	302
24.	Financial and Stores Management	Sri C.B. Sankara Narayanan	313
25.	Idea generation and Creativity	Dr. B.V. Sudershan Rao	390
26.	Motivation in Work Environment	Dr. M. Anwer	402
27.	Library Usage	Dr. (Mrs.) D. Sugunawathy	420
28.	Use of correct English	Sri S.M. Iqbal	423

INTRODUCTORY TOPICS

AGRICULTURAL HUMAN RESOURCE DEVELOPMENT IN INDIA-PRESENT CONCERNS AND FUTURE STRATEGY

*R.S. PARODA**

PREAMBLE :

In India 70% the population subsist on agriculture, which is gradually attaining a status of an industry. Presently, agricultural sector contributes 32% of the GDP and generates about 17% of total export earning. Today, India ranks second in the world in rice and wheat production which is our staple diet.

With the adoption of high-yielding varieties and expanded use of fertilizer, water and the new technologies, government initiatives and the positive response of farmers have enabled us to become self-sufficient in food. Thanks to the cutting edge of science that from Begging Bowl's status we have reached and era of "self-sufficiency". Food consumption and nutrition indicators have also substantially improved. A large part of the credit for this splendid achievement in food production from nearly 51 million tonnes in 1950's to an estimated 189 million tonnes in 1994-95 goes to the credit of scientists and the extension personnel, who have been instrumental in developing and absorbing the technologies leading to "green". "white", "yellow" and lately "blue" revolutions in the country.

Having become self-sufficient in food grain production, there is no room for complacency. Notwithstanding the successes, the rate of agricultural growth has to be boosted further from the present 2.5% per year which is marginally above the 2.1% annual increase in population. Also more of this growth in production has been skewed, and largely from irrigated areas. Future agricultural growth must come from increased productivity largely from rainfed areas. In fact, "second Green Revolution" will have to come from making grey areas green while, simultaneously, sustaining the green areas as green. Also diversification, value addition and commercial agriculture are to find prominent

* Former Director General, ICAR, New Delhi

place in Indian agriculture to meet our nutritional demands and also to become globally competitive.

To propel Indian agriculture into the 21st century, the quality, technical skills and management of agricultural manpower must improve in consonance with rapidly changing needs of our society-both nationally and internationally. If the education imparted is not tuned to the current and future realities, the national research, extension and Agri-business system will get affected adversely despite large investment in infrastructure, extension network and scientific institutions.

NATIONAL AGRICULTURAL RESEARCH SYSTEM

ICAR assumed the agricultural education responsibility on behalf of UGC as part of a scheme begun in 1964 to strengthen agricultural education at national level. Indian agricultural scientists have performed exceedingly well, both in India and abroad. The Human Resource Development (HRD) Programme initiated since early 1960's based on land gran pattern, have received wide acclaim. There are currently 28 SAUs four ICAR institutions with deemed University status and one Central Agricultural University. The SAUs have 22,500 sanctioned scientific staff position and 161 colleges with an undergraduate and postgraduate admission capacity of 9650 and 5850 students respectively thus having a total enrollment of about 44500 students. Besides, about 4200 scientists are working exclusively in the ICAR institutes. Today, Indian NARS is the second largest System in the WORLD. Thanks to the planners and excellent support by various State Government and the Central Government that we could develop an infrastructure and a system of which nation can be proud of.

PRESENT CONCERNS

There is a wide spread consensus that the quality of graduates in various disciplines of agricultural science is falling and that there is an urgent need for the SAUs to accord priority towards upgrading the quality and standards of higher agricultural education. Major problems facing the SAUs are academic inbreeding, internal grading lowering of qualifying standards and decline in teaching ability. Students in most SAUs come from the same state, which

tends to perpetuate parochialism. There are no incentives to excel in teaching. Teaching methods and notes memorization in learning are over-emphasized. Clear links between course work skills which would enable them to assess new changing situations and to make rational judgements about options needs special attention.

University libraries are poorly equipped and are rarely integrated to the learning/teaching experience. Libraries largely lack computer and telecommunication facilities resulting into lack of access to global information net works. Course loads are generally heavy, thereby leaving little time to cultivate general inquiry skills, class discussion or intellectual debate outside classroom. Physical facilities such as lecture rooms and laboratories at times are overcrowded, uncomfortable, poorly lit and ill-maintained, inadequately cooled/heated. All these, in general, are obviously poor environments for learning by required standards. Teaching laboratories are old, out-of date and scarcely equipped, and computing facilities are practically non-existent. Hostel, recreation, medical and dining facilities are also far from satisfactory. Financial support too has bee inadequate.

There is also little emphasis in the present curicula on preparing our undergraduates for careers in agriculture of agri-business outside government service. Also there is no readily available mechanism in the present HRD system to remedy this mismatch private employers often have to invest significantly make up for existing weaknesses of the educational system. Also there exists a imbalance relating to intake and human resource needs. Advance planning and student placement counseling is often lacking in most of the institutions, which need to be addressed on priority.

HUMAN RESOURCES DEVELOPMENT AND MANAGEMENT

There is an incredible variation in human capability of the physical and mental attitudes, equally incredible is the degree to which an individual or group can evolve or degenerate based on the effort put in the process. This simply underscores the need to develop the human resource irrespective of the area of activity which in fact is a management tool equally applicable in Agriculture Science as it is in other disciplines. All management tools are neutral and can

be applied equally to business, industry, agriculture education and even to a considerable extent to individual and domestic needs with profitable results. Only the methodology and the technique of their application and the degree of applicability would change. Science because of the suitability of its nature requires considerable sophistication and refinement for these process to yield tangible results. For that very reason it requires a vision and a well directed mission to this charter for desired development and a fruitful change.

Actually, human resource development is the process of helping people in a continuous and planned way to acquire new competence and to sharpen and fine tune the existing ones. As the organisation grown in complexity and variety, the general run of the employees need opportunities and encouragement to catch up with the pace of change. If there is no congruity in the organizational development and human resource development, the synergy of the system will be adversely affected and the productivity in all probability would suffer.

The change due, either, to the stimulus of external environment or to the internal pressure, can not remain static in any dynamic system. The only alternative to change is decay. Any vibrant forward looking organisation sensitive to forces of change impacting on it has to have a set of integrated and interrelated initiatives in HRD. The problem acquires complexity because it is not only acquisition of simple skills but also knowledge, attitudes and more important of values. These together constitute the work culture of the organisation and the nation.

One important aspect of the relationship between human resource development and the management of change is that the former must precede the later so that the qualified manpower is ready to develop and absorb the new techniques and technologies that are likely to be developed/introduced to avoid time lags. This requires foresight on part of the management to anticipate the degree and magnitude of the change either planned or spontaneous.

HRD is a necessary concomitant of all dynamic systems for stability and attaining equilibrium with external forces. Without HRD, organizations can't grow. Any diversification or an effort at renewal should be preceded by matching HRD initiative. All improvements in systems services have to be a component

of HRD. If the organisation wishes to assume leadership role it has no option but to launch comprehensive HRD programmes to match with these efforts.

An ideal HRD systems would be an integrated system with main objective of building a strong team involving the entire work force, as the organisation's foundation and most precious asset and to develop interdisciplinary work culture for mutual benefit. It must aim at :

An ideal HRD systems would be an integrated system with main objective of building a strong team involving the entire work force, as the organisation's foundation and most precious asset and to develop interdisciplinary work culture for mutual benefit. It must aim at :

i) It achieving continuous development.

ii) Improving communication and coordination, and

iii) Creating motivation and job satisfaction and thereby ultimately contributing to increased production, economic benefit and cleaner environment.

Keeping in view the above considerations and the interest shown by the World Bank, AHRD Project in agriculture is launched from July, 1995 with an assistance of US$74.9m from the Bank. The project aims at :

i) Setting UP a manpower planning unit at the ICAR Head quarters.

ii) Strengthening infrastructure for teaching, library and communication network.

iii) Training of teachers in India and abroad and

iv) Utilization of professional competence and inter-institutional mobility of scientists/teachers.

These objectives are to be realized in a programme mode with four essential components viz., strengthening of Council's education division, SAUs, Human Resource Studies and Man power Assessment. The project covers deemed Universities of ICAR and three states and Andhra Pradesh, Tamil Nadu, and Haryana in the first phase. Simultaneously, the process of reorganization of Education Division of the Council and formulation of Annual Action Plan have been initiated.

Strategic planning need to be introduced for an efficient and effective performance over a long-term perspective. The strengths, weakness, opportunities, and threats (SWOT) for an effective performance need to be assessed and structural reforms introduced.

Human resource management (HRM) functions such as recruitment and selection, staffing, performance assessment and appraisal, reward and control systems, and training and development need to be designed, implemented, and evaluated.

Future Strategy for HRD

To ensure quality education and uniform standards, establishment of an accreditation boards is considered ideal. Council is taking initiatives in this direction. Similarly, revision of course curriculum befitting national requirements, are undertaken to ensure that the education imparted is fruitfully utilized.

To meet the changing needs after foundation courses, excellence in specified areas are imperative. This would call for long term perspective plan based on our requirements in the changing scenario. To be effective and relevant one need to foresee the requirements and plan for human resources well in advance. In this endeavor, a forward-looking group needs to be set up for monitoring the changes and to suggest commensurate adjustments needed.

Inbreeding is a serious impediment in educational institutions. Hence, it would be appropriate to ensure at least 15% seats in each of the State Agricultural Universities to out side students at under graduate level. Similarly, at Post-Graduate level about 25% seats for outside students need to be fixed. This would not only eliminate the ill effects of the inbreeding but would also inculcate sharing of experiences and utilisation of excess institutional capabilities. With the high cost involved/states cannot be thought of. Hence, in the frontier areas of science limited institutions can impart the job with greater efficiency and economy.

It would be appropriate to consider an all India entrance test at under-graduate and post-graduate levels for the students to be admitted in universities

from outside states. This would bring much need improvement, as well as the quality of education.

In recruitment it would be desirable if eligibility tests are conducted regularly and those who qualify in the tests are only considered for recruitment in various institutions. This would bring much needed improvement in environment as well as quality of education. This would also be taken care of inbreeding to a great extent. At the same time, it would bring efficiency in work culture. It would also help in raising the academic standards of various institutions to be competitive nationally.

Sabbatical level should be viewed not only as an opportunity for an individual to perform a job of his choice but also in developing institutions by judiciously utilizing the expertise available elsewhere. In fact, we must devise a system through which we can utilize the expertise of non-resident Indian and foreigners as well in developing our institution all capabilities through their sabbatical leave provisions. It is believed that expenditure likely to be incurred on such a venture would far more rewarding with multiplying effects.

Modernization of Libraries with CD-ROMS facilities would help the institutional capabilities tremendously to keep pace with the changing scenario. In fact, a few centralized facilities with effective tie-up can cut short the expenditure by avoiding duplication of efforts. Hooking of such libraries with each of our institutions in the NARS would enhance our research, teaching and training capabilities tremendously. Through ARIS we are venturing to ensure these facilities in the offing.

The human resource in agriculture sector is so vast that with meagre financial resources it is not possible to have formal education systems turns out graduates whoa re not well equipped to take agriculture as a vocation and depend mainly on governmental jobs. In order to relieve this pressure and also use agricultural human resource as an instrument of agricultural transformation, is important to introduce vocational resource-cum-training programmes in new emerging areas and provide intensive training in methodologies and technologies such that the trained man power is able to find self occupation at village/ community level. To provide jobs to the millions to earn their livelihood. Short-term remedial courses linked with the "on farm and" : off-farm employment to a vast majority of the rural masses need to be organised. Among many areas,

technology bases agricultural input generation/production, post harvest operations and value addition merit consideration.

With the economic liberalization in post-GATT era, it is important to have commercialisation of agriculture. We need to capitalize on our strengths specially in relation to exporting agricultural commodities. Our training and educational programmes must gear in developing human resource taking advantage of the new technology generated in frontier areas of science including biotechnology, Agri-business, Resource conservation and other innovative changes so that our farmers are able to realize higher productivity, profitability, sustainability and also a greater share of export market. Our programmes must aim at the development of value added products from agricultural produce.

To be competitive and relevant, locally, regionally and globally, we need to have cutting edge technologies to attain and sustain advantages. This would call for reorientation of basic and strategic research and academic courses practically in almost all disciplines at the higher learning stage including Environmental Sciences Land Resource Management and Planning, Geographic information System, Agricultural Management, Marketing, Trade and Informatics.

Information is knowledge and knowledge is an essential and basic capital. There is information explosion around the globe and our farmers and scientists have to keep pace with these developments. This is possible only if our institutions are connected to international networking and have access to international data bases and information on emerging technologies. ICAR has undertaken an elaborate net-working plan involving NIC and Internet and connecting ICAR Institutes, SAU etc. with the objective of dissemination of information and sharing of knowledge. Knowledge is important but understanding is far more important. Job-oriented education is a priority but excellence promotion in frontier areas can not be sidelined. Development of school of thoughts, establishment of centres of excellence, recognition to meritorious teachers imparting higher education etc. is receiving attention of the council. We have recently instituted best teacher's award as well as best institution award. We believe such token catalytic indicators would pave the way for wider recognition as well as incentive and reward systems for much-needed excellence in education. In our perception, other programmes may wait but not the human resource development.

FACULTY UPGRADATION AND HUMAN RESOURCE DEVELOPMENT

*Padmasri (Dr.) I.V. SUBBA RAO**

AGRICULTURAL EDUCATION IN RETROSPECT

Tracing back the history of Agricultural Education in the country, five agricultural colleges were established as early as 1902-1907 which were imparting only diploma courses and they were subsequently upgraded to offer degree programmes in Agriculture. With the establishment of the imperial Council of Agricultural Research in the year 1929, as a sequel to the directives given by the Royal Commission on Agriculture, Agricultural Education and Research started to gain increasing attention. Post-graduate Courses in the faculties of Agriculture and Veterinary Sciences were unknown till 1930. The imperial (now Indian) Agricultural Research Institute and the imperial (now Indian) Veterinary Research Institute were established primarily for conducting research and for imparting Post-graduate training in the respective disciplines. By the year 1947, there were 17 institutions offering basic first degree programme in agriculture with an enrolment of 1500.

Ever since the concept of State Agricultural Universities has been adopted in India, based on the Land Grant College pattern of the United States of America, the complexion of Agricultural education and training has undergone perceptible change in the country. The need for reforming agricultural education was voiced unequivocally by the Radhakrishnan Committee on educational reforms as early as in the year 1949, who recommended establishment of rural Universities in the country. The foundation for reorienting agricultural education was laid in the year 1960 with the establishment of the first agricultural University at Pantnagar in Uttar Pradesh. Subsequently, over the years, each State has established at least one Agricultural University by now; and some states such as Maharashtra, Uttar Pradesh, Bihar, Karnataka, Tamil Nadu, West Bengal and Madhya Pradesh have more than one State Agricultural University (SAU).

The constitution of the Joint Indo-American Team in the year 1954 by the Government of India to study the Agricultural Education system in the

* Vice Chancellor, Acharya N.G. Ranga Agricultural University, Hyderabad

country paved way for establishment of State Agricultural Universities. The Indo-American Joint Team, while endorsing the views of the University Education Commission of 1947, also emphasized the need to establish rural Universities. The constitution of Second Joint Indo-American Team in 1960 and the Agricultural Research Review Team in 1963 and their recommendations resulted in the reorganization of the Indian Council of Agricultural Research and the recommendations of the National Commission on Education in 1964 helped to establish the Agricultural Universities in each state. Currently, the country has a network of 29 SAUs and four Deemed Universities imparting education in Agriculture, Veterinary Science, Dairy Science. Fisheries, Home Science and Women Studies both at UG and PG levels. The current enrolment (1995-96) for UG and PG courses in Agriculture is 67,990 in the country constituting 1.1 per cent of the total enrolment. In the Veterinary Sciences, the total enrolment is 16.201 representing a mere 0.3 per cent of the total enrolment. As compared to these the enrolment in other professional courses such as Medicine and Engineering stood at 3.4 and 4.9 per cent of the total enrolment respectively.

FACULTY UPGRADATION IN SAUs

Faculty upgradation in SAUs, as compared to the other Universities, poses specific problems because, the faculty is expected to perform a multifunctional role. In addition to teaching, the faculty of the SAUs are expected to function as researchers and also involve in transfer of technology programmes to the end users, i.e. farmers. The faculty is also expected o perform functions such as managing agricultural and dairy farms, veterinary clinics, workshops, maintain forest and horticultural plantations, supervise hostels, produce and sell critical inputs such as seeds, planting materials, biofertilizers, technical publications etc. It is not uncommon to find a 'teacher in a SAU performing all or several of these functions simultaneously. Even otherwise, they are called upon to perform these functions one time or the other in their careers. Therefore, the mechanism and procedures of faculty upgradation are not as simple as those obtainable in traditional universities where the faculty mostly is involved in teaching and to a limited extent in conducting research through post-graduate students. More often, the problem of faculty upgradation when viewed with the needs of a traditional university system is too simplistic and does not meet the requirements of SAUs. There is therefore, a need to evolve appropriate procedures for faculty upgradation for SAUs.

STAFFING OF FACULTIES IN SAUs

There is no denying the fact that the human resources is vital for the effective functioning of any organization. Inspite of this, the human asset never finds a place in the balance sheet as a distinct entity of any organization. A great deal of effort and expenditure are needed for recruitment, selection and training of faculty. It is for this reason that some nenowned management experts such as Rensis Likert emphasized the need to account for valuable human assets and referred to this process as human resource accounting (Rensis Likert, The Human Organization : Its Management and value; Mc.Graw – Hill Book Co., 1967.Chap.9). There is, however, a conflict among management experts themselves particularly among proponents of human resource accounting and specialists in finance who have to develop a system for measuring human assets so as to account for them. Nevertheless what is stressed here is that human resource is a crucial asset and staffing is an important aspect of management of educational institutions. In fact, human resource is such an important aspect of institutional function and development that may well determine the success or failure of an organization.

The managerial function of staffing is defined as recruiting and retaining the faculty positions in an organization through critical appraisal of faculty requirements, inventory of available human resource, selection, placement, promotion, appraising, career planning, compensating, training or otherwise upgrading and developing the capabilities of fresh recruits or faculty already in position, to accomplish their assigned tasks effectively with a high degree of efficiency and confidence.

TRANING NEEDS FOR FACULTY UPGRADATION

In any academic institution, before deciding on specific training and development programmes, the needs for such a recourse must be carefully considered. The objectives of the organization, availability of trained personnel and the need to train the untrained are vital aspects which require consideration. Faculty upgradation and training needs must be based on a critical analysis and appraisal of requirements which are evolved from a comparison of actual performance and behaviour. On the basis of this simple analysis, training needs and methods for overcoming the deficiencies in actual performance and behaviour of the faculty are identified.

A similar process of training needs for faculty upgradation has to be applied for identification of training needs of the faculty member for the 'Next Job' on the ladder. For instance, a faculty member who has worked mainly in teaching as Assistant Professor may have to shoulder the responsibilities of managing a department independently in a new college. An Associate Professor may be offered the assignment of a Senior Scientist or Associate Director which calls for kindling his managerial skills. This systematic approach to faculty upgradation preparing the personnel for new assignments and challenges is a more professional approach than pushing a person into a new work environment without proper training and facilities for upgradation of his/her professional skills and managerial capabilities. Very often we come across this avoidable situation in SAUs where a faculty member who is not professionally well trained is pushed into a situation wherein he is expected to lead a research project or an academic programme in which neither he is proficient nor trained. Several such programmes suffer due to lack of academic leadership and professionalism.

Very progressive organizations think far ahead in identifying their training and development needs. These organizations look for beyond the horizon and prepare for a distant future. This calls for a forecast of competencies demanded by emerging scenario in the field of science and technology. This is a very important aspect which should receive due recognition in SAUs.

FACULTY UPGRADATION vis-vis EMERGING TRENDS

Perhaps the most comprehensive recommendations for faculty upgradation through induction (Pre-service) and in-service training were provided by the National Commission on Agriculture appointed by the Government of India. In their report on Research, Education and Extension published in 1976 (Part XI P 156) the operational aspects of pre-service and in-service training have been outlined in detail. The major recommendations of the Commission are :

- The professional training of the job aspirants in SAUs which they receive in academic institutions before induction into service and the preservice or induction training should be complementary. Both these types of training should be flexible and be open to adjustments as the situation demands.
- The in-service training should enable the faculty to update their knowledge effectively and the training should be imparted after the functionaries are in position for a minimum of 3 to 4 years.

As early as in 1928, the Royal Commission on Agriculture deliberated extensively on in-service training of teachers in their recommendations for improving agricultural education in the country. Later, the Second Joint indo-American Team (1960) and Education Commission (1964-66), both appointed by the Government of India have recommended the organization of In-service Training for teachers by way of Summer Institutes and specially designed courses for specific target groups.

The rapid strides in science and technology underscore the need for professional in-service training of the faculty.

INDUCTION TRAINING-NEEDS AND EXPECTATIONS

The induction training which should become an integral component of SAU, has to aim at reorienting the freshly appointed faculty to the organization structure, mandate and functions of SAUs and the expectation of farmers, line departments, industries and commercial organizations from the University. All fresh appointees, whether they are placed in research, teaching or extension should be trained in pedagogy and extension methods. This may enable them to perform their tasks as teachers or extension workers much better. Knowledge base of a fresh recruit to a teaching, research or extension, profession of the University has to be widened to be in tune with the needs of the organization and aspirations of the end users. The Induction Training should, therefore, include at least four separate modules which can be.

- Pedagogy – Including effective teaching methods and use of Audiovisual Aids.
- Recent Advances in Agriculture, Horticulture, Animal Husbandry, Agril., Engineering Dairying etc. and recent developments in the candidate Specialization.
- Agriculture, Animal Husbandry and Gender Issues, Status of development and future strategies both in India and the State.
- Filing, file movement, administrative set up and general administration and personnel management.
- Accounting procedures in vogue and the Administrative and Accounting mechanisms which the different SAUs have been adopting.

In a few universities eventhough a system of pre-induction training is existing, the training modules have not been prepared appropriately. There is, therefore, a reason to consider whether it is appropriate and logistically preferable to entrust this responsibility of pre-induction training to the fresh recruits to faculty positions of SAUs to organizations which have expertise in these fields.

The minimum period of training could be of 12 weeks duration and can even be extended to 16 to 20 weeks based on the needs and the requirements of the recruitees to the faculty positions.

INSERVICE TRAINING

As has been pointed out earlier, the inservice training to faculty can be offered only 3 to 4 or 5 years after their induction into the SAUs service. Such trainings have already been formalized through organization of summer and winter institutes schools. Organizations which look ahead, identifies their training needs rather carefully to prepare their personnel for the next job. This may call for a complete reorientation of the employees knowledge base and skills to meet the future requirements and challenges. A careful introspection by the organization so as to enable it to forecast what new competencies are required by the changing scenario in sciences and technology development is essential. For example, the current stress on production oriented agriculture and animal husbandry practices may give way to ecologically sustainable protection (of resources) oriented practices. Fossil energy use may become a practice of the past. Information technology is witnessing an unparalleled progress and development. Traditional meteorological methods are already obsolete giving way to satellite based weather forecasting. Everywhere computers are replacing paper based data acquisition, retrieval and analysis procedures. Post harvest processing an storage operations are becoming high-tech. The need for exports of agricultural, animal husbandry products is being felt increasingly. The Geographic Information Systems are becoming handy for several applications in agricultural and allied areas of activity. Biotechnology is now the pass word in biological sciences including animal sciences. Rapid progress is being witnessed in the fields of veterinary sciences and animal sciences including fisheries. Qualifications of the faculty alone do not always meet the requirements of the organization or its future needs. If academic excellence has to be pursued, inservice training becomes an essential component of faculty upgradation and

human resource development. Yet, another aspect which needs consideration is the selection of faculty for inservice training and a follow-up of the extent to which the training has helped in serving the interests of the organization. There is a need for greater introspection on these issues. Those who are committed to serve the interests of the organization are innovative and capable of putting into practice the knowledge and skills acquired through inservice training, should not be left out in preference to others who have no aptitude and lack initiative, commitment and creativity.

IN-SERVICE TRAINING FOR MANAGERIAL POSITIONS

As the faculty goes up the ladder by virtue of their service or are required by the organization to shoulder managerial responsibilities, the need to train faculty as managers becomes obvious. They have to manage resources – physical, financial and human. This calls for a high degree of professionalism and creativity. Often it is assumed that most people are static, non-creative and do not have the capacity to develop new ideas. If an appropriate and encouraging environment is provided, most people can exhibit creativity which of-course may vary. The cardinal requirement of managers is that they should be capable of independent judgment, be innovative, confident and enthuse others by their leadership qualities. It is beyond doubt that all progressive looking organizations are thriving because of creative individuals and managers. Unlike in the traditional university systems, in the SAUs it is imperative that managers are trained to assume responsibilities which have multifunctional and multi-dimensional tasks. Opinions differ as to what exactly constitutes a 'Managerial job'. The requirements of managerial tasks have to be viewed from different perspectives. One school of thought, known as the "Great Man School" documented the behavioural characters of highly successful managers, without providing the reasons for their success as managers. Economists have a tendency to view managers with coloured glasses and focus on entrepreneurial behaviours of good managers, the emphasis being on profit maximization, risk taking and innovation. A group of behavioural scientists view leadership qualities as essential for managerial tasks. However, a study of different view points about the requirements of good managers ultimately crystallizes to five functions viz., planning, organizational ability, human resource development, leadership and overall control.

OPERATIONALIZATION OF FACULTY UPGRADATION (FU)IN SAUs

Current Status

Some specific issues which have to be considered for enhancing the benefits of faculty upgradation in SAUs are discussed below:

The aspect of faculty upgradation suffers from many ills in most SAUs. There is no proper planning in place for faculty upgradation. Budgetary allocation is either non-existent or if available, very meager. The responsibility for faculty upgradation is shared by none. It is no-body's baby. In most SAUs grant of sabbatical leave is viewed with suspicion. Faculty exchange from one SAU to another is non-existing. The faculty desire to complete their doctoral studies in their own universities and there are no takers for the offer of grants by some SAUs to encourage their faculty to pursue higher studies in identified deficiency areas. There is a clamour for reservation of seats for inservice candidates and for foreign training programmes. Inbreeding is eating away at the base of the academic structure. Low motivation and morale, one has to admit frankly, is creeping in. quality of research, teaching and other academic activities is gradually declining. Very few among the faculty are impressed with the advances in sciences and technology, particularly information technology, computer based literacy. Wide vistas have opened up due to the recent developments in information technology and computer based learning. How many among the faculty are eager to prepare themselves for the future as we enter the 21st century? I would not like to hazard an opinion as it may be unpalatable. Unpalatable as it may be, we cannot run away from truth. If we do, the clientele of the SAUs consisting of future generations of students, farmers and entrepreneurs will not oblige to pardon us. The time is ripe to do some soul searching. Procrastination any further, breeds inefficiency, inbreeding, low motivation and morale which are eating at the vitals of the academic structure of SAUs. I would like to put forward some points for action.

FACULTY UPGRADATION – FUTURE TASKS

The existing mechanisms for faculty upgradation in several SAUs are grossly inadequate. The overall system which is in place (if at all there is a system), procedures and budgetary may not be sufficient. A separate system for faculty upgradation being non-existing at the institution level, the procedures

adopted are, therefore, haphazard. Several universities are generous in deputing their faculty to conferences, seminars, summer schools, training programmes and such other events. These need to be systematized.

Sabbatical assignments and faculty exchange are unknown phenomenon in Indian Universities including SAUs. A majority of the faculty members are not keen on utilizing this facility, perhaps, because of temporary dislocation of settled familial links. There should be a way out to promote movement of faculty from one university to another. The same facility when offered for foreign assignments is grabbed but not when it involves moving to another SAU or institution next door. One of the reasons also may be that the recipient institution may not provide willingly all the required facilities for work and living of the sponsored candidates. This aspect needs serious consideration.

Lack of motivation and accountability, depressed morale, inadequacy of facilities, the existing promotion policies have all been adding up to the malaise of inbreeding and faculty degradation.

Study leave for prosecuting higher studies is a boon for faculty upgadation. This programme has been utilized with varying degrees of success in SAUs. A comparable scheme known as the Faculty improvement Programme (FIP) is in place in traditional Universities. The only and perhaps in the critical difference being that this is offered to the faculty if the higher studies are prosecuted in any institution other than the host institution university. In the absence of this regulatory rider in the SAUs, most of the faculty members opt to prosecute their higher studies in their own universities. They do not like to move even to other campuses within the universities. Eventhough this scheme has succeeded in satisfying the individual's academic aspirations, it has led to serious inbreeding. At the Acharya N.G.Ranga Agricultural University, there is yet another scheme in place for faculty upgradation, where the faculty members are encouraged to prosecute higher studies in other SAUs in specific identified deficiency areas. But this offer is not being utilized to the fullest by the faculty whose preference is for facilities to study in the same University, even at the cost of inbreeding. In the light of this realistic situation the issue for consideration is faculty upgradation for the benefit of whom – the institution or the individual beneficiary. Ways and means have to be found to ensure that faculty upgradation benefits the institution first and the individual next. A lot of distortions have

taken place in the existing FU system ultimately leading to help personal preferences and comforts and the dangerous portents of inbreeding and ill effects. This malady is more than evident in most SAUs.

Misuse of several Faculty Improvement and Faculty upgradation programmes initiated by SAUs is yet another aspect which requires serious consideration. Study leave for completing the course work with full salary benefit and opportunities to pursue research work for Ph.D. are being offered for the benefit of in-service faculty members of SAUs. Several faculty members who are selected to prosecute studies under this programme complete the course work and do not complete their thesis research work. Some sort of mandatory check has o be introduced to prevent this indiscipline. This is perhaps a common phenomenon in several SAUs which is discrediting the system. It is, therefore, preferable to select candidates not merely based on seniority but have aptitude for research and his record of contributions as a teacher/research worker. There can even be a screening test for the purpose. A periodic review of thesis research work, perhaps, is also necessary which largely depends on the major advisor and the advisory committee of the student. It should be made obligatory on the part of the candidate that he should complete his research work satisfactorily and submit the thesis within reasonable time limit.

The existing situation in most SAUs calls for serious introspection. Faculty upgradation not only involves supporting the faculty to acquire higher degrees. It involves deputation to several other training programmes, seminars, symposia, summer and winter institutes, foreign assignments etc. Here again it should not be a one-way traffic. The institutions expectations are that the faculty itself should also strive for academic upgradation. Such self upgradation occurs when the faculty has the confidence to propose research projects, new academic programmes, conduct training programmes and summer institutes, organize seminars and become academically competent to get recognized by the scientific fraternity. Faculty upgradation therefore should promote these activities too. If a department or an individual faculty member by virtue of his or her hard work and contributions can get any of the above credits or if a department has done sufficient enough to get recognized as an Advanced Centre, the requirements for faculty upgradation can be considered as more than served. To ensure success of faculty upgradation tasks, the SAUs may consider the following which may be essential.

- Establish complete data base of all the faculty members including teachers, researchers, extension workers, technical and para technical personnel.
- Identify appropriate individuals for deputation to various programmes including higher studies.
- Monitor the contributions of the individual to the institution after his return from faculty upgradation activity.
- Encourage the personnel to propose independent research projects and promote creation of teams of excellence.
- Inculcate sense of multidisciplinary approach for fostering academic activities.
- Develop long-range, time-bound faculty development plans and annual work plan schedules which should be specific, incorporating the nature of responsibility and sharing, academic goals, professional development objectives and other initiatives proposed during the year.
- Make specific budgetary provision for faculty improvement activities.
- Establish a cell for faculty upgradation to function with one of the university officers.
- Establish a fool-proof monitoring and evaluation system.

Some specific requirements which need urgent attention for faculty upgradation are :

- To make the faculty computer literate
- Enable all faculty members to access information world wide through internet
- Improve the spoken and writing skills of the faculty.
- Those involved in teaching functions should improve communication skills and use the emerging developments in information technology. They should be proficient in curriculum design and development. Researchers on the other hand, in addition to being proficient on the above aspects, should have knowledge of computer software, plan design and analyse experimental data, project management and reporting skills, data acquisition through personal computers etc.

The SAUs may be required to seriously consider establishment of a faculty upgradation and human resource development cell to attend to the needs outlined above.

PERFORMANCE APPRAISAL

Performance appraisal, monitoring, evaluation and mid-course correction initiatives are viewed with suspicion by a majority of the faculty as a tool or a weapon to control recalcitrancy. It is unfortunate that in none of the SAUs or other institutions this aspect has been given the importance which it deserves. The casual attitude towards performance appraisal and accountability has bred indiscipline. The crux of the matter when comparisons are often attempted between developed and developing world is that accountability in public service is conspicuous by its absence. It may not be out of place if I observe that most institutions are ticking because of the toil, tenacity and dedication of a few individuals whereas the rest pack their bags after four. Even during the limited 6 to 61/2 office hours much time is lost in talks, endless gossips, discussions and for coffeee breaks. Accountability is the key to progress of institutions which is reflected ultimately as the power and progress of nations.

INFRASTRUCTUE FOR FACULTY UPGRADATION

The SAU's should seriously consider the need to establish a Faculty upgradation and HRD Cell. Resource allocations should be judicious with larger investments for improving basic technological infrastructure. The Library facilities need to be modernised as an immediate need. This will enable access to information and knowledge is power.

HUMAN RESOURCE DEVELOPMENT

Faculty upgradation and human resource development (HRD) are complementary to each other. In this brief discussion, aspects related to HRD activities of SAU's alone are attempted, but not the whole gamut of human resource development activities on a larger perspective such as human resource needs of the country in agriculture and allied fields of activity.

The human resource development programmes are expected to meet the institutions requirement for academically well qualified and motivated people to achieve the mandates of the organization in the short-term and be prepared to face the challenges of the future dictated by innovations, growth and

developments in science and technology. The HRD initiatives of any organization should necessarily include career management programmes, which should be integrated with performance appraisals and reward components. In a nutshell the HRD programmes must ensure that the organization has the right people it needs with the requisite skills to achieve its strategic objectives and goals.

The approaches essential for HRD are :

- The identification of needed skills and implementation of appropriate training programmes to meet the organizations' strategic requirements.
- Follow-up of the effectiveness of HRD initiatives adopted by the organization.

The basic requirement of HRD programme is that the organization should have a strategic plan which can be translated into human resource action plan. The HRD plans define requirements both in terms of numbers and quality and include the additional skills and expertise which the organization requires because of developments in science and technology, as also the changing economic scenario of the state in particular.

The Human Resource Development activities include two major components (1) Training and (11) Development.

Training : The training component bridges the gap between what a person can do and what is expected of him to do by the organization. Training, therefore, builds on this foundation by enhancing skills and knowledge required to improve performance in the present job or develop capabilities for the future requirement.

Development : Development is modification of behaviour through experience. It provides for people to do well in existing jobs and prepare them for greater responsibilities for the future. The development of human resource builds organizational strengths, helps overcome weaknesses and ensure that the organization has the right expertise to do a right job.

Human Resource Development : operates at all levels of human activity in an organization. The development activity needs to be programmed by an organization in such a way that appropriate training is provided at the right time and also broaden employees responsibilities, expertise, skills and abilities by entrusting them with new tasks and responsibilities. At a higher level,

management development programmes operate to identify talent, improve skills, widen expertise and help people to assume greater responsibilities.

Yet another phenomenon peculiar to the realm of higher education in India is the discipline oriented 'caste' system. For example, a particular discipline does not like the participation of any other discipline, even if a research project demands an inter-disciplinary approach to tackle a specific problem. This is one of the serious bottlenecks coming in the way of human resource development. The professional societies have an important role to play in inculcating the concepts of inter-disciplinary research and technology development because the strict boundaries between various disciplines no longer exists and even widely varying disciplines such as Botary and Physics, Biology and Information Technology have overlapped.

The spin-offs from HRD activities are many. More importantly it provides the organization with human resource having the requisite skills, expertise and managerial capabilities to achieve its strategic objectives. The initiatives reduce significantly the learning time of fresh recruits and enable them to reach the performance levels of experienced and effective workers as quickly and economically as possible. The efficiency and effectiveness of existing employees are also improved. The HRD activities will assist people to develop their intrinsic strengths and capabilities so as to enable to organization to meet its future human resource requirements. The HRD initiatives have to be regarded as an investment and if it is properly allocated and utilized, the returns are worthwhile and rewarding.

The State Agricultural Universities have the major responsibility to prepare the country to enter the 21st century. The country's economy being largely dependent on Agriculture, the manpower in the SAUs should change in consonance with the rapid strides in science and technology related to agriculture and allied sciences. The human resource available in the SAU's will determine the quality of education imparted to the students who have to be tuned to understand the current situation and future trends and realities. If this is not accomplished, inspite of large investments in infrastructure, extension support and scientific institutions, the country's research, extension and Agri business sector will continue to suffer.

CONCLUSIONS

Human Resource Development in State Agricultural Universities in India is of enormous proportions. The 28 SAU's, four deemed universities and the one Central Agricultural University have a sanctioned scientific staff strength of over 22,500. The universities put together have more than 160 constituent colleges with an intake capacity of 9700 and 5900 students in UG and PG programmes respectively. The total enrolment works out to about 45,000 students. In addition, the ICAR institutions employ 4200 scientists. Thus, the Indian Agricultural Education and Research System is one of the largest in the world. A casual attitude towards Human Resource Development and non-allocation of adequate budgetary support are preventing initiation of appropriate HRD programme. Compared to the situation existing a decade ago, the rapid strides of information technology offers unlimited scope for gaining access to information. It is now possible to access information on any aspect of science and technology without moving out of the confines of an institution. This unlimited opportunity has to be exploited by making needed facilities like a computer, E-mail or Internet facility accessible to the faculty in SAU's and Scientist in research institutions. They should be coerced to be computer literate and capable of utilizing information technology and office automation facilities.

The opportunities for continuing education are unlimited because of the rapid strides in information technology. This should, however, be not to the complete exclusion of interpersonal interaction and academic exchange programme as they are irreplaceable. They can be complementary to each other.

The country has to march forward utilization the opportunities thrown open by a liberalized economy. The country's relative strengths and strategic advantages have to be fully exploited. The human resource in SAU's and research establishments have to be exposed to the emerging opportunities offered by newer technologies and in frontier areas of science. The future stress in HRD initiatives can be oriented towards Biotechnology, Remote Sensing, Information Technology, Agri business, Ecological Agriculture Climate change and Applied Electronics. The emphasis should be on blending traditional knowledge and frontier technologies so as to enable the personal working in SAUs and research institutions to render assistance to Indian farmers to increase

productivity, enhance profitability and at the same time ensure sustainability. The faculty in SAUs and ICAR Institutions should be trained to appreciate the needs and nuances of domestic and export markets and apply technological innovations to make agriculture and allied activities more profitable and sustainable.

The overall scenario of higher education in the country suffers from several weaknesses. There is a phenomenal increase in demand for opportunities for higher education, lack of academic standards, outdated curriculum, wide disparities in academic standards and improper management of higher education. To make higher education responsive to emerging challenges and needs of the country, the faculty have to interact with industry and trade. They also should be aware of the needs of the development departments o the Government, non-Governmental and quasi-Governmental organizations.

The entry of mediocrity in institutions of higher learning has tobe prevented as it sets in a chain reaction leading ultimately to fall in academic standards and the resultant indiscipline among the faculty, staff and students. A recent development in the field of resource utilization and human resource development is to identify core competencies and take steps to hamess these competencies to the fullest advantage of the organization. This approach prevents wasting of the resources on areas where the organization does not have comparative advantages and competencies. Every SAU has specific comparative advantages which they should strive to promote. In this endeavour human resource development assumes a lot of significance. Human resource in areas where the organization has core competency need to be developed, which make the organization effective in serving the needs of a region or the State.

Faculty upgradation and Human Resource Development are therefoe very important in the changing scenario of technological development and scientific progress. It is all the more relevant for the SAUs take specific initiatives for Faculty Upgradation and HRD as these institutions serve the needs of the farmers, up and down steam industries, commercial organization, line departments of Government and NGOs. The SAU's are vital links in the progress of the Nation.

AGRICULTURAL MANPOWER PLANNING IN INDIA-AN OVERVIEW

*Dr. S.S. MAGAR**

India is the seventh largest country in the world in respect of area and second in respect of population. Since Independence India has made a rapid stride in agricultural production, and attained self-sufficiency. The progress in respect of agriculture research, education and extension is very well reflected in terms of production and productivity of various crops and educational, social and economical development in rural area. The food grain production has increased almost four times from about 50 MT in 1950-51 to 197 MT in 1996-97. Inspite of significant contribution made in agriculture development there is always fear of shortage of food grain production due to continuous increase in the population. In India the land to man ratio is already around 0.140 ha per person and when population would be around 1.5 billion by the middle of next century, the availability of land would reduce to meagre 0.05 ha per person i.e. 500 m2 capita. With the present level of food intake we shall have to produce an average of 4000 kg of foodgrains per ha, which at present is only 1500 kg/ha.

No doubt such a commendable progress could only be attributed to the sound planning in research and effective adoption of research achievements through the effective new work of agricultural extension and development departments of Central and State Governments. However, despite of our good progress, there is a great cause to meet out the increasing food demand with human population in the country. Indian population is likely to touch one billion more by the end of the century which demands about 230 MT of food grains, 9 Mt of edible oil, 13 million bales of cotton. The very basic question is whether our research base can meet the anticipated requirements for which systematic planning of available manpower coupled with natural resources in the country would be a key not only meeting the newer challenges that our agriculture faces today but would enter the second green revolution phase. In the country sound manpower planning is

* Director of Instructions and Dean, Faculty of Agriculture, MPKV, Rahuri, Maharastra.

required to provide in agriculture sector to achieve the future target. At present there is no much relation between need and supply of agriculture manpower. It required more than the usual mechanisms of the market to strike a balance between supply and demand. However, it would take along time since the size and contents of professional education should necessarily confirm to the development needs over a period of time and since the gestation period of production of scientific manpower is relatively long. There has to be calculated margin of time between present educational planning and future development.

In effective manpower planning, proper coordination of the time schedule of implementation of education and development plan is important. In view of this the problem of need of scientific manpower in agriculture by 2010 needs to be considered.

SCIENTIFIC MANPOWER IN AGRICULTURE - NATIONAL OVER VIEW :

Manpower planing still remains by and large in the periphery of the planning process in the country. Despite realization among planners and academicians in the past that scientific manpower was key to economic development, limited attempt at perspective planning of manpower was made in the country except by way of and-hoc and piece-meal studies made by some institutions. As specialized branch of study it has yet to be brought within the purview of the existing institutional framework of development planning. An obvious consequence of all this is that the country has poor and unrealistic manpower database both at the national and the state levels. The data presently available does not permit objective assessment of scientific manpower in any area including agriculture. Nevertheless an attempt is made to highlight the present scenario at the national level and also at the state level and focus on the issues pertaining to manpower planning in future.

There are 41 State Agricultural Universities (SAUs) in the country. Moreover, there are eleven disciplines involved in agricultural allied sciences, such as agriculture, agricultural engineering, Veterinary science and animal husbandry, horticulture, sericulture, agril marketing, fisheries, dairy technology and food science etc. There are 194 colleges and 46 private colleges admitting 9500 students in under graduate and 5500 students in

postgraduate programme annually (Mehta, 1997). Assuming that 65% of postgraduate degree holders are absorbed in the Universities and that 15% of under graduate products opt for postgraduate education, then by even a conservative estimate eight thousand graduates and post graduates in agriculture and two thousand and odd in veterinary science remain every year in the fray. This is the overall supply side of the Scientific & Technical (S & T) manpower scenario in the agriculture and veterinary sector. On the demand side to catch up with the present output each state has to create on average three hundred plus positions in the Govt., Corporate and public sector units annually. But, either because the volume of plan investment and / or plan execution has fallen short of the target or because the direction of development planning is at variance with manpower planning, there has been an accumulated stock in excess of demand knowledge explosion in diverse branches of science has of late resulted in proliferation of institutions in our country. Although the employment status of these products is not known for certain, on the same plea it can be summarized that supply has outstripped demand to a very large, if not alarming extent.

The implications of the national scenario presented above are far reaching. To this we shall come later on. Suffice it to say that the rules of the game as far as manpower planning is concerned are yet to be followed even partially in our country.

STATUS OF SCIENTIFIC & TECHNICAL (S&T) PERSONNEL IN THE STATES :

For an analysis of the corresponding scenario in the states the author solely banked on information received from the SAU's in response to the communications made in this regard with all concerned. But the information so far received from some of the SAUs is scanty and partial in that it primarily relates to the manpower position of the SAU, rather than the states. Therefore presentation of state wise positions based on the information could be extracted from the SAUs report will be more of subjective nature than factual. The following are the findings of the SAU's reports.

BIHAR :

As per the Ist degree holders and technial personnel survey there were 3960 agricultural scientific persons working the state of Bihr,

accounting for nearly 6.6 per cent of agrlicultral scientific persons in the country. Post-graduate and doctorate degree holders were nearly 2108 per cent to the total agrlicultural scientific persons in Bihar whereas the corresponding proportion was 26.61 per cent in the country Number of agrlicultrual scientific personnel increased from 660 in 1981 to 6303 in 1991, recorded an increase of 59.14 cent during the period. It is worth pointing that the increase was comparatively higher in Ph.D. degree holders (5 times) followed by M.Sc. Degree holders (74.5%) and agricultural graduates (54.56%).

As many as 80.93 per cent of agricultural scientific personnel were employed in salaried job in the year 1981 whereas corresponding national proportion was 74.24 per cent. The extent of unemployment in agricultural scientific personnel was comparatively higher in Bihar (10.86%) than that of the country (9.10%). In Bihar, the extent of unemployment was comparatively higher for agricultural graduates (13.86%) than postgraduate agricultural scientists (4.46%). As far as nature of employment of agricultural graduate is concerned, as may as nearly 77 per cent of agrlicultural scientific personnel were engaged in managerial and administrative jobs in the State of Bihar whereas the corresponding proportion was nearly 36 per cent in the country. A majority of agricultural scientific persons are responsible for activities (jobs) where there is little scope for utilizing their scientific knowledge. Analysis further revealed that the proportion of agricultural scientific personnel employed in teaching and research has comparatively been lower in Bihar (9.89%) than the corresponding proportion in the country (27.51%) indicating comparatively less priority to agricultural teaching and research in the state. Development and marketing have also been less important area of employment for agricultural graduates in the State of Bihar (7.75%). It is probably due to less development of secondary and tertiary sectors in the State.

FUTURE TREND

An analysis as also been undertaken to get an idea of expected opportunities of employment of agricultural scientific personnel in the State of Bihar by 2010 A.D. In Bihar, as many as 370 agricultural scientific personnel have retired during 1990-95 and the number would further increase to 575

persons during 1995-2000, 960 persons during 2000-2005 and 800 persons during 2005-2010.

Analysis of availability of agricultural scientific persons and replacement needed due to retirement during 1990-2010 revealed that there would be cumulative deficit of 662 agricultural scientific persons in the State by 2010 A.D.

Table : Estimated requirement of S & T personnel in Bihar

	Total requirement ment	Available strength	Actual requirement ment	Estimated supply of S & T man- power	Short fall
Agriculture	24,840	1848	22,992	2,550	20,442
Agril. Engg.	271	3	468	425	43
Vet. & A.H.	10,266	167	10,099	1,700	8,399
Fisheries	1,519	193	1,326	170	1,156
Home Science	1,200	—	—	425	775

(Based on report of Dr U.C.Upadhyay on Manpower Requirements-Agriculture. Animal Science and Home Science by 2010).

Hence, it may concluded that there is an urgent need of proper planning for training and employment of agricultural scientific personnel in the State of Bihar so that an adequate number of persons are trained for right job which is almost pre requisite for increasing agricultural production in backward state like Bihar.

MAHARASHTRA

The State Agricultural Universities cater to the agricultural needs of 30 districts covering 78.9 million population and 308000 sq. Km area. The state is endowed with great diversity of agriculture with high productivity and modern techniques related of horticulture, green house technology, biotechnology, biological plant protection and cash crops adoption There is tremendous scope for self-employment of Agriculture Human Resource in Government and Semi government sectors in addition to enormous NGO potential.

There are 38 colleges in the jurisdiction of 4 SAU's in the State with intake capacity of 2036 (UG), 623 (PG) and 81 (Ph.D). Moreover there are 39 constituent and 103 affiliated agricultural schools with intake capacity of 5250. The minimum Competition Vocational Courses (MCVC + 2 programs) sponsored by Central Government in Junior Colleges of tradational Universities are being implemented in the subjects of horticulture (4380) Crop Science (2760), Seed Production Technology (180), Agril. Chemicals (20), Sericulture 260, Poultry production (600), Land protection (300) and Dairy Technology (1400). The total intake capacity under MCVC comes to 9900 personnel.

The Expert group of IX Five-Plan formulation Committee for Agricultural Human Resource Development has estimated the requirement which is given below :

S.No.	Area	Existing Agricultural Human Resource	Expected Agricultural Human Resource	
			2000	2010
A)	Agricultural Human Resource			
1.	Agril. & Allied Department, GOM	6022	9542	15232
2.	SAU's	3252	4052	5007
	Total	**9274**	**13594**	**20239**
B)	Total Human Resource			
1.	Agril. & Allied Department, GOM	28202	34337	42479
2.	SAU's	15659	18191	21101
	Total	**43361**	**52528**	**63580**

Ref : Sawant A.G. 1997. Report on Agricultural Human Resource Development in Maharashtra State submitted to the State Planning Commission, Mantralaya, Mumbai.

ORISSA :

Agriculture and its allied sectors dominate in the State's economy contributing 33% to the net state domestic product. Nearly 64% of the total working force are engaged in such activities. Agriculture is fast

changing. In the recent years, the national and international scenario of agriculture have been changed and the demand for quality food have increased The socio-economic inequalities widened. Land, water and forests have degraded and agricultural productivity is yet to reach at an impressive level.

The existing growth rates for cereals, pulses food grains, oil seeds and fish in Orissa are 1.30%, 6.74%, 1.13% and 7.50% respectively (1970-71 to 88-89). The required growth rates to meet the needs of the growing population in Orissa for 2010 AD and 2020 Ad will be 3.26% and 2.38% for cereals, 3.81% and 3.34% for pulses, 3.84% and 2.52% for foodgrains, 11.80% and 9.01% for oilseeds 36.41% and 25.65% for milk and 9.08% and 8.08% for fish. Since there is less possibility of expansion of area under crops after 2001 A.D, it will be a tough task for the farm front to meet the requirements of foodgrains in future. Besides, apart of the production is required to meet the needs of Agro-processing and expert industries to generate productive employment and income. This earmarks about 15% to 20% of the production, calling for an additional growth rate of 2.5% to 3.5% per annum. Hence generation of appropriate technology and skilled manpower to handle such technology will be crucial in years to come.

In this context, the agricultural production including dairy, poultry, meat, fish and fruits will have to be achieved against the constraints of diminishing land resources, increasing biotic and abiotic stresses, indications of factor productivity decline, threatened loss of bio-diversity, natural resources shrinkage and degradation, climatic changes, tightening of intellectual property rights, intensifying competition in the international trade and widening economic disparties in addition to growing population. Thus, generation of appropriate timely technology and transferring, it for improving productivity and to train qualified graduates in the specific areas of agriculture, animal science, fisheries and other allied sectors play a major role.

MAN POWER AVAILABILITY AND UTILIZATION :

The Orissa University of Agriculture and Technology (OUAT) since its inception has produced 4867 graduates in Agriculture, 156 in Agricultural

Engineering, and Technology, 1674 in Veterinary Science and Animal Husbandry, 141 in Fishery Science, 184 in Home science and 2809 graduates. Besides the University has also awarded Master Degree, 2012 in Agril. Sciences 105 in Agril. Engineering, 464 in Veterinary Science 41 in Fishery Science, 25 in Microbiology and Ph.D degree to 105 in Agril. Science, 23 in Veterinary Science, 3 in Agril. Engineering and 7 in Fishery Science. About 90% of these Ph.D holders are involved in teaching and research activities of the University while about 85% of the graduates are working in the State Department of Agriculture, Horticulture Soil Conservation and Animal Husbandry, Fishery and Agril. Engineering. Rest are working in various commercial banks, Agricultural Industries and other research organizations very few of these graduates are under self employment.

MANPOWER REQUIREMENT DURING 9TH PLAN PERIOD :

Considering the thrust areas in the development of 9th plan in the State Agricultural University/ICAR/Govt. of India and the State Department of Agriculture, Fisheries and Animal Resource Development, it is estimated that the requirement of manpower will be as follows during the 9th plan period.

1.	Agriculture	-	1100
2.	Agril. Engg.	-	200
3.	Animal Science	-	750
4.	Fishery Science	-	200
5.	Home Science	-	150
6.	Forestry	-	175

Besides these there is a need of manpower in new emerging areas in future. These areas are Bio-technology, Agril-business Management, Environmental Management. Molecular Biology, Computer application in Agriculture, Resource Conservation, Crop Modeling and Remote Sensing in Agriculture. Agriculture is fast changing with technological development. There is necessity to give more stress to these new emerging fields during the 9th plan period.

TAMIL NADU :

The annual out turn of graduate and post graduates as per intake capacity of the colleges under T.N.A.U. on the assumption of zero failure percentage is as given below :

Graduates	-	576
Post-Graduates	-	339
Doctorates	-	162
Total	-	1077

The output is reported to have been taken care of by the on-going demands of the State Department (65%), educational and research institutions (10%) and banks, corporations and the university. At the going rate of outrun the *state shall have a total stock of 16158 S & T personnel in the above* professional fields by of 2010 AND. Out of these, roughly 2550 Masters and Ph.D degree holders might be employed by the University. The moot point is whether the remaining 13600 S & T. Personnel can hope to get the gainfull employment. According to the estimates given in the TNAU report, 568 agricultural graduates will be required every five years from now totaling roughly 1700 by the year 2010. This is against the anticipated output of 2550 graduates. Assuming that 15% of the output would go for P.G. programmes, the total number of contenders for jobs outside the university will be 2618. It appears that there would be a surplus of nearly five hundred graduates. Since the projections made in the report are based on the present trend only without much weightage being given to the emerging scenarios by the turn of the century and beyond, it might eventually prove wrong either way.

ASSAM :

In estimates made by the State Department of Agriculture the additional requirements of the department alone during the VIIth Plan was placed at 940 including vacant posts. With the addition of the requirements of Assam Agricultural University (AAU), the tea industry and the banks the sum of total of additional requirement of trained manpower worked out to more than 1500. The requirement of veterinary personnel was likewise estimated at 1545 over the base year (1984-85) level. To meet this requirement, as far as possible, the AAU enhanced the intake capacity of the College of Agriculture from 120 to 170 and that of the College of

Veterinary Science from 90 to 155. The out turn of graduates was estimated at 600 in agriculture and 525 in veterinary science, thus leaving a gap of 700 and 1000 respectively in the supply of agriculture and veterinary science graduates.

In a study for assessment of manpower in the N.E. region, the Institute of Applied Manpower Research observed that additional manpower needs as the sum of employment likely to be created in routine administration and development activities. Based on the above principle the study arrived at the following figures after making necessary allowances for pitfalls and revisions in the allocation of the plan resources :

Education level	Total estimates requirement		Estimated out turn	Surplus(+) deficit (-)
	VIIIth plan	IXth plan		
First degree or above in agriculture	700	1063	1120	-643
First degree or above in Vety. Science	641	808	428	-1021

Thus the shortfall in supply of Graduates and postgraduates works out to 140 in agriculture and 213 in Veterinary Science in the VIIIth and IXth Plan periods.

KERALA:

The projections for the State of Kerala are based on the agricultural development trend in terms of multiplicity of state and Central sector programs as also on the presumption of a flat 10% retirement vacancies in all the line departments. The projected figures work out as follows :

Employment Institutions	Agriculture	Animal Husbandry	Home Science	Total
Agril. Edn. & Research	1650	450	50	2150
Development departments	5455	3909	975	10339
Private Sector and others	1000	200	100	1300
Total	8105	4559	1125	13789

KARNATAKA :

The premises followed in the presentation of the case in Karnataka are broadly as follows :

1. That 84% of scientific personnel are absorbed in the public sector, 12.2% in the private sector and 3.8% are self employed.
2. That the state domestic product would grow at the rate of 5.5% and given 0.22% growth in employment for every 1% growth in S.D.P. employment likely to be generated through plan programme would be of the order 11794. With private sector employment added, the number could be around 14720.
3. That structural adjustments being made in the country in the wake of liberalization which entails progressive reduction of revenue expenditure of the government would eventually result in diminition of the share of public sector employment from 84% to 50%.

The picture that emerges after consideration of the above is as given below :

Sector		Requirement by 2010 AD
Agriculture	-	42,389
Animal Husbandry	-	7,546
Home Science	-	750
	Total :	53,685

ANDHRA PRADESH

Manpower projections for Andhra Pradesh are mainly program based conforming to specified norms. For instance, the requirement of scientific hands for rainfed agriculture is based on certain target of watershed development within a specified time, the requirement for routine extension programme is based on certain norms such as one VEO for every 900 farm holdings, one A.O. for every 7 VEO's etc., The requirements for other programs are based on long term physical targets envisaged. The requirement of veterinary personnel is based on the norm of one veterinary doctor for every

5000 cattle units. In case of home science graduates the requirement is worked out assuming a flat 10% increase in the growth in number. Thus calculated the requirements of scientific manpower different areas of the agricultural sector of the State work out to 10060 in agriculture, 8845 in veterinary and animal husbandry, 640 in fisheries and 774 in home science as detailed below:

Estimates of scientific / technical manpower requirements by 2010 AD in Andhra Pradesh:

Particulars	Existing	Estimated (2010)
Agriculture	3926	8300
Horticulture	281	1760
Veterinary & Fisheries	3258	8280
Home Science	180	774

HIMACHAL PRADESH

The Himachal Pradesh Krishi Vishwa Vidyalaya (H.P.K.V.V.), in its report has estimated the supply of S & T personnel in the fields of Agriculture, Veterinary Science and Home Science at 1125, 565 and 345 respectively and anticipated as much demands from government departments, input manufactures and financial institution to match the supply.

RAJASTHAN :

The estimates given by Rajasthan Agricultural University (RAU) places the requirement of agricultural and veterinary personnel in the State at round 3000 each and of Home Science personnel at 900. The report does not indicate the basis for the above projections.

REVIEW AND CONCLUSION :

The assessment of technical manpower requirements of the agricultural sector at the national and state levels presented in the foregoing sections leaves much to be desired. The manpower projections given in the reports are largely of the nature of conjecture and are not based on scientific analysis of objective situations. In the absence of definite correlation between

employment and the chosen parameters manpower demand projections are bound to become unscientific and untenable.

The creation of comprehensive database for macro-analysis of manpower supply and demand on a long-term basis is possible only when manpower planning gets duly institutionalized. Therefore, it is high time that a nodal institution at the national level is built up and exclusively entrusted with manpower planning in the country in the field of agriculture affiliated and / or subsidiary units established in each SAU's for undertaking state level exercises. Manpower planning will remain an academic exercise unless the scientific personnel in agricultural and allied fields have nearly reacted the saturation point. Even the vacant positions in the concerned government departments of most of the states not filled. We have to break new paths not only to create new avenue of employment but also to make agricultural education, ever growing. Times has now come to restructure and reorient education in the SAU's with tilt towards trade oriented courses of specialization. Students in any faculty may be divided into different trade streams depending on their choice after completion of the basic course. Such a system will at once meet the trade related demand of the sector and stand gurantee for assured employment of the products of the SAU's. Manpower planning area should be looked at from both a short and a long term perspective. In the long term, the aim should be to have atleast one farm graduate available to each Panchayat and Nagar Palika to serve as a multi-purpose farm consultant Initially they can work either whole time or part time depending on needs and circumstances. Sustainable agriculture is highly knowledge intensive and hence, it is important that in the long term, all Gram Panchayats / Zilla Parishads and Nagar Palikas have atleast one agricultural consulatant on a regular basis. If this pattern is to be followed the requirement for farm graduates will be over seven lakhs. This should be our ultimate goal. During the 9th five-year plan, the estimates made by NAARM on the demand for farm graduates and postgraduates could be taken as the basis for deciding admission policies. However, further detailed description by discipline analysis will be needed at the post-graduate level. There is at present a high degree of regional variation in the availability of farm graduates. Almost one farm graduate is available for every 2 to 3 villages in Kerala. In contrast, in Bihar one farm graduate is available only

for every 100 villages. While deciding on investment in further agricultural education, such regional disparities should be kept in view. There should also be a method by which the knowledge and skills of such graduates are continuously updated (Swaminathan, 1997).

REFERENCES

Sawant A G., 1997. Report of expert group on manpower resource development in Agriculture submitted to State Planning Commission, Mantralya, Mumbai.

Swaminathan M S., 1997. Report of the committee on Agricultural Education submitted to Government of India.

Upadhyay U C., 1995. Paper on manpower requirement – An overview. Paper presented at 22nd Annual Convention of IAUA.

HIGHER EDUCATION IN AGRICULTURE 2,000 AND BEYOND

*S.L. MEHTA**

Agricultural Research and Education

ICAR in 1965 assumed the responsibility of UGC as part of a scheme begun in 1964 to strengthen agricultural education. Indian agricultural scientists have performed exceedingly well both in India and abroad. The HRD programs undertaken in the past have received wide acclaim. However, over the years there has been explosion in information and the gap in technology generation and adoption has widened particularly in developing countries. To meet the challenges of excellence combined with social relevance, the course curriculum has to be suitably restructured with innovative methods of teaching our educational system. There are currently 28 SAUs and four institutions with deemed University status. The SAUs have about 22,500 sanctioned scientific staff positions and 161 colleges with an undergraduate and post-graduate admission capacity of 9,650 and 5,850 students, respectively, and with a total enrollment of about 44,500 students. There is widespread consensus that the quality of graduates in various disciplines of agricultural sciences is falling and that there is an urgent need for SAUs to give attention to upgrading the quality and standards of higher agricultural education. Lowered overall academic standard particularly in terms of information available and imparted to students now are a matter of growing concern.

Major problems facing SAUs are academic inbreeding. Students at most SAUs come from the same state, which tends to perpetuate parochialism. There are no incentives to exile at teaching methods and curricula are out –of date, and physical I facilities, equipment and teaching aids are in poor condition. The lecture method in teaching and note memorize in learning are over emphasized. Clear links between course work and practical are often missing. Students fail to acquire good general problem-solving skills, which would enable them to assess new and changing situation and to make rational judgments about options. University libraries are poorly

* Former DDG (Education) ICAR, New Delhi

equipped and funded and are rarely integrated into the learning / teaching experience. Libraries lack computer and telecommunication capacities for accessing and managing the growing international information explosion. Course loads are heavy, thereby leaving little time to cultivate general inquiry skills, class discussion or intellectual debate outside the class room. Physical facilities such as lecture rooms and laboratories are overcrowded, uncomfortable, poorly lit and maintained, inadequately cooled; heated and generally are poor environments for learning. Teaching laboratories are old, out-of-date and sparsely equipped, and computing facilities are practically non-existent, hostel, recreation, medical and dining facilities are deteriorating rapidly.

Financial support has been inadequate. There is little emphasis in present curricula on preparing undergraduates for careers in agriculture or agribusiness outside government service, and there is no readily available mechanism in the present HRD system to remedy this mismatch. Private employers often have to invest significantly in induction and on-the-job training for graduates to make up for education weaknesses.

To propel Indian agriculture into the 21st century, the quality, technical skills and management of agricultural manpower must improve in consonance with rapidly changing marketing requirements. If the education imparted is not in tune to current and future realities, the national research, extension and agribusiness systems will perform below potential.

In-Service Human Resources Development And Management

"One of the most important tasks of a teaching organization is to develop a cadre of experienced teaching personnel of the proper size, mix and educational level, and to inspire them to give outstanding performance.

With people who have been carefully selected to do specific tasks; who are skillfully coached to do that task, and above all who are highly motivated, there is almost no limit to what can be accomplished, even with less-than-ideal facilities and budgets'.

An ideal human resources development (HRD) system is an Integrated system with main objectives being that of building a strong team involving the entire work force as the organizations, foundations and most precious

asset and to develop Interdisciplinary work culture for mutual benefit. It must aim at :

- achieving continuous development
- improvement in quality and productivity
- improving communication and co-ordination
- creating motivation and job satisfaction and thereby ultimately contributing to increased production, economic benefit and cleaner environment.
- Enhancing training quality, by establishing a human resources management approach.

Strategic planning needs to be introduced for an efficient and effective performance over a long-term perspective. The strengths, weakness, opportunities, and threats (SWOT) to the effective performance need to be assessed and structural reforms introduced.

Human resource management (HRM) functions such as recruitment and selection, staffing, performance, assessment and appraisal, reward and control systems, and training and development need to be designed, implemented, and evaluated.

Strategy for HRD

A. Establishment of Agricultural Education Council

Agricultural Education council with statutory powers to set norms and standards in agriculture education and their implementation is necessary with a mandate to monitor educational programs in the country. This musty be done after memorandum of understanding between ICAR, SAU's and state department of agriculture because agriculture is a state subject.

B. Establishment of Board

Need to be setup with statutory powers to set norms and standards in agricultural education and monitoring. Such a statutory body would ensure uniform standards of agricultural education at National level. Monitoring and developing a sound accreditation system regulating higher educational system is a must.

C. *All India Entrance Examination*

Fifteen percent of the admission at under-graduate and post-graduate level should be based on all-India entrance examination to be conducted by Agricultural Education council. This will promote not only to help national integration but to a large extent abolish parochialism. It would also lead to improvement in the standards of education.

D. *Recruitment based on NET*

In order to avoid in- breeding in employment in agriculture universities, the recruitment should be based on NET examination. Only those who qualify in NET should be considered for recruitment.

E. *Sabbatical Leave*

ICAR has in principle agreed to allow sabbatical leave and provide honoraria and travel expenses for such assignment. This encourage scientists to make short-term study visits within India and abroad to learn about new technology innovations and educational methodologies. It would also encourage participation of scientists in conferences/ Symposia within India and abroad.

F. *Faculty competence and improvement*

If we really make an in-depth assessment of the Faculty competence, we would find that at present there are no incentives given for faculty competence. If we have to improve higher education commensurate with the exacting demands of technology expansion and knowledge generation, the system should have attractive rewards for meritorious faculty and staff. Simultaneously we should also develop a mechanism to weed out the dead wood. Accountability of the teachers towards the students, peers and management, constant evaluation of faculty by the students and peers, curriculum updating in line with socio-economic needs and technology development and innovations, evaluation and review of the HRD program should be the hall-mark of the new education policy. A well defined carrier management and advancement policies need to be evolved for faculty in order to motivate them to enhance job satisfaction and eliminating stagnation.

One of the pitfalls of the present educational system is lack of adequate practical training. Although everybody considers education to be important, but when it comes to providing support and appreciation, higher education does not receive matching support in reality. In fact in most of the interviews, one is asked about research contributions rather than achievements in teaching and development of instructional material.

Institutional Education quality control involves;

Admission criteria –curriculum design-program selection-curriculum implementation- evaluation- employability.

G. Infrastructure development

Most of the universities, at present, do not have even the basic facilities. Even central institutions are starved of funds, specially for teaching. This is mainly as a result of lack of vision among the so-called educationists manning the universities. We are not able to face the ground realities and take effective steps for removal of weakness but are content with sermons. Proliferation of educational institutions in utter disregard of the requirements has led to deterioration in educational standards. To remedy this situation, it is important to have an assessment of our HRD needs and the levels at which different institutions need to be nurtured. The private colleges and institutions which have mushroomed recently, infact churn out graduates who have hardly any knowledge or practical training. There must be an effective mechanism no ensure that no institution is given recognition without first having minimum infrastructure and necessary faculty. Recognizing science graduate degrees without practical has no relevance.

H. New Technology Adoption

Demands on the quality of human resource is changing rapidly in view of the explosion of knowledge in many areas. In fact, discoveries in science with the coming into operation of intellectual property rights is becoming not only rewarding in terms of money but also becoming a danger to developing countries. Most of the developing countries are rich in natural resources but technologically poor. The advantage of technology developments has lead to denial of many novel gene pools

to developing countries because of the patenting rights. Therefore, we have to develop and adopt newer technologies so that natural resources of the country could be harnessed for the benefit of large segment of society. Our future agricultural science must train our graduates in the frontier areas and in the light of newer developments our courses need to be restructured so that the graduates not only have competence, but know the latest tools of technology. In particular, as an illustrious example we need to introduce Plant Biotechnology, Post-harvest technology, Agriculture Management with special emphasis on exports need at graduate level. Many of the newer technology are costly but we cannot afford to miss as this would be a greater risk of reaping the benefits due to newer technology development.

In many areas, our higher education need to be restructured both in terms of course curriculum and in operation. Educational institutions need to be provided full autonomy and freedom of operation with built-in-accountability. We need to provide better environment to our young scientists for flowering of their talent and take them out from shackles of administration. Unproductive time spent on many of the procedures need to be removed. Personnel policies need to be changed in tune with modernization and newer management skills. When an average scientist from India goes abroad, he performs three times better, whereas under Indian conditions, the output is less despite the fact that he really wants to put in his best. Our beaurocratic procedures and lack of proper environment comes in way of getting best from the scientist. There is also growing demand for applied a researches neglecting basic researches. If we look into the history of development of science, basic researches have paved the way for development of applied researches. The basic researches therefore, lay the ground work for applied research. Basic research is at the heart of academic research enterprises.

All SAUs do not perform efficiently. Those which sprang up late have not developed sufficiently. Proliferation of universities and colleges in states without sufficient resources has affected their quality of work. Home science education (and research), is an important activity of SAU-system, and it must make its relevance to rural home and women more practical.

The university research and management should be at such a level which can facilitate consultation, mediation and organization of cooperation between the university and industry. The futuristic research projects should not only be provided with incentives but also help in testing the acquired knowledge of basic research in practical situations. The institutional guidelines should be simple enough to promote technology transfer activities and consultancy to provide additional income based on exceptional educational skills. Side line jobs in projects in the framework of futuristic researches should be promoted and authorized.

India has (in its national system of educational and research) a wide infrastructural network with international links, with sufficient expertise as well as knowledge to tackle all the challenges of education in agriculture.

As the farmers need advice on a very broad range of activities/subjects, the extension agents must be trained/educated to possess a sound information so that they are able to advice on fairly broad range of farm activities. A team of competent subject matter specialist must be built-up. It has been observed that in a large number of cases the recommended and test (on farm trials') technologies are not uniformly adaptable by farmers due to local and specific constraint/problems. These must be defined in terms of socio-economic conditions so that the farming community can be better educated. It must also be emphasized that besides extension, other systems like research, input supply, credit, irrigation, infrastructure, market, public policies, physical and socio-economic environment have great influence on adoption of technology. However, extension education must continuously upgrade its capacity for : (1) effective technology delivery, (2) promotion and adoption, (3) establish functional linkages with the related support system.

Spreading 'simple' messages may create only awareness, but 'target oriented education' to farmers may help them adopting the technology. These situation/location specific recommendations should also be able to educate the women of the farming community. Thus, a continuous 'training' input is necessary to develop competent extension specialists with professional excellence.

Vocationalization

The human resource in agriculture sector is so vast and with meagre financial resources it is not possible to have formal educational at higher degree level for all. In addition, the present educational systems churns out graduates who are not well equipped to take agriculture as a vocation and depend mainly on governmental jobs. In order to relieve this pressure and also use agricultural human resource as an instrument of agricultural transformation, it is important to introduce vocational courses cum training programs in new energizing technologies and provide intensive training in methodologies such that the trained man-power is able to find self occupation at village/community level.

Commercialization of Agriculture

In the past, we have not granted industry status to agriculture, but with the economic liberalization, post-GATT scenario, it is important to have commercialization of agriculture commodities. Our training and educational programmes must gear in developing human resources taking advantage of the new technology generated in frontier areas of science including Biotechnology, Agri-business and other innovative changes so that our farmers receive higher economic returns by cornering greater share of export market. Our programms must aim at the development of value added products from agricultural produce.

Information net-working and management

Knowledge is growing at the rate of 3,000 words per minute and the gap between the develop and the developing countries is widening simultaneously.

Information is knowledge and knowledge leads to power and wealth. Our farmers and scientists have to keep pace with newer developments. This is possible only if our institutions are connected to international networking and have access to international data base and information on emerging technologies.

ICAR has undertaken a very elaborate net-working plan involving, NIC, INTERNET and connecting ICAR institutes, SAU's etc. with the objective of fast dissemination of knowledge and sharing of knowledge.

There are tremendous opportunities because of liberalized economic policy, expansion of agricultural marketing, greater exports investment from private sector and emergence of Non-governmental organizations, impetus on food storage, processing and marketing and competitiveness leading to development of good quality products. However, the system faces the threat from inadequate incentives and avenues of career advancement and alluring salaries and other perks offered by the multinationals and private sector leading to migration of promising and innovative personnel.

The agricultural education in coming decade and beyond is to meet the objectives of not only imparting knowledge and generating new knowledge but have to train graduates which make them not only better citizens of tomorrow but contribute significantly to socio-economic developments of the country. It is also essential to develop a direct link between education and industry. The gradual evolution of society, with its ever-increasing over emphasis on materialistic goals, demands that education also should be a means to make people earn more. Any kind of education that fails to cater to this requirement will be irrelevant or, at best be termed, incomplete. Let us hope that the goals of education will be achieved with strong political will, able leadership and professional approach.

HISTORICAL BACKGROUND OF AGRICULTURAL EDUCATION IN INDIA - SOME MILESTONES

*Dr. P. RAGHAVULU**

Inspite of the fact that agriculture has all along been the most important sector of India economy, research and education in agriculture had not received much attention in the pre-independence era. For agricultural and Veterinary colleges established then were affiliated to general universities, showing a stepmotherly treatment to agricultural education.

The decade immediately after independence after independence and partition of India can be viewed as watershed in the evolution and strengthening of a system of agricultural education and research in the country. It is a period in which a large number of commissions, committees, study teams were appointed by the government, which reviewed critically the then prevailing overall agricultural situation in the country and the structure and functioning of the related teaching, research and extension institutions engaged in agriculture and related areas.

The growth and development of agricultural research, education and extension in this country was orderly. The detailed account of these developments are presented in the following paragraphs as important milestones for easy understanding.

MILESTONES IN AGRICULTURAL EDUCATION

1. Early British period – Need for expert in Agriculture not recognised : The British ruled the country with shrewd administration. Among them there were very few scientists who realised the importance of agriculture and its development. Hence very often the stock argument put forward was that the farmer knew his business and was not in need of guidance or help. Hence the need for experts in agriculture was not recognised for long.

2. Famine in Bengal and Orissa (1866) : on the conclusion of Bengal and Orissa Famine Commission, a policy for having a special department to watch over the interests of agriculture was mooted. Lord Lawrence, the then Governor-General thought it premature.

* Former Dean of Agriculture, ANGR Agricultural University, Rajendranagar

3. Lord Mayo-interested in Agri.Agril.Depts. at centre and Presidencies: Lord Mayo (a civilian in Bengal service, coming from a farming family near Derblin) when he came to India wrote to Lord Wapier, on the need to start. Agricultural departments in Government of India with branches in the presidencies. This also tell on deaf ears.

4. Manchester Textile Mills closure threat in 1863-64 : The deciding force for establishing Departments of Agriculture was a consequence of the stoppage of supply of cotton from U.S.A. A memorandum was submitted on 12th March, 1869. The body of this association was powerful and consultations between the Secretary of State and Lord Mayo, the Governor General, who wrote on 6th April, 1870 a letter emphasising the establishment of a separate Department of the Government which would take care of all matters affecting the practical improvement and development of the Agricultural resources of the country. This department, proposed as Department of Agriculture and Commerce to be headed by a Director General thus to be branch of Home Department. It was also expected to deal with the administration of the land revenue, salt and opium. In Lord Mayo's conception it was to be purely Agricultural bureau directors of Agriculture with some experts would be appointed in each province who would also work through the direct agency of Farms and Agricultural Schools. Director General would oversee this working at the province and otherwise the Schemes in operation during the crop season and brief the Government of India during Summer.

5. Department of Revenue Agriculture of Commerce : 27th April, 1881 The secretary of State accepted the proposal but wanted the department to be designated the "Department of Revenue, Agriculture and Commerce".

   This was accepted but was proposed to be placed under a Secretary instead of Director General.

6. Poor staffing and poor investment resulted in a failure of this Department : Ultimately when implemented an additional Secretary was placed in charge of this new department of Revenue, Commerce and Agriculture. Hume, who became the chief secretary, in the Department of Revenue, Agriculture and Commerce wanted this new Department to have 7 Directors.

With their staff to offices in the provinces and 40 Model farms with Schools or Colleges, at an annual cost of Rs.2.5 million and a capital cost of

Rs.2.5 million. This staffing and investment did not come through and the Department of Revenue, Agriculture and Commerce proved in effective. Lord Mayo wanted to name it as the Department of Agriculture, Revenue and Commerce to give importance to agriculture but this was not approved by secretary of State since in his view the importance is for Revenue and not agriculture. Similar divergently opposite views prevailed between the two even in respect of appointment of the Officer to head this Department. Mean while Lord Mayo died and no body encouraged it any further.

7. Department of Revenue and Agriculture (1881) : The Department of Revenue and Agriculture were separated from Home and formed into a Department of Revenue and Agriculture.

Origin of Department of Agriculture in States

8. Famine Commission of 1880 revived interest in agriculture: The disastrous famine of India in 1876-78 affected 60 million people and resulted in mortality of more than 5,250,00 people. This led to the institution of Famine Commission in 1880 which received the interests in Agriculture.

9. Sir Edward Buck appointed as Secretary Agriculture: It recommended that improved Agriculture should be the main step for obtaining security against disastrous failures in food supply. Creation of central Department of agriculture controlled by Imperial secretariat and a simultaneous formation of a Department of agriculture with a large coordinate staff under an Executive Officer were recommended. Sir Edward Buck was appointed as the secretary at the centre and under his guidance development of provincial agencies was taken up the work related to agricultural enquiry, Agricultural Improvement and Famine relief Directors of Agriculture were appointed in most provinces.

10. Visit of Dr.John Augustus Voelcker (1889-1891) : secretary of State deputed Dr.John Aggustus Voelcker, consulting Chemist of Royal Agril. Society of England to advise India on (1) applying teachings of Agricultural Chemistry to Indian Agriculture, since Large tracts of non-cultivated (uncultivable) land was lying in North West provinces (present U.P.) and (2) to effect improvement in Indian Agriculture, After an Agricultural enquiry he recommended (1) Ascertaining the requirements of each District in regard

to water, manure, seed to decide on development of the District. (2) Ascertaining on the transference of a practice of one part beneficially to another part (3) Collecting vital information of the effect of agricultural practices in a crop on its yield (4) information on the scope for introduction of Foreign Agricultural practices or crops or varieties to improve Agriculture in India.

11. Asst. Chemist Appointed (1892) : An Agricultural Chemist and an Asst. Chemist were selected and they came to India. The senior Officer was for Research at New Delhi and the Junior Officer was located at Poona and Looked after·Teaching in Agril. Schools at Poona, Dehradun and Saidapet. Interest in Agril. Development increased during the next decade in the privinces.

12. Inspector General of Agriculture (1901-1903): Need for Inspector General of Agriculture was felt to look after the increasing development in Agriculture and in 1901 J. Mollison was appointed in view of his excellent work as a Dy. Director of Agriculture at Bombay. He was primarily to advice the departments in centre and State on their improvement and development. During this period the Imperial Mycologist and Imperial Entomologists, were appointed.

13. Great famine of India left united miseries (1899-1900; 1898-1905) : Lord Curzon a farmer's son was Viceroy and interested in Agriculture. The famine further convinced Lord Curzon that Government of India must pay attention to agriculture. As a consequence.

14. Imperial Agricultural Research Institute, Pusa and Depts., of Agriculture (1905) :

    1) Imperial agricultural Research Institute at Pusa, Bihar and then in composite Bengal which included Bihar and Orissa.

    2) Departments of Agriculture in Provinces were established.

A generous donation of pounds 20,000 supplemented later by another 10,000 by Henry Phillips of Chicago a friend of Lord Curzon for this Institute helped in its sound establishment.

Government of India decided to set apart annually a sum of Rs.2 million to assest in development of agricultural research demonstrations and education

in the provinces. Full time Directors of Agriculture were appointed in the State and based on differences in soil and climate the State was divided into number of 'circles' and at each circle a farm was established.

With this annual grant of Rs.2 million it was contemplated to establish in each important province, an Agril. College and Research Station adequately equipped with the labs and class rooms to which would be attached a farm of suitable size.

Staff consisted of :

a) an Agriculturist who would also be Principal

b) an Agril. Chemist

c) an Economic Botanist

d) an Entomologist and

e) a Plant Pathologist (Mycologist).

Staff to combine Teaching with research since it was held that research should be ordinarily more active and better sustained if associated with lecturing because this would check any tendency to take up investigations on problems unlikely to lead to practical results.

To enable experts to carry on research and go on tours for investigation a number of Assistants and demonstrators need to be provided, who would also assist in teaching.

15. Six Agricultural colleges established : (1905) Since it was held that the backbone of the scheme was the education, for each province the establishment sanctioned was (1) an allround agriculturist as the Principal of the college (2) an Agril. Botanist and (3) an Agril. Chemist with this staff 6 provincial colleges were established or recognised at Pune, Kanpur, Sabour, Nagpur, Lyallpur and Coimbatore.

16. Civilian Directors in Larger Provinces: To direct the work of research and education and demonstration Civilian Directors were appointed on all larger provinces.

Till 1963, I.C.A.R., was primarily a Research Organisation at the apex level in Government of India with a number of Central commodity committees functioning independently.

17. 1963 Agricultural Research Review Team : An Agricultural Research Review Team was setup (Aceded by Dr. M.W. Parker of U.S.D.A.) by Government of India to enquire into the existing research setup and suggest suitable changes. This committee recommended abolition of ICAR and to replace it by a council for agriculture and food research. This recommendation was rejected out right and it was decided to reorganise it by.

a) reconstituting ICAR as a fully autonomous organisation.

b) Bring all research institutions under the control of Department of Food and Agriculture including those under Central Commodity Committees, under reorganised council.

c) Redesignate IBRI, IVRI and NDRI as national institutes and delegate to them enhanced financial and administrative powers.

d) Give financial assistance for research to State institutes and universities by the reorganised council in the form of block grants.

e) Make selections to its technical posts by its own Selection Committees.

18. Radhakrishnan's University Education Commission (1951) Rural University system : University Education Commission under the Chairmanship of Dr.S.Radhakrishnan recommended that a system of rural Universities be established to supply skilled persons that would be need by the country.

A rural university should includes a rind of small resident undergraduate colleges with a specialised and university facilities in the centre. It was stressed thtat the curriculum should fit into the needs of individual students and should provide for specialisations and selection of courses from more than one college. Each rural university should be autonomous and free to work out its own programme in its own way in terms of syllabi, curricula, evidence of completion of work and examinations. Through its concept of rural universities, the university education commission introduced the land Grant College (USA) Philosophy into India.

The earliest advocate of the agricultural university idea was PANDIT GOVIND VALLABH PANT, former Chief Minister of U.P. and later Home Minister of Government of India who initiated the reclamation of Tarai in U.P.

19. First Indo-American Team (1955) : First Indo-American Tean was set up on the advice of Dr. Frank W. Parker (Team Advisor to Govt. of India). The team had 8 members-5 Indians and 3 Americans. It endorsed the recommendations of university education commission that (1) each State should develop a rural university and (2) post-graduate schools should be established by Govt. of India at IARI & IVRI, among other suitable places.

20. Second Joint Indo-American Team (1961): Second Joint Indo-American Team was headed by Dr. Randhawa and had 3 representatives of American Land-Grant universities, a representative of U.S. Dept. of Agriculture, and eight Indian members. It reported the wide spread demand from many states for the establishment of Agril. Universities and recommended assistance to be given for this only when it had.

1) *autonomous status*

2) location of Agriculture, Veterinary, animal husbandry, home science, technological and science colleges on the same campus.

3) Integration of teaching by offering courses in any of these institutions to provide a composite course and

4) Integration of education, research and extension.

The result of the report of above committee is the establishment of first Agri. University at Panth Nagar in the year 1961.

21. Cummings Committee Report (1960-1962): In 1960, Government of India appointed a committee headed by Dr.Ralph W.Cummings to advise State governments on legislation for establishment of Agril. Universities. Main idea was that the new Agril. Universities should have the essential features that characterise the system and that they have a uniform base to carry on the functions with which they were charged.

Report published which spelt out the distinctive features of an agricultural university compared with existing universities and provided guidelines for their development.

22. Appointment of Director General, ICAR (May 1965) : Dr.B.P.Pal appointed as Director General and Vice-President of I.C.A.R. To assist him on technical side DDGs for a) crop sciences b) soils, agronomy, irrigation and Agril. Engineering c) Animal Sciences d) Agril. Educaiton.

It's effective functioning was limited as it continued to remain as an attached office of the Department of Agriculture of Govt. of India.

23. Agricultural universities model Act (1962) : Based on these ICAR developed a MODEL ACT FOR AGRICULTURAL UNIVERSITIES. This is an important milestone in the development of these universities.

24. Kothari Commission (1964-66): The impact of the scheme on Agricultural Universities on Policy makers is reflected in the report of this commission headed by Dr.D.S.Kothari, the then Chairman of U.G.C.

1) The Commission recommended the establishment of atleast one Agril. University in each State.

2) All aspects of research on Agriculture should be the concern of Agril. Universities.

This led to integration of teaching, research and extension education, where it did not exist. Thus came in to existence the Andhra Pradesh Agricultural university at Rajendranagar, Hyderabad in A.P. on June 12, 1964.

25. (1) Gajendra Gadkar Committee - June 1972. Establishment of DARE (1973) : Government appointed a Committee under the Chairmanship of Mr. Gajendragadkar (Retd. Chief Justice of Suipreme Court) to review recruitment and personnel policies of ICAR and its Institutes and to suggest measures for its improvement. Report submitted in January, 1973.

(2) The Government approved the recommendations leading to establishment of DARE - (1973)

26. 1) Establishment of a Department of Agril. Research and Education (DARE) with efect from Dec. 15, 1973 to provide ICAR with linkages with Central and State Government agencies and to deal with administrative aspects of international collaboration in agril. Reserch and Educaiton.

2) Director General, ICAR was designated as Secretary to the Department of agril. Research and Education.

3) Composition of ICAR Council was made more compact with Minister for Agriculture as its president.

4) Governing body of ICAR was reorganised with Director General, ICAR as its Chairman.

5) Advisory Board was abolished.

6) Standing committees were abolished and their functions entrusted to newly constituted scientific panels.

7) 8 Regional Committee based on Agro-ecological regions were set UP, with Director General as its Chairman, to review the status of Agril. Research and Education in the different regions and discuss location specific agril. Problems.

Agricultural Scientists Recruitment Board : Initial introduction into scientists 51 cadre through all India competetive exam conducted by Agril. Scientists Recruitment Board of ICAR.

27. Randhawa Committee Report (1977-78) : Under Chairmanship of Dr.Randhawa, a committee has been appointed ro reveal the work of agricultural universities with terms of reference mainly relating to;

1) Producing non-elite graduates who should be equipped with a high degree of competence in practical work and who should be motivated to take up agriculture on a self-employment basis and

2) Giving rural orientation to home science education.

The committee's overall assessment was that the agricultural universities together has made a tremendous impact on agricultural production during their short span of existence. The committee recommended among other things :

1) The State Government should adopt a positive policy of support to agricultural universities. They should transfer statewide agril.research responsibility to agril.university along with staff, farms, budget, buildings, equipment etc. parallel research organisations should not be set up in the State departments in the name of adaptive research.

2) Agril.universities are essentially State institutions and hence State Government should accept direct responsibility for development and operational costs.

3) The ICAR should firmly adhere to the policy of having only one agril.university in a State, where there are more than one agril.university as in M.P. and Maharashtra, the coordination mechanism should be strengthened.

4) Existing agril.complexes in Himachal pradesha nd Rajasthan, attached to General universities should be set up as separate agril.universities.

5) The possibility of establishing an agril.university in Jammu and Kashmir should be explore with the State Government.

The agricultural universities have contributed for improvement in quality of agril.education, improved in quality and competence of teachers, better libraries, labs and farms. Development of high yielding varieties in many crops leading to higher produciton and protection technologies; extension education training imparted to farmers yielded improved production.

ROLE OF ICAR IN AGRIL.EDUCATION

According to its original aims it is intended to undertake, aid, promote and co-ordinate agril.education in the country. In practice it played a very limited role prior to 1966 because it neither had funds to offer nor statutory authority to discharge this responsibility.

With their reorganisation of ICAR in 1966, giving it the role in relation to the agricultural education as of the U.G.C. in general education, a full fledged division of agril.education was established in 1966, to provide necessary leadership and support, to accelerate the pace of development of agril.universities.

Currently, the country has a network of 29. State agricultural universities, 4 deemed universities imparting education in agriculture Veterinary, dairy, fishery and home science both at UG and PG levels. The current enrolment for UG and PG courses in agriculture is 67,990 (1.1% of total enrolment), 16,201 in Veterinary Sciences (0.3% of total enrolment of students in the country).

INTEGRATION OF TEACHING, RESEARCH AND EXTENSION IN AGRICULTURAL UNIVERSITIES

*Dr. N.SREERAMA REDDY**

The need for an operational integration of teaching, research and extension has been long felt all over the world. Such arrangement is relatively easier where all the three units are under one administrative control. Integration is a term which denotes the unification of related units or activities into a harmonious whole or entity. It is neither cooperation nor coordination but it goes a step beyond these two concepts. This kind of a distinction is of practical importance, since people quite often mistake integration for coordination and cooperation. While cooperation emphasises all for one and one for all, coordination means organised cooperation. Integration is inclusive of cooperation, coordination and such other aspects like human relations. Human relations may be referred to as relating ourselves to another in ways our greatest potentialities as an individual and as a contributor to the common welfare. Integration thus unifies all these values of cooperation, coordination and human relations. Tools stipulates some conditions which would facilitate effective interrelationship if considered and implemented :

1. Favourable climate and atmosphere facilitate the desired interrelatedness

The climate is most productive when there exists a spirit of trust among personnel of the institution at all levels, including administrative staff and otherwise. The suggestions of each person are honoured and given careful consideration. Where there is an abiding faith on the part of the leaders in relation to the intentions and suggestions of others, faith in the ability of the individuals to resolve the problems and to carry through assignments and responsibilities, greater personal satisfactions are realised and more actions are achieved.

2. Satisfying interrelationship is achieved through clear-cut channels

This means bringing co-workers into a situation where they can express ideas to share and to learn from each other and respect the ideas of others. To think cooperatively and to reach joint decisions, carefully weigh all alternative courses of action to reach compromises. Greatest care needs to be employed in providing necessary communication network for such purposes in the organisations like Agril. Universities.

* Dean of Agriculture, ANGR Agricultural University, Rajendranagar, Hyderabad-30.

1. Effective inter-relationship is achieved more satisfactorily and harmoniously when there are opportunities for joint decision making within each branch and between the branches viz., teaching, research and extension.
2. The inter-relationship is facilitated when the organisation is planned and developed so as to achieve specifically the desired interrelatedness.
3. Cooperative working interrelationship is achieved more successfully when specific plans are developed jointly, and
4. The interrelationship only possible when desirable personal satisfactions, programme achievements and good human relations are strong ingredients in the process.

Thus to achieve integration in Land Grant Institutions the respective teaching, research and extension staff members were housed under the same roof. Regular and frequent joint administrative committee meetings, joint seminars and conferences and regular prepared news issued to all staff members to help mutual understanding and interrelationships. An Executive committee comprised of all Heads of each branch needs frequently to discuss common objectives and problems.

3. *The present picture of Integration of teaching, research and extension*

The problem of integration and / or coordination of these three highly inter-related activities or functions in Agricultural Universities appears to be assuming serious proportions in our country with the increase of number of Agricultural Universities. Though, introduction of Agricultural Universities is a major reform in the field of Indian agriculture, it cannot be denied at the same time that like any other half hearted measure it has perhaps created more problems than it has solved. They were created as a new type of Universities with the prime objective of achieving the much need integration of research, teaching and extension which was found to be lacking in the previous set up. They were patterned on the Land Grant Universities in the U.S.A. but in actuality this remedy seems to be worse than the disease. This was mainly because, unlike in the United States where they were started on a clean slate, in our country we have tried to create new institutions with Agricultural Universities to take over the functions of already established institutions like State Departments of Agriculture, Animal Husbandry, Forest, Fisheries etc. Instead of taking over these three main functions in their entirety in the Agricultural Universities, we have been trying to share them between the new and old

institutions and such sharing has been done on adhoc basis only without any rational guidelines. This has led to rivalries and conflicts, sometimes a process of disintegration in place of the hoped for integration of the functions. The picture is generally true of all the States where agricultural universities have come into being though there appears to be some difference which is a matter of relative degree.

4. The suggested pattern

How to remedy this situation has become an important issue for discussion many a time. But little has been done to reach any agreement as to how it should be implemented in Agricultural Universities in India. Cummings, one of the pioneers in agricultural research and extension during the last three decades states, "Effective integration of teaching, research and extension can be accomplished only if a provision is made for a close and natural inter-relationship of these functions at all levels. The three separate organisational units for these three functions cannot hope to achieve effective integration if linked only by the top Executive". Thus it is obvious that the remedy for the prevailing melody of the States is to integrate the three functions under the single agency of agricultural universities. Infact the second workshop on Agricultural Universities stressed this point in its following recommendations.

"The cause of agricultural research will gain if the State Governments make agricultural research and extension education the concern of the respective universities is through extension work that the live problems of the farmers are revealed and many of these cut across several branches of agriculture. The transfer will eliminate duplication of effort and ensure cooperative attack on the problems by the Departments concerned".

By the same token there should be integration of these three functions at the All India level also. At present teaching and research are under the I.C.A.R. and extension is under the Ministry of Agriculture. Perhaps bringing all these three functions under a single agency may be by redesignating the ICAR as Indian Council of Agricultural Development (ICAD).

There should be coordination in respect of these three functions between the ICAD at the Centre and Agril. Universities in the States as well as between one Agril. University and another. Within the Agril. University there should be integration of these three functions at three levels 1) University level, 2) Department level and 3) at every individual level within the Department. While the Dean of each faculty should coordinate the teaching activities of several

departments of his faculty, the Directors of research and Extension should coordinate the research and extension activities respectively of different departments in all the faculties of university.

This broad pattern suggested above is in line with the enlightened view point of eminent authority like Cummings which will go a long way in eliminating the existence of overlaps and conflicts and will also ensure effective integration of research, teaching and extension at all the needed levels. A superficial understanding of the concept of the theme is likely to lead to the fear that the State Departments of Agriculture and Animal Husbandry would be rendered superfluous but a more careful consideration would reveal that this fear is unfounded because there is enough work for the Agricultural Universities and allied State Departments in the rapidly developing agricultural economy. There are no any unsurmountable difficulties in achieving this, provided that all the concerned spend their energies towards this end with sincerity, earnestness and good will.

However, without going in to the details of how this could achieved at broader levels like federal and State I would like to only dwell in this discussion the integration of teaching, research and extension in Agricultural Universities as suggested earlier. In otherwords how to bring integration of these three functions at university, Department and individual level.

INTEGRATION IN AGRICULTURAL UNIVERSITIES

1. Integration at departmental level

The first step in initiating the much-needed integration in Agricultural Universities is to reorganise these functions, i.e., research, teaching and extension by creating well-defined, integrated university departments to discharge the responsibilities for research, teaching and extension education, entrusting the head of each Department with overall responsibility for all the three functions in the entire State. This involves the reallotment of staff members, at present working under different sections in teaching, research and extension in order to constitute coherent and integrated university departments in each discipline. For instance, all scientists of the university who teach Entomology (i.e., Professors, Assoc. Professors, and Asst. Professors), all those who conduct research in Entomology (i.e., Scientists in research stations) should be brought under the over-all technical supervision and guidance of the Professor and Head of the Department of Entomology. Similar should be the case in respect of other disciplines in the university.

II. Integration at individual level

The second step to consider is how best to encourage integration at the individual level. While no rigid formula can be prescribed, the heads of departments may distribute the work-load in such a way that, as far as possible, every staff member in the Department is entrusted with atleast two of three functions. To bring about this integration at individual level and at the same time to make the best use of the available staff the Head of the Department shall have the discretion to reallocate the duties to the staff members of his Department in the areas of teaching, research and extension in varying proportions, depending on the competency and aptitude of the individual concerned.

However, in the interest of the overall efficiency of postgraduate teaching and research, the following guidelines may be kept in view while allotting work to individual staff members.

1) Every teacher offering postgraduate courses should have definite research projects (s) to work on. The project (s) should be selected in consultation with the Head of department and Director of Research. Teachers entirely engaged in undergraduate teaching may be exempted from research work at the discretion of the Head of Department.

2) When two or more individuals are engaged in one research project, efforts should be made to define the component units of this project and assign specific responsibilities to each worker engaged in such project.

3) Staff who are employed mainly for teaching should devote at least one-third of their time every semester (or one semester out of three semesters in a year) to research and/or extension based upon the discretion of the Head of department.

4) Similarly staff who are employed mainly for research or for extension work should devote atleast 1/3 of their time every semester to one or more of the other two areas, depending upon the discreation of the Head of the Department.

To summarise, the head of the Department will be required to distribute work-load in such a way that every staff member is given scope for doing research, teaching and extension, taking into consideration his competence and aptitude.

III. Some relevant considerations

In this connection the following comments seem to be pertinent.

1. This system can work efficiently only when all the positions in the three branches are filled up; otherwise, research and extension will have a set-back. In the present set-up, extension is obviously the weakest link in the chain, and this deficiency needs to be made good by providing Extension Specialists at the university departmental level (i.e., State level) duly supported by Subject-Matter Specialists at district and block levels. This can be taken up as a phased programme, if financial and other considerations do not permit this arrangement to be implemented all at once.

2. As research is a continuing activity, it may be argued that it is difficult to maintain continuity of research if a person is to be shifted from one activity to another. Hence for proper execution of research activity, it is essential that research is organised into ultimate units of projects and all the collaborators should have well-defined, small projects or responsibilities so that the project as a whole, does not come to a stand-still at any time. The same argument and arrangement would hold good in the case extension activity also. For it is at the project level that most of the detailed operational controls, such as budgets, and man-power scheduling are most effective. The top and middle organisational levels are the primary means of planning, communication and coordinating the overall research and extension effort. Projects are the means by which the detailed research and extension activities are performed. If these projects are adequately described and their objectives clearly defined, they also serve as the primary mechanism for proper supervision and control, in the same way that syllabi and course outlines do in the case of the teaching activity.

3. At the regional stations, and sub-stations, the research staff can do extension work but no resident instruction at the undergraduate level, though they can guide and supervise the research work of postgraduate student.

4. The staff engaged in extension education activity at the district level, may undertake adaptive research on some local problems.

In all these arrangements, it is important to ensure that the activity for which the individual staff member is primarily employed does not suffer by his dabbling with too many things at the same time.

As the problem of complete integration of teaching, research and extension is fairly complex and demands a well-rounded programme for effective implementation, the following points also deserve adequate attention.

IV. Programme planning in research, teaching and extension

Programme planning in research, teaching and extension will have to be done by the Heads of University departments, not on an arbitrary or unilateral basis but on the basis of consulting and collaboration with all the concerned staff members in his Department who have the needed experience, knowledge and ability. Besides such consultation with his own staff members, the head of a Department should seek the view-points and help of other departments, especially when the project involves the collaboration of more than one discipline. To be more effective such consultations shuld be made on a continuing basis, in the three critical stages of planning, execution and evaluation of the projects.

For administration convenience, each State may be divided into certain regions, based on agro-climatic conditions and other pertinent considerations. These regions may have the Agricultural and Veterinary collages as their focal points for carrying out the activities of teaching, research and extension. Once the research or extension is projected as mentioned earlier, it will be the responsibility of the Officer in charge of the regional station to execute the same through the staff that are made available to him in the region. However, essentially as advisers, consultants or helpers in carrying out the assigned research or extension projects. It is needless to stress that maximum freedom should be given to the staff in the day-to-day execution of projects of research and extension, as in the case of teaching.

V. Channels of communication

Communication is probably the greatest problem in any aspect of the work of an institution. If we do not know what is going on we cannot be part of the team. Further, the problem of communication, especially with widerspread research and extension programme is crucial. Therefore it is essential to establish clear channels of communications, as indicate below, in order to facilitate effective integration and co-ordination of research, teaching and extension.

1. Between Departmental Heads and Dean

Heads of departments of the University should communicate with the Dean of Faculty through the Principal of the concerned College on all academic matters connected with undergraduate and postgraduate work and overall physical facilities and budgetary requirements.

2. **Between Departmental Heads and Director of Research**

There should be direct communication between Director of Research and Heads of Departments in respect of all technical matters like formulation of research projects including the allotment of personnel and money for research projects, periodical evaluation, supervision and final evaluation, reporting etc., connected with research projects; and also other areas like research seminars, conferences, workshops, budgetary provisions under recurring and non-recurring items, public-articles, deputation of staff to participate in summer institutes, conferences, workshops, seminars etc.

3. **Between Heads of Departments and Director of Extension**

Heads of Departments may communicate directly with the Director of Extension on all matters connected with radio & TV programmes, preparation of crop calendar, extension bulletins and other extensions materials, conducting farmers training classes, short term courses, programme planning in extension activities of the Department and in connection with all workshops, conferences, seminars organised for extension activities and the budgetary provisions for extension activities in the departments.

4. **Between Heads of Departments and Project Leaders or Co-Leaders**

The project leaders and co-leaders can communicate with each other and with the Heads of Departments directly on all matters connected with execution, evaluation and reporting of research projects once the projects are formulated and assigned.

5. **Between Heads of Departments and Heads of Sections in the other constituent Colleges**

Heads of Departments can communicate directly with Heads of Sections in their departments in other constituent colleges on all matters connected with teaching, research and extension activities as detailed above pertaining to their region with a copy marked to the Principals of the Colleges concerned.

6. **Between Heads of Departments and ADRs and Scientists of Regional Stations**

ADRs and Scientists of Regional Stations can communicate direct with the Heads of Departments on Matters of technical nature.

7. Between ADRs and Scientists of Regional Stations and the Director of Research.

ADRs and Scientists of Regional Stations can communicate directly with Director of Research on all matters connected with the execution of research projects and General administration of research stations, as well as problems that need solutions through the work of two or more departments.

8. Between ADRs and scientists of Regional Stations and the Director of Extension.

ADRs and Scientists of Regional Stations can communicate directly with Director of Extension on problems connected with the execution of extension work in their regions.

ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY RAJENDRANAGAR, HYDERABAD - MANDATE, UNITS AND FUINCTIONS

*Dr. S. RAGHUVARDHAN REDDY**

1. PREAMBLE

The report of the second National Education Commission (1964-1966), headed by Dr. D.S.Kothar the then Chairman of the University Grants Commission, stressed the need for establishing an agricultural University in each State. Accordingly, the Andhra Pradesh Agricultural University (APAU) was established on June 12, 1964, with headquarters at Rajendranagar, Hyderabad.

As per the provisions of the APAU act, the Agricultural College, Bapatla established in 1945 and affiliated to Andhra University, the College of Agriculture and the College of Veterinary Science, established in 1946, both functioning at Hyderabad, the Andhra Veterinary College, Tirupati established in 1955, Sri Venkateswara Agricultural College, Tirupati established in 1961 and affiliated to Sri Venkateswara University, the College of Home Science, Hyderabad established in 1961, which was affiliated to Osmania University were transferred to the University as constituent colleges on the day of its establishment. In addition, 45 research stations, functioning under the Departments of Agriculture or Animal Husbandry, comprising 41 Agricultural and four Livestock Research Stations, also were transferred to the University during July, 1966 and May, 1967 respectively. The University was formally inaugurated on March 20, 1965 by Sri Lal Bahadur Sastri, while the building Programme of the University was inaugurated on 23rd, June, 1966 by Smt. Indira Gandhi, the then Prime Ministers of India.

The University assumed statewide responsibility for research in agriculture since July 1, 1966. Subsequently, from May 1, 1967, the responsibility for research in animal Husbandry also was entrusted to the University. In the subsequent years, the University was also charged with the responsibility for conducting research on home science, fisheries and farm forestry from 1974, 1976 and 1977, respectively.

The University was renamed as Acharya N.G. Ranga Agricultural University (ANGRAU) on November, 7, 1996 in honour and memory of late

* Registrar, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad - 30

Acharya N.G. Ranga, an outstanding parliamentarian and Kisan leader hailing from Andhra Pradesh.

2.UNIVERSITY MANDATE :

The mandate of the University is to

- Train the man power needed for agriculture, animal Husbandry and allied sectors for the development of the State (Education)
- Constantly improve and generate technologies for increasing production in agriculture, animal husbandry, home science and allied sectors (Research)
- Assist through the development departments of the Government, in the process of dissemination of the improved technologies to the farmers of the State (Extension / Transfer of Technology)

3.INSTITUTIONAL GROWTH

a) Infrastructure

The basic infrastructure at the time of its establishment in the year 1964 consisted of 6 Colleges to which 41 agricultural and 4 livestock research stations were added in the year 1966 and 1967 respectively. Over the years, the infrastructure of the University has increased substantially. Now it has 8 teaching campuses with 13 constituent Colleges, 4 Agricultural Polytechnics, one Animal Husbandry Polytechnic, 7 Regional Agricultural Research Stations and 60 other Research Stations. These units comprising the basic research infrastructure are spread out in all the 7 Agroclimatic zones of the state, encompassing all the 23 districts (administrative units of the state).

ANGRAU – INSTITUTIONAL GROWTH
(1964-2001)

ACADEMIC INSTITUTIONS		
1964	**2001**	
		Year of Establishment
Agriculture		
	Colleges of Agriculture	
Rajendranagar	Rajendranagar	1946
Bapatla	Bapatla	1945
Tirupati	Tirupati	1961
	Naira	1989
	Aswaraopet	1989
	Mahanandi (Nandyal)	1991

1964		2001
		Year of Establishment
	College of Agricultural Engineering	
None	Bapatla	1983
	Agricultural Polytechnics	
None	Palem	1989
	Jagtial	1996
	Maruteru	1999
	Anakapalle	1999
Veterinary Science		
	Colleges of Veterinary Science	
Rajendranagar	Rajendranagar	1946
Tirupati	Tirupati	1957
	Gannavaram	1998
	College of Fisheries Science	
None	Muthukur	1992
	Animal Husbandry Polytechnic	
None	Palamaner	1999
Home Science		
	Colleges of Home Science	
Hyderabad	Hyderabad	1961
	Bapatla	1983
	RESEARCH AND EXTENSION INFRASTRUCTURE	
	Regional Agricultural Research Stations	
None	7	
	Agricultural Research Stations	
41	50	
	Livestock Research Stations	
4	6	
	Fisheries Research Stations	
None	4	
	DEVELOPMENT OF HUMAN RESOURCE	
Scientists 403	Scientists 1910	
Technical & Supporting staff 1270	Technical & Supporting staff 3950	

Thus, the growth and development of the University in terms of expansion of teaching, research and extension activities have been exemplary. Three campuses, at the time of establishment in 1964, have now increased to 8 and the number of constituent Colleges have growth from 6 to 13. At the time of establishment of the University, undergraduate programmes only were offered in all the teaching campuses, with the PG programme offered at Rajendranagar

campus alone. However, over a period of time, postgraduate programmes were introduced in the other teaching campuses along with the B.Sc. (Hort.), B.Tech. (Ag.Engg.), B.F.Sc. and B.Tech. (Dairy Tech.). Academic activities were, thus, expanded to cover eight teaching campuses consisting of 13 Colleges, plus four Agricultural polytechnics and one Animal Husbandry Polytechnic (first in the country).

With the implementation of National Agricultural Research Project (NARP) in 1979, the infrastructure for implementing research programmes was vastly expanded and diversified. More research Stations were established to meet the location specific needs of the farming community. The number of research Stations has increased from 45 to 67 and six Krishi Vigyan Kendras also have since been established.

b) Human Resource

At the time of establishment of the University, the sanctioned staff strength was 403 faculty positions, including scientists and extension staff and 1,270 technical and supporting staff, whereas the current strength of the University is 1910 scientific and 3,950 technical and supporting staff. The growth of the institution is, thus, substantial, both in terms of expansion of teaching, research and extension infrastructure and deployment of faculty, consisting of teachers, researchers and extension personnel and supporting and administrative staff.

Manpower in ANGRAU

Particulars	Teaching	Research	Extension	Administration	Total
Teaching					
Professor cadre	79	32	4	12	127
Assoc.Prof.cadre	188	177	23	12	400
Asst.prof.cadre	585	674	112	12	1383
Non-teaching					
Technical staff	765	1020	115	170	2070
Supporting staff	560	994	42	284	1880
Total	2177	2887	296	490	5860

4. ORGANISATIONAL SETUP

a) Board of Management :

The University is governed by Board of Management, which, at present, consists of 21 members, and is the apex body empowered to take all policy

decisions. The Vice-Chancellor of the University is the Chairman of the Board of Management.

The Board of Management has representation from the State Legislature, Progressive farmers and the agri-business sector. In addition, a representative from the Indian Council of Agricultural Research, 3 Academic Council Members representing Agriculture, Veterinary and Home Science faculties of the University, Secretaries to the Government, representing Panchayat Raj, Finance Departments and Directors of Agriculture and Animal Husbandry are also Members of the Board.

b) Academic Council

The academic administration of the University is guided by the Academic Council, which is Chaired by the Vice-Chancellor, and consists of two Members from the Board of Management, the Deans and Directors, Assoc. Deans of the Colleges, the Heads of Departments of various faculties and the Professors of the University. In addition, the Vice-Chancellor nominates four members to the council representing research wing of the University and prominent academicians. The Vice-Chancellor is the Principal Executive of the University and is also responsible for the academic administration.

c) Research and Extension Advisory Council

The research and extension activities of the University are guided by the Research and Extension Advisory Council, comprising seven Members of Board of Management, Deans of Faculties, Director of Extension, Director of Research (Animal Sciences), seven Progressive Farmers representing the seven agroclimatic zones, one woman farmer and one farmer each from the Animal Husbandry and fisheries sectors, Directors of line departments (Agriculture, Animal Husbandry, Fisheries, Women and Child Welfare, Horticulture), Managing Director of State Seeds Development Corporation, two eminent Scientists and two representatives of agribusiness sector, all Assoc. Directors of Research, Assoc. Deans, Principal Scientists and University Heads of all Faculties, with Vice-Chancellor as Chairman and Director of Research as the Secretary.

The Vice-Chancellor heads the University administration and is assisted by the Registrar who is responsible for general administration, Director of Research, Director of Research (Animal Sciences), Director of Extension, Deans of Faculties, Comptroller, University Librarian and the Estate Officer. The Deans of various Faculties are responsible for implementing the academic programmes

in the faculties concerned and the Director of Research and Extension for the research and extension activities respectively, while the management of University finances is the responsibility of the Comptroller.

d) Operational Wings of the University :

The University is organised functionally, into three operational wings, namely Academic instruction (Teaching), Research and Extension supported by Administration and Finance wings.

The Associate Deans are the academic and administrative heads of Colleges, while the Associate Directors of Research are responsible for planning and implementation of the research and extension programmes and developmental activities in their respective agro-climatic zones. The individual research stations, within a particular agro-climatic zone, are headed by the heads of research Stations and the Krishi Vigyan Kendras are headed by Chief Training Organisers.

e) Teaching Campuses

The University has seven teaching campuses with 13 Colleges at Rajendranagar (Agriculture, Veterinary, Home Science), Bapatla (Agriculture, Agricultural Engineering and Home Science), Tirupati (Agriculture, Veterinary and Dairy Technology) and one each of Agricultural Colleges at Aswaraopet, Naira and Nandyal including a Fishery College at Muthukur. In addition to two Agril. Polytechnic Colleges working at Palem and Jagtial, the Government of Andhra Pradesh as accorded approval for starting two Agricultural Polytechnics at Maruteru and Anakapalle and one Vety.Polytechnic at Palamaner.

f) Research Stations

Sixty-seven research Stations are spreaded over in the seven agro-climatic zones of the state for conducting location specific and need based research on various crops grown in the state.

g) Extension Services

The limited but specialised extension services based on the results of research are being rendered through Extension Education Units locate at the RARS's as well as K.V.Ks, E.E.I., AI & CC and Regional Biogas Training Centre and also recently established District Agricultural Advisory and Transfer of Technology Centres (DAATTC) in each district.

h) Faculty Improvement Programme

Since inception, the University has been encouraging its staff members to acquire qualifications by deputing them to higher studies in subjects identified as deficient areas in ANGRAU to obtain higher degrees. So far, 44 per cent of the staff could be benefited of this programme in acquiring higher degrees including Ph.D.

Best Teacher / Researcher / Extension Worker Awards

- Instituted during 1986, these awards have been a source of encouragement towards maintaining a high standard in teaching, research and extension in the middle and junior level faculty to exhibit dedication to duty and to excel in their respective fields.

5. ACHIEVEMENTS OF OPERATIONAL WINGS OF THE UNIVERSITY

a) Teaching

The teaching programmes have been conducted under three faculties of Agriculture, Veterinary and Home Science through offering of the undergraduate and postgraduate courses including the doctoral programmes. The annual intake and out turn of various programmes are furnished here under :

Annual intake and Out-turn in various Degree Programmes since inception

Degree Programmes	Annual intake	Out-turn since inception of the University upto 2001
Faculty of Agriculture		
B.Sc.(Ag.)	528	11382
B.Sc.(Hort.)	38	272
B.Tech (Ag. Engg.)	28	265
M.Sc.(Ag.)	160	3739
M.Sc. (Hort.)	13	45
Ph.D.	26	459
Diploma in agriculture	100	336
Faculty of Veterinary science		
B.V.Sc. & A.H.	170	3587
B.Tech (Dairy Technology)	18	132
B.F.Sc.	30	54
M.V.Sc.	70	1197

Degree Programmes	Annual intake	Out-turn since inception of the University upto 2001
M.Tech. (Dairying)/M.Sc.(Dairing)	6	12
Ph.D.	14	117
Faculty of Home Science		
B.H.Sc. (Rural)	147	2151
M.Sc.(H.Sc.)	26	514
Ph.D.	5	31

RAWEP

ANGRAU was the first is in the country to have introduced Rural Agricultural Work Experience Programme (RAWEP) for the final year B.Sc. (Ag.) students in the year 1979-80 and this programme has been extended subsequently to B.Sc. (Hort.) degree programme from the year 1983-84. Introduction of a similar programme, Rural Home Science Work Experience Programme (RHWEP) for the Home Science final year students during 1992, whereby the students stay in the villages and work with their Host Farmers for one full semester and gain first hand experience in farming and identifying production constraints.

Student Welfare Activities :

Schemes for special coaching to schedule castes and schedule tribe students are being implemented. The other welfare schemes included National Cadet Corps (NCC), National Service Schemes (N.S.S.), Information and Guidance Bureau, the Employment and Placement Bureau as well as Earn while you Learn projects.

Other Facilities

Library and documentation services, Computer Centre and Health Centres provide related services to the staff and students.

Innovations

- Interinstitutional agreements are made for advanced postgraduate research with International Rice Research Institute (IRRI), Philippines and International Crops Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad.
- Continuous revision and modification of undergraduate course content and syllabus is made based on the principles of educational technology.

- Development of common course outlines for each course by the teaching faculty of each discipline is done to bring about uniformity in teaching courses at different campuses.
- Distribution of lecture outlines is arranged in advance to students by teachers.
- Common semester final examination system with centralised paper setting and correction in all the faculties is introduced in the year 1979.
- Evaluation of students on 10 point scale was introduced in the year 1979.
- Written and viva-voce are introduced in all the Postgraduate qualifying examinations.
- Colloquia are introduced for research programmes before embarking on the research programme and also before submitting the thesis to improve the quality of research and also presentation of report.
- Meritorious awards are introduced to recognise and reward outstanding teachers, researchers and extension workers in the year 1986.
- Planning and monitoring cell is established at the University for effective implementation of various educational, research and extension activities of the University.

b) Research

The major thrust of the University is research; with the implementation of National Agricultural Research Project (NARP), the research has been reorganised with a strong multi-disciplinary approach to serve the location-specific research requirements more effectively. About 800 scientists are working in various research stations spreaded over seven agro-climatic zones of the state.

Agroclimatic zones and lead functions

S.No	Zone with headquarter stations	No. of Res. Stations	Lead Crops / Functions
(1)	(2)	(3)	(4)
i.	Krishna-Godavari Zone, RARS, Lam	23	Rice, Pulses, Cotton, Chillies, cashew, Spices, Post Harvest Technology, Oil Palm, Water Management, Coconut, Mango, Banana, Cattle and Fisheries.

(1)	(2)	(3)	(4)
ii.	North Coastal Zone, RARS, Anakapalle	7	Sugarcane, Sesamum, Mesta and Livestock
iii.	Southern Zone, RARS, Tirupathi	10	Groundnut, Citrus, Sheep and Pigs.
iv.	Northern Telangana Zone, RARS, Jagtial	11	Sugarcane, Rice, Water Management and Fisheries
v.	Southern Telangana Zone, RARS, Palem	8	Rice, Maize, Millets, Oilseeds, Horticulture, Poultry, Agro-Industrial by-products in livestock rations, Forage crops and Post-Harvest technology.
vi.	Scarce Rainfall Zone, RARS, Nandyal	4	Sorghum, Dryland Agriculture and Water Management
vii.	High Altitude and Tribal Area Zone, RARS, Chintapalli	4	Horticultural crops and Tribal area development.

Outstanding Research Contributions :

1. Improved crop varieties released :268
2. First in India and second in the world

   Hybrid Rice developed and released two rice hybrids APHR 1 and APHR 2 first time in India and next to China in the world.
3. First in the country

Rice	:	Gallmidge resistant (Kakatiya, Surekha, Pothana, Divya, Kavya, rudrama) and brown plant hopper resistant (Vajram, Pratibha, Chaitanya, Nandi, Chandan) varieties.
Maize	:	First triple cross hybrid (Trisulata)
Blackgram	:	Powdery mildew resistant variety, Krishnayya (LBG 17).
Groundnut	:	Nematode resistant variety (Tirupati 3)
Sunflower	:	Hybrid (APSH 11)
Sugarcane	:	Red rot resistant varieties (Co A 7601 and Co A 7602)

Cotton	:	Godavari Ganga (one of the first early released hybrids)

4. National Recognition

Ragi	:	Godavari
Chillies	:	Bhagyalakshmi (G4), Andhra Jyothi (G5), Bhaskar (CA 235)

The research programmes are formulated at the Station level, discussed at the respective zonal headquarters and finalised at the state level with due interaction, of the scientists, farmer representatives and officials of the Department of Agriculture and other related departments and institutions.

c) Extension Education

The concept of Agricultural University envisages a strong integration of teaching, research and extension through their balanced development. The major emphasis in extension education of Agricultural Universities is on front line extension activities like testing and introduction of new technologies on the farmers fields, processing of technical information, training of extension personnel of the state and other development departments and developing innovative extension methodologies and strategies etc.

In order to perform these activities, the University has the following Extension and Transfer of Technology Centres set up in different places of the state.

Extension Education Units : Agricultural Information and Communication Centre, K.V.Ks, E.E.I., Rajendranagar, Regional Biogas Training and Development Centre and recently established District Agril. Advisory and Transfer of Technology Centres (DAATTC) in all the districts of the state.

The University has excelled in the transfer of technology with its several innovative and novel programmes as follows :

1. DAATTC

One of its kind, the University has reorganised its extension services by establishing District Agricultural Advisory and Transfer of Technology Centres in all the 22 districts headquarters except Hyderabad urban district. These centres provide technological back up and lend support to the extension agencies of the line departments and conduct regular field diagnostic visits, identify the field problems and provide scientific solutions.

2. Krishi Vigyan Kendras

There are 10 Krishi Vigyan Kendras working under the control of this University and organise the skill oriented, production oriented, short term training programmes for the farmers, rural youth and farm women.

3. Agricultural Information and Communication Centre (AI&CC)

The Agricultural Information and Communication Centre processes technical information generated by the University Scientists and other related agencies and disseminates it for he benefit of the farming community and the extension personnel of line departments, through publications and other channels of mass media.

Vyavasaya Panchangam

Vyavasaya Panchangam – A farmers' almanac in Telugu provide valuable information on agriculture and allied subjects is published from this centre and is released on "Telugu New Year" day every year. This is very useful and valuable publication has received wide accolades and every year several thousands of copies are sold on heavily subsidised prices.

Bulletins

The University had also started publishing crop wise bulletins on insect pests, diseases and nutritional disorders both in Telugu and English on wide variety of crops for the benefit of farmers as well as to the Extension Officers. Perhaps, this is the first of its kind in the country and these publications have received much appreciation and applaud from all the concerns of the society in the country.

Distance Education

a) Annadata-Velugubata

Realising the enormous potential of mass media, Distance Education through Electronic media, as an outreach-programme for the farmers, the University first of its kind in the agril. and allied fields has introduced telecasts of 10-15 minutes duration at 6.30 AM twice in a week through a private ETV channel under the caption "Annadata-Velugu Bata".

This non-formal training has attracted the attention and appreciation of rural youth, women and schooled ropouts response. more than 150 modules have already been telecasted through this Distance Education. Enterprise oriented topics are given utmost importance.

b) Rytu Mitra

Another programme for the farmers has been introduced by the university through another Private Teja T.V. channel under the caption 'Rytu Mitra' with a duration of 1 hour at 6 pm every day. This programme includes both telecast on subject on agril. and allied fields and question answer sessions.

4. ***Agricultural Technology Information Centre (ATIC)***

Agricultural Technology Information Centre (ATIC) is a "single window" support system linking the various units of the University with intermediary users and end users (farmers) in decision making and problem solving exercise. This centre has been established in the University on 25-7-2000.

5. ***Kisan Melas***

Kisan Melas are being organise by this University in all the 77 Revenue divisions of the state and these have become effective platforms for the dissemination of the technical information.

6. ***Village Adoption***

Another novel programme implemented by the University, is village adoption and is being implemented by the University in 50 centres all over the state. The frequent contact of the scientists with the villagers help the farmers to take up remedial measures on time for the field problems and also in having overall economic development and upliftment of the people.

7. ***State wide broadcast over All India Radio***

The University in collaboration with All India Radio, every day is broadcasting a 10 minutes bulletin at 6.50 PM, on agriculture, horticulture, Animal Husbandry, fisheries, women in Agriculture exclusively for the benefit of the farmers. This programme, introduced in the University in 1960, is first of its kind in Agricultural universities aimed at quick transfer of technologies, without time lag.

8. ***Agricultural Market Committee Level Training***

The University scientists in collaboration with the Department of Agriculture have been training several thousands of farmers at 286 agricultural market committees every year both in Kharif and Rabi. At each market committee, about 300 to 400 farmers or more have been trained on major crops grown in that particular area.

9. *Linkages of ANGRAU with State Department of Agriculture and other Organisations :*

The linkages between ANGRAU and State Department of Agriculture are at two levels which include the linkage mechanism for coordination of research and extension programmes at state level and at Regional as well as local levels.

6. FINANCES

Source of funds

The University is supported largely by the Government of Andhra Pradesh, which provides 75 to 80 per cent of the finances for conducting research, teaching and extension activities under non-plan block grant budgetary provisions and also for specific schemes sanctioned under the state plan. The non-plan funds are meant to meet the expenditure of the University in respect of research Stations, schemes and the Colleges transferred by the Government in 1964 or converted to non-plan establishment subsequently.

The University also gets financial support from ICAR, Government of India and several other National and International Agencies and agro-industries. Financial assistance is provided annually by the ICAR, as development grants for educational institutions and also for implementing a number of All India Co-ordinated projects and Ad-hoc Schemes.

Some of the extension activities of the University are financed by the Government of India. Such finances are provided mainly for maintenance and strengthening of Extension Education Institute, and its training programmes, and also for some specific extension projects. The University has implemented several Ad-hoc Research Schemes financed by the State, National and International Agencies like the Indian Council of Agricultural Research, Department of Agriculture, Indian Council of Medical Research, Department of Bio Technology, Department of Science and Technology, NIPPCD, Ford Foundation, food and Agricultural Organisation, United Nations Development Programme, IDRC, USWA etc.

Acharya N.G. Ranga Agricultural University is one of the four State Agricultural Universities in the country selected for assistance to imp.rove and strengthen the teaching and training capabilities of undergraduate degree programmes under the World Bank aided Agricultural Human Resource Development Project (AHRDP) initiated in the year 1995.

MONITORING AND EVALUATION

Teaching

To improve the teaching quality and academic standards, teacher evaluation by students has been introduced during 1979-80 at Agricultural College, Bapatla and is being extended to all Colleges now. The teacher's performance is evaluated by the students by obtaining responses through a well structured questionnaire, at the end of each semester. The teaching programmes of various faculties are revised and updated periodically, at 4 to 5 years interval, with a view to introduce courses/topics in the curriculum to be in tune with Global and National scenarios. The needs and expectations of the farmers, agro-industries sector, agricultural financing institutions and NGOs are also taken into account while revising the curriculum of UG and PG programmes. The latest such revision was done in May 1997 for all degree programmes. The assistance of academicians of repute is also enlisted for improving the quality and content of the courses taught while revising the syllabi of different courses. The Accreditation Team constituted by ICAR for evaluating the education programmes completed its visit to the different campuses and accorded accreditation. Self evaluation by teachers themselves will be introduced shortly. The Faculty Deans monitor the teaching programmes.

Research

The relevance and performance of various research programmes of the University, sponsored by ICAR, are evaluated by the respective Quinquennial Review Teams (QRT) appointed by the ICAR for the purpose, once in five years. The recommendations of the teams, on approval by ICAR, are implemented by the University. The ICAR and World Bank teams regularly monitor the progress of implementation and accomplishments under The World Bank aided projects.

With regard to the programmes sponsored by the State Government, the performance is evaluated by the respective Associate Director of Research and finally by the Director of Research periodically.

Research programmes and their implementation are reviewed every year by the University heads of departments, identified senior researcher in the respective disciplines.

Review committees are also appointed for the purpose of evaluating teaching, research and extension activities of the University. Two such committees have been appointed, in the recent past, headed by Director of

Research N.K.Anantha Rao and Director of Research.J.S.Kanwar. The recommendations of the committees have been implemented.

The research and extension programmes of each Research Station are evaluated, for their relevance and performance at the respective Zonal Resarch and Extension Advisory Council meetings, under the Chairmanship of Associate Director of Research, with the involvement of Officials of line departments, input Agencies, voluntary organisations, scientists and farmer representatives. The programmes are revised and implemented, based on the Council's recommendations. At the state level, this is being done by the state level Research and Extension Advisory Council, comprising the Heads of various line departments of the Government of Andhra Pradesh, Professors, Members of the Board of Management, farmers representatives and eminent nominated Scientists, under the Chairmanship of Vice-Chancellor.

The systems of evaluation which have been developed over the past three and half decades for teaching, research and extension activities have been continuous and result oriented. The evaluation systems adopted have succeeded in making the educational, research and extension programmes more relevant. The evaluation systems have succeeded in identifying deficiencies, needs of the user Agencies and enabled mid-course corrections in teaching research and extension programmes.

Extension

The individual training programmes organise by the Extension wing are evaluated by he participants through a schedule at the end of each programme. The extension training programmes proposed by the University, financed under the centrally sponsored schemes, are evaluated for their relevance and usefulness by a committee constituted, for the purpose, by the Department of Extension, Ministry of Agriculture, Government of India, annually before they are approved. The training programmes proposed by the Extension Education Institute are evaluated by the Governing body of the Institute.

The University has established a "Planning and Monitoring Cell" in its Administrative Office during the year 1986 with the objective of finalising plan documents, preparation of annual plans and constantly monitoring the implementation of planned proposals. In order to design more systematic planning and monitoring mechanisms, the present "Planning and Monitoring Cell" is proposed to be upgraded to "Directorate of Planning and Monitoring" a Satutory

Body headed by an University Officer with the following objectives :

- Preparation of Annual Plans of Teaching, Research and Extension
- Monitoring the implementation of the above plans
- Performance evaluation of research stations, teaching and extension units
- Preparation of reports based on technologies generated
- Development of schemes for research priorities and sources of funding
- Impact assessment studies
- Training of staff on preparation of sound Project proposals
- man power planning including need based redeployment

The Director of this unit is proposed to be nominated as a Member of Research and Extension Advisory Council and Academic Councils of the University to facilitate decision making in organisational, academic and managerial matters and undertake self assessment of all Research and Extension Programmes.

In recognition of the university's outstanding achievements in the fields of teaching, research and field extension, the ICAR has awarded "Best Institution Award" to the ANGRAU in the year 2000.

INSTRUCTIONAL TECHNOLOGY

EDUCATIONAL TECHNOLOGY - THE NEED OF THE DAY FOR EFFECTIVE TEACHING LEARNING

*Dr. B.V. SUDERSHAN RAO**

INTRODUCTION :

Educational technology is an area of innovation that has shot into prominence in recent years. Educational Technology is related to the application and utilization of modern audio-visual techniques and aids, and organised knowledge in the teaching – learning process. In other words, the word 'Educational Technology' refers to the application to education of devices, processes and styles of thinking developed outside the realm of education, such as, the programmed instruction, systems approach, computers etc.

Educational Technology has been defiend by different authors and commissions in different ways. The Birtish National Council for Educational Technology has defiend educational technology as 'the development, application and evaluation of systems, techniques and aids to improve the process of human learning'. The U.S. Commission on instructional technology has defined it as 'the systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of specific objectives based on research on human learning, communication, and employment, a combination of human and non-human resources to bring about more effective instruction'. Another definition of educational technology is that of Kulkarni (1974) – who defined educational technology as 'a science of techniques, method and media by which educational goals could be achieved'.

Concept, Different Views and their Implications :

Educational technology is the application of technology in the field of education, which aims at improving the teaching, learning process. The concept of educational technology has emerged form a gradual process of evolution. Before 1950's, the term 'educational technology' was used to

* Professor & Head, O & RT unit, Department of Agricultural Extension, College of Agriculture, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad - 30

refer to teaching aids, such as filmstrips, films, radio, tape-recorder, overhead projectors etc. This was known as the 'service-concept of educational technology'. It was the audio-visual equipment or hardware concept. After 1950's, as a result of Skinner's achievement in programmed instruction, the concept of educational technology became broader. It included the application for Learning-Principles, communication and information theories, to develop a quality in the instructional process. Thus, the term educational technology absorbed 'the behavioural science concept' besides hardware concept.

After 1960's the concept of educational technology became more broader, as a result of evolution of theory of systems-approach and systems-analysis. Thus, in view of the above facts, the present-concept of educational technology includes the following :

a) the service or equipmental concept.
b) The behavioural science concept;
c) The systems concept.

Different views have been expressed by educational experts on the subject of educational technology.

Views for Educational Technology (or) Advantages of Educational Technology :

1. Educational technology serves as an instrument for evolving and designing the methods and means of utilizing developments in science and technology towards improving teaching – learning process.

2. Educational technology replaces the age-old traditional methods by new scientific methods; for example, the lecture method can be replaced or supplemented by new methods like computer-assisted instruction or programmed instruction.

3. Educational Technology can speed up the rate of learning and help the teacher make better use of his time. It provides a greater variety of bearning-experiences according to individual styles of learning.

4. It serves as a measure of improving teacher education, to increase learning experiences; it gives robust and adventurous thinking to teacher education.

5. Educational technology is a means of bridging the gap between the content of educational and live-experiences of the students, and the modernity of science.

6. Non-formal education can be effectively carried-out through adoption of *educational technology; i.e., mass-media, radio, television* etc. play on effective role in the spreading of education.

7. Shortage of well-equipped teachers can be overcome by introduction of audio-visual technology. Educational technology makes teaching not only efficient but also saves the teacher from the dull monotonous, repetitive roles.

8. Innovations are possible in educational field because of educational technology.

Other views advanced in favour of educational technology are that, better evaluation, supervision becomes possible through technological aids, the behaviour of the students can be controlled in a more effective way by utilizing modern aids, like tapes, projectors etc.

Views against educational technology (or) Disadvantages of Educational Technology :

Although several arguments have been put forward in support of educational technology, some fears and limitations have also been expressed in some quarters. These are :

1. that, the educational technology makes the classroom a factory;

2. that, it is very rigid, mechanical, and inhuman;

3. that, the teachers lack necessary skills to adopt educational technology. The use of aids like projectors, films, and computers, needs specialised knowledge and training on the part of teaching community.

4. That, it is inherited from Western system.

Educational technology has come to acquire a variety of implications. Educational technology has to be regarded not as an end in itself, but as a means to an end. The task facing the teachers of today and tomorrow is 'how they are to utilise the modern media of communication' to improve

the teaching – learning process. Thus, with the evolution of educational technology, the learner has become the center of attention in educational process. It is the learner who has to gain knowledge, experience, and skills to become a useful citizen. The teacher, therefore, is to guide the learner and not to have despotic control on him. The learning material has to be culled, organised and shaped to meet the needs and interests of the learner, rather than moulding the learner to the needs of the learning material. Modern teaching technology is the synthesis of psychological, scientific and progressive forces in education, in which all teaching methods are harnessed to the unique characteristics of the learner. An important aspect of educational technology is to make teaching not only visible, but also quantifiable. Aids like television, group teaching methods, teaching models etc. form part of the milieu here.

One could conclude from the above views and implications, that educational technology is not a glamorous product of electronics alone. But it is also a system of techniques and approaches to design learning outcomes.

Educational Technology-Need of the day :

Educational technology is an essential ingredient of an educational revolution which will lift the colleges out of the dark ages into 20th century enlightenment, (as Cecco, 1968, very aptly observed). The need for introducing educational technology into the educational system has aroused mainly because the country has recently designed and accepted a replacement of the age-old traditional system of education, which is not connected with the real life situation in this country. It is the educational technology which brings students nearer to realities of scientific inventions.

The need for using technological aids in education arises mainly because of the following reasons :

1. In the present day colleges, the number of students is very large and the teachers are a few, and the information to be passed to students is increasing constantly. With the aid of audio-visuals, more information can be passed on rapidly in lesser time to the learners and with a fewer number of teachers.

2. To cultivate a scientific attitude among youngsters, the only means techniques and methods which are easily comprehensible. Audio-visuals are the first ones to come into this category.

3. Modern teaching aids can speed up the pace of learning and allow students to learn at their own speed.

There is a need for equalising educational opportunities irrespective of economic, social, and geographic conditions of the learners. Educational technology plays a vital role in this aspect.

The need and significance of educational technology also lies in the fact that, it make education more productive, more purposeful, and more personal, to give instruction a more scientific base, and to make learning more immediate, and access to education more equal. Educational technology is needed, because there is a need to reach not only more students, but to reach them with an improved range of learning materials. It is needed to offer greater opportunities for independent study to permit atleast a limited student response.

Thus, to improve the quality of education and to make teaching and learning more objective, educational technology is needed. Technology enables teachers to decide which techniques produce the most effective results.

Educational Technology-As Software and Hardware :

It is only during the last one decade, the idea of educational technology could gain considerable attention and gradual acceptance in our country. According to the U.N.E.S.C.O International committee on development of education, instructional committee on development of education, instructional technology basically meant 'all the intellectual and operational efforts made during recent years to regroup, organise and systematise the application of scientific methods to the organisation of new sets of equipment and material to optimize learning processes. 'Educational technology consists of two components, namely, 1. Hardware; and 2. Software. The hardware approach relates to the application of physical science to the educational system. The objective of hardware approach is to systematically mechanise the process of teaching by using teaching aids

like nonprojected visual aids, slide projectors overhead projector, closed-circuit television (C.C.T.V.) films, computer etc. These aids transmit, amplify, distribute, record and reproduce subject matter with a consequent increase in both teacher impact, and in the number of students a teacher can instruct. On the other hand, the 'Software aspect' of educational technology has its origin in the application of behavioural science to an education and training system. Its main objective is to control and shape the learning process by adopting procedures like approximation towards masterly, differential re-inforcement, and precise shaping of emitted behaviour. In fact, the software approach is closely related with programmed learning, and learner centered instruction.

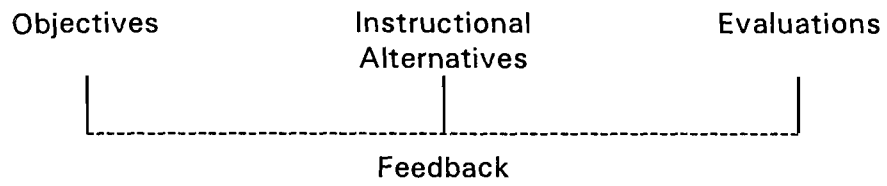
To sum-up, while the hardware aspect is concerned with using equipments like teaching machines; the software aspect is concerned with using learning aids like programs. Both the approaches are functionally related with each other. If educational technology is to be useful, the relative merits of both 'hardware' as well as 'software' approaches have to be integrated.

Educational Technology and systems Approach :

The educational technology, systems approach is a new technique, which provides structure to learning situations. A 'system' is an integrated assembly of interacting elements, designed to carryout cooperatively a predetermined function. In other words, a systems approach in education is, a rational and systematic approach that analyses objectives and then selects resources and methods to achieve those objectives. The aim of systems approach is to give each individual opportunities to learn and develop effectively and enjoyable, using his own talents, natural motivations and interests. The systems approach makes teachers to deal with the class room problems confidently and intelligently. It gives the teacher much of what he needs to achieve his goals by enabling him to understand, design, and manage instructional systems to optimise output. It provides learning experiences in a well-knitted and sequential manner, and enables assessment of knowledge, skills, talents, values, motivation and congnitive style of each student. An important new feature or characteristic of systems approach is wider use of the computers for acquiring information about systems

behaviour or through experimental mathematics for synthesis of complex systems.

In education, systems approach to curriculum-design and development attempts to increase educational effectiveness by clarifying objective with clarity, and then by redesigning the entire teaching process to ensure student achievement. Achievement here means moving towards desirables educational objectives. This aspect can be diagramatically shown as :



An instructional systems in a set of learning experiences which are designed to achieve a given outcome for a group of learners. In systems approach, feedback mechanisms are built in to measure, control, and identify impediments, and to continuously revise the process as it moves toward the next objective.

BIBLIOGRAPHY :

GLENS. G. WILLIAM M.ALEXANDER — 'Innovations in Secondary Education' Chapter – VI-Focus on the Materials and Media'.

S.S. CHAUHAN — 'Curricular Achievement and Automated Teaching', Bharatiya Vidya Prakashan, Varanasi, 1973, Chapter 1, pages 14 to 15 and 39.

MOTILAL SHARMA — 'Systems Approach in Education' Shanti Parkashan, Rajasthan, 1978, Pages 3-7 and 38, 39.

TEACHING-LEARNING CONCEPTS PROCESS AND PRINCIPLES

*Dr. B.V. SUDERSHAN RAO**

WHAT IS TEACHING?

Teaching is a process of guided interaction between the teacher, the student and the materials of in a physical environment.

The purpose of teaching is to provide for both needs and opportunities of learning.

WHAT IS LEARNING?

Learning is a process by which one changes one's own behaviour through one's own activity.

It is the modification of behaviour through experience and training. It is adjustment .of an individual to the situations.

Classroom teaching is one of the most important and effective means of imparting knowledge. It consists of a situation in which the individuals come together to learn from a teacher. Learning in classroom situation results from haring, seeing, feeling and doing.

Basically, classroom teaching is a process designed o bring about learning. To be effective, it must follow acceptable educational principles.

Teaching is the process of attempting to change the behaviour patterns of students of getting them to do, or think, or to feel the 'right' things in the right way to reach desired objectives. The objectives may be to develop manipulative skills, technical knowledge, ability to solve problems, skill in handling people, changes in attitude towards situations or to attain many other kinds of learning. Objectives are reached through the teaching-learning process. If they are to be attained, students must acquire new knowledge, new skills and change their attitudes.

* Professor & Head, O & RT Unit, Department of Agril. Extension, College of Agriculture, Acharya N.G. Ranga Agricultural University, Rajendranagar-30

Much learning is done by the learner himself without specific help from any one as an instructor. He watches other persons in action. He reads pertinent material. He tries things out by himself, makes some mistakes and achieves some successes. But usually, in this kind of situation, his efforts are put forth in a hit-or-miss fashion. He may attain his goal, but at great cost of time and effort. He would usually reach it more quickly and more efficiently if his efforts are organized, if he proceeds in an orderly manner, if he has access to the right kind of help at the right time. Good class-room teaching provides such help.

Experience has shown that human beings cannot be freed to learn unless a desire to learn has been created in them. Thus, the creation of a genuine desire to learn and proper environment for learning. To promote effective learning his techniques of conducting a class must be effective. Learning must be authentic, lasting and useful in life. Teaching methods that fulfill these needs can be termed effective techniques of teaching.

LEARNING SITUATION

Learning situation is a structure of elements interacting with each other. This includes five elements –

1) Instructor/teacher, to guide and stimulate the learner and his interaction with other elements of the situation.

2) Learner, the participant in the process of interaction who tries to make his own efforts to gain learning experiences through interaction with other elements of the situation.

3) Subject-matter/content, which is designed to the needs of the learner.

4) Appropriate instructional equipment and material, that aids the learner and teacher to understand the content of the subject-matter; and

5) Appropriate physical environment.

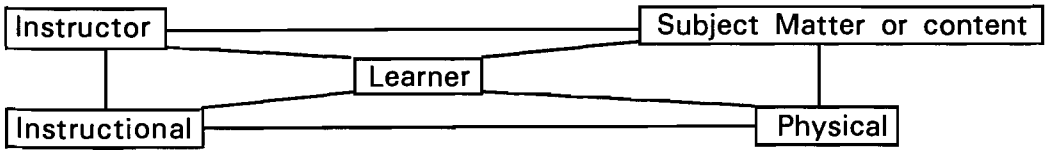


Diagram Showing Elements of Learning Situation

LEARNING EXPERIENCE

It is the mental and/or physical reaction the learner makes to seeing or hearing or doing the things to be learnt through which the gains meanings and understandings useful in solving new problems. An effective learning experience is on which results in maximum behavioural change in the learner in the expected direction.

To be the teaching-Learning Process effective, each element should possess certain characteristics.

These are:

1) TEACHER OR INSTRUCTOR : The teacher in a classroom situation is the key element. On him largely depends the effectiveness of the instruction. He must have clear objectives that are precisely and briefly stated. His knowledge of subject matter should be authentic, up to date and well organized. He must have interest in the subject matter and show enthusiasm in putting it across to his class. He should be democratic and should encourage students to participate. Before facing a class, an instructor should be well prepared in all respects including a well though out teaching plan arranged into suitable and meaningful lesson plans. He should be friend and courteous at all times. He should speak clearly so that everyone can hear and should be skillful in the use of his teaching materials and equipment. As a teacher he should set a good example for his students/learner. A good teacher is one who:

- has a thorough knowledge of subject matter,
- has more listening skills,
- goes out of his way of help people,
- has no favourites,
- is fair and considerate,
- admits his mistakes,
- does not get annoyed when asked to explain a point,
- can explain difficult subject in a simple manner,
- does not control the class by fear,
- has a pleasant manner of presentation,
- has sense of humour,

- is cheerful, encourages students,
- is sincere,
- takes interest in students, and
- is friendly.

A teacher should be dynamically alive and have a charming personality, Charm is a conglomeration of traits. All people have specific traits, but it is their symphonic arrangement that gives charm. In short a charming personality, ability to deal with others and regard for teaching are some of the main traits that need to be considered besides the professional training and experience of teachers.

It is not possible to place monetary value on the work of a good teacher. His services are largely of an intangible nature. It is not only in the economic sphere that a teacher's contribution should be judged. There are other equally important spheres. Since good teaching must accomplish desired changes in behavior, knowledge, skills and attitudes-it is the teacher's foremost contribution to effect these desired changes in his student's behaviour. A good teacher inculcates in the lives of his pupils many qualities including good conduct, sociability, responsibility and a feeling of duty as a citizen of this country.

It is imperative that teachers continue to improve themselves professionally. A growing self is essential to the teachers. Improvement or growth of teacher should be in these directions namely, 1) learning needed subject mater, facts, principles and practices, 2) development of ability, to teach well and 2) development of personal and special qualities.

2) LEARNER

The learner is one of the active partners in the process of learning. He must be receptive and strive actively to learn. He should be capable of learning and should understand clearly the purpose of the knowledge is to learn. Mere physical presence of a learner in the class-room does not promote learning. A good learner;

- has a desire to learn
- has need for learning
- be interested in learning

- feel that the learning will be useful to him
- be willing to put up effort, and
- feel satisfied after learning.

It is the job of the teacher to bring out and promote these qualities in a learner.

3) SUBJECT-MATTER

The main objective of classroom instruction is to bring about desirable changes in the behaviour of learners. For this, the subject matter should be authentic and upto date. It should satisfy the immediate and future needs of the learner. It should be properly arranged so that it follows in proper sequence. To do this, every teacher should arrange his subject matter into a course outline and should prepare a good lesson plan for each topic. These are essential to any sound programme of classroom teaching.

Subject matter not related o the needs of the learners should find no place in the teaching programme. To keep himself abreast of the rapidly accumulating facts about science and technology, the teacher must make frequent use o the latest text books and reference materials. Lesson plans should, therefore, be revised frequently to assure current material at all times. A good library is a must for every educational institution. Criteria for judging effective subject matter require that the contents must be :

- pertinent to learner's needs
- applicable to real life situation
- challenging, satisfying and significant to learners
- well organized and logically presented divided into small units of experiences directed towards goals, and
- units related to each other

4) TEACHING MATERIALS AND METHODS

To be effective, the teacher must use adequate tools like methods of presentation including audio-visual aids. For effective teaching, one must reach for methods that will produce the desired results. Some methods are useful in getting opinions and ideas while others are better for presenting information material. To carry through a task the teacher should have the

ability to select suitable methods for presenting the subject matter and to choose the specific kinds of aids that will help attain his purpose. There are no short cuts to the selection of teaching methods and aids.

The following criteria may be useful for choosing a specific kind of teaching aid for a specific instructional purpose :

- Does it fit the objective?
- Does it fit the age and intelligence of the learner?
- Does it fir the budget?
- Is it suitable for the size of the group?
- Does it fit the ability of the instructor?
- Does it fit the time available?

Careful consideration of these criteria before selecting an instructional aid is essential to its effective use.

Effective teaching usually requires the use of more than one sense of the learner.

The following are the major senses involved in learning:

a) Sense of seeing
b) Sense of hearing
c) Sense of doing
d) Sense of feeling

The use of more than one sense usually increases learning. Hence the use of teaching methods and audio-visual aids that make possible the use of more than one sense o the learner is highly desirable. To do this, the teacher must :

- be skilful in the sue of teaching aids
- be able to select the most effective teaching aid
- remember that the teaching aid is for promoting learning and not for enjoyment.

It is in this broad setting that one needs to study the nature, selection and use of teaching materials and methods.

6) PHYSICAL FACILITIES

Physical arrangements of the classroom play significant role in creating a congenial learning situation. The following physical facilities are the bare minimum for a good classroom situation.

- The classroom should be neat and clean
- There should be sufficient light from all sides
- It should be well ventilated and not affected by outside noise
- The temperature in the room should be as comfortable as possible
- There should be protection from dust or strong gusts of wind.
- There should be sufficient space for accommodating the students. If possible, five to ten square feet of space must be provided for each student in classroom, depending on the type of furniture provided.
- The seating arrangement should be such that each student can be seen, heard and approached by the instructor easily.
- The furniture in the classroom should be comfortable so that each student can sit conveniently and write.
- The black board should be fixed at a place from where each student can see every part of it.
- There should be sufficient space for the display of visuals.
- There should be arrangements for drinking water and other facilities nearby.

How to set – up good learning experiences – some guidelines:

While planning learning experiences which is a crucial point in the process of teaching and learning, one's aim should be to enable learners to have an effective learning experiences (s) regardless of its content, form and objective. This is one of the basic criterian by which all teaching and learning must be judged.

There are several guidelines useful in making learning experiences effective regardless of the methods employed by the teacher. These guides are not mere opinions but are well-established principles based on research findings and extensive experience. Therefore, it is important that the teachers make their efforts on setting up their learning experiences based on these principles :

1. Learners must have experiences that give them an opportunity to practice the kinds of behaviour employed in the educational objectives.
2. Learning experience employed by an objective must be satisfying to the learner when he carries them out.
3. Reactions desired in the learning experience should be within the range of ability both mental and physical of the learner.
4. There are many alternate learning experiences that can be used to attain the same educational objectives.
5. A single learning experience will usually contribute to the attainment of more than one objective.
6. Learning experiences must be such that the teacher could be able to provide effectively with in the limitations of his department or institution etc. or within his ability to plan his experiences.

There are several action steps that could be taken by an Instructor in setting up effective conditions in which the learners may be effective learning experiences. Some of them are :

1. Carefully analyse the educational objectives and list a series of possible learning experiences that are thought to be useful for attaining each objective. This includes two activities on the part of the Instructor.
   a) Deciding on the types of instructional material and its content. An extensive list of these things can be made when the educational objective is carefully analysed.
   b) Deciding on the kind of activity to be assigned o and carried on by the learner. This may include activities such as reading a part or whole of a book on a related subject or listening the students giving their experiences or participating in a demonstration etc. Again this list can be made extensive when one examines the educational objective carefully and attempts to identify the kind of action needed on the part of the learners which is likely to provide an effective learning experience for them.
2. Making a careful check on the tentative draft of learning experience against the desired objective to determine whether the proposed experiences meet the following criteria satisfactorily:

a) Does the proposed experience give the learner an opportunity to practice the kind of behaviour implied by the objective?

b) Do the experiences sample or relate to the content implied by the objective?

c) Is the degree of complexity of the experience in line with the learners ability and readiness to act?

d) Will the experience be satisfying to the learners? Will the experiences be interesting and likely to result in value recognized by the learners?

SETTING UP GOOD LEARNING SITUATIONS

One of the important points made previously was that an effective learning experience can only be had in a well structured and successfully executed learning situation. After the learning experiences to be provided have been decided upon by an instructor the problem then is to arrange a learning situation which will provide an opportunity and stimulation that cause the desired mental and physical action on the part of the learners. This is the function of an instructor. He must decide and plan for the methods to achieve them. Hence, the task is highly professional one that calls for deep insight into the educational process and great skill in the teaching. There are a number of things an Instructor can do that help assure a good learning situation but some of the very important ones are :

1. Have a teaching objectives clearly in mind that are significant to the learners, that are attainable through the educational process within the mental, economic, physical and time limitations of the learners, and make these things clear to them.
2. Have a thorough knowledge of significant subject matter related to the learners needs.
3. Be enthusiastic, and interested in the subject-matter and the welfare of the learners.
4. Be able to communicate effectively with the learners.
5. Use democratic instructional methods and approaches.
6. Encourage learners participation in the learning situation.
7. Be prepared, prompt, and courteous in every teaching-learning session.

8. Set a god example of educational leadership and effective teaching.

9. Arrange and manage the learning situation so as to prevent or minimise distractions within and outside the learning situation (These include heat, light, location, space, furniture arrangement, and teaching and reading materials, etc.)

10. Have suitable teaching equipment and supplied readily available or easy use with a minimum of distraction of the learners attention from the subject.

11. Be skilful in the use of every item of teaching material and equipment – chalk – board, visual equipment, reading materials etc.

12. Always prepare and use a carefully developed teaching plan.

PRINCIPLES OF TEACHING AND LEARNING

1. The learning activities should be based on the learners characteristics and maturation :

Maturation is the interaction between developing physiological functions and experience. Each stage in the development of behaviour is an outgrowth of some earleir stage, not a more addition. Maturation is a mental organisation which results from the interplay of organic function and experience. Both maturation and learning contribute to the development of the person. Maturation is growth that proceed regularly within a wide range of environmental conditions, or that takes place without special conditions of stimulation such as training and practice.

The learning process proceeds most effectively when the experiences and the desired outcomes are carefully adjusted to the maturity of the learners.

Adjust assignments and requirements to the learners abilities, his readiness or near readiness to his physical mental, and social maturation.

Each new learning situation should be relevant to the learners level of mental development and previous achievement, as well as to his methods of learning, interests, attitudes and purposes.

Learning is goal – directed activity

The principle that responses are selected and organised in terms of their relevance to the learners goal has far reaching implications for educational method.

No one either as an individual or as a member of a group can act to the best purpose until he has definitely decided what he wants to do. The importance of clarifying objectives and goals is found in two truths.

1. The subject-matter and method necessary to attain educational ends can be wisely selected only when the objectives are specific and clearly stated.
2. Evidence of the effectiveness of teaching activities can be collected only in the light of specific and clearly defined objectives.

The first step in economical learning in other words is to establish the goal as clearly and explicitly as possible. Then, after each attempt to execute the skilled behaviour pattern the learner must guage the success of his performance by reference to the objective and adapt his responses in the next trial in the light of this evaluation.

Teaching objectives represent, the learning, the teacher intends to secure in the learners – the changes to be brought about in the behaviour of the learners.

The problem is to utilize the motives and needs of participants to encourage them to work for goals that are regarded as educationally desirable. In the process of seeking the desirable goals, behavioural changes take place. Educational experiences are designed to promote these behavioural changes.

Just as the learner must have a definite goal in order to work effectively. The teacher must decide upon outcomes to be attained by students before he can determine what learning activities they should engage in.

Understanding comes from discovering what information or what skills are necessary for attaining a desired end, or from determining the consequences or the uses or the implications of what is being earned.

Learning involves insight

Discovering and using means and relations is an example of insightful learning. Learning activities are insightful when they enable the individual to see into the situation, to understand it as a whole. In problem situation, insight means the emergence of complete solution.

Educational methods must emphasize the organisation of responses into highly coherent systems of ideas and smoothly coordinated acts. When the individual learns new patterns of behaviour as a means of attaining his goals he changes as a person.

3. Learners participation in actions that promote their growth

Thinking appreciations, skill and information are interrelated in learning activities.

There is no point in the philosophy or progressive education which is sounder than its emphasis upon the importance of the participation of the learner in the formation of the purposes which direct his activities in the learning process.

It is the learner who learns; learning requires active interest and concentrated effort of the learner. Learning is a result of what the learner does with his learning material and what the material does to him.

Learning is more rapid and efficient when the learner is a participant rather than simply a spectator.

The best .way to learn is by doing. When a person does something or says something his own words it is much more likely to become a part of him, Though if he watches some one else do it or hears someone else saying it. Each person must do his own learning because no one else can learn for him. People develop skills, habits and the ability to solve problems through practice. What is practised is learned.

Continued practice is necessary for the relation of learning and for the development of habit. Few vivid, intense actions may be enough to learn, whereas a score of half-hearted repetitions may be relatively fruitless of learning.

The problem of directing the learners activities must be coordinated with the kind of abilities that the teacher wishes to develop. It will be helpful to outline a number of conditions governing regulation of activities.

1. The learner must have opportunity to practice the abilities selected.
2. The activities selected should be within the capability of the learner.
3. Several kinds of activity may contribute to the development of a single outcome.
4. A single activity may contribute to the development of several outcomes.

4. The use of group process

Group process refers to the procedures through which a group of *individuals approaches, attacks, and solves a common problem. It is a process* of communication, that is the procedures consisting of thinking, suggesting, planning, deciding acting and evaluating as a group. This implies an opportunity for free face-to-face communication, leading to a consensus of decision and action. The group productivity that is, getting something done which could not be done by a single individual.

The principles of effective group action are :

1. A democratic atmosphere, or one which is permissive rather than prohibitive. All members must feel free to voice an opinion to suggest to disagree without fear of being ridiculed or losing status. The group interaction necessary to arrive at common decisions depends on a voluntary, spontaneous, cooperative effort, to which this atmosphere is conductive.
2. Communication must be goal-directed not aimless conversation. It is aimed at establishing a consensus, not a mere majority vote. The group process is not a debate, but an attempt to clarify viewpoints.
3 Morale and discipline is group centred. The emphasis is on we, not I. The suggestion of a member is judged according to its contribution to the group goal rather than as an expression of his individual goal.
4. Leadership is shared. A member can be a leader by making a contribution. Leadership is not a matter of position or of dominance, but of membership in the group.

Kurt Lewin Says, "it is easier to change the ideology and social practice of a small group handled together than of single individuals. Decision in a group setting seems to be effective even if the group is not a permanent organisation. Group decisions prove to be superior to individual treatment as a means of changing social conduct".

One of the many assets a group situation offers in helping an individual to change is the differences which exist among group members. In almost any group of people there are some important differences of ideas, understandings, attitudes, informations, or feelings, if differences do not exist in a group an individual will find little stimulation to change. A leader may invite resource people into the group to provide some of the differences.

Without open communication there is likely to be little opportunity for the group members to stimulate, encourage or support change. Together the members explore ideas or situations test their insights, old and new, through the combined contributions and helpful criticisms of all the member and the leader.

5. Using problem-solving in teaching

A problem situation arises when progress towards the goal is blocked in some way, and when available habitual response patterns are not adequate to permit the individual or group to surmount the obstacle and proceed towards the objective. The essential factors in a problem situation are, therefore, a goal, an obstacle, and inadequacy of immediate responses. These are essential conditions of thinking.

Thinking is a determined course of ideas, symbolic in character, initiated by a problem and leading to a solution.

Thinking is a determined course of ideas, symbolic in character, initiated by a problem and leading to a solution.

Thinking is the most important goal of education. Teaching learners to think means first of all providing problem situations.

Productive thinking involves mental struggle. It is an attempt to answer this kind of question what factors, intrinsic to the situations, need to be altered in order to reach a solutions, need to be altered in order to reach a solution.

The important features o the process are the selection of relevant data from past experience, the collection of all further pertinent information, and the reorganisation of all the essential factors into a new pattern of behaviour which meets the demands of the problem situation.

Thinking comes very close to being the method of an educative process. Problematic situations for the learners must exist if the learners are to think reflectively.

1. In problem solving, significant facts are taught in useful association and thus will be more likely to be used when the need arises.
2. The solving of a problem by the learner calls for the use of old things in new ways.
3. It contributes to the development in the learners of a habit of evaluation and using data intelligently in a new situation.
4. Problem solving lends itself to learner participation in all its phases or aspects.
5. The many variations in kinds of problems and methods of solving them give rich opportunity for flexibility in teaching procedure.

Activities for improving problem- solving abilities

1. Activate soluble problems in the learning situation.
2. Assist the learner to State and to limit the problems.
3. Assist the learner in finding needed information and methods.
4. Aid the learner in interpreting and analysing information and methods.
5. Provide opportunities for stating and testing hypothesis.
6. Encourage independent discovery and evaluation.

6. Motivation is the key to purposeful learning

Motivation is the direction and regulation of behaviour towards a goal.

Motivation is activity by one person designed to stimulate or arouse a state within a second person or group that under approOriate circumstances

initiates or regulates activity in relation to goals, or it is the aroused State of the individual that under appropriate circumstances initiates or regulates behaviour in relation to goal.

Motivation is an essential feature of learning. On the one hand, it involves need and, on the other a goal that it attained, satisfies the need. Behaviour and learning are purposive.

Education use such terms as needs, interests, and goals in treating the motivational aspects of teaching learning processes. Unsatisfied needs, with the accompanying tensions, arouse and activity towards goals which the individual directs his efforts for satisfying those needs.

Learning cannot be successful or efficient without persistent selective and purposeful effort. Learning experiences are meaningful when they are related to the indvidual's interests, when they are involved in his living, when they not only contribute to his purposes at the time but enable him to make more intelligent adjustments in the future, when they involve discovery and problems solving rather than formal drill or mere memorisation and when they result in satisfying social relationships.

The wants, interests, and attitudes of the individual at any moment are the means of making experience meaningful and worth-while. Out of these experience however, new interests and more mature purposes and values should emerge.

The principles of motivation are as follows :

1 Focusing learners attention towards desired learning outcomes.
2. Utilising curiosity and encouraging its development
3. Using existing interests and developing others.
4. Providing concrete and symbolic incentives if necessary
5. Arranging learning tasks appropriate to the abilities of the learner.
6. Changing interests by changing the nature of the situation or activity.
7. Learning under intrinsic motivation is preferable to learning under extrinsic motivation.
8. Aiding the learners in making and evaluating progress toward goals.

9. Recognising that too high tension produces disorganisation and inefficiency.

7. Learning should be related to and should make use of the learners experience

Learning is experiencing. The presentation of ideas and knowledge, if it is to be meaningful to the students, should be adapted to their level of experience. It means relating and applying the generalisations being taught to the kinds of experiences represented in the group students learn by, associating a new experience to a past experience by relating the unknown to the known.

Learners have the tendency to fuse the new ideas with previous experience, thus acquiring new or clearer understanding, broadened interests, rational attitudes, improved patterns of thinking and behaving and richer and more stable personalities.

8. Use a variety of learning activities or experiences

This is based on the principle of multisensory approach. Messages reach the human mind through the senses namely seeing, hearing, feeling, tasting and smelling. The greater the number of sensory channels used in the learning process, the greater is the actual amount of learning.

The functional learning experiences should be provided as far as possible. For example, hearing a lecture, participation in a discussion, observing demonstrations, laying out demonstrations and use of audio-visual aids.

Good teaching tries to reach any learner through as many a avenues to the human mind as can be employed. A good teacher is skilful in using all teaching methods, varying them according to the requirements of the situation and the needs of the Learners. The helps to maintain interest, stimulate participation and meet individual differences.

Learning involves appropriate activities that engage a maximum number of senses. Learning results through self-acting and activities appropriate to the specific learning situation must be used.

9. **Providing individual differences.**

Individual differ in interests, abilities, attitudes, appreciations and under standings, habits and skills capacity to learn, and speed of learning.

Learning ability varies widely among individuals. The level of communication and the level of udnerstandability of the subject-mater taught must be in line with the learners ability, not only to understand what is taught, but to apply it to his problems.

Students in group situations, some form of individualisation of grouping in part of the instructional programme is essential. Individualised assignments and activities, achievement level grouping and differential ability grouping are means of providing for differences among students.

10. **Human relations**

The cultivation of an atmosphere of understanding between the teacher and the students is essential.

Qualities and characteristics essential for good human relations are; sincerity, personal integrity, humility, curtesy, wisdom and charity.

Understanding of he principles of human relations is the essential basis for effective analysis of behaviour and conduct of educational programmes designed to foster more effective desirable behaviour.

Human relations has to do with how people get along with one another. Since their job is to bring about changes in behaviour, teachers have to discover how to get students to act in ways they want them to or else change the goals of learning.

11. **Competition and cooperation as means of motivation**

Learners are often learn new ideas by the motivation of competition. This may be observed between individuals and gorups. Competition may be thought of as a basic ingredient in the prestige motivation and successful competition usually leads to greater prestige for the winner.

In educational programmes, the importance of competition has generally been recognised, and efforts, have been made to utilise this motivation in better learning.

Cooperative activities offer opportunity for more students to experience success than do competitive activities among individual where only a few receive the rewards.

12. Knowledge of success and failure

The learner in an educational programme does not make much progress sunless he knows in what respects he is failing. A knowledge of his successes and failures should result in a challenge to the learner rather than in discouraging him.

Praise for success and reproof for failure are more effective than indiscriminate praise and reproof.

Rewards and punishments are in the same category as praise and reproof.

The objective in both reward and punishment is indentical to effect future conduct favourably. They differ as to methodology. Reward seeks to influence conduct favourably by associating a pleasant feeling with the desired act. Punishment seeks to deter or prevent an undesirable act by associating unpleasant feeling with it.

It is an accepted principle of educational psychology that reward is a more effective stimulus to learning than punishment.

The people learn fast when there is some reward for learning in terms of needs satisfied or a general feeling of accomplishments. Things learnt which produce satisfying action tend to be repeated. It is frequently necessary for the teacher to help the learner to see that he is moving toward the desired goal and to help him recognise and appreciate the progress that he is making.

Learning takes place in both instances. Both success and failure can be useful within limitations. Failure may be a spur to success. Failure may be considered temporary with success as the ultimate goal.

13. Learning must result in functional understanding

Understanding a thing consists largely in seeing why it is true. Nothing is really known unless it is understood. Ability to apply to or use knowledge

in new situations depends largely on how well it is understood. Understanding is closely related to thinking, the seeking of relationships. Learners come to understand as a result of the thinking they do. Understanding of a truth comes from seeing its relation to other knowledge particularly that which explains it.

Useful learning requires that students not only acquire new facts and ideas, but also understand how to apply them in realistic situations. Subject-matter is useful only when it is understood and contributes to the attainment of a chosen objective.

To gain a functional understanding of technology, requires knowledge of the whole, recognition of the part and ability to see distinctions among the parts of related knowledge. Learners must identify the connection of ideas with each other an with the problems.

14. Retention and transfer of learning

The teacher is concerned about the extent to which the learning students acquire will be remembered at a subsequent time. He is also concerned about transfer of learning whether what is learnt and remembered will help in meeting few of different situations with greater effectiveness.

The fundamental educational problem is to discover and establish the conditions which are most conducive to the effective utilisation of experience. The important question is what methods of teaching and learning will be most productive of transfer.

The more meaningful the learning, the more likely it is to transfer rote learning, routine and blind rule-of thumb procedures, and empty verbalism are almost certain to give disappointing results. Where these characteristics dominate, not much learning has occurred. Therefore, there is actually nothing to transfer. As the essential relationships in experience are discovered and generalised learning becomes meaningful and what is learnt becomes more available for wide application.

Transfer is not automatic. It depends upon a deliberate attempt to interpret new situations in the light of past experience and to apply appropriately the meanings or methods previously learnt.

Facts, concepts or principles, skills, attitudes, interests, methods of learning and methods of adjustment acquired in one situation may be remembered and transferred to another situation. What is acquired must be remembered when the new situation is encountered; otherwise, no transfer results.

Forgetting results from lack of use, reorganisation and motivation. There is general agreement that 1) meaningful material is retained better than meaningless, 2) material acquired with purpose is retained better than that without purpose through rote procedures.

Retention is encouraged by :

1. Fostering intent to learn well and remember.
2. Making the original learning meaningful.
3. Providing for satisfying consequences of the original learning.
4. Distributing practice and review.
5. Avoiding interference and faulty reorganisation.
6. Providing for sequential cumulative learning.

Positive transfer is facilitated through :

1. Emphasising learning outcomes that readily transfer.
2. Developing meaningful generalisation.
3. Assisting the learners to make applications.
4. Evaluating the learner's ability to apply responses to new situations.

EFFECTIVE TEACHING

It is a known fact that learning process would be effective when different techniques are used in teaching rather than mere verbal expressions. Teaching techniques facilitate the acquisition, retention and recall lessons learned, because they seem to evoke the maximum response to the whole organism to the situations in which the learning is done. The specific objective of teaching should be to make learning experience memorable. When the teaching techniques are used intelligently, they promote effective kind of learning. Educators have found that many teaching problems can be

solved, partly or wholly by the proper use of rich experience that can be gained through use of certain teaching techniques.

TEACHING TECHNIQUES AND GOOD TEACHING

"Good teaching is an elusive concept, one difficult to define because it refers not to something static but to something dynamic and evolving". Whether teaching is "good" or not depends on the time, the place, the needs of the society and of the individual. But regardless of the variables, we can name a number of characteristics common to all good teaching good teaching signifies that it is not the facts alone taught or to be taught as per the syllabus but the general context in which they are assimilated.

Good teaching depends upon the teacher who invokes interest in his pupils, makes the students to acquire certain skills, information, tastes and so on. Good teaching should provide the 'basic learning' fundamentals, vocational understanding, moral and spiritual fibre and the dynamics which stimulate pupils to know and act in accordance with the values of society. This clearly indicates that teaching would become effective provided the teacher is good. Then how to consider whether a teacher is good or not.

Looking Ahead

A good teacher should always invoke interest in his student, help them find answers to their problems, train them to acquire certain skills, information, and become self-sufficient individuals in a social civic setting. He must provide the basic learning fundamentals. In doing so he has to use different teaching techniques available to him. Constantly he has to endeavour in developing his own audio-visual material. He should also know when and why a particular audio-visual material is to be used. Students participation coupled with verbal description of lessons and use of audio-visual material is found to be the most effective teaching technique in making learning a permanent, interesting and a lively one.

At present in some of the universities the facilities to use the audio-visual materials are not adequate. Classrooms are not properly equipped to use these material. Variety of audio-visual materials are not procured by the universities. This warrants the necessity of providing adequate funds to

purchase the audio-visual material. Remodeling of classrooms is to be taken on priority basis.

The most troublesome problem connected with audio-visual education and use of the audio-visual material at the present juncture is simply to persuade teachers to use these aids in their classrooms. The majority of teachers got their own training without the benefit of sensory aids on the scale now considered normal, and they tend to teach as they were taught. Many have been teaching for years without audio-visual equipment and without encouragement to use it, or to demand it, and many more are totally uniformed about it. They need training courses of short duration ranging from four to seven days. Ways and means are to be evolved to train these teachers by the universities so as to make them better teachers and impart learning to students on a more effective way.

PREPARATION OF COURSE OUTLINES

*Dr. M. SUDARSHAN REDDY**

Course outline is the sequential arrangement of the content/curriculum in a given period of time according to the course objectives with an appropriate teaching strategies and evaluation methods. The course outline must be directly related to each objective of the course. The topics/lessons should have relationship with each other and should be arranged in sequence by which learner is able to understand. The course outline normally should consist of the following elements :

1. Course number and title of the course
2. Course objectives
3. Content
4. Time allotment
5. Teaching methods
6. Teaching aids
7. Evaluation
8. Reading material and reference books

DEVELOPMENT OF COURSE OBJECTIVES :

The objectives of the course should have direct relation with the overall objectives of the curricula and should be in support of these objectives. The objectives of the course should be compatible and blend with objectives of other courses which a student has already completed and with the objectives of all the courses in the curricula. Course objective describes in measurable terms what learners should be able to do at the end of the course as a result of teaching.

CRITERIA FOR COURSE OBJECTIVES :

There should be several criteria for deciding the course objectives. Some of the important criteria which should be kept in mind are; course objectives should be :

- able to confirm with the goals of course

* Principal, Extension Education Institute, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad - 30

- able to identify a learning outcome i.e., cognitive domain or affective domain or Psychomotor domain
- Specific
- Feasible in practice
- Measurable
- Appropriate
- Time bound

Another important point to be considered while developing the course objective is the terminal behaviour of the learner. The terminal behaviour means what the learner ought to be or what he/she should able to do after completion of the course. Learner's intended 'terminal behaviour' should be expressed in terms of the subject matter of the course. While formulating objectives of the course following **essential steps** may be considered.

- Identification of the desired terminal behaviour. It should be what the student should be able to do at the end of the learning experience. Developed objectives should be able to specify the terminal behaviour in a precise and concise manner.
- Specify in action words which are unambiguous and clear to the learners or any teacher without need for further explanation.
- Define the conditions under which the behaviour to be changed.
- State the minimum standards of acceptable performance.

Formulating the objectives in clear and unambiguous behaviourable terms required a considerable amount of skill and practice on the part of the teachers. But once the objectives are developed in proper way these will certainly help to provide the students with a clear idea of what has to be achieved, how this has to be achieved and the level of performance that is required to demonstrate satisfactory achievement of the objective.

ADVANTAGES OF DEVELOPING COURSE OBJECTIVES :

- Provide a clear picture of the behaviour that is expected of the learner at the end of the course
- Helps to provide direction and stability in the course.
- Provides an opportunity to the teacher in proper selection of teaching strategies.

- Helps in the process of evaluation.
- Forces a teacher to think deeply about what he is trying to achieve.
- A systematic approach to course design and course monitoring.

CONTENT :

The content of the most of the courses will consist of theory and practical. The content should be decided according to the course objectives. The logical structuring of the course content provides better understanding to the learners and systematic coverage of the curriculum by the teacher. The content of the course is associated with the types of the learners, time availability and facilities. Collect the material from different sources and classify them into essentials, desirables and possibles. The teacher should provide a reading material reference material for each topic / lesson of the content so as to enable the students to learn more and quick.

TIME ALLOTMENT

The teacher should complete the content of the course in given period of time. To accomplish this task the teacher should know how many contact hours he/she is getting for the course for the both theory and practical. Based on the number of hours for theory and practicals and teachers should be able to decide the number hours for each lesson topic in the course outline. Allotment of the time for each lesson/topic again in associated with the background knowledge of the learners with respect of the subject matter. Time allotment for each lesson/topic of the content in the course outline provides an opportunity to the learner and teacher about the completion of the curriculum in given period of time as well as proper time management.

TEACHING STRATEGIES :

Development and finalization of the teaching strategies for each learning outcome/lesson is another step while finalizing the detailed course outline. Teaching strategies include the teaching method and teaching aids to be used for each lesson/topic/learning outcome. The particular teaching method and teaching aid that can be used for each lesson will depend upon large number of factors, including the detailed nature of the topic, physical facilities, learners and teachers. These will however be of three broad types

namely, those associated with mass instruction, group and individual learning. The teacher generally uses the following teaching methods and teaching aids in class room teaching depending on the above mentioned factors.

TEACHING METHODS :

METHOD	APPLICATION
1. LECTURE An organized presentation with or without visual aid aimed at sharing knowledge and experience, events and facts, concepts and principles.	Sharing knowledge and experience to a group of learners.
2. DEMONSTRATION A demonstration in an action Charged presentation to convey how something works	Learning skills
3. GROUP DISCUSSION Is a verbal interaction between two or more learners in a learning situation, discussion may from part of forum Panel and seminar	- Problem solving - Planning and strategy formulation - Arrive consensus on controversial issue.
4. WORKSHOP Is a meeting organized with the main objective of promoting experimental learning and produ cing identifiable results/solutions to the problem.	- New plans, strategies and results - Personal development through learner's participation - Arrive at new experiences
5. COLLOQUY : Is a conversation between persons who possess expertise in the given subject.	- Current professional issues. - Presentation of term papers, Synopsis and results of research.

6. **BRAIN STORMING :**

Is a strategy used to get ideas from learners by posing a problem or question and having them to suggest as many possible answers in a brief period.

- Getting new ideas
- Introducing a subject
- Problem solving

7. **DISCUSSION :**

A sharing of ideas and view points on a certain topic/lesson by various people to arrive at a better under standing if not agreement on the topic.

- To bring out the individual experience and opinion of groups on known topic.
- To check the students level of Knowledge or learning the subject, either before or after the lecture.

8. **EXERCISE :**

A structured or planned group activity which stimulates the condition of real situation. The group followed specific instructions to arrive at a goal within a certain time limit

- To develop and practice interpersonal and managerial skills.
- To get the learners physically and mentally active in the classroom

9. **CASE METHOD :**

Allows the learner to absorb and analyse information on a written issue to develop possible solutions under guidance of teacher in a specific time

- To present the facts of the problem in written form.
- Intellectual involvement of learners.
- To change interpersonal communication skills.
- Problem solving and decision making
- To develop human relations
- Suggestions and solutions.

10. ROLE PLAY :

Is an instructional method in which learners play certain roles in an informal and realistic manner on certain situations. It may be structured or spontaneous.	- To present the problem lively by the learners. - To express feelings and emotional involvement of learners. - To implement solutions. - To change the knowledge, skills and attitude of learners.

EVALUATION

Evaluation is the process of delineating, obtaining and providing useful objective information for judging the student's academic achievement. It is aimed at providing reliable and objective information needed throughout the instructional programme to the student and teacher so that they may know how well they have done and how to proceed further. Evaluation is the process of judging the merits of the student's performance (e.g. poor, average, excellent). The evaluation of students learning process during instruction with the purpose of providing continuous feedback to students and teacher concerning learning success and failures.

SUMMATIVE EVALUATION

Comes at the end of instruction and is designed to determined the extent to which objectives have been achieved, and is used for assigning course grades. Evaluation of student's academic achievement required measurement and assessment. While measurement is defined as a systematic determination of learning outcomes by means of an assessment device (e.g. tasks). The assessment involves securing two or more measurement of the same student on his level of achievement in several aspects against which he/she is evaluated. The two forms of tests are criterion-reference and norm reference. Criterion referenced test enables the teachers to describe what an individual can do without reference to the performance of others. Performance is judged according to a standard or criterion that has been set. Norm-reference test describes students performance in terms of relative position in some known groups. The performance of a student is compared with the performance of others in the class. Evaluation refers to a series of

activities that are designed to measure the effectiveness of an instructional system as a whole. The results of the student assessment may be just one of the areas of evidence that are taken into account in evaluation. The evaluation of the students may vary from course to course. However the teachers offering courses should indicate the scheme of evaluation in the course outline. The number of examinations, assignments, presentation of term papers by the students particularly at P.G. level performance tests, should be mentioned in the course outline with the specific date and time so as to enable the teachers and students to follow the examination schedule scrupulously. The evaluation reports of the students should be submitted as per the instructions of that institution.

READING MATERIAL AND REFERENCE BOOKS :

The reading and reference material of the course should be indicated in the course outline. The teachers, particularly offering courses should be abreast and know the latest journals, periodicals and books concerned to their courses. The teachers should indicate reading material and reference book lesson-wise in the course outline that the students can collect more and comprehensive information on that particular lesson for better understanding. Sometimes the students can also get an opportunity to go through that particular lesson in that reference book before attending the class. In addition to this the teacher should indicate the general reference books, periodicals and journals both for theory and practicals at the end of the course outline. This has to be updated by the teachers every year.

ADVANTAGES OF THE COURSE OUTLINE

- To take care of students felt need and requirements.
- To enable to think through whether propose to teach and how to teach.
- To avoid their personal bias in terms of coverage of lessons/topics and time allotment to each lesson.
- To provide sequence of teaching.
- To coordinate and integrate the activities likes examinations and evaluation.
- To allow to have a record of what has been taught.
- To ensure an adequate supply of suitable reference books.
- To arrange proper physical facilities and teaching equipment.

PLAN OF COURSE OUTLINE

1. Course No. :
2. Course title :
3. Credit hours :
4. Course in charge :
5. Academic level of learners at entry :
6. Course objectives
   A. Theory :
   B. Practical :
7. Course content :

7 (a). THEORY

Sl.No.	Lesson	Time required	Teaching Methods to be used	Teaching Aids to be used	Reference Material

7 (b). **PRACTICALS**

Sl.No.	Practical	Time required	Teaching Method to be employed	Reference Material

8. SCHEME OF EVALUATION

8 (a) THEORY

1.	Mid Semester	40
2.	Final Theory	60
	Total Theory	100

8 (b) PRACTICAL

1.	Class work & Record	10
2.	Assignments	10
3.	Spotting/Identification	5
4.	Final practical exam	25
	Total Practicals	50
	Theory reduced to 50	50
	Practical Marks	50
	Total Marks	100
	GPA in the subject	10.0

9. REFERENCE BOOKS :

LESSON PLANNING

*Dr. G.V. NARAYANA REDDY**

WHAT IS LESSON PLAN?

A lesson plan is the outline of activities that the teacher will follow in order to create an effective learning situation. It is a statement of the aims to be realized and the specific means by which threse are to be attained as a result of activities performed.

The advantages of Lesson Planning are :

1. Teaching becomes effective, purposeful and economical in terms of time and energy.
2. Systematic and orderly teaching.
3. Appropriate teaching techniques and methods can be adopted.
4. Content can be effectively managed.
5. Infuses continuity, repetition avoided and an appropriate link between the subsequent and the previous lesson or units of a study maintained.
6. Develops better study habits in the teachers, thus, leading to advancement in profession.
7. Eliminaties class room disorders and other ills of thought less teaching.
8. Makes teacher confident.

ELEMENTS OF LESSON PLANNING :

1. *Determing Objectives :* Should be specific, well defined and measurable in terms of changed behaviour of the learners.
2. *Study the Audience :* In respect of the size, educational standard, level of knowledge, interest in the subject, social environment, discipline and expectations.
3. *Content :* Valid, authentic, factual, applicable and adequate.

* Professor, Extension Education Institute, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad-30.

BODY OF THE LECTURE :

Attention should be given to the main body of lecture. The body of lecture should be divided into portions dealing with discussion, arguments or a narrative part of the lecture. For the body of the speech the following points should be foremost while preparing the lecture.

1. *Selection of material :* For effective lecture, much depends on the proper selection of material to be presented. The audience become interested if the material is carefully selected.

   i) Wide reading: For this purpose the lecture should make use of wide reading of selected publications, journals, articles, bulletins etc. The lecturer should have knowledge of the current thinking on the topic.

DISCUSSING WITH INFORMED PERSONS

Useful information can be obtained by discussing the body of the lecture with persons who have the knowledge and experience of the topic in question. By exchanging views the relevant questions that may be asked by the audience can be anticipated and answered satisfactorily.

III) FROM OBSERVATION AND EXPERIENCE :

Much of the information and material to be presented can be gained from observation and experience. By quoting examples from personal observation and experience it becomes easier to convince people of your view.

2. *IMPORTANCE OF ILLUSTRATIONS :* Illustrations;

   a) Make points clear

   b) Within the possible experience of audience

3. *USE OF HUMOUR :*

humour is extremely necessary during the body of lecture. The audience can be made to become more interested in the topic by intorducing humour at the right time. It is a very effective to handle if one can use it wisely and well. Humour makes the audience up and makes them more effective.

CONCLUSION :

This is far most important as introduction. Unless the ideas that have been spread out are pooled together in specific terms, the audience will not get a clear picture of the objective of the lecture. The conclusion should be brief but comprehensive. The following points should be borne in mind, while concluding a lecture.

i) **SUMMING UP OF MAJOR POINTS** : In Doing this there should be no digression or should minor points to be taken up at this stage. the summing up should not be elaborate. The points that are of equal weightage should only be taken up. There should be continuity and sequence so that the picture in the minds of the audience is not confused.

ii) **PLACE FOR FINAL APPEAL** : The conclusion forms the most suitable place for the final touch. By an effective way of drawing the conclusion, the speaker can aim at conviction.

ii) **NATURAL ENDING** : The conclusion should not form a small speech by itself. It should be natural ending to the lecture.

EVALUATION :

The stage helps the teacher to know the extent to which the learners have learn the lesson. This phase may consist of diagnising questions and problem solving questions regarding the subject matter presented.

There is no element of rigidity in the above given outline and some deviation or minor changes can be made according to the nature of subject matter to be presented and the method of teaching. A proforma for the preparation of leson plans is given herein for the use of the participants.

PLAN OF LECTURE

Name of the course _____

Subject of lecture _____

Lecture No. _____ of _____ Lectures _____

Prepared by _____

Number of students _____ Duration _____

Class _____

Previous knowledge of students : _____

Aim _____

_____

_____

_____

Source-material for lecture _____

_____

Main teaching aids	Material for students
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____

Teaching place and its arrangements : _____

Remarks :

LECTURE OUTLINE

Time	Headings	Duration	Contents	Teaching aids

MODEL PLAN OF LECTURE

Dr. B.V. SUDERSHAN RAO

General Subject	:	Motivation
Subject of lecture	:	Techniques of motivation
Lecture Number	:	Two out of four lectures
Prepared by	:	Dr.B.V.Sudershan Rao
Number of Participants	:	30
Duration	:	60 minutes
Type of participants	:	Undergraduate Students
Participants knowledge	:	Previous knowledge and experience in the behaviour patterns and needs

Aim : To teach and discuss with undergraduates the different techniques of motivating the farmers (or) To make the undergraduates to understand the different techniques of motivation.

Source material for lecture	:	Books, publications on the subject and written notes of teacher.
Main teaching aids	:	1. Chalk board / Black Board 2. Flannel board 3. OHP
Material for participants	:	Lecture outline
Teaching place and its arrangements	:	Preferably comfortable class-room with facility of taking notes and teaching aids etc.

MODEL LECTURE OUTLINE

Time	Headings	Duration	Contents	Teaching aids
(1)	(2)	(3)	(4)	(5)
10 minutes	Introduction	4 minutes 6 minutes	1. What is motivation (Definition) 2. Need and importance of motivation	Black Board

(1)	(2)	(3)	(4)	(5)
		Body of the subject		
2 minutes	Step - I	—	1. Techniques of motivation	Black board, Flannelgraphs & OHP
24 minutes	Step - II	—	2. Explaining individual techniques	
		4 minutes	a) Need based approach	
		4 minutes	b) Participation	
		4 minutes	c) Use of AV Aids	
		4 minutes	d) Leadership	
		4 minutes	e) Aspiration	
		4 minutes	f) Achievement motivation	
5 minutes	Step - III	—	1. Summarisation	Flannel graphs & OHP
10 minutes	Step - IV	—	1. Discussion, question and answers, Clarification on points etc.	
		5 minutes	2. What do you understand by motivation	
		2 minutes		
		3 minutes	3. What are the different techniques of motivation	
9 minutes	Attendance of Students	9 minutes		
60 minutes				

(Proforma)

PLAN OF PRACTICALS

A. Basic Factors

i) Subject of Practicals : _____

ii) Aim of Practicals : _____

iii) Materials & Equipment required : _____

iv) Instructional aids Needed : _____

_____

_____

_____

Remarks : _____

B. Out line of Practicals

Duration	Heading	Content	Materials/ Equipment/ Visual Aids required

PLANNING OF PRACTICALS
(A MODEL PRACTICAL PLANT)

*Dr. N. MRUTYUNJAYAM**

A. BASIC FACTORS OF PRACTICALS :

i) Subject of activity (or) practical : Veneer grafting method in Mango

ii) AIM : To teach the students the method as well as the skills required for Veneer grafting in Mango.

iii) Materials and Equipment required : 1. Budding & prunning knife
2. Root stock

iv) Instructional aids : 1. Chart indicating steps in grafting
2. Photographs indicating grafting steps

B. OUTLINE OF PRACTICALS

Duration	Heading	Content	Materials/ Equipment/ Visual Aids required
1	2	3	4
2 minutes	Introduction	a) Why grafting the need b) Advantages of grafting	Chart indicating advantages of grafting
20 minutes (Total)	Body Information (steps in Veneer grafting)		

* Former Professor, Extension Education Institute, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad-30.

1	2	3	4
	Step - 1	**Explains**	
3 minutes	Introduction of equipment needed for grafting	a) Budding & pruning knife and need	a) Show all these equipment one after another
		b) Root stock, scion-Characters	b) Chart indicating the characters of root stock, mother plant and scion.
		c) Mother Plant - Characters	c) Show alternate equipment
		d) Polythene tape (or) banana fibre	
		e) Alternate equipment that can be used in case the above materials are not available like; ordinary knife, blade, fibre (or) thread etc.	
	Step - 2		
5 minutes	Preparation for grafting	a) Selection of root stock, scion	Chart indicating how to make cuts, method of getting scion
		b) Preparation of Scion	

1	2	3	4
		c) length of cut d) how to get scion e) how to make cut in the root stock.	
5 minutes	**Step - 3** Grafting Procedure	a) Graft the scion to root stock - precautions b) Use of budding & pruning knife - Do's and Don'ts	a) Chart indicating precautions b) Photograph of scion & stock c) Chart indicating Do's & Don'ts
5 minutes	**Step - 4** Conclude the practicals (Summarisation)	a) Introduce the equipment once again b) Explain the steps in brief c) Emphasise on Dos & Don'ts	Chart indicating the steps in veneer grafting
15 minutes	**Step - 5** Ask the student to do veneer grafting	a) Observe whether the students do the exercise following the the steps in chronological order. b) Correct if he does mistakes	

1	2	3	4
		c) Emphasise the precautions to be taken. d) Encourage the student to practice it.	
15 minutes	**Step - 6** Evaluate your practical session	a) How did the students perform the skill. b) Seggregate the students who could not do the practicals properly. Teach the skill again to these students. c) Ask questions to ascertain their under-standing of steps in grafting	

HOW TO PLAN AND PRESENT YOUR LECTURE AND PRACTICALS

*Dr. B.V. SUDERSHAN RAO**

I. LECTURE :

Even though many techniques of teaching are now available the lecture still occupies prominent place in classroom instructions for the theory. It has several advantages:

- The teacher can present his ideas in planned logical order.
- A large amount of information can be conveyed in a short-time.
- A large group can be taught at a time.
- It can be used for communicating facts, generalizations, terms, principles and theories.

PLANNING OF LECTURE :

1. OBJECTIVE : Should be specific and well defined in terms of change in the behaviour of the participants (change in knowledge or attitude or both).
2. LEARNERS : Plan your lecture to meet the learners expectations and needs.
3. CONTENT : Plan the content to be appropriate for the nature of the audience (size and type), time availability, faclilities and aim. And collect the material from different sources and classify into essentials, desirables and possibles.
4. LOGICAL STEPS: Classified material is to be divided into, bits since learning will be fast when taught in logical and simple steps.
5. ARRANGEMENT: Plan the place where you are delivering the lecture, class room, well lighted and ventilated with adequate seating arrangements.
6. METHOD AND TEACHING AIDS : Methods and techniques you are using should be appropriate for the audience, facilities and objective of teaching and should be readily available.

* Professor & Head, O & RT Unit, Department of Agricultural Extension, College of Agriculture, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad-30.

7. DURATION : Decide the total time you take to complete you lecture.

DIVISION OF MATERIAL AND TIME :

Divide the subject matter into the following steps :

A) **OPENING OR INTRODUCTION** : Stress the importance of the message in terms of economic gain or loss. It must be attractive, motivating and stimulating. Use examples, experiences field studies etc., to make the introduction more interesting.

B) **BODY INFORMATION** : Explain the subject matter step by step in sequence making meanings clear by citing examples with the help of audio visual aids. While communicating, follow inductive methods of teaching the audience from specific to general situation involving them wherever necessary by asking questions.

C) **SUMMARY** : Emphasise the essential points covered in the body information so that it facilitates the participants to remember longer and retain more information.

III. **QUESTIONS** : There are two kinds of questions – questions asked by the audience and questions posed by the students.

TYPES OF QUESTIONS :

1. Direct questions (asked directly to a person)
2. General questions (asked to group of people)
3. Reversed questions (when student puts a question to a teacher he directs the same to another students in the class).
4. Passed on questions (when question was asked to one person he passes on the same to another person).

HOW TO ASK QUESTIONS ?

- Ask very clearly
- Choose words carefully
- Make questions short
- Make intentions clear
- Adopt questions to listeners level
- Give sufficient time to answer

- Do not interrupt in the middle
- Give chance to others

QUESTIONS AS A TOOL (ADVANTAGES) :

- Questions activate
- Ensure participation
- Arouse interest
- Provoke thinking
- Help in exercising opinion
- Helps to collect data
- Finds in contributing factors / facts
- Open and initiate discussion
- Control discussion
- Change subject (switching over the topic)
- Develop subject
- End discussion

IV. GUIDELINES FOR EFFECTIVE LECTURE

1. BEGIN WITH OBJECTIVES AND KEEP OBJECTIVES IN FOCUS FROM PLANNING TO EVALUATION

Communication of learning objectives to the student, directly or indirectly, initiates him to the process of learning and enables him to prepare himself for evaluation. Planning and preparation by classifying objectives in different domains of learning leads to meaningful teaching, learning and evaluation.

2. ESTABLISH THE INITIAL PROFILE OF THE LEARNER AND HIS EXPECTATIONS BEFORE TEACHING

All learning events should be designed with regard to learner abilities, his knowledge structure, and his expectations. Prior knowledge of learner's level of mental processing provides a foundation for building up of higher level cognitive activities.

3. MATCH THE LEVEL OF INSTRUCTION TO THE LEARNER'S LEVEL OF RECEPTION

Organisation of subject matter in-terms of concepts, principles, etc. is necessary to match the learner's level of mental processing in order to facilitate cognitive learning, assimilation, accommodation and adaptation.

4. MOTIVATE THE LEARNER BY INTRODUCTING THE SUBJECT VIS-A-VIS ITS FUTURE RELEVANCE AND IMPORTANCE

Immediate needs of learners and needs for their professional growth constitute the driving force for adult learning. Introduction should relate to the relevance of the subject to the perceived goal. An innovative introduction may arouse enough motivation to sustain the interest throughout learning.

5. DIVIDE A COMPLEX SUBJECT INTO SMALLER ACHIEVABLE LERNING UNITS AND SUBUNITS

Identifying the components of a subject and arranging them sequentially in small steps appropriate to the comprehension ability of the learner ensures satisfaction of learning, arousal of interest and continued change. A learning task may be arranged in a continuum of general to specific, simple to complex and abstract to concrete following an elaboration process.

6. VARY ACTIVITIES DURING TEACHING IN ORDER TO SUSTAIN A LEARNER ATTENTION.

Activity variation can extend the attention span of a student, and sustain his interest in learning for a longer duration. Variation refers to teaching methods, audiovisual, style of presentation, level of interaction, introduction of humour, etc.

7. ASSESS THE LEARNER'S UNDERSTANDING AND INTERACT THROUGH QUESTION - ANSWERS

Neither the teacher nor the student is immediately aware of what the learner knows or how much he may have learned. Questioning can bring this out and help learners to appreciate their own abilities. Before proceeding to subsequent learning, gaps in understanding must be diagnised. Responses to different questions based on content, type of learning hierarchies give a clear indication of understanding.

8. ALLOW TIME FOR COGNITIVE PROCESSING IN ORDER TO INTERNALISE THE CONCEPTS

Meaningful pauses during the instruction allow time for encoding and decoding of information and facilitate insightful learning and thought

process respectively. Rate of presentation of ideas and concepts should match the comprehension ability of the learner.

9. PROVIDE ENVIRONMENT CONDUCIVE TO LEARNING

External stimulation controls the arousal level. For learning to take place the environment should have similarity with real life. Learning tends to occur best in a relatively relaxed atmosphere.

10. TEACHING INTERACTIVELY IN ORDER TO DEVELOP HIGHER MENTAL ABILITIES

Activity-oriented formats require the learner to respond, organise, hypothesise, abstract and process the stimuli. In order to achieve deep cognitive processing on the part of the learner, one way is to engage the learner in a discussion and attempting to go beyond surface interactions to reach some sort of 'interaction of minds'.

11. PROVIDE IMMEDIATE FEEDBACK TO THE LEARNER RESPONSES

Immediate knowledge of correctness of result contributes to continued motivation for learning. Feedback given should be informative so that the learner gets the opportunity to improve his/her responses. Tasks such as projects, practical exercise, group discussion etc., give immediate feedback to the learner.

12. PREPARE SELF-LEARNING EXERCISES, eg., ASSIGNMENTS, LIBRARY READINGS, ETC, FOR THE LEARNER

People do not learn in a linear manner. The human brain is highly eclectic, gathering bits and pieces from all over to make new connections. Self learning task allow learners to learn in their own ways and, possibly, at their own pace.

13. CONCLUDE THE INSTRUCTION BY RECAPITULATING THE SALIENT POINTS AND BY LINKING WITH FUTURE LEARNING

Summarisation and recapitulation are effective if they are complete enough to serve as repetition, reiteration and review of whatever has been communicated. Preparedness for further learning is assured by linking the present learning with the future, i.e., by providing advance organizers and creating expectations.

A well planned, organised lecture presented in logical order, supplemented with field examples and instructional aids drive the student to learn more and retain it for longer periods. Do aim your lecture for clarity in understanding of the student. Use lesson plan while lecturing. (A model lesson plan appended in this reading material to the topic lesson plan). A good teacher always enthralls the students and motivates them to learn.

II. PRACTICALS

The practicals are aimed at generating interest among the learners, make them understand the skill and do the skill right way. Therefore, the aim of the practicals is not concerned with proving worth of practice but 'how to do something'. The method 'how to do job' is demonstrated and thus skills are imparted through the triple process of seeing, hearing and doing.

The process of practical teaching consists, broadly of six phases namely :

1. Planning	2. Preparation	3. Rehearsal
4. Demonstration	5. Follow up	6. Evaluation

1. PLANNING :

A very important step in practical teaching is proper planning well in advance. The following points may be kept in view while preparing a practical plan.

a) Importance of the Practicals

Emphasise the importance and the aim of the practicals.

b) Basic Knowledge

The information about the practicals can be sought by referring to manuals, books, journals, periodicals, research papers and discussion with experts of related fields.

c) Tools, Materials and Literature

Listing of tools and materials required for carrying out the practicals. Sources of availability and collecting them. Literature to be supplied to learners should also be collected and prepared.

d) **Physical Facilities**

The place where the practical is to be organised - Laboratory, college farm, Horticultural garden, or some other convenient place. Plan the seating arrangements, arrangements of equipment, materials, lighting and ventilation facilities.

e) **Identifying factors causing Harm**

It is possible that sometimes mishandling of the practical may cause harm to teacher and or learners. It is therefore, essential to list out some Do's and Don'ts carrying out the practicals.

f) **Prevent Damage**

Plan well in advance to avoid possible damages to equipment and to individuals due to improper handling. List out such precaustions and the procedure to overcome them.

2. PREPARATION

Once planning is done, next important step in practicals will be preparation for the skill. The following points may help the teacher to prepare skill properly.

a) DIVISION INTO STEPS - The practical is to be divided in small and easy to carry out steps for effective learning. Learning will be fast when taught in simple bits.

b) CHECK AND ARRANGE MATERIALS, EQUIPMENT AND PHYSICAL FACILITIES - The collected materials, equipments are to be arranged sequentially to fit in to the steps. Physical facilities in the class room are also to be arranged taking all the care.

c) REVIEW - Review the entire process, see any thing is missing. Check at every stage. You are now ready for rehearsal.

3. REHEARSAL

After planning and preparation, the next step in practicals is rehearsal - preparing yourself for presentation. Rehearse the entire skill as per the planning and in step-by-step manner. Repeat the process till you master the entire practical.

4. DEMONSTRATION

You are now ready for demonstration of the practical. The required confidence you have already built up by planning, preparation and rehearsal. The following points may help you to make your practicals quite effective.

a) INTRODUCE TOPIC - Make introduction exciting. Catch the interest of the students. Make clear, its aim, importance and advantages.

b) DEMONSTRATE SYSTEMATICALLY - Carry out practicals step by step. Explain each step properly with examples. If possible, use visual aids whenever it is essential.

c) TALK DIRECTLY - Maintain eye contact while talking to students.

d) USE SIMPLE LANGUAGE - Use of complicated sentences make the practicals complicated and learners will be confuse. It is therefore, better to use simple possible language.

e) EMPHASISE KEY POINTS - Repeat the key points or essentials in practicals to reimpose the idea. This will help the learner to learn fast.

f) TRAIN THE LEARNER AT EVERY STEP - Involve the learner at every step of demonstration. Do not do it yourself alone. Train learner simultaneously. This will help in learning fast.

g) COMPLEMENT - Praise thelearner if does it correctly. Do not use harsh words or threaten him if he fails to do. Guide him to do it properly and correctly.

h) SUM UP - At the end summarise the entire practical. The learners will learn more when summarisation is done, effectively.

5. FOLLOW UP

To ascertain whether the learner has understood the process of skill and acquired necessary skill to carry out the practicals, follow these guidelines : While learner does the practicals;

a) LISTEN TO LEARNER - what he says. Whether he is expressing correctly or not ?

b) WATCH CAREFULLY - What he does, how correctly he carrys out the practical or skill ?

c) CORRECT HIM- If he commits mistakes, guide him to correct himeself.

d) ASK TO PRACTICE - If you are not sure about his performance several rehearsals will help to perfect his task.

e) CHECK WHOLE PROCEDURE - Ask him to do it again. Check his mistakes. Guide and ask him to repeat. Make sure that he has acquired the necessary skill.

f) ANSWER DOUBTS - If any, expressed by the learners.

g) WARN CAUSE OF HARM - Explain again that the possible effects of incorrect demonstration - emphasis on Don'ts.

h) PREVENT DAMAGE - Due to improper handling of the skill and equipments.

6. **EVALUATION** : The quality of the learner's performance should be evaluated by conducting the appropriate tests and examination in the next practical class if possible.

Any successful practical teaching has got to have both behind curtain and on stage practice. Meticulous and careful planning and preparation are like foundation to a building. Rehearsing the entire process will not only help to build confidence but also in correcting the possible mistakes. Make your practicals easier. Ascertain yourself whether the learner has acquired the skill or not. One mistake committed by teacher will multiply many folds in the students' performance. So avoid such costly mistakes by careful planning of the skills in practical teaching.

STUDENT EVALUATION - QUESTION BANKING

- *Dr. M. SUDARSHAN REDDY**

A question bank is being used by teachers/evaluators for internal and external assessment in a particular course or courses. These question banks are used to conduct examinations during or at the end of the course.

The main function of question banking would be to make available to teachers and examining bodies such questions together with associated information that they might wish to use in preparing their own tests and examinations. They :

- identify the forms and levels of question to be framed.
- provides the art of structuring strong questions in a particular course
- help to develop a standardised question paper with good quality of questions

It is necessary that a question bank must contain a large number of questions or items in a particular subject.

Question bank offers the chance to :

a) Produce and evaluate question on a relatively more effective base.
b) Carry out concurrent compatibility
c) Match the examination to the curriculum that is taught.

Thus question bank consists of a large number of different questions in every subject with known technical values. Some technical values of questions are :

1. The content/topic with which it is concerned.
2. The intellectual abilities that the question demands of the student.
3. Time required for answering
4. The type of question whether selection or supply
5. Marks allotted.
6. Facility value or Difficulty index
7. Discrimination index

* Principal, Extension Education Institute, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad-30.

DIFFERENT STAGES IN DEVELOPMENT OF QUESTION BANKING

Stage-I : Deciding pattern of question paper in the subject.

Stage-II : Collecting questions/items from

a) Specially conducted question banking workshops in various Universities/Colleges
b) Teachers and item writers from all over the country.
c) Past examination papers of Universities.

Stage-III : Preparing a draft questions through workshops on question banking in individual Colleges/Universities.

Stage-IV : Screening, selecting, questions/items and constituting initial banks.

To pre-validate these questions give technical values to each question consisting of :

a) Reference No.
b) Class
c) Subject
d) Topic
e) Date of making
f) Type of question
   - Selection type
   - Supply type
g) Objective tested
   - Knowledge – Understanding,
   - Application and skills.

Stage-V : Preparing the questions/items

Stage VI : Sampling 50% of these questions/items, reconstituting into cyclostyled forms for field trials.

Stage-VII : Field trials of questions/items through teachers.

Stage-VIII : Incorporating item/question in the bank.

TYPES OF QUESTIONS AND DESIGN

I. SELECTION TYPE

1. Constant alternative (T/F, Yes/No, A/DA)

It involves the student to choose an answer from two alternatives that remain the same for a series of items. Usually a statement is given and the student is asked to choose between true or false.

Example : 1. Teacher should be effective communicator True/False
2. Learning is not affected by emotions True/False

2. Multiple choice

It involves the students to select the right answer and insert the alphabet (a, b, c or d) of right answer in a special box provided at the end of the item. Every multiple choice item, there is one and only one predetermined correct answer; either as student's answer is right or wrong. The student is usually asked to choose or select the best or most nearly correct response.

Example : The first Agricultural University in India was started at :

a) Madras b) Allahabad
c) Pantnagar d) None of the above.

3. Multiple Facet

It involves the student to go through the given passage, information paragraph, diagram, sketches and then proceed to select the correct answer to every one of the many multiple choice items that follows. A series of multiple choice items will enable testing either multiple knowledge about a single topic.

Example : Visual aids are clasified into four categories namely : literature, symbolic, three dimensional and two dimensional. The example for symbolised are charts, three dimensional are models and specimens, two dimensional are divided into projected and non-projected aids. The simple non-projected visual aids are poster, flannel graphs, flash cards, and chalk board, and projected aids are hand made slides and types of transparencies.

1. How many categories of visual aids are there

a) 1 b) 6 c) 10 d) 4

2. An example of three dimensions visual aid;

a) Models b) Poster c) Leaflet d) Flash cards

3. A poster is an example of

a) Literature b) Non-projected two dimensional visual aid
c) Symbolised d) None of the above

4. Simple projected visual aids are

a) Flannel graphs b) Charts c) Transparencies d) Specimens

4. Marching

Presents invariably a list of 'premises' to be matched with a set of responses. The student is directed to look into the premises one after the other and match it with one of the responses and indicate it in the box provided :

Example :

Premises		Response
1. IARI	( )	a. Bombay
2. IVRI	( )	b. Hyderabad
3. ICRISAT	( )	c. Izzatnagar
4. CIFE	( )	d. Delhi

5. Rearrangement

This is an item in which the student is presented with material which is in random. He is to put them in order i.e., logical, chronological by rearranging the material.

	Order
1. Learner	( )
2. Treatment	( )
3. Commicator	( )
4. Feed back	( )
5. Channel	( )
6. Message	( )

II. **SUPPLY TYPE :** In this a student is asked to supply an answer.

1. ***Simple question :*** A direct and specific question to elicit a short, and clear cut answer from the student in the form of number, a word, a phrase or a sentence.

Example : 1. In which year the APAU was established.
2. Which institute is responsible for coordinating the Agricultural Education in the ocuntry.

2. ***Completion :*** A student has to write in a number, a word or a sentence in a given blank space.

Example : Two types of questions in the question banking.

3. ***Short Answer :*** A direct and clear question with the scope of the answer must be limited i.e. like define, name, list out, mention etc.,

Example :

1. Define Extension Management
2. Mention any four distinguish features between the Role play and case study method.
3. List out three natural laws of remembering
4. Name different teaching methods.

4. ***Long / Eassy answer :*** A student representing a problem may be given. This may produce a verbal working. For closed ended problems, there will be only one answer. Very often problems may be open ended giving rise to many forms of solutions. This will particularly enable testing the ability to judge and evaluate, when the student is asked to choose one of the several alternative solutions using given criteria.

Example : There are series of deaths of Animals in a village. All dead animals are bloated. There is a dark tarry coloured blood oozing from natural articles of animals. If you are a Veterinary Assistant Surgeon in that area, how do you arrive at diagnosis of the disease. What are the suitable control strategies you formulate to eradicate the disease you have diagnosed.

PREVALIDATION OF QUESTIONS / ITEMS :

Prevalidation relates to the activity undertaken by each group towards passing a judgement about the quality of question/items.

Criteria to judge the quality of **selection type** items.

A. General

- Is the item measuring an important learning outcome?
- Is the level of difficulty likely to be appropriate?
- Is the item likely to be answered wrongly by lower ability students?

B. Specific

1. Constant alternative type:

- Does the item include only one significant idea in each statement.
- Is the statement short and in simple language.

2. Multiple choice or multiple facet types :

- Is the content of the question clear?
- Are the options parallel in structure?
- Are the options parallel in content?
- Does the item use an efficient format?

3. Matching

- Does the item include only homogeneous material in the premises?
- Does the item specify the basis of matching, type of marching, kind of entry, etc.

Criteria to judge the quality of **supply type** of test items

A. General

- Is the item measuring an important learning outcome?
- Is the item measuring an important content area?
- Is the level of difficulty likely to be right?
- Is the item independent or does it overlap with other items.

B. Specific

- 1. Simple questions
- Is the item so stated that a single, brief answer is possible?
- Is the question direct?
- Is the answer related to the main point in the statement?

2. Short answer question

- Is the statement of question simple, clear, unambiguous?
- Is the scope of the answer is limited?
- Is the answer to the question capable of being marked objectively?

3. Long answer question

- Does the situation present in the question seem to be new to most of them?
- Is the time limit reasonable?
- Is the length and scope of the answer specified?
- Does it avoid usage of very often verbs?

POST VALIDATION OF QUESTIONS / ITEMS

For post validation of question item in question bank the facility value and discriminatory index of the questions to be calculated. The following procedure is used for calculating of facility value in case of objective type of questions.

1. Taking any one objective type question and working out the tabulation by giving the score (1) for right and (0) for wrong answers.
2. Dividing the number of students into high and low group by taking the 25%.
3. Adding the total marks obtained for that particular item in high and low group.

Working out facility value for the higher group.

Example :

Higher group :

12/12 x 100 = 100%

Lower group :

11/12 x 100 = 91.67%

$$\text{Facility value of the total} = \frac{100 + 91.67}{2} = 95.83$$

DI of the same item is $\left(\frac{12}{12} - \frac{11}{11}\right) = \frac{1}{2} = 0.083$

Calculation of F.V. and D.I. for short and long answers

A high group $\frac{60}{60} \times 100 = 100\%$ Lower Group $\frac{30}{60} \times 100 = 50\%$

for whole $\frac{100 + 50}{2} = 75\%$

$DI = \frac{100 + 50}{100} = 0.50$

Selection of Questions with DI value :

D.I. for objective type items : 0.2 to 0.6

0.6 : Excellent item

0 to 0.2 : Needs improvement

0 to be discarded

D.I. For short / long answer :

0.5 : Acceptable

0.3 to 0.5 : Needs improvement

0.3 to be discarded

Standards prescribed for good questions / item :

Facility value for selection and supply type of questions must range from 20% to 80%.

ADVANTAGES :

- Availability of a large number of variety of questions for use in examinations as well as continuous assessment.
- Uniform evaluation of students in different educational institutions.
- Saving the time and efforts of the teachers and evaluators.
- Matching the examinations as per the curriculum taught

Producing desirable changes in methods of teaching

- Training to teachers in preparation of questions.

REFERENCES

Eble R L 1965 Measuring Educational Achievement, Prentice Hall, Bombay.

Gronlund Norman E 1976 Measurement and Evaluation in Teaching, Mc Graw Hil, Bombay.

Srivatsava H S *et al.* 1978 Reforming Examinations – Some emerging concepts – NCERT, New Delhi.

PERFORMANCE APPRAISAL OF TEACHERS/ TEACHING

*Dr. B.V. SUDERSHAN RAO**

Education organizations actively involved in teaching – learning process are keenly interested in evaluating the instructional programmes keeping in mind two of the major purposes for evaluation i.e. to assist 'Faculty Members' in self examination of their teaching programme for improving it and to help those with proper authority to make enlightened decisions about promotion, awards and selection into higher positions of the faculty members. The purpose of evaluation influences the type of information collected, the analysis, territorial of the information, the dissemination and these to be made of the information in an instructional evaluation programme. There are several considerations that are relevant to establish a formal evaluation programme. Following are points for consideration for taking personnel decisions :-

1. Evaluation programme to have any utility, the linkage between performance, the evaluation of performance and reward for quality of performance must be established. Evaluation will lose its meaning if the performance (what the teacher does) and evaluation (judging the value of what the teacher does) and rewarding the faculty member in some way for teaching effectively as determined in the evaluation. However the linkage between these three must be strongest when the connections are flexible, fluid and dynamic.

2. Evaluation is a powerful method by which faculty learns all organisational expectations and goals.

3. Evaluation must be based on acceptable methodologies and practices related to personnel appraisal while evaluating the faculty member's fulfillment of their responsibilities related to teaching, on justifiable methods of data analysis land suitable interpretation. The methodologies and practices related to the personnel appraisal programme should consist of a system through which comprehensive, reliable, valid, and objective information is

* Prof & Head, O&RT Unit, Acharya N.G. Ranga Agricultural University, Rajendranagar.

collected about the activities undertaken by the teacher. At the time of evaluation, question must be asked whether the information collected as accurate, praise –worth and has been properly interpreted.

4. The faculty must be taken into confidence while developing the evaluation procedures of the teaching-learning process. The faculty should be asked to develop a comprehensive set of procedures for evaluating the educational process. Once they have developed the evaluation procedure and agreed upon it they will be able to implement the evaluating system more effectively.

The evaluation should not only be done for taking personnel decisions regarding the faculty but also for their improvement. Following are the points for consideration for taking the faculty improvement programme :

1. The information collected on the basis of the faculty evaluation system should be discussed thoroughly by the faculty members in closed meeting so that they are not felt hurt. This will provide them an excellent opportunity to discuss thread bare their strengths and weaknesses related to teaching strategies.

2. The information should be frequently and informally collected for getting the proper feedback. Since the information is not intended for personnel decisions, any type of evaluative information can be immediately examined to help the instructor in assessing a course. All the Faculty members should be couraged to collect enough information to monitor their progress.

3. Faculty members need to think of related to evaluation as starting point for further analysis and problem solving evaluation, professional development and improvement instruction are inseparable. The Faculty members must design their own self evaluation system if they are really interested in bringing desirable changes to make the teaching learning process more effective.

4. In an educational organization a system should be built up in which all the faculty members and policy makers should interact closely so that they can share their views freely and frankly regarding teaching methodologies and effectiveness of the present courses being offered

by them. The senior faculty members should play a significant role in sharing their experiences and exchanging ideas about their successes in their profession.

METHODS OF ASSESSING INSTRUCTIONAL EFFECTIVENESS

Evaluation of student attitudes about instructors and instructions is perhaps the most commonly used method of assessing instructional effectiveness. The rationale for this is that students are assumed to be the only ones who are constantly exposed to the elements of the course (e.g. instructor, textbook, home work, course content, method of instruction, etc.) and therefore, are the most logical evaluations of the quality and effectiveness of those elements, in addition student attitudes can indicate areas of rapport, degrees of communication, and the existence of problems and thereby help instructors as well as instructional development personnel describe and define the learning environment more concretely and objectively than they could through other types of measurements.

Self evaluation on the part of the faculty member is necessary to determine the rationale for the various elements of the course (s) taught such self-evaluation could deal with : 1) course content, 2) method of instruction, 3) ability to keep student interest and attention high, 4) ability to promote student learning, 5) course and instructional objectives and 6) course and instructional organisations.

The quality of student learning is another important variable to consider and could be used to determine if the course objectives are being met. It would be possible to a measure of student achievement in course by employing course or departmentally agreed on examinations that were designed to fit the instructional objectives.

Faculty (colleague) and department head attitudes and judgments represent the most comprehensive method of assessment. For example, these judgments could be based on an evaluation of :

1. the procedural adequacy of the course (s),
2. the appropriateness of the course content,
3. the appropriateness of course objectives,
4. the adequacy and quality of the course examination,

5. the stability of an instructor's teaching effectiveness over the years,
6. the student attitudinal report,
7. the instructor's self report,
8. the quality of student learning and
9. other course materials or comments that the instructor wishes to submit.

Such evaluations ideally should be made by three person departmental review committees using well structured guidelines and criteria of excellence and where needed, instructional development personnel expertise.

In order to accurately measure and evaluate instructional effectiveness, departmental faculty needs to agree on a set of criteria and then guidelines for that evaluation. Once a set of criteria has been agreed on, the departmental faculty would need to establish the guidelines (standards) necessary to evaluate them.

STUDENTS APPRAISAL OF TEACHER PERFORMANCE :

It has become the latest fashion, in education institutions, to subject teachers to student assessment. This has come into vogue partly because of concepts, life 'cost effectiveness in education', 'teacher accountability', customers satisfaction' etc. which have gained priority in the academic world and partly due to the wave of innovation sweeping over foreign countries. These countries have adopted teacher evaluation by peers and pupils to tone up and improvise the existing system of education. In our country private and self financing colleges, mostly professional have started using the procedure in order to improve their academic standards so that they can attract more and better 'customers'. Their mode of assessment is confined to the circulation of a questionnaire to the student with enquiry on the teacher's classroom activity rather than his overall performance in the college. Such enquires seem to be embarrassing to the teacher and the student alike, eg. What is the teacher's knowledge of the subject? Do you like his teaching? Do you want him to be continued next year? etc. Then, on the basis of adverse responses obtained from students, steps are taken for stopping the increments, stalling the promotion and in some cases even terminating impact, as it may create a feeling among the students, that the fate of the teacher is in their hands.

The teachers in their anxiety get a good report from their wards would like to placate them rather than do justice to their subjects. They

would also be unreasonably lenient in the class as any serious attempt to pull up an erring student may attract an adverse comment in the appraisal sheet. Besides the student's subjective assessment may not always be correct.

The question of accountability of teachers was never a serious issue in the past. Teachers were highly responsible persons of unquestionable integrity. Besides they were dedicated to the profession, they chose it out of interest and it was not very difficult for them to settle down in better remunerative and administrative jobs. But in the present circumstances, people land in teaching profession out of accident or compulsion as doors to employment in other professions are closed on most of them. As a result, persons having no aptitude for teaching have taken up the profession and many of them are not able to measure up to requirements and some of them are highly indifferent to their duties and obligations. There has also been a sharp deterioration in the academic performance of students. The examination scores have lost their validities they are no more the indicators of the real proficiently in the subject.

There is a widespread opinion prevailing in industries that the present graduates with inadequate technical and background knowledge cannot match what is expected of them in their actual profession. And hence the question of the accountability is an inevitable necessity. The National Policy of Education 1986 envisaged a system of performance appraisal of college and university teacher to be evolved in consultation with the teachers' organisation. Consequently the UGC setup a task force involving, All India Federation of University and College Teachers Organisations which prepared a report after a few sittings and based on the suggestions made in the report, guidelines were drawn and two different formats were designed for the guidance of the educational institutions. But they were not meant for the professional colleges and serious steps were also not taken to implement the appraisal system in the Arts and Science colleges either.

There is a wrong notion that teacher appraisal means the assessment of teacher's bookish monologue in the class on a one point scale. Transmitting knowledge is certainly not the only funciton of the teacher. He has a crucial role to play in shaping the destiny of students in the class and for that purpose mere instructional input will not do. He should involve himself in

various action-oriented and result-oriented activities directed towards promoting the academic excellence and technical competence of students. For that purpose he should have in his repertoire skills, technical insight; critical attitude, perpetual enquiry, imagination and creativity and these areas will constitute the focus of attention of assessors.

The performance apraisal of teachers should have two specific stages, (1) identification of the different aspects of a teacher's job – academic as well as non-academic. (2) which agency should assess the performance and what should be the mechanism of evaluation?

The performance appraisal should include the various useful activities of the teachers. As a first step, a profile of all the desirable traits and characteristics is drawn up.

The profile may have four broad categories – personal, pedagogical, professional and institutional.

PERSONAL

Compassion, patience, consistency in dealing with pupils, open mindedness, healthy interest in students, tact, sense of humour and dynamism.

PEDAGOGICAL

Democratic and flexible teaching methods to suit the needs of the pupils, creativity, style of functioning in the class, creation of a congenial climate to facilitate pupil participation, tutorial work, evaluation work, remedial instruction, counselling, guidance for research, communicative competence etc.

PROFESSIONAL

Dedication to the institution, exam duties, admission work, organisation of picnics, blood donation camps, placement programme.

The second stage pertains to teacher evaluators and the mechanism of evaluation. In the learning process students happen to be at the receiving end and are keen observers of the style of functioning of teachers in the class. The morale of the students is boosted when they are assigned the responsible job of making some decision about the class room proceedings and commenting on the teachers' global performance. The main point,

however, is whether the teachers in colleges are willing to participate in the process of student rating, as some of them may feel that such a rating means sharing power with students which will reduce their status of hierarchy with the students.

Voluntary participation of the teachers will provide only a distorted and incomplete evaluation of academic and instructional input, as only the best teacher will opt for it. All the teachers without any hierarchial difference, should be involved in student rating and they should best first be educated on the merits of students' evaluation which will provide them with some positive feedback resulting in the change of their instructional style and behaviour in the class.

Student assessment should be confined to the more obvious and noticeable personal traits and pedagogical attributes of the teachers but in matters of actual academic input it is doubtful whether they have the required insight to analyses, synthesis, interpret and evaluate the teachers academic performance for which the faculty members and heads of departments alone are the better judges.

There is a popular fallacy that the teacher's accountability pertains only to the academic standards of the students. The changing character and concept of education as the development of whole-sided personality requires the teacher to do more than mere teaching. It is said. The mediocre teacher tells, the good teacher explains, the superior teacher demonstrates and the great teacher inspires. The teacher with unimpeachable integrity of character, qualities of leadership, environmental awareness and a acquaintance with the day to day development in the chosen discipline becomes a source of inspiration, mentor and model for students. The teachers in general should have a strong ethical commitment to evaluate the performance of their colleagues or subordinates with utmost objectivity without any personal prejudice. The faculty assessment of a teacher should be concerned with the major attributes relating tot he professional and institutional aspects.

The evaluation of a teacher's overall performance can be done by administering suitable questionnaires to students, faculty members and the head of the department. The main objective of the evaluation process is to promote academic excellence and to maintain quality and standard of

education. The questionnaire should focus on all the reasonably representative activities of the teacher, his interactional traits and professional and personal characteristics. The responses should not be in the descriptive parameters but in objective check list with specifications and the options in greater explicitness. So that the respondents may not have any difficulty in recording their responses. Any drastically adverse comment should not be taken at its face value, observation by faculty colleagues, interviews with randomly selected students will throw more light on it.

The western autocratic style of 'hire and fire' culture will leave the teachers in a state of unrest and they will always be on the look out for better jobs and the departments will be functioning under great stress and conflict and consequently the evaluation process will not prove to be an effective tool. We have to infuse confidence among the teacher so that they do not consider the evaluation process as a management tool for punishment. Only then, will they willingly and positively respond to the questionnaire enquiry with a view to benefit from the positive feed back from the tripartite assessment. The college should function as a family in which the shortcomings and drawback of a member are made by other members to set them right.

The teacher's willing participation in the tripartite rating and the assessors' conscious endeavour to record their unbiased views and the college authorities' supportive attitude to round off the angularities of teachers without infringing on their academic freedom will certainly pave the way for cordial relationship among the students, teachers and college authorities which will promote the academic and professional growth and functioning of the teachers.

Effectiveness of teacher or teaching process can be assessed on the following points. Please remember that these points serve only as guidelines and by no means they are exhaustive. A teacher is therefore can develop a questionnaire incorporating the details to assess his teaching abilities by the students.

Points For Evaluating Teacher : The Following Guidelines may Help us in Evaluating A Teacher and his Teaching Efficiency

A. THE LECTURER AND HIS BEHAVIOUR

*1. He feels comfortable and at ease

2. He does not play with chalk, ruler, keys, etc.
3. He is not pretentious
4. He manifests interest in the subject matter
5. He does not criticise superiors or others
6. He has a sense of humour
7. He has self-confidence
8. He is well balanced from emotional point of view
9. He adjusts his gestures to the subject and the circumstances

B. KNOWLEDGE

1. He is familiar with the subject
2. He has a broad professional background
3. He has a broad general background
4. He has practical approach and experience

C. STRUCTURE OF THE LECTURE

*1. The objective of lecture is clearly defined
2. The subject is adapted to the students
3. The preface and the introductions are outlined according to the subject and the circumstances.
4. He develops the major portion of the lecture by stages and in logical order.
5. The summary and the conclusions suit the subject and the audience.
6. The lecturer passes progressively from the simple to the more difficult topics.
7. The arguments and the reasoning are convincing.

D. COMMUNICATION

1. The lecturer is sensitive to the atmosphere prevailing in the class
*2. He encourages students participation
3. He keeps the interest of his students constantly
*4. He knows how to reply to those who put numerous questions
*5. He does not enter into a debate with one participant
6. He is prepared to listen to the idea of the students
*7. He succeeds to stimulate discussion in the group
*8. He is sincere

9. He knows how to arouse enthusiasm of the students
10. He is capable of overcoming the difficulties of communication
11. He makes the group feels that decisions taken are it's own.

E. PRESENTATION

1. The introduction is interesting and arouses the interest of the students
2. He keeps to the established timetable
*3. He does not jump from one subject to another
4. He knows how to make use of the outline
*5. The explanation is simple and is presented in clear language
6. He does not use unclear terms
7. He continually verifies the comprehension of the students
8. He sums up his subject in intermediary stages
9. He effectively combines different methods of instruction.
10. He makes an efficient use of all the different types of questions
11. The questions are put clearly and in such a manner that they can be answered easily.
12. Abstract concepts and ideas are fully explained
13. He broadens the sphere of interest of the students
*14. He underlines the essential theme
15. He uses clear – easily understandable language
16. The delivery is adapted to the audience and is not monotonous
*17. The summing up is clear – convincing and easy to remember

F. VISUAL AIDS AND THEIR USE

*1. Suited to the subject
2. Adapted to the auidence
3. Adapted to local technical facilities
*4. They are employed at the right time
5. They are sufficient, but not superfluous
6. They are prepared in the correct form and shape
*7. The lecturer handles them with assurance
8. The main points of the subject under discussion are given emphasis through the use of the aids.
*9. The aids represent a stimulant to the auidence

G. GENERAL REMARKS

1. The teacher is able to create a pleasant general atmosphere

Note : * Most essential points to kept in view

SCORE CARD FOR JUDGING THE TEACHER

	Areas of judgement	Score allotted	Score obtained
I.	Personal (25)		
	a) Appearance	5	-
	b) Friendly conversational approach	5	-
	c) Poise, confidence and enthusiasm	5	-
	d) Gestures, mannerisms, eye contact and humour	5	-
	e) Voice, delivery, style, fluency and pronounciation	5	-
II.	Presentation (35)		
	a) Introduction and objectives	5	-
	b) Treatment, highlights, key points and examples	10	-
	c) Teaching aids carefully selected, arranged and used	5	-
	d) Summary and conclusion	5	-
	e) Questions and answers (Audience participation)	5	-
	f) Maintaining interest	5	-
III.	Subject Matter (40)		
	a) Related to field situation	5	-
	b) Adequacy	10	-
	c) Systematic break-up (Logical steps)	7	-
	d) Balanced coverage	6	-
	e) Problems well brought out and covered	7	-
	f) Latest information	5	-
	Total	100	

RATING		Score range
Excellent	---	90 to 100
Good	---	80 to 89
Fair	---	70 to 79
Needs improvement	---	69 and below

SCORE CARD FOR JUDGING THE TEACHING OF PRACTICALS

		Possible Score
I. PRESENTATION (40)		
i)	Teacher's appearance (neat and appropriate for job)	5
ii)	Teacher's voice, selection of words, posture, enthusiasm, and self-assurance.	5
iii)	Preparation and organisation of subject matter, arrangement and efficient use of equipment in time.	20
iv)	Visuals neat and clear.	10
II. SUBJECT MATTER (40)		
i)	Supporting evidence, showing importance of the topic demonstrated.	10
ii)	Accurate up-to-date and significant information.	10
iii)	Summary of main points.	10
iv)	Replies to questions.	10
III. RESULTS (20)		
i)	Apparent interest of the audience in practical	10
ii)	Was Objective of the practical accomplished.	10
	Total	100

PERFORMANCE RATING

Excellent	---	85 to 100
Good	---	70 to 84
Fair	---	50 to 69
Needs improvement	---	40 and below

Given below are three specimen questionnaires for measuring the teacher's performance by students, peer and faculty head.

QUESTIONNAIRE : 1. Student assessment of teacher

1. How does the teacher respond to the doubts raised in the class?
   Encourages/Ignores/Discourages

2. What is the teachers reaction when the students seek his guidance and consult him while identifying and solving academic problems?
   Appeciates / Avoids / Discourages

3. What is the teacher's attitude to slow learners?
   Helps / Ignores / Discourages

4. Does the teacher attempt to boost the confidence of the slow learners?
   Often / Some times / Never

5. What is the teacher's attitude to bright students?
   Appreciates / Ignores / Discourages

6. Is the teacher enthusiastic in covering the syllabus?
   Yes / No

7. Does he relate his teaching to the university examination questions?
   Often / Some times / Never

8. Does the teacher create congenial classroom climate to facilitate the learning process?
   Yes / No / Difficult to say

9. How often does he use slides, charts OHPs, and other instructional aids to supplement his teaching?
   Often / Some times / very rarely / Never / Not applicable

10. How often does the teacher use the black board?
    Often / Some times / Rarely / Never

11. How often does the teacher conduct tests (apart from the centrally organised department and college tests) to find out the students' grasp of the portions covered?
    Often / Some times / Never

12. How prompt is he in his correction and evaluation work?
    Prompt / Not so Prompt / Inordinately delays

13. How is the teacher's tone?
    Audible / Inaudible

14. What is his general relationship with the students?
    Cordial / Tolerable / strained

QUESTIONNAIRE : II. Peer assessment of teacher

1. How often does the teaher participate in the academic discussion in the staff room?
   Often / Some times / Never

2. How often does he clarify the doubts of his colleagues in the subject?

   Often / Some times / Never

3. How often does he seek the help of his colleagues in locating and solving academic problems?
   Often / Some times / Never

4. How often does he invite comments on some of his teaching points?
   Often / Some times / Never

5. How often have you noticed the teacher preparing for the classroom lectures?
   Often / Some times / Never

6. Have you noticed the teacher using the non verbal medium of communication for teaching purpose like instructional aids etc?
   Often / Some times / Never

7. How is his relationship with the other colleagues in the departments?
   Cordial / Tolerable / Strained

8. How is the teacher's grasp of the subject?
   Very good / Good / Satisfactory / Fair

9. How is the teacher generally received by the students?

Respected & fared / Respected & loved / Tolerated / Ignored / Hated

10. In the inventory given indicate how often the teacher supplements his knowledge of the subject (by putting tick mark)

		Often	Rarely	Never
a.	Reads books on the subject apart from the prescribed and recommended text books	-	-	-
b.	Reads professional magazines and journals	-	-	-
c.	Keeps in touch with learned professors	-	-	-
d.	Visits to related institutions	-	-	-
e.	Discusses academic topics with the staff and the head	-	-	-

QUESTIONNAIRE : III Faculty head assessment of teachers

1. In the inventory given below indicate the teaching and learning activities in which the teacher involves himself (by putting a tick mark)

a. Interdisciplinary activities ( )

b. Instruction related activities ( )

c. Department activities ( )

d. Remedial instruction ( )

e. Counselling ( )

2. Indicate in the inventory the teacher's participation in the following curricular and extra curricular activities

a. Admission work ( )

b. Examination duties ( )

c. Organisation of picnic and excursions ( )

d. Placement programme ( )

e. Sports activities ( )

3. How often does the teacher use the infrastructural facilities available in the college?
   Often / Some times / Never

4. What is the techer's degree of awareness of the updated development in his chosen field?
   Very good / Good / Satisfactory / Fair / Poor

5. Grade the teacher's innovation and sophistication in his teaching process.
   Very good / Good / Satisfactory / Fair / Poor

6. Does the teacher vary his teaching pace and adjust it to the level of students udnerstanding?
   Yes / No

7. Indicate the distinctions earned and involvement in academic pursuit

a. Number of Ph.Ds produced
b. Number of completed research projects
c. Number of ongoing reseasrch projects
d. Number of guest lecturers given
e. Number of articles published
f. Number of text books published
g. Number of seminars / workshops conducted
h. Number of seminars / workshops attended

8. Does the teacher show keenness in the sharing of responsibility with his colleagues in the department affairs?
   Yes / No

9. Do you receive complaints from the students about the teacher's classroom performance?
   Often / Some times / Never

10. Please indicate the teacher's loyalty to the institution he serves.
    Commendable / Doubtful / Difficult say

11. What is the teacher's degree of involvement in the activities of the college?
    Commendable / Satisfactory / Poor

COMPUTERS IN EDUCATION

K.M. REDDY *

In a developing country like India there is a perpetual need to adopt emerging areas of technology to inform, to provide skills and to educate the people to enable them to realize their full potential and contribute towards national development. In order to keep pace with the wide and far reaching changes in technology, it is necessary to use high technology for education as well. Computerisation in education is our present need though it is in its infancy. The computer has a number of exciting innovations for use in education. Presently, let us examine various facets of use of computers in education.

COMPUTERS AND TEACHING

The Educational Computer is basically viewed as an instructional medium rather than a machine. In this context, we need to examine the following three aspects :

1. Can computer think ? If computer cannot think, how they can possibly teach ?
2. Why would a teacher wants to use the computer to deliver instruction ?
3. How do computer compare with other instructional media ?

Computers can keep records and do administrative tasks they can be powerful tools to enhance the learning experience and they can deliver instruction. Though each of these uses are important, the most challenging of these uses is, however the computer's function as a medium to deliver instruction.

Good teaching is often described as an intuitive activity. The computer, though different from other machines, is still only a machine. Intuition and understanding are definitely out of its reach. Then the question comes: how can a computer teach? The answer is that it cannot. Computer does not teach-people teach. In fact, people built instruction into computer

* Principal Scientist, ICM Section, NAARM, Hyderabad-500 030.

programme and the programs are run on the computers. This makes computers a medium of instruction delivery. In that sense, computers are just like textbooks, chalk boards or video media. However, computer is somewhat different. It can interact with students and this ability to interact is computer's greatest strength as an instructional media.

Computers are dumb as they are generally described. As they are capable of doing only four simple taks, namely (1) Input (2) Storage (3) Manipulation and (4) Output. But, then 'how these simple features enable computers to function as a medium', is the question which has got to be examined.

Dual Meanings of Computer Education

The term computer education has two rather different meanings depending upon the part of the phrase stressed. In other words, a distinction needs to be made between teaching and learning about computers, on the one hand, and teaching and learning with, from or through computers, one the other.

(Please shift this star * to this page last)

Learning about computers

In view of the enormous impact that computers have on many aspects of daily life, it is hardly surprising that computers themselves should be considered as an object of study in educational institutions. Three different aspects may be distinguished in learning about computers:

a) Computer awareness

- described by one writer as "a national asset".
- It seems likely that as a society's general awareness of computers rises, the need for specific computer awareness courses will decrease.

b) Computer studies

- may include among other things programming of computers, computer architecture and design.

c) Computer electronics

- Often included as part of an introduction to electronics or digital electronics.

- Can include the study of integrated circuits, flip flops, counters, clocks and logic gates.

Knowledge of computers may be thought of as a continuum, ranging from skills and awareness of computers as learning and educational tools at one end of the continuum, through to programming in higher and lower level languages, and to solid-state physics at the other end of the continuum.

Learning with, from the through computers

The terminology concerning computers as a learning medium varies widely and there are no universally agreed-upon definitions. Among those frequently encountered are :

a) Computer Assisted Instruction (CAI)

In this mode the computer acts as tutor teaching new skills or concepts or providing practice for learners. Software in this mode is often referred to as :

"drill and practices; and tutorials"

b) Computer Based Learning (CBL) or Computer Assisted Learning (CAL). Various categories of software in this mode include :

"Simulations & modeling, instructional games, problem solving, information handling, demonstrations".

c) The Computers as a General Purpose Tool

As in business, commerce and industry, the computer may function as a general purpose tool. These functions are; as a tool for calculating and statistical analysis; writing, drawing, design; and playing or composing music.

d) Computer Managed Learning (CML)

In this mode the computer serves as a tool to help in the management of student learning. Its uses include :

"test scoring, managing of student records and text analysis".

The above terms or expressions are quite common, but emerging more prominently in the recent times as a result of developments in artificial intelligence (AI).

e) Knowledge-based systems

Knowledge-based systems, commonly referred to as expert systems, are computer programmes that enable computers to reason within fairly restricted domains. There are two main components of knowledge-based systems. First, there is the knowledge base. Which consists of the known facts about a particular subject areas. Second, there is an inference engine, which comprises a set of procedures or rules relating to the knowledge base.

Computer Literacy

The term computer literacy covers aspects both of learning about computers and of learning with, from and through computers. It involves consideration of the application of computers in educational settings and in society at large, as well as consideration of the implications for education and for society.

Commonly included among the objectives of computer literacy are the following :

a) An awareness of information technology and how it affects day-to-day living;

b) An understanding of man/machine interaction so that students may have the confidence to communicate and use computers in a variety of ways;

c) An understanding of common computer systems and associated terminology so that students feel ' at home' with them;

d) An introduction to the importance of information so that students may appreciate the full potential of computers as tools in analyzing decision making processes; and

e) An understanding of when computers may be used for problem solving purpose. Computer literacy implies, then, being, familiar and at ease with computers generally in the same way that literacy implies being familiar with books.

Instructional strengths of the computer

A good computer based education depends on effective exploitation of computer's strength as an instructional media. Computer's capacity for

interaction sets it apart from other instructional media and defines its unique strengths. The computer does following instructional tasks :

a) Stores its information in a fluid, electronic matrix so that it can be held in reserve and presented to the students in any order, not just from beginning to end.

b) It is interactive, so that the student can put in information as well as retrieve it.

c) Can combine the potentials of fluid information storage and interactive ability to deliver the information its program may contain contingent upon the student's inputs.

While books and films contain only 'information an educational computer programme might be set to contain 'instruction' – a combination of information and a way to deliver that information to students as per their specific needs.

In essence, computer is useful as a medium to deliver fully adaptive instruction, it does many of the things a good teacher does. Then the question arises: "if a computer merely does what a teacher does, why we need it?" it is the capability of the computer to deliver individualised instruction in an interactive mode as per the requirements of the individual student which makes the computer as useful instructional medium. Among other things computer also has a large storage capacity, capability to store pictures, diagrams, sketches apart from the text and presents them as and when required. It is, hence, worthwhile at this stage to consider its strength and weaknesses vis-à-vis human teachers, books and films.

Computers versus Human Teachers

Shared Features : Computers share three main features with human teachers. Not insignificantly, each feature is related to one of the basic computer operations viz., Input/Output, Storage and Manipulation (Process)

Computer as instructional medium	**Basic operations of computers.**
* Interactive ability	* Accept user input Display output
* Ability to hold information in a fluid matrix	* Storage of information

* Ability to deliver information to students contingent on their performance.
* Simple calculations

Things Teachers Do Better

Even though computers share all those features with human teachers, they do not interact and provide contingent feedback in the way teachers do. Teachers think, make rational judgements, understand language, and can draw on knowledge of the world and the students particular experiences. Computers cannot.

Things computers Do Better

When instruction must be delivered to several students simultaneously, computers offer the advantage of being able to attend to each student individually. At the same time, and partly because of their individualizing capability, computers can guarantee achievement, given appropriately designed instruction. In a limited sense, computers may also be regarded as better at storing information. Unlike most teachers, they have total recall; however, they cannot reach into their "life experience" for additional information than stored.

Computers versus Books

Shared Features

Both computers and books store information like computers, books may be said to be interactive to some degree. Textbooks, work books and similar materials accept student input.

Things Books Do Better

Atleast at the present time, books are more portable. For delivering long sections of text, books are unbeatable, and easy to handle/read.

Things Computers Do Better

For the task of delivering instruction, computers are better than books in almost every way. Their interactive capacity, their ability to withhold and record information, and their ability to deliver feedback contingent on student response make them more effective.

Individualizing Instruction

The conventional teacher – centered education is disagreeable to all because it seeks to standardize students. In contrast learner-centered educational approaches are viewed as a laudable reaction to the stultifying effects of teacher- centred instruction. But they have a drawback: They accommodate the individuality of students only at the cost of efficiency. Individualized delivery of instruction means (1) that each student must get every bit of instruction he or she needs to master content effectively, and (2) that no student should get one bit more instruction than he or she needs.

In specific terms, individualization means

1. In delivering instruction, we must device some means for determining whether student already knows the content taught in a lesson and, if he or she does, individualizing the lesson by permitting the student to skip it.
2. For students who do not already know the facts and /or skills the lesson teaches, and who thus enter instructions, we must:

a) Teach them only the skills they do not know, Delivery is not fully individualized if the lesson is "all or nothing".

b) Give them immediate corrective feedback on their performance; and it must specific to the learning errors they have made.

c) Provide some efficient means for extended practice on the skills they have learned in the lesson.

Major tasks that a computer can perform in teaching

1. Display text (eg. A poem in English, historical facts)
2. Draw pictures, including maps and graphs (of particular help in Geography)
3. Perform calculations (Simple averages to complex multi-variable equations)
4. Test users on their knowledge or skill (multi-choice, quizzes & arithmetic exercises) and mark & grade results.
5. Display information in table form

6. Draw a succession of pictures to give the illusion of movement (rockets, projectiles, vehicles etc.).
7. Store information making it simple for individual items to be found (library databases etc.).
8. Produce printouts of form lists, exam results, lists of questions etc, which can be copied and distributed.
9. Produce simulations which allow the user to control and direct a process by varying certain factors (eg. Voting patterns, chemical change in the environment etc.).
10. Combine complex calculations and graphical display to simulate real processes (eg.queuing systems, chemical reactions, etc.)

CAI, CBL and CBT

From the beginning computers have been used as a medium for programmed instruction. A piece of information maybe presented to the students and perhaps a quiz is given immediately thereafter. Another use is the drill and test mode. These uses come into the category of Computer Assisted Instruction (CAI). At a later stage, computers were used to convey concepts which routine teaching using traditional media cannot. In this way computers enriched teaching, or made it more effective and this general mode is referred to as Computer Based Learning (CBL). However, some believed that the main advantage of a student working at a terminal was not fully exploited to provide personalized attention to the student. Recent advances in knowledge engineering promise new types of software which capture the role of the computer as tutor to a student. This mode, referred to as Computer Based Tutor (CBT), will become more prevalent. It is necessary, however, to emphasize that the three modes described here, CAI, CBL and CBT, will be used to cover the various aspects of student-teacher interaction.

Computer Assisted Instruction (CAI)

The most exciting innovation in the educational technology is the Computer Assisted Instruction (CAI). For CAI, a computer is programmed with linear or branching programmes. It acts like a super teaching machine catering to the needs of a number of students at the same time. The

characteristic aspect of the CAI is its capacity to initiate flexible interactions with the student. There are a number of ways in which this can be brought about. The computer is able to record and store all the responses of all the students. It can branch not just in terms of one answer but also in terms of a whole series of previous answers. It can also record the time taken to answer a question and the degree of correctness of the students response. It uses the information in planning to determine which branch to take.

A typical CAI installation consists of individual learning booths, each with a console. The student is seated. Facing him on the console is a television screen for displaying information. Before he starts a programme, the student checks in with the computer by displaying his identity number. This connects him with his part of the learning programme. A complete package of information stored in the system is presented sequentially. This information could take the form of video-tape recordings, slides, motion picture films, filmstrips etc. The student may question the computer and feed answers into it by means of a typewriter keyboard. The computer responds by printing out comments, answers and questions. Sometimes, the student may write directly on the display screen with a 'light pen'. His answer will be picked up by the computer and evaluated. When he has finished, the computer assigns him the next programme, records his progress and prints out a report for his teacher. The CAI identifies the way a student seems to learn best.

Computer assisted instruction besides using programmed instruction, used electronic data processing, data communication theory, systems theory and learning theory. Computer Managed Instruction (CMI), in contrast to CAI analyses the relationship between various factors pertaining to a student and suggests activities appropriate to individual students.

Instructional Uses of Computer

Although computers can be used in many ways in the educational programmes, the following are some of the areas where it proves to be effective in the instructional process.

1. **Drill and Practice**

The student sits at a specially designed terminal which is connected to a computer. He identifies himself by a code number and his name. The

machine types out the first question and the student responds. Soon the lesson is under way. The computer keeps track of each student's performance and can 'read back' to the teacher a summation of each student's work whenever the teacher wants it. Depending upon the programme, the student might be referred to a branching type of remedial exercise. The student moves at his own pace, gets immediate feedback and receives individual tutoring.

2. Tutorial and Dialogue

The subject-matter is literally taught by the computer programme. Explanations are given orally through audio-tape and needed visuals presented in cathode ray tube as in television. The student responds and the computer reacts to student's response by 'talking' to him. Student makes further response. A kind of dialogue takes place between student and machine.

3. Simulation and Games

These have come into effective use in education in recent times. Simulations are condensed learning exercises specially designed to represent vital real life activities by providing learners with the essence or essential elements of the real situation without its hazards, costs or time constraints. Simulations are realistic imitations. Simulations are frequently planned in the form of competitive games to increase motivation and interest. Organised Social simulation is called gaming, as for example, historical games.

Simulation and gaming increases motivation and self-confidence and can accommodate students of different ages and levels of maturity. They approximate reality far more closely than conventional class methods. But some of these take considerable time and demand too much from the teacher.

4. Information Handling

One area where processing and information handling capacity of computer is profitably used is counselling and guidance. Computers store complete cumulative records and match them against employment needs and potentialities.

ADVANTAGES OF CAI

Computer Assisted Instruction proves better than all other aids in several aspects. There is not only saving of time in learning but it also

performs miracles in processing the performance data. This later characteristic helps to determine subsequent activities in the learning situation. The large amount of information stored in the computer is made available to the learner more rapidly than any other medium. The dynamic interaction between the student and instructional programme is not possible to be secured in any other media. With CAI, we would completely individualise materials.

Limitations of Computers

Before computers can be of any use, they must be carefully programmed to perform desired functions. This requires thorough planning of every step and prior thinking. Computers are simple minded. They demand instructions spelled out in explicit detail. Human beings are brilliant but rather sloppy thinkers; computers are stupid but accurate.

Although computers open the possibility of educating the students completely by individualised programmes, their chief limitation lies in the fact that they are some what costly. Computers may 'dehumanize' man. Further all individualised instruction and CAI instruct the students the same way that all will achieve the same competency.

Teachers and computers

There is a concern among some about the role of a teacher when computers are introduced into schools/colleges. It is a mistake to think that the replacement of teachers is the goal of computer education. It should be emphasized that the teacher, in fact, becomes more important in getting the most out of the investment in computers. Activities that a teacher does not have time for because of the many other conflicting demands of teaching. Such as finding time for drill and routine testing and evaluation, or for tutoring to provide individual attention, will be taken care of by computers. Also a teacher can use computers to increase understanding of difficult concept in a course through specially tailored CBL packages.

For teacher who will use computer based learning in their classrooms, the following skills and knowledge might be considered appropriate :

- Awareness of the potential of computing in the teaching of the subject; familiarity and understanding of the extent and nature of computer use in the subject area outside schools.

- Minimum knowledge (level similar to that suggested for Computer Awareness Teachers) of equipment operation, maintenance and care.
- Working knowledge of available software, sources of software, and sources of information to keep this knowledge up to date.
- Software selection skills.
- Classroom organiziation skills, integration of equipment use into lessons; use of demonstration and small group techniques.
- Awareness of changes in curriculum and shift in emphasis due to new technologies.
- Ability to discuss social impact of information technology on the subject area.

Where there is already a well-developed programme of in-service activities for teachers within an education system and an expectation that teachers will avail themselves of such professional development, the task of implementing in-service teacher educating courses on computer education becomes manageable. Where there is no well developed structure, establishing the requisite climate becomes a prior task.

Plan for acquiring educational Hardware & Software

1. **Take stock of your hardware situation**
   a. What machine features do you need ?
   b. How many machines do you need ?
   c. Where are they to be situated in the college ?
   d. How do current acquisitions fit into the future of computing in your college ?
2. **Take stock of your instructional requirements**
   a. For what academic subjects do you want to use the computer as teacher ?
   b. Where within the curriculum of each subject do you want to use CBE ?
   c. What instructional approach do you favour – tutor, tool, or tutee ?

d. When do you want the computer to deliver complete teaching, and when instructional supplements ?

3. With that information and those decisions firmly in mind, embark on the processes of selection and evaluation carefully.

The first two steps in the process are interrelated and must be undertaken simultaneously.

Present trends in the use of computers in education

Computer courses have been integrated into engineering education in the country. In addition, specialized manpower developed programmes like B.Tech and M.Tech courses in FORTRAN programming and numerical computers in enriching teaching and they are largely used as a tool (super calculators) or to teach some form of computer science. The potential of the computer to modernize the education process itself is yet to be recognized. However, there are instances of use of CAI, some research in developing CAI systems has also been undertaken. The use of computers in educational management is limited, and largely confined to processing of admission and examination results.

Future work in CBL

To develop CBL packages, themes and scripts would have to be evolved by creative teachers. Availability of software tools would facilitate a teacher experimenting with graphics and animation.

The future work should include :

a) Development of prototype development tools particularly for graphics

b) Tools to incorporate 'HELP' features to make packages self-instructional

c) A CBL package developed in high-level language to be automatically converted into the particular machine on which it has to run;

d) Integration of audio-visual aids such as audio tapes/video tapes and slides with CBL packages;

e) Development of facilities for capture of software directly from broadcast on the line of 'CEEFAX' technique to afford easy dissemination and error-free replication; and

f) Use of school computers in laboratory and robotics to illustrate control application of computers.

Further Reading

1. Trends in Computer Assisted Education Ed. By Lewis, R and Tagg, E.D.
2. Using computers in Education by Clive Gifford.
3. Understanding Computer Based Education by Martin A.Siegel and Dennis M.Davis.

RESEARCH

RESEARCH WING OF ANGRAU

*Dr. A. PADMARAJU, Dr. SURYAPRAKASH RAO**

The major thrust of the University is research. With the implementation of National Agricultural Research Project (NARP), the research has been organised with a strong multi-disciplinary approach to serve the location-specific research requirements more effectively. About 800 scientists are working in various Research Stations spreaded over seven agro-climatic zones of the state.

Agroclimatic zones and lead functions

S.No.	Zone with headquarter Stations	No. of Res. Stations	Lead crops / functions
i.	Krishna-Godavari Zone, RARS, Lam	23	Rice, Pulses, Cotton, Chillies, Cashew, Spices, Post Harvest Technology, Oil Palm, Water Management, Coconut Mango, Banana, Cattle and Fisheries.
ii.	North Coastal Zone, RARS, Anakapalle	7	Sugarcane, Sesamum, Mesta and livestock
iii.	Southern, Zone, RARS, Tirupati	10	Groundnut, Citrus, Sheep and Pigs.
iv.	Northern Telangana Zone, RARS, Jagtial	11	Sugarcane, Rice, Water Management and Fisheries
v.	Southern Telangana Zone, RARS, Palem	8	Rice, Maize, Millets, Oilseeds, Horticulture, Poultry, Agroindustrial by-products in livestock Stations, Forage crops and Post-Harvest technology
vi.	Scarce Rainfall Zone, RARS, Nandyal	4	Sorghum, Dryland Agriculture and Water Management
vii.	High Altitude and Tribal Area Zone, RARS, Chintapalli	4	Horticultural crops and Tribal area development

* Director of Research and Associate Director of Research, Directorate of Research, Administrative office, Acharya N.G. Ranga Agricultural Univeristy, Rajendranagar, Hyderabad - 30

Outstanding Research Contributions

1. Improved crop varieties released :268
2. First in India and second in the world

   Hybrid Rice developed and released two rice hybrids APHR 1 and APHR 2 first time in India and next to China in the world.
3. First in the country

Rice	:	Gallmidge resistant (Kakatiya, Surekha, Pothana, Divya, Kavya, rudrama) and brown plant hopper resistant (Vajram, Pratibha, Chaitanya, Nandi, Chandan) varieties.
Maize	:	First triple cross hybrid (Trisulata)
Blackgram	:	Powdery mildew resistant variety, Krishnayya (LBG 17).
Groundnut	:	Nematode resistant variety (Tirupati 3)
Sunflower	:	Hybrid (APSH 11)
Sugarcane	:	Red rot resistant varieties (Co A 7601 and Co A 7602)
Cotton	:	Godavari Ganga (one of the first early released hybrids)

4. National Recognition

Ragi	:	Godavari
Chillies	:	Bhagyalakshmi (G4), Andhra Jyothi (G5), Bhaskar (CA 235)

The research programmes are formulated at the Station level, discussed at the respective zonal headquarters and finalised at the state level with due interaction, of the scientists, farmer representatives and officials of the Department of Agriculture and other related departments and institutions.

The agro ecological situation, lead and main functions of research Stations located at each Regional Agricultural Station are briefly presented here under :

1. KRISHNA GODAVARI ZONE

The Krishna-Godavari Zone spreading over 43 thousand sq km., accounts for 15.5 per cent of the total geographical area of the state.

Three districts namely West-Godavari, Krishna and Guntur and a large portion of East-Godavari district (80%), 60 per cent of area in Prakasam district, 40 per cent in Khammam district and a small area (20%) in Nalgonda district are included in the zone. It lies between 15°3' and 17°5' North latitude and 79°5' and 82°7' east longitude. The zone has an extended cost-line with an annual rainfall ranging from 800 to 1100 mm. The storms and depressions which form in the Bay of Bengal move across the coastal areas of the zone causing heavy to very heavy rains. These storms are the main cause of floods which on an average occur twice a year. The soils are predominantly deltaic alluviums (29.2%), deep and medium black soils (27.2%), red and red loamy soils (23.3%), red soil with clay base (8.7%) and coastal sands (8.7%). Soil salinity is encountered in areas adjacent to the coast due to impaired drainage. The zone receives rainfall from both South-West as well as North-East monsoons contributing 90.4 per cent of total rainfall extending from June to November. The zone is agriculturally most important with productive soils, ideal tropical humid-climate and vast irrigation potential under Krishna-Godavari Canal system (Krishna delta canal systems, Godavari delta canal system and N.S. canal system) which has largely been exploited. Rice is the principal crop grown with large areas under pulses (blackgram, greengram and redgram), cotton, sugarcane, tobacco, chillies, sesamum, banana, coconut and other crops. Mango is widely planted and is emerging as an exportable produce. The biggest fresh water lake viz., Kolleru lake extending 900 km^2, is situated in this zone. Fresh and brackish water aquaculture activities are spreading in the lake area and the coastal regions of the zone.

Out of 18 agro-ecological situations identified in the zone as many as 12 are included under irrigated situations. There are 165 cropping systems, out of which, the predominant ones are rice, rice-blackgram, rice-groundnut and cotton. As the cropping intensity and irrigation intensity are high in the region, there are several location specific problems associated with the intensive agriculture and have been attended to effectively to increase agricultural productivity and profitability.

The total population of the zone is 172.42 lakhs (1991 census) with 71.8 per cent of population residing in rural areas. The number of farm holdings are 23.15 lakhs operating an area of 29.53 lakh hectares and the average size of individual holding is 1.27 ha.

Lead and verification functions of the Krishna-Godavari Zone research Stations

District/ Research Station	Functions	
	Main	Verification
(1)	(2)	(3)
Guntur District Agricultural Research Station, Lam.	Pulses, cotton, chillies, coriander, soybean and minor millets, Regl. Res. Units Soil Science, Helicoverpa Management, Hybrid cotton	Mustard, Castor, Gingerly, Mushroom spawn production, Farming systems research, Forage Sorghum
Livestock Research Station, Chintalapudi	Cattle breeding Betelvine	Management of betelvine malady
Agricultural College Campus, Bapatla		
Rice Research Unit	Rice (Krishna western delta and NSP Black soils)	Rice based cropping systems
Post Harvest Technology	PHT of Rice, pulses and groundnut, farm implements and machinery	
Weed control fallow	Integrated weed Management	Control of weeds in rice fallow pulses
Saline water Research	Research on use of saline water	
Bacterial Inoculants Unit, Amaravati	Rhizobium cullture production	Hybrid cotton
Seed Production farm, Janga-Maheswarapuram	Seed production in rice, soybean, cotton	Soybean, cotton
Cashew Research Station, Bapatla	Cashew-nut	Cashew based cropping systems – inter cropping

(1)	(2)	(3)
Fisheries Research Station, Bapatla	Fish culture	
Krishna District		
Agricultural Research Station Vuyyuru	Sugarcane	Sugarcane based cropping systems (rice and pulses)
Agricultural Research Station Machilipatnam	Rice for saline soils	
Agricultural Research Station Endakuduru	Agricultural Drainage for low land rice and other irrigated crops in delta lands	
Agricultural Research Station Garikapadu	Crops and cropping systems, water management for NSP Left Canal	Rice pulses, soybean
Agricultural Research Station Ghantasala	Rice fallow pulses (rabi and summer)	Rice in kharif
West Godavari District		
Agricultural Research Station Maruteru	Rice, Rice-based farming system, soil and water management for delta soils, post-hyarvest technology (rice), rice-cum-fish farming, summer pulses	
Agricultural Research Station, Pulla	Rice for deep water and flood situations	
Agricultural Research Station, Kovvur	Banana, tuber crops other than potato	

(1)	(2)	(3)
Seed production farm, Venkata-Ramanna Gudem	Seed production (upland and light irrigated crops)	
Agricultural Research Station Vijayarai	Oilpalm, water management for horticultural crops, melons, cropping systems and cropping models in fruit crops and research on vegetables including off-	
Fisheries Research Station, Kovvali	Fresh water prawn culture	
East Godavari district (part)		
Agricultural Research Station Ambajipet	Coconut, arecanut, coconut based multitier cropping system	
Fisheries Research Station, Kakinada	Brackish water fish and prawn culture	
Prakasam district (part)		
Agricultural Research Station Darsi	Crops and cropping systems for NSP right canal, oilseeds, millets, agro-forestry, soil and water management	Pulses

NORTH COASTAL ZONE

The North Coastal Zone is one of the seven agro-climatic zones identified and lies in the North-eastern part of the state comprising major parts of Srikakulam, vizianagaram, visakhapatnam districts and parts of East Godavari district (upland area). The zone spreads over an area of 19 thousand

sq km. Covering 6.9% of the area of Andhra Pradesh. The zone has the population 67.96 lakhs (1991 census), with 10 lakh operational holdings operating 9.43 lakh ha and 0.94 ha as its average size of holding.

This zone is characterised by humid to sub-humid climatic conditions. The normal annual rainfall of the zone is about 1060 mm. Out of the total rainfall 61% is received during South-West monsoon, 26% during North-East monsoon and the remaining 13% during winter and summer months. The first rain which accounts for over 6% is received in May marks the beginning of the main agricultural season.

The zone has five types of soils viz., alluvial, red sandy loams with clay base, red sandy loams, lateritic soils and coastal sands. A total of seventeen agro-ecological situations are identified and the dominant crops of the zone are rice (37.60%), groundnut (14.58%), pulses (10.56%), bajra (6.3%), mesta (5.97%), sesamum (4.61%), ragi (4.18%) and sugarcane (3.92%).

Main and vetification functions of Research Stations of North Coastal Zone

District/ Research Station	Functions	
	Main	Verification
(1)	(2)	(3)
Visakhapatnam district (part)		
Regional Agricultural Research Station Anakapalle	Sugarcane and sugarcane based cropping systems	Oilseeds and millets watershed management
Agricultural Research Station Yelamanchili	Sesamum	Groundnut, sunflower
Srikakulam district (part)		
Agricultural Research Station Amadalavalasa	Mesta and mesta based cropping systems	Oilseeds and pulses

(1)	(2)	(3)
Agricultural Research Station Ragolu	Rice and rice based cropping systems, technology for tankfed areas	Oilseeds
Vizianagaram district (part)		
Agricultural Research Station Vizianagaram	Finger millet, pearl millet	Oilseeds and pulses
Livestock Research Station, Garividi	Composite livestock	Sheep, goats, pigs and livestock based cropping system
East Godavari district (part)		
Agricultural Research Station Peddapuram	Ragi and tapioca	Pulses, oilseeds and millets

SOUTHERN ZONE

The southern zone covers an area of 43 thousand sq km comprising the districts of Nellor and Chittoor and parts of Cuddapah and Anantapur. The zone is having dry tropical climate and an average annual rainfall ranging from 700 to 1050 mm. The predominant soils of the zone are red loamy shallow to moderately deep with limited spread of heavy textured black soils. The total population of the zone is 81.77 lakhs (1991 census). The total number of operational holdings are 12.08 lakhs operating an area of 17.77 lakh hectares and the average size of holding is 1.47 ha.

The principal crops grown in the zone are groundnut and rice with the cultivation of sugarcane, ragi, bajra, redgram and other pulses limited to localised areas. Of late, sunflower is grown on large areas which were covered earlier by millets particularly bajra and sorghum. Citrus, mango and melons are also grown extensively in some parts of the zone. Sericulture is a predominant agricultural activity in parts of Anantapur district and fast catching up in Chittoor district of the zone.

Main and verification functions of research Stations in southern zone

District/ Research Station	Functions	
	Main	Verification
Chittoor District		
Regional Agricultural Research Station, Tirupati	Groundnut and groundnut based cropping systems, water management	Vegetable and floriculture (dept.of Hort. SVAC), pulses, watershed management, Fodders
Agricultural Research Station Perumalla Palle	Sugarcane, millets	Rice and rice based cropping systems, fodders
Livestock Research Station Palamaner	Sheep, goat and punganur cattle, fodders	Agro-forestry
Nellore District		
Agricultural Research Station Nellore	Rice and rice based cropping systems, Tankfed cropping systems	Rice fallows, groundnut, pulses, sugarcane
Agricultural Research Station Kavali	Agro-forestry, Progeny orchard-cum-nursery for citrus, mango, sapota, guava	Pulses and oilseeds
Agricultural Research Station Petlur	Citrus	Citrus based cropping systems
Agricultural Research Station Podalakur	Sorghum based cropping systems, pulses, fodder jowar	Chillies, oilseeds (castor sunflower, soybean), soil management.
Livestock Research Station Chintaladevi	Sheep	

NORTHERN TELANGANA ZONE

The Northern Telangana Zone which is one of the seven agro-climatic zones of A.P. lies between 17-42° and 19-84° Northern latitude and 77-35° and 18-16° Eastern longitude. The zone comprises of Adilabad, Nizamabad, Karimnagar districts, major parts of Warangal, Khammam, Medak and a small part of Nalgonda district. The zone is spread over 64 thousand sq km accounting for 23.3 per cent of the state's geographical area.

The major river of the state is Godavari and its tributaries, Manjira, Sabari, Paler, Mandir and Wyra pass through this zone. The zone is served by Sriramsagar Irrigation Project which is the major irrigation Project of the state. Other projects of importance are Nizamsagar, Kadam, Maner, etc., The lakes Pakala and Ramappa are present in this zone.

The zone consists of 248 Revenue mandals of which 52 are in Adilabad district, 35 in Nizamabad, 56 in Karimnagar, 40 in Warangal, 25 in Khammam while 31 and 9 are in Medak and Nalgonda districts respectively.

The predominant soils are red sandy soils (*Dubba and Chalka*), red earths with loamy sub-soils, heavy black cotton soils (deep to very deep) and laterite soils. Some patches of saline and alkaline soils are also present. The soils are deficient in available phosphate content and medium to high in available potash and low to medium in organic carbon.

The zone is in semi-arid tract receiving about 86 per cent of the annual rainfall during South – West monsoon. The zone receives an annual rainfall of 900-1150 mm. The mean maximum temperature lies between 32.7 to 36.5°C and minimum temperature is between 18.8-24.7°C.

Of the total geographical area of 63.35 lakh hectares, the net sown area is 23.22 lakh ha. (37.44%). The cropping intensity of the zone is 128 per cent. The net irrigated area is 7.50 lakhs hectares comprising of 3.61 lakh ha. In red *chalka* soils, 2.34 lakh ha. of shallow to medium deep black soils, 0.58 lakh ha. of red loamy soils and 0.42 lakh ha. of deep red and 0.3 and 0.12 lakh ha. of laterite and problem soils respectively. Irrigated area forms 29.25 per cent of the total gross cropped area. Wells are predominant sources of irrigation benefiting 2.55 lakh ha, while tanks and canals serve 2.13 and 1.4 lakh ha. respectively.

According to 1991 census the total population of the zone is 126.25 lakhs. The total number of operational holdings and the area oeprated are 21.32 lakhs and 32.55 lakh ha respectively, with the average size of holding 1.53 ha.

Main and verification functions of resesarch Stations of in Northern Telangana Zone

District/ Research Station	Functions	
	Main	Verification
(1)	(2)	(3)
Karimnagar District		
Regional Agricultural Research Station Jagtial	Rice, groundnut, sesamum, turmeric, water management, cropping systems and watershed management, on-farm research on sweet oranges, reseasrch for tankfed and irrigated areas	Pulses, cotton, mustard, sunflower, maize, rajma
Agricultural Research Station Karimnagar	Maize, on-farm research on water management	Oilseeds and pulses
Nizamabad District		
Regional sugarcane and Rice Research Station, Rudrur	Sugarcane, rice, crops and cropping systems for Nizamsagar area	Oilseeds, pulses, onfarm research on turmeric
Adilabad District		
Agricultural Research Station Mandamarri (Bellampalli)	Arid Horticulture	

(1)	(2)	(3)
Agricultural Research Station Adilabad	Cotton, jowar, rainfed rice	Pulses, watershed management.
Agricultural Research Station Mudhol	Rainfed cotton	Jowar, chillies, sesamum
Warangal district (part)		
Agricultural Research Station Warangal	Rice, pulses, water	Cotton (iirrigated), oilseeds
JVR Horticultural Research Station, Malyal	Mango, chillies (irrigated), onion, garlic	Groundnut
Khammam district (part)		
Agricultural Research Station Wyra	Rice based cropping systems, seed production	Oilseeds and pulses in rice fallows
Agricultural Research Station Madhira	Pulses, Maghi jowar	Jowar, cotton, chillies
Agricultural Research Station Aswaraopet	Vegetables (tubers and beans) for tribals, minor forest produce, banana	Oilpalm, oilseeds, pulses
Fisheries Research Station, Palair	Air breathing fish culture	

SOUTHERN TELANGANA ZONE

Southern Telangana zones spread over an area of 39.188 thousand sq km. Is one among the seven Agro climatic zones of Andhra Pradesh. This zone spreads over the districts of Rangareddy, Hyderabad Mahabubnagar, (except Southern border), Nalgonda (except South Eastern border) and North Eastern borders of Warangal district and southern parts of Medak district.

The zone lies in the peninsular plateau (152.600 meters) situated in between 16° and 18° North latitude and 77° and 79° East longitude. The zone approximately accounts for 14.25% of the geographical area of the state. River Krishna along with its tributaries Tungabhadra, Musi, Dindi and Aler besides Manjira a tributary of Godavari flow through this region.

The zone has a population of 115.98 lakhs (1991 census). The total number of operational holdings are 12.45 lakhs, oeprating an area of 25.83 lakh hectares and the average size of holding is 2.07 ha.

Sandy loams 43% and red chalkas (39%) are the predominant soil types of the zone. The black soils (16%) and laterites (2%) are found in small patches. Wells are the major sources of irrigation followed by tanks (16%) and canals (4%). Deep water tables are common in the zone. Hard rock masses like granites allow for formation of shallow aquirers of limited thickness and the wells on the formations have low yields.

Main and verification functions of research Stations of in southern telangana zone

District/ Research Station	Functions	
	Main	Verification
(1)	(2)	(3)
Regional Agricultural Research Station Palem	Sorghum, bajra, castor, horsegram, fodder crops	Ragi, groundnut, greengram, blackgram, rainfed cotton, rice based cropping systems, research for tankfed and well irrigated areas.

(1)	(2)	(3)
Livestock Research Station Mahabubnagar	Livestock research	
Agricultural Research Institute, Rajendranagar	Tissue culture, floriculture, grapes, vegetables, agroforestry	PHT of fruits and vegetables rice and rice based cropping systems, soil science and agril. Chemistry.
Poultry Research Institute, Rajendranagar	Improvement of poultry for eggs, forage crops	
Agricultural Research Station Tandur	Safflower, rabi sorghum and redgram	Oilseeds and pulses
Agricultural Research Station Amberpet	Maize, maize based cropping systems, fodder maize	Fodder sorghum

SCARCE RAINFALL ZONE

The zone covers an area of 48 thousand sq km. which inlcudes the whole Kurnool district, most parts (90%) of Anantapur district, 30% of area in Cuddapah district, 20% in Prakasam district and a very small area in Mahabubnagar district. The soils encountered in the zone predominantly are black slils (30.1%), red earths with loamy sub soils (21.6%), red sandy soils (16.6%) and red earths with clayey sub soil (15.0%). The total population of the zone is 74.1 lakhs (1991 census). The total number of operational holdings are 10.23 lakhs operating an area of 25.61 lakh hectares and the average size of holding is 2.5 ha.

The mean annual rainfall is erratic in the zone ranging from 545 mm in Anantapur district to 645 mm in Kurnool district. More than 80% of

zone depends on monsoon for agricultural operations and only 20% of the area has irrigation facility.

Out of the 17 agro ecological situations identified in the zone as many as 12 are included under rainfed situation. The cropping systems which predominate in the zone are sorghum, groundnut, cotton, sunflower and rice.

Main and verification functions of Research Stations of in Scarce Rainfall zone

District/ Research Station	Functions	
	Main	Verification
Regional Agricultural Research Station, Nandyal	Rice and rice based cropping systems, setaria, groundnut, sunflower, bengalgram, tobacco, *jowar*, cotton, water management, seed production technology	Vegetables, onions, coriander, chillies, mustard, soybean, redgram, safflower, farming systems (wth sheep, goat and dairy), sericulture.
Agricultural Research Station, Anantapur	Dry farming, groundnut based cropping systems, arid fruits, pulses, fodders, implements, watershed management on red soils, farming systems research	Jowar, bajra, setaria, horsegram, groundnut field beans, pulses
Agricultural Research Station, Reddipalli	Water management, pulses, groundnut	Cropping systems for HLC of Tungabhadra, sunflower.

HIGH ALTITUDE AND TRIBAL AREA ZONE

Tribal area zone covers an area of 18 thousand sq km. along the eastern ghats. The zone comprises of 40 mandals inhabited mostly by tribals in Srikakulam, Vizianagaram, Visakhapatnam, East Godavari and Khammam districts of Andhra Pradesh. The zone is surrounded by Madhya Pradesh and Orissa states on its northern side, coastal plains of srikakulam, vizianagaram

and east Godavari districts on its eastern side, plans of West Godavari and Khammam districts on its southern side and plains of Warangal and Karimnagar districts on its western side. The zone has the population of 26.6 lakhs (1991 census) with 3.67 lakh operational holdings operating 4.07 lakh ha. Average size of holding is 1.11 ha.

The agro-climatic conditions are characterized by heavy rainfall and moderate atmospheric temperature. The terrain is hilly with intermittent valleys covered by thick forest vegetation and shrubs. The soils are medium to heavy textured, poor to medium in fertility status, prone to moderate to severe erosion. The soils at the higher ranges of hill stops are moderately deep to shallow and at some locations gravelly, intermixed with pebbles. They retain moisture but due to excess rainfall, have been subjecte to higher leaching and run off losses of both nutrients and top soil. The zone has three types of soils viz., red loamy, alluvial and coastal sandy soils.

This zone is having the highest rainfall in the state and the mean normal annual rainfall is around 1200 mm and characterise by humid to sub humid climatic conditions. The first summer showers are received in May which marks beginning of the agricultural operations in this zone. Majority of the area (73%) in the zone is under rainfed farming. Seventeen agro-ecological situations are identified in the zone based on soil type, altitude and irrigation.

The area is characterized by large scale 'podu' or shifting cultivation which involves cutting down of greenery, distruction of forests by slash and burn method in order to prepare the land for cultivation of food crops.

The principal crops grown in the zone are rice cultivated under both low land and upland conditions, finger millet, sorghum, little millet, niger, mesta, pearl millet, groundnut, horsegram, maize, redgram and tobacco. Among horticultural crops cultivated cashew occupies the major area followed by chillies, coffee, vegetables, mango, turmeric and ginger.

Lead and verification functions of the research Station

District/ Research Station	Functions	
	Main	Verification
Visakhapatnam (part)		
Regional Agricultural Research Station, Chintapalli	Rice, cereals, millets, pulses, fruits, lead centre for niger for the entire state, vegetables particularly rajmash, lima bean, spices and condiments, floriculture, agro forestry, watershed management.	Oilseeds, sericulture, white barley tobacco, farming systems, on-farm research on citrus, other fruit crops, turmeric, ginger, pine apple, cereals, millets, pulses, oilsees for tribal areas
Srikakulam (part)		
Agricultural Research Station, Seetampeta	Rice, rice based cropping systems, agroforestry, fodders	Millets, pulses and oilseeds
East Godavari (part)		
Agricultural Research Station, Pandiri-Mamidi	Horticultural crops, particularly tamarind, cashew, custard apple, minor forest produce	
Vizianagaram (part)		
KVK, Rastakuntabai	Transfer of technology to tribal areas	

Job Chart for Functionaries in Agricultural Research

Every functionary will have to perform the job assigned tohim to derive the remuneration entitled. Every job carries certain functions which will have to be made known to the funcitonary to follow and to the asesed to monitor the performance. In agricultural research under the University, the following functionaries are involved.

Scientific

- Director of Research
- Associate Director of Research
  One each at the Headquarters of the University and at the Headquarters of the Agroclimatic Zone
- Principal Scientists (Profesors) for each of the major crops and subjects spread over the State
- Senior scientists (Assoc. Professor)
- Scientist (Asst.Professor)

Expected Functions

Director of Research (DR)

One of the University Officers as per the Statutes, located at the University headquarters with state-wide jurisdiction and answerable to the Vice-Chancellor on all matters (Technical and administrative) relating to agricuiltural research for supporting state's agricultural development. He will perform the following functions :

- Getting suitable research projects prepared to tackle the existing, emerging and anticipated problems hindering agricultural development in the state
- Monitoring the required funds from possible sources to implement the research projects effectively and seek the approval of the Board of Management before sanction
- Monitoring the implementation of the research projects and programmes as approve by him at respective research Stations under each of the agroclimatic zones
- Interacting with and responding to the heads of the governmental departments / farmers representatives in matters relating to research support to State's agricultural development.

- Sanctioning the funds as per the powers delegated for various purposes to the research Stations/schemes.
- Management of research personnel (scientific and supporting)
- Convening the Research and Extension Advisory Council (REAC) meetings
- Reporting the research results to REAC

Director of Research will be assisted by Assoc. Director of Research (Headquarters) and Asst. Director of Research who in-turn will be assisted by the supporting staff comprising five sections, each headed by a superintendent.

The cases relating to service matters will be dealt by respective service sections through Director of Research / Registrar.

Associate Director of Research (ADR)

These posts were created with the reorganisation of research under the World Bank aided National Agricultural Research Project (NARP) during the year 1978. Their job functions were broadly outlined by the World Bank. These posts have come under state Non-Plan on completion of NARP.

- The Assoc. Director of Research (Headquarters) will be under the direct control of Director of Research and will assist him in all reseasrch related matters dealt by him.
- All files dealt in research wing will be routed through him via the respective Asst.Director of Research.
- He will finalise the research programmes in the zone in association with the respective scientists in the zone, Principal Scientists and University Head of the Department concerned and inform the zonal REAC (ZREAC) results.
- He will report the research findings and extension results in the zone to the ZREAC under his Chairmanship and also to the Director of Research / Director of Extension.
- He will sanction the funds to various research Stations in the zone (including zonal Headquarters) as per the powers delegated to him.
- He will report the needs and developments in respect of agriculture in the zone to Director of Research for information and followup, beyond his level.
- He will maintain close liaison and relationship with district administration including the line departments in the zone.

- He will monitor the implementation of various programmes of the University in the zone (Research and Extension)
- He will look after the personnel management, to the extent of powers delegated, in his zone.
- He will constitute Disease/Pest Diagnostic/Disaster Management Teams in the zone to assist the line departments in diagnosis and assistance works
- He will be assiste by Administrative Officer and Asst. Comptroller on administrative and accounts matters respectively in the zone.

Principal Scientist

The Principal Scientist of respective crop / discipline wherever located, will be responsible for all the technical aspects relating to that crop / discipline for the state.

- He will have state-wide jurisdiction and responsibility for that crop / discipline programme formulation and proper implementation.
- He will serve as a reference source for all technical aspects relating to that crop / discipline
- He will be under the direct control of the head of the research Station where he is located.

Heads of the Research Stations

The Head of the Research Station is the pillar of the research organisation in the University.

- He is the custodian of the property of the Research Station
- He will administer the research projects, personnel and labour as per the powers delegated
- He will get the projects / programmes prepared by the scientists of the Station, discuss and recommend for approval by the Director of Research through the Assoc. Director of Research concerned.
- He will report all matters / developments concerning to the Station and agriculture in his jurisdiction to the Assoc. Director of Research concerned and DR for information and followup beyond his level.
- He will maintain good rapport with and muster the support of local administration / line Department personnel and farmers in the implementation of the programmes related to agricultural research and extension.

- He will prepare the budget proposals and seek the approval of the University.
- He will report the results of research under his jurisdiction to the Assoc.Director of Research concerned and Director of Research.

Senior Scientists / Scientists

- They will work under the direct administrative control of the Head of the Research Station and Technical supervision of the respective Principal Scientist.
- They will ensure interdisciplinary involvement wherever feasible
- They will discuss the programmes of the Project at the Station / zonal headquarters level and seek the approval of the Director of Research through the Heads of the research Station / zone
- They will implement the programmes as approved.
- Record the findings, analyse and interpret and data and report to the Head of the Research Station and Principal Scientist concerned

Asst.Director of Research (Headquarters) / Asst. Agril.Economist / Asst. Statistician

- They will work under the control of Director of Research.
- They will assist the Associate Director of Research (HQ) and Director of Research
- Asst. Director of Research will pass the files put up by the respective Superintendents after their scrutiny and remarks to the ADR (HQ) for approval by DR/ Comptroller / Registrar / VC
- Staff attendance, tappal marking, Personal Registers of staff, discipline in the sections, file movement, Project proposals processing, budget, sanctions, variety release, notification reports, replies approval of each programme all correspondence to and from the Director of Research will be monitored by Asst. Director of Research. They will arrange for the successful conduct of interaction meetings, review meetings, discussion meetings, workshops, seminars, symposia, REAC, Technical Programme meetings organised at the Headquarters, Memorial Lectures, Awards etc. relating to Research Directorate will be organised / monitored by them. Responsible for scrutiny of Technical Programmes and Reports. Maintenance of required data base, implementation of research programmes assigned.

CONDUCT OF ON FARM AND OTHER TRIALS IN RESEARCH

*Dr. V. RAJA**

Agricultural Research is location specific and Research conducted under controlled conditions in Research Station by researchers can help to test the biological feasibility of different systems and to develop component technology to overcome production bottlenecks created by competitive interferences and field problems but the technical feasibility and economic viability of the developed technology should be tested only in the farmers field under the supervision of the scientist with the active co-operation of the farmers. On farm research is related to specific production environment. The co-operating farmer is involved in the design and testing of the technology generated. Thus on farm trial help in testing and verification of proven technologies from research Station. It also helps in utilization of technologies from research farms for solving identified problems in cultivator fields. These also ensures early feed back from the farmers about inputs, management and market related constraint. An on farm trials at the research Station by the researchers with full package of practice will demonstrate the yield potential available on wider scale. Similar on farm trials at different sites on the same agro climatic condition will give the researcher feed back on about mechanical feasibility, economic viability, adaptability and other bottles necks of the generated technology so that he could prepare action plan to overcome the above constraints. The research is conducted by research technicians, trained in research methodology assisted by field assistants and supervised by research team of the near by research Station comprising of scientist of cropa nd soil science, crop protection and agricultural economics.

Selection of site : A test site should

(i) Represent a major agroclimatic zone (ii) Be rainfed or irrigated with low cropping intensity but with potential for increasing intensity (iii) Represent

* **Principal Scientist (Agronomy), AICRPon Cropping Systems Research, Agricultural College, Rajendranagar, Hyderabad- 500 030 (AP).**

priority development area (iv) Have competent scientific leadership to supervise on farm research and development component technology (v) should have adequate physical infrastructure, good communication facilities, markets and transportation net work.

Site description : The researcher should first describe the existing cropping systems in the area and identify production complexes (with the same irrigation soil type, topography etc.). then he should identify the environmental factors that can e changed by structural intervention or by resorting to new management techniques so that improved cropping system can e improved.

Date on environmental factors including physical resources (climate and related), economic resources (availability of land, labour, cash, power, equipment and material) and socio-economic conditions (product prices, input costs, marketing cost and preference for certain foods and practices) should be collected before developing new technologies and cropping system. The initial requirements for research planning are identification of land types at the site, description of cropping system determination and description of farm types and farm resource base at the site.

Land types of particular region may be classified into 3 or 4 groups, a common recommendation holding for each group. Existing soil survey and maps can be made use of division of land into wet land/ dry land and irrigated / rainfed land is useful. Type and duration of irrigation, depth of water table, soil physical and chemical characteristics and socio-economic conditions such as farm types and distance to market are useful criteria for land classification.

Among the climatic related factors rainfall (monthly average preferably 20 year period), temperature (monthly average, time of low and high temperature)_ probable occurrence of drought (once in how many years) and flooding can be obtained from the nearest meteorological Station.

Resources used in crop production can be divided into two categories, those coming from farm (on farm) and those coming from outside farm (off farm). Credit, chemicals, processing, storage and marketing facility are off farm resources and are not easily changed. Under this category, location

and capacity of markets, availability of production inputs and their cost, transport facilities of inputs and produces, processing facilities communication services, land tenure, Revenue and rental arrangements, labour availability and seasonal wage rates, power supply and traffic and availability of credits and interest rates are factors on which information should be gathered. This information can be collected side by side as on farm research progresses. Among the on-farm resources, soil type, water supply family labour availability presence of other non crop enterprises, farmers capital and his technical knowledge are the ones on which information should be gathered. Methods of cultivation and cost of production should also be ascertained.

Design of the cropping system research : This has two distinct but closely related activities, the design of improved cropping pattern to be tested and formulation of the overall research programme to be conducted at the site for the next years. This should be decided atleast one month prior to the season in a workshop in which the field research staff and specialist in agronomy, soil science, Entomology, plant pathology, plant breeding and agricultural economics of the research Station participate. The research programme experimental design and details about management of trials are finalized in workshop in which previous year results are discussed.

In designing cropping pattern for the site, possible genotypes, tillage operations, planting and fertilization methods, management practices and pest control measures should be decided to suit local conditions, biological feasibility is decided by identifying physical, climatological and biotic factors that will influence the cropping pattern well enough to achieve locally acceptable yield levels.

Technical feasibility of a pattern is determined by ability of the farmer to execute it with specified resource structure. From the baseline survey information is available on labour availability, farm equipment in use, chemicals used and managerial skill of the farmer for the existing cropping pattern. A list of these resources needed for the proposed cropping pattern is prepared and compared with available sources. When demands of certain resources (eg.Labour) are are high at certain times, the new pattern is feasible only if the excess demand can be met from other farm enterprises or from

outside farm. As the on farm research progresses more information on component technology will be come available and will form basis for decision making about the levels of component technology to be used for the cropping pattern.

Economic viability of a pattern is decided by the cost of resource and price of the products produced by the pattern. This can be done by budget analysis where cost of labour and purchased inputs can be deducted from the gross income obtained yields. In the first years, the information available from baseline study can be used. In later years, these data can be gathered by book keeping. The profitability and returns to resources should be higher than those obtained from existing cropping pattern.

Cropping pattern trials : These compare a number of experimental cropping pattern with one or two representative existing pattern. The existing pattern are managed by. the farmers and the field technical staff only monitor their performance. The management of experimental pattern is designed by the scientists. It is discussed with the farmer cooperators and if necessary modified. The experimental pattern are then grown by the farmers using their own labour and power sources, under the supervision of the field staff who monitor then performance. The experimental pattern may be restricted to 3 to 4. The farmer pattern need not necessarily have been adopted in the farm in which trials are conducted. Pattern from peripheral areas but of the same land type can be compared on pattern to pattern basis by partial budgeting or on a whole farm basis in which the impact of the pattern on other farm activities and total resource use is studied.

Component technology research : Here optional management practices of a crop are determined. Information gaps and factors that need to be studied at the site are included in this research. Varieties, tillage methods, fertilization practices, weed control measures and pest management techniques are some of the management factors that are to be tackled for a specific crop only. Only these factors that will have a major impact on economic performance of a cropping pattern should be chosen for the study. Generally response to management factor is only studied leaving the explanation of mechanisms causing the response to other scientists.

Once the components are identified, then they can be superimposed

on the experimental and existing cropping pattern in the same field in which cropping pattern are tested. The changes in the input levels can be accommodated as sub plots of cropping pattern. The component technology treatments may be farmer's practice with and without tested input, the level of component technology assigned to cropping pattern and level that is expected to produce higher yields. These superimposed trials (where the component technology treatments are impose dove existing and experimental cropping pattern) are managed by farmers, monitored by field staff and supervised by scientists.

A few trials are directly managed by the scientists themselves. These trials are laid out like any other experiment in the research Station except that they are conducted in the farmer's fields. In these trials, specific management components that need detailed study are included with more number of variables and levels. Generally inputs and techniques which involve high risk and which are to be tested more precisely in the specific location are studied by the scientists. The results form these trials determine changes in the management levels and the components to be studied in the superimposed trials. Normally treatments are replicated in different researcher managed trials are fertilizer responsible trials testing response to nutrients such as NPK and micro nutrients, pest control studies involving yield losses due to pests and economic control of these pests, weed control studies assessing competition from weeds and evolving control measures and varietal trials testing new varieties in different locations.

In the first one or two years base line studies and researcher managed trials are given priority and take more time. In later years study or improved cropping pattern and superimposed trials will take precedence. Because of the close and frequent interaction among scientists, field staff and the farmers, new improved cropping system technology will emerge. Problems that arise periodically are referred to the nearly research Stations if they cannot be solved at the site itself.

Cropping Pattern Testing : All the onfarm research trials (except researcher managed trials) are managed by the farmers. This will help to bring out management problems faced by the farmers in adoption of new technology. This would not have been possible in the trials managed by the scientists as

the inputs are supplied by the scientists without any resource conflict. For the effective management of the trials, the farmers have to be oriented properly and familiarize dwith the objectives and methods of such research. Generally high cost inputs such as fertilizers and plant protection chemicals are supplied by the research team to the farmers free of cost.

The field staff are trained to take corrective measures whenever problems (like unusual rainfall, bird or rat damage) arise. Sometimes modification of cropping pattern may become necessary due to unavoidable delay in field operation or failure of establishment of a crop in such cases necessary modifications are made and reasons are documented.

Cropping pattern trials are conducted in large plots (1000 m^2 if possible) in order to measure quantity of labour used, time taken for each operation and cost and return of different patterns. Completely randomized design is used and different sites with in the same environment complex are employed as replicates. Normally three experimental patterns and two predominant farmer's pattern are evaluated in atleast four fields per land type. As the time progresses the number of experiments pattern may be narrowed down to the most promising one or two patterns increasing the number of replications.

Data to be collected from research site include climate, land and crop performance. Rain guages are installed in each site and daily rainfall data are collected. Other weather data can be collected from the nearest meteorological Station. Information on soil such as area, previous cropping history, ground water level, soil texture, availability of irrigation, soil chemical characteristics such as pH, organic carbon, N, P and K fertility, micro nutrient deficiencies or toxicities etc is recorded. For each cropping pattern, type of crop, variety, establishment method, seed rate, spacing, management techniques, stand, pest incidence, harvest date and yield recorded. In crop production operations, number of hours, labour employed, date of field operations, labour used for operation, type and quantity of inputs used. Power source and yield from harvest area (excluding border rows) are noted down. On farm prices of inputs (including cost of transport to farm) and produce (subtracting cost of transport to the near by market from the selling

price at market in the season) are recorded for each cost. Wages rates for each operation at the time of labour also be carefully recorded.

Because of changes in weather and price from year to year, several years data may be required to come to reliable conclusion. However, the scientists can evaluate the test results by properly weighing for these changes. A simple t Test, mean and standard deviation of data will give a reasonable statistical basis for comparison of data. Reasons for crop failure if any should be looked into with the help of weather and soil data. Crop performance with reference to the effect of preceding crop, tillage method, planting date, fertilization practice and pest incidence should be critically examined. Economic evaluation is generally based on net returns, although returns per unit of most limiting input (eg. Labour, water) is also frequently used. Any improved cropping pattern, which gives less than 30% greater net return than existing pattern has doubtful promise for wide scale adoption. Even pattern which gives 30% greater net return than existing pattern is not likely to be adopted widely if the net return per rupee spent is small or if the new pattern demand too much of particular resource (labour, water, credit etc.). Marginal benefit cost ration (MBCR) is a good index of the economic advantage of new pattern.

$$\text{MBCR} = \frac{\text{Gross Return (E)} \times \text{Gross Return (F)}}{\text{Total Variable Cost (E)} - \text{Total Variable Cost (F)}} = \frac{\text{MVP}}{\text{MVC}}$$

Where E refers to experimental pattern, F to farmers pattern, MVP to Marginal value product and MVC marginal value cost. MBCR helps to evaluate series of alternatives to the existing pattern and to select the most remunerative pattern to the farmer.

All the data collected for the site, crop performance and economic analysis are summarized yearly and the summaries of results from different centers are discussed in the pre-season workshop to develop strategies and programmes for the ensuing year.

Pre-production Testing (Multi location Testing) :

Successful cropping pattern from on-farm research are evaluated at many sites representative of land and climatic conditions of the area. The

first step is to identify the areas, based on climatic, soil or irrigation classification into which the improved pattern tested in on farm research can be adopted: The extrapolation area is mapped and actual location of testing is identified. The trials should be in clustered distribution throughout the desired land types in the extrapolated area. The trials are usually managed by applied research staff with active participation of the extension personnel and farmers. Farmers prepare land and attend to routine operations like weeding and field maintenance and the applied research or extension personnel ensure timely application of fertilizers, pesticides and collection of data. Only yield data are collected assuming input levels are same as in on farm research. Results of different locations are compared and reasons for poor performance in some locations are critically analysed. Based on results, the suitability of the cropping pattern for different areas is decided and recommendations finalized. Along with cropping pattern, component technology such as varieties, seed rate, fertilizer levels etc can also be tested in multi location testing. Multi location testing is continued for 2 to 3 years after start of pilot production programme.

Pilot production programme : This is organized to develop infra structural facilities and to assess the changes necessary in the policies for the successful wide sale adoption of the improved cropping pattern. Most new pattern require additional resources in the form of cash, labour, seed, chemicals, equipment, storage, transport and marketing facilities and call for farmers capacity to assume risks. In the pilot production programme, the quantity and time of requirement of these resources are assessed and policy changes required at different levels of administration are specified. In the process, a final evaluation of the new cropping pattern is also made on large scale. Infrastructural facilities are developed to supply credit and inputs in time and in sufficient quantities and to market produce at remunerative prices.

The production recommendations are made in simple and clear language. General recommendations are given for pilot production area as a whole and specific recommendations (such as drainage, quantity of fertilizers to be applied etc.) are to be made taking the local land conditions into account extension personnel are trained on the production recommendation by scientists. Several institutions such as credit Agencies input suppliers,

irrigation and drainage Department, transport organization and marketing Agencies are involved in successful implementation of the production programme and the activities of all the involved institutions should be properly co-ordinated for smooth functioning. There should he frequent contacts with farmers for necessary feed back on the problems faced by them. After completing a year the programme should be evaluated and corrective action required if any should be taken.

What is an experiment or trial :

An experiment differs from observation of phenomena in nature principally I that most of the conditions that effect the results are accounted for climate and weather of course cannot be controlled and soil, insect and disease post can be only partly controlled and some times it is difficult or impossible to account fully for them. The best that can be done is to set up an experiment in such a way that all variables to be compared are expose dot the same conditions and so far as is possible record the effect of the uncontrolled conditions on experimental result. In a corn hybrid trial, for example, all hybrids are plante don the same day at the same rate and in the same uniform field which has been previously prepared and fertilized as uniformly as possible. So far as can be assured all hybrids have the same opportunity to produce maximum yield.

Levels of production : Tillage practices, use of fertilizers, control of disease, insect and weed pests in field experiments and the amounts and quality of feed and control of pests in livestock experiments should be atleast equal to those generally used by average or above average farmers in the area. It is not generally advisable however to control a disease or insect pest if only available methods are so expensive or impracticable that no farmers would use them. For eg: rust in wheat can be easily controlled but cost is so great that no farmer can afford. On the otherhand bunt in wheat if not controlled, it is unpardonable.

Standardization of Technique : Standardization is often not possible and may not be desirable except to a limited degree. This is because, objectives, conditions under which experiments are conducted and facilities for conducting them are so extremely variable. What is best for one field or a given situation of may be relatively poor for others.

Eg : sand, groundnut shell, maize shank and castor hull as amendment. Many Regional trials are set up with the same experimental design and managed alike at each location so that discrepancies in the results cannot reasonably attributed to differences in techniques.

Data to Record : Data to be recorded depends on the purpose for which the trial is conducted. Additional data collection helps in full utility of the trial.

For eg: Rice – Blackgram rotation or tice – tomato instead of rice – rice: only monetary returns do not give correct picture, soil balance sheet, water requirement of crops gives full benefit of the crop sequence.

Duration of variety, tolerance / resistance to water stress, water logging, insect, pest attack, harvest index, fodder value gives utility of variety to local situation.

Preliminary experiments : Initiating a research programme either in a newly developed agricultural area or with a new problem, preliminary or exploratory experiments are those designed to determine whether a suppose dproblem is real or fancied and if real to gain some idea of how bet to attack it. Thus an elaborate experiment with different fertilizers and combinations and formulation of fertilizers and with dates, rates and methods of application would ordinarily be justified until it had been determined that (a) fertilizers are needed (b) which nutrients are most deficient in relation to needs. Varieties introduced from foreign countries are first grown in preliminary experiments or observation nurseries as they are called, to weed out the obviously unadopted varieties before yield and other expensive tests are attempted.

Bracketing : In preliminary experiments and often in others, practices known to be impractical for various reasons may be included in order to determine the range of variable it may be useful to study. Rate of seeding and rate of application in fertilizer experiments, often include rates for less than and far in excess of what is likely to be practical. Failure to include a sufficient range in variable being tested may result in failure to take advantage of an opportunity or may require that the experiment be repeated at considerable extra expense.

Intervals : In planning experiment on rates and dates of seeding or planting,

rates of fertilizer application etc, decision may be made as to intervals. A rate of seeding test with wheat for example, might inlcude 60, 90, 120, 150 and 180 kg ha^{-1} or 60, 75, 90, 105 and 120 kg ha^{-1}. In time of seeding test, the interval between dates might be week, 10 days, 2 weeks or even more. If the intervals are too great, important differences may be over looked or if too small, the range may not be sufficient to include optimum or may not be sufficient to include optimum or may incur unnecessary expense in conducting large cumber some experiment.

Exclusion of aberrant or non-typical data unfortunately experiment cannot always be carrie dout exactly according to plan. An Animal may become sick, be injured or may die, a field plot may be destroyed by flooding, excessive soil erosion or by stray cattle. In such cases nothing can be done except to interpret the remaining results as completely and accurately as possible. For replicated experiments the missing plot technique described in most statistical books is often useful.

Selecting experimental fields : A universal problem in planning experiment is the choice or selection of a suitable area, whether it be an experimental farm or specific field on that farm. The usual practice is to choose those that are representative with respect to factors that are considered most important generally climate and soil. Second only in importance is the uniformity of the individual field that are to be used. All parts of the field should have same capacity to produce crops. This is largely function of soil and sub-soil. Topography is always important not only because it is usually related to productivity but also because it effect water supply in soil temperature and air drainage.

Uniformity indicators : There are a number of indicators of soil uniformity. No one is completely reliable but they are often useful if used with discretion. Some suggestions are :

1. Avoids farms or fields that vary markedly in topography. A slight and gradual slope is desirable in order to assure adequate drainage.
2. Visual appearance of grown crop may often indicate marked differences in productivity. In a newly settled area, the kind and development of native vegetation is a useful index of variation.
3. Examination of soil and sub-soil previous to choosing experimental field is desirable. Field with different types of soil, grovel and sand beds

beneath the surface are objectionable.

4. Fields, some but not all parts of which have been heavily fertilized in the past with Animal manure should be avoided. The same applies to treatments with any fertilizer or other materials (insecticide and herbicide) which remain in soil for several years.
5. For experiments with grain crops, it is usually advisable to avoid fields near trees because of possible damage by birds and squirrels. Also tree robs the soil of moisture and plants food for a considerable distance into fields. Although east to West tree rows may avoid shade, but it effect micro climate.
6. As far as possible fields, which have been covered or portions which have been covered with sub-soil from borrow pits or drainage ditches should not be used. The sub-soil may have marked effect for several years.

Uniformity trials : A more formal and generally a more useful way to determine the suitability of a field for experiment is to conduct a uniformity trial. Numerous uniformity trials have been conducted in various countries. The results used (a) to study the nature of the variation in fields (b) to exclude certain areas that prove to be less desirable than others or to group treatments so that all will be on plots tht are nearly alike as to productivity (c) to compare different sizes and slopes of plots and number of replications (d) occasionally to adjust yields of experiments conducted subsequently on the same plot.

Variation in experimental fields : A knowledge of the variation in experimental field is useful in various ways in planning experiments. Unfortunately there is no way to acquire precise information of this kind for any particular field that has not been previously used in an experiment short of conducting uniformity trial. Some general information may be obtained from experiments that have been conducted under similar conditions.

Management of field experiments : Fields intended for experiments with crops should be uniformly tilled and cropped when not actually in experimental plots. In general, two or more fields should be available for fertilizer, variety, seed treatment, rate and date of seeding experiment etc so that while one field is in experimental plot, the others can be cropped

uniformly and in a definite crop rotation, otherwise, residual or carry over effect of the experimental treatment may greatly increase the error. Gradual leveling of the land in order to fill depressions where water may settle is usually desirable. If done gradually with only small amount of soil moved at one time, the inimical effect of the exposed sub- soil and of filling small depressions will usually be less than the benefit from leveling. Seeding roadways and border of the field to permanent gross will greatly aid in controlling erosion. Three to six borders with bulk crops reduces border effect and protects from accidental grazing and reduces lodging effect of experimental area.

Rate of seeding or planting : A problem of some importance in conducting field experiments with many field crops is related to rate of seeding or planting. Theoretically each variable such as a variety or fertilizer treatment should have the number of plants per unit area that is optimum for that variety or treatment. Even though the optimum might be same for all, variation in seed size and viability may cause variation in plant population. Early varieties planted at heavy rate compared to late maturing varieties spreading and bunch type variation exists in seed rate.

Time of seeding and planting : It is important to sow the crop at optimum time of sowing. For germ-plasm evaluation early and late sowing treatments should be included. Obviously all the plots in an experimental trial should be planted the same time on the same day. Lest, unexpected rains, storms delay rowing of other treatments and may create error.

Correction for stand differences : Inspite of the greatest care in preserving seed and in seeding or planting, stand may be poor and variable. Most crops are able to compensate to as considerable extent for deficiencies in stand by tillering, by branching or by producing larger plants. Compensation is only partial, however and if as is usually the case, the deficiencies are not equal for all comparisons the error may be considerable. In many cases the proper procedure is to abandon the experiment and abandon those replications in which stands are deficient.

Most common method used for corn and other plants is to correct for stand by means of correction factor based on formula.

$$CW = FW \left(1 + 0.6 \times \frac{\text{Number of missing hills}}{\text{Number of hills present}}\right)$$

CW = Corrected weight

FW = Weight before correction

For 20 hil plot, with 2 hills missing,

CW = FW (1 + 0.6X2/18)

CW = FW x 1.067)

A better plan is to count the number of plants in each treatment and adjust the yield of all the treatments to maximum number of stand in the particular treatment.

A third method is to determine the stand of each plot by actual count of the missing plants or hill and adjust the yield of each plot by covariance.

In all cases, it should be recognized that no method of correction for stand is perfect, that is none can be expected to give precisely the same results that would have been recorded had there been a perfect stand. Since in most of the field experiments yields and some times other characteristics – are greatly affected by stand no reasonable precautions in getting good stand should be neglected.

Moisture content of the crop : Variation in the moisture content of the crop when weighed after harvest is an obvious source of error especially if plots are harvested at different times or same time. The error can be avoided only by thorough drying of crop or by taking samples for determination of moisture content. In the latter case representative and adequate sampling is obviously necessary.

Size of plots : Variation in yield decreases more or less regularly as the size of the plot increases regardless of whether the latter is achieved by increasing the width or length of the plot. It will be realized that as the size increases there will be fewer plots for any given area of land and consequently for any experiment, fewer treatments to be compared or fewer replication per the treatment.

Shape of the plot : Long narrow plots are less variable than square or nearly square plots if they extend in the direction of greatest variation of the field.

Natural pastures long narrow plots preferred but on cultivated pastures square or nearly square plots are preferred because of border effect.

Border effect : Border effects are considered to be those due to alleys and roadways separating the plots. Borders of the plots are often greatly effected by the additional moisture or fertility they obtain from the cultivated and uncropped roadways or alleys that separate them. The effects are often apparent in the more vigorous, taller growth of borders as compared with the centre of the plots especially in dry years or on soils deficient in available nutrients. Hence borders be removed.

Competition : Competition is the effect of treatment in adjoining plots. Some common examples are inhibition of growth and depressed yield of a short, weak growing variety in narrow plots, adjoining of all vigorous variety which may not only take moisture and nutrients fro the former but may also shade it. Competition effects are often encountered in fertilizer and pesticide trials. Some fertilizers are quickly adsorbed by the soil and do not readily move form one plot to another. Others on the contrary are easily moved by wind or water and by cultural equipment. Plant's roots may extend from unfertilized to a fertilized plot and adsorb nutrients that are not intended for them.

Border and competition effects could be reduced / eliminated by suing multiple row plots in which central rows are harvested for yield. Usually also varieties and hybrids that differ greatly in maturity dates or plant height are not included or are included in special test in which border effects and competition are eliminated. The latter practice is also followed for many fertilizer trials and others in which unquestionably accurate results are considered necessary.

Neighbour effects : Some common examples of error due to neighbour effects are the damage caused by grass hoppers, that migrate from near by fields to experimental plots and attack most severely the plots in the path of migration. The injury may be due to the direct attack of the insects or to diseases carried by them. Birds and squirrels from near by trees may congregate on plots nearest the trees or attack most severely those varieties or treatments that mature early or conversely rice bugs may attack most severely those varieties that mature late. It has been observed in time of cutting tests with alfalfa, that leaf hoppers may concentrate on plots that have been recently harvested and cause more damage than they would in a

large field. Storms may cause more damage to border than to inside plots, especially if the experimental area is not surrounded by a growing crop.

As for border and competition effects, there is no universal cure for those problems more formulas to avoid them. Surrounding experimental fields with a growing crop will usually reduce the damage from storms or surrounding them with early or late maturing varieties may atract birds and thus reduce or avoid damage to the experimental plots. The use of insecticide may reduce the damage from insects and reduce error incurred as a result of damage. It some cases, the best that can be done is to note damage, measure or estimate the loss and make suitable allowances in drawing conclusions.

Replication of plots : Greatest improvement of design of field experiments consists of use of replicated plots instead of single plot for each treatment. Replication achieves two objectives, it reduces efet of random variation and makes it possible to measure random variation. The use of replication has been accompanied in most cases by reduction in size of the plot.

General practices in conducting field experiments :

Determination of the size, shape and dimension of plots, what to do about border and competition effects, the use of check plots and most desirable number of replications for any particular problem or situation is an enormously complicated problem. Beyond what has been indicated no generalization seems desirable. Probably the best solution will be reached through an understanding of the numerous factors concerned, taking into account the specific objectives of a proposed experiment and the conditions under which it is to be conducted. Usually a reliable guide for the beginner is the general practices followed by competent investigators in a given area or field. The variations are too numerous to give.

References for further reading

Cropping systems in Asia. On farm Research and Management. IRRI, Los Banos Laguna, Phillipines, P.O.Box No. 933, Manila, Phillipines.

Cropping system I the Tropics, Principles and Management, New Age International (P) Ltd. publisher.

Salmon, s e assiste dby Hanson, A.A. The Principles and practices of Agricultural Research, Leonard Hill : London.

STATISTICAL ANALYSIS OF SCIENTIFIC DATA

*B.S. KULKARNI**

Since the advent of computers, statistical analysis of data has become very simple! Several packages are available for this purpose. To list a few, these are: LOTUS, MS EXCEL, SPSS, SYSTAT, and many more! These packages provide ready-made solutions. However, one should know how and where to use the statistical procedures as well as the interpretation of the results. In this brief lecture, an overview of the different and most commonly applied statistical procedures is made.

Data Analysis is a five-step process :

1. Statement of the objectives/hypothesis to be verified
2. Data Collection
3. Application of suitable analytical procedures
4. Presentation of results (summary tables/diagrams/graphs)
5. Conclusions/Inferences.

1. Statement of the Objectives : It is an important step in planning of the research project. The objectives should be clearly defined and based on a critical review of the earlier attempts. These should also involve the list of hypothesis to be verified.

Hypothesis : It is an uncertain statement having one of the two possibilities – "Yes" or "No". It could be also an assumption about the "unknown" universe or population, which may be subjected to verification.

2. Data Collection: Data is the backbone of any research. The validity of the research findings depend on how precisely the data are collected. Hence the sanctity involved in the data collection has to be maintained.

There are two types of data: a) Primary data and b) Secondary data. Primary data is the one, which is collected by applying suitable sampling procedures involving schedules and questionnaires. It can be also collected (or 'generated') after conducting a well-planned experiment. Secondary data can be collected from "secondary" sources such as published reports like

* Professor & Univ. Head Dept. of Statistics & Maths., College of Agriculture Rajendranagar, HYDERABAD 500 030

Season and Crop Reports, Statistical Abstracts of the State. Yet there is one more category of data, the "Time Series data", which is collected in relation to time. The time series data play an important role in forecasting of rainfall, area under the crops and crop production.

3. **Statistical Procedures for Data Analysis:** The statistical procedures can be categorized into two groups: I) Statistical Methods and II) Experimental Designs. The procedures under the first category are the basic methods, which can be applied in general; whereas those under the second category are developed for a specialized situation. These methods deal with planning of experiments and the analysis of the data obtained from these experiments.

I. STATISTICAL METHODS

These methods can be listed as follows :

1. Methods for summarization of data :
§ Frequency Distribution
§ Measures of Central Tendency or 'averages'
§ Measures of Dispersion or 'variation'
2. Tests of Significance
§ Tests based on Standard Normal Distribution
§ Tests based on Student's t-distribution
§ Tests based on F-distribution
§ Tests based on Chi-Square distribution
3. Correlation, Regression and Multiple Regression

1. Methods for Summarization of Data :

The methods under this category are elementary and well known. Among the different measures of central tendency and dispersion, the following measures are important and are the basis for the advanced statistical methods. These are the Arithmetic Mean (A.M.), Standard Deviation (S.D.) and its counterparts such as Variance and the Coefficient of Variation (C.V.). S.D. play an important role in the validity of A.M. for summarizing the numerical data :

- A.M. can effectively summarize the data if it has no 'extreme' values implying 'minimum' variation.

- A.M. can be considered to be 'reliable' or effective (in summarization) if the S.D. is less than the A.M. (rule of thumb!).
- A.M. ± S.D. are the well-known limits (scanners) for categorization of data.
- C.V. is a measure of consistency. Between the two series of data with same A.M., the one with relatively minimum C.V. is preferable.

2. Tests of Significance :

A 'test' is a procedure for verifying the hypothesis. Statistically, the hypothesis is an assumption about the unknown characteristics of the population, commonly referred as **"Parameters"**. These characteristics may be either quantitative or qualitative. Tests based on quantitative (measurable) hypothesis are known as Parametric Tests; while those based on qualitative (attributes) hypothesis are known as Non-Parametric Tests or "Distribution Free" tests.

Construction of hypothesis, particularly, the Null Hypothesis (H_0) is an important step in application of the test procedure. Null hypothesis is a hypothesis, which is likely to be rejected after testing. The decision-making in the test procedure could be erroneous, leading to the following two types of errors :

- **Type-1 Error** : It is the error in rejecting the Null hypothesis when it is in fact "True"
- **Type-2 Error** : It is the error in accepting the Null hypothesis when it is in fact "False".

The general setup of the test procedure can be described in the following five steps :

1. Setting of Null Hypothesis
2. Drawing of Random Sample (Data)
3. Construction of the Test Criterion
4. Specification of the Risk Level or Level of Significance
5. Conclusions/Inferences.

- **Level of Significance** is the "risk" level or the probability with which the Null hypothesis is rejected. It is also referred as Size of Type-1 Error.

- The choice of the probability level depends on the sample size.
- The suitable level of significance for Small Sample tests (Sample size < 30) is 0.10 (Ten per cent) or 0.05 (Five per cent)
- The suitable level of significance for Small Sample tests (Sample size $>= 30$) is 0.05 (Five per cent) or 0.01 (One per cent).
- **Test Criterion** is the expression computed from the sample data. It has certain well-known distribution such as Normal or Student's t or F or Chi-Square.
- **Decision-Making** is based on the comparison of the computed value of the test criterion, popularly known as the "Calculated Value" and the value obtained from the distribution of the test criterion, popularly known as the "Table Value". Whenever the Calculated Value is greater than or equal to the Table Value, the Null hypothesis is rejected; otherwise it is accepted.

More of "Common-Sense" is required in application of the tests. For instance, if there are valid differences between any two Group Means such as say, 20 and 100, there is no need for testing this difference! Drawing inferences from a test is an art! Many a times, these inferences are of "statistical" nature. It would be clear from the following example :

Suppose the hypothesis to be verified is whether the growth of the plants in a plot is Normal. The Normal growth indicator is the Plant height = 6.0 Cms. (say).

Suppose that the hypothesis is verified by drawing a random sample of 30 plants from the plot and measuring the Plant height. The 'estimate' for drawing the conclusion about the growth of the plants in the plot is the sample average, say = 4.0 cm. Application of suitable test procedure revealed that the Null hypothesis of Normal Plant height = 6.0 cm has to be accepted in the context of these plants. The possible ways of drawing inferences are :

i) There is no significant difference between the sample average and the Normal value.

ii) Since there is no significant difference between the Average height of plants in the plot (estimated on the basis of the sample average) and

the Normal Plant height, the growth of all the plants in the plot can be considered to be Normal!

Obviously, the second inference (ii) is preferable.

SOME COMMONLY APPLIED TESTS OF SIGNIFICANCE

Test	Null Hypothesis	Test Criterion	Sample Size	Table Value
Standard Normal Deviate (SND) Test for Means :				
a) Single Sample :	$\mu = \mu_0$	$Z = \frac{\lvert\bar{X} - \mu_0\rvert}{S/\sqrt{n}}$ $S^2 = \frac{\Sigma(X-\bar{X})^2}{(n-1)}$ n = Sample Size	Large Sample n > = 30	1.96 (5%) 2.57 (1%)
b) Two Samples :	$\mu_1 = \mu_2$	$Z = \frac{\bar{X} - \bar{Y}}{\sqrt{(S_1^2/n_1) + (S_2^2/n_2)}}$ n_1, n_2 : Sample Sizes S^2's : As above	Large Sample $(n_1 + n_2) >= 30$	1.96 (5%) 2.57 (1%)
Standard Normal Deviate (SND) Test for Proportions :				
Single Sample :	$P = P_0$	$Z = \frac{[\lvert\bar{P} - \bar{P}_0\rvert - (1/2n)]}{\sqrt{(\bar{P}\bar{Q}/n)}}$ $\bar{P}$ = Sample Proportion $\bar{Q} = (1 - \bar{P})$	Large Sample n > = 30	1.96 (5%) 2.57 (1%)
Two Samples :	$P_1 = P_2$	$Z = \frac{[\lvert\bar{P}_1 - \bar{P}_2\rvert]}{(\bar{P}_1\bar{Q}_1/n_1) + (\bar{P}_2\bar{Q}_2/n_2)}$ $(\bar{P}_1, \bar{Q}_1)$; $(\bar{P}_2, \bar{Q}_2)$: Sample Proportions of the Two Samples $\bar{Q}_i = (1 - \bar{P}_i), i = 1,2$	Large Sample $(n_1 + n_2) >= 30$	1.96 (5%) 2.57 (1%)

Test	Null Hypothesis	Test Criterion	Sample Size	Table Value
Student's t-test for Means :				
Single Sample :	$\mu = \mu_o$	$t = \frac{\lvert\bar{X} - \mu_o\rvert}{S/\sqrt{n}}$ $S^2 = \frac{\Sigma(X-\bar{X})^2}{(n-1)}$ n = Sample Size	Small Sample $n < 30$	Depends on df df = (n-1)
Two Samples : Important Assumption : Populations Have Common Variances	$\mu_1 = \mu_2$	$t = \frac{\lvert\bar{X} - \bar{Y}\rvert}{S\sqrt{[(1/n_1)+(1/n_2)]}}$ n_1, n_2 : Sample Sizes $S^2 = \frac{\Sigma(X-\bar{X})^2 + \Sigma(Y-\bar{Y})^2}{(n_1+n_2-2)}$	Small Sample $n_1 + n_2 < 30$	Depends on df df = (n_1+n_2-2)
Paired t-test: Important Assumption: Observations on X,Y are related, i.e., pairs.	$\mu_d = 0$	$t = \frac{[\lvert\bar{d}\rvert]}{S_d/\sqrt{n}}$ $\bar{d} = \Sigma d/n$; $d = (X-Y)$; n = Sample Size i.e., no. of Pairs of (X,Y) in Sample; $S_d^2 = \Sigma(\bar{d}-d)^2/(n-1)$	Small Sample $n < 30$	Depends on df : df = (n-1)
t-test for Correlation :	$\rho = 0$	$t = \frac{r\sqrt{(n-2)}}{\sqrt{(1-r^2)}}$ r = Sample Correlation Coefficient		Depends on df : df = (n-2)
F-test for Homogeneity Of Variances :	$\sigma_1^2 = \sigma_2^2$	$F = \frac{S_1^2}{S_2^2}$ $S_1^2 > S_2^2$; (n_1, n_2) : Sample Sizes $S_1^2 = \Sigma(X-\bar{X})^2/(n_1-1)$; $S_2^2 = \Sigma(Y-\bar{Y})^2/(n_2-1)$		Depends on df : df = (n_1-1), (n_2-1)

Test	Null Hypothesis	Test Criterion	Sample Size	Table Value
Chi-Square Test :				
Contingency Table	No Significant Association between the Attributes of a Two-Way Table.	$\chi^2 = \frac{\Sigma(O-E)^2}{E}$ O : Observed Freq. E : Expected Freq.	Large Sample	Depends on df : df = (m-1)(n-1) (m,n) : No. of alternatives of the two attributes.
2x2 Contingency Table Important Assumption : Expected Cell Frequency *should be* > 5	(Same)	$\chi^2 = \frac{\lvert ad-bc\rvert^2.N}{R_1.R_2.C_1.C_2}$ (a,b,c,d) : Cell Frequencies (R_1, R_2) : Row Totals (C_1, C_2) : Col. Totals		df = 1 (2x2 Table)
Goodness of Fit Important Assumption: Expected Frequency of any class should be > 5	No disagreement between Observed and Theoretical Distributions	$\chi^2 = \frac{\Sigma(O-E)^2}{E}$ O : Observed Freq. E : Expected Freq.	Large Sample	df = (k-1) k = No. of groups/ classes

3. Correlation, Regression and Multiple Regression

Correlation and Regression are the most commonly applied procedures in data analysis. However, there are certain 'misunderstandings' about the interpretation of these procedures.

Relation between two variables may be either linear or non-linear. These relations can be described through the following equations :

S.No.	Type of the Equation	Equation
I.	Linear	$Y = a + bX$
II.	Non Linear	
i.)	Exponential	$Y = aX^b$ $Y = ab^X$
ii)	Semi-Log	$Y = ae^{bX}$
iii)	Quadratic	$Y = a + bX + cX^2$
iv)	Cubic	$Y = a + bX + cX^2 + dX^3$

The most elementary method of identifying the relationship between the variables is through the Scatter Diagram.

3.1 Correlation :

- Correlation refers to the mutual or linear relation between the variables. It is of the 3 types:
- Positive Correlation refers to an increase in the one variable leading to a corresponding increase in the other variable by same proportion.
- Negative Correlation refers to an increase in the one variable leading to a corresponding decrease in the other variable by same proportion.
- Spurious (Non-Sense) Correlation is the one, which cannot be logically explained.

Correlation Coefficient measures the "degree" (extent) of linear relationship between the variables. The coefficient, which is popularly referred as Karl Pearson developed "r", as follows :

$$r = \frac{\Sigma XY - [(\Sigma X)(\Sigma Y)/n]}{\sqrt{[\Sigma X^2 - (\Sigma X)^2/n]\ [\Sigma Y2 - (\Sigma Y)^2/n]}} \qquad \text{(Sample Estimate)}$$

Correspondingly, the 'Population' correlation coefficient is defined as :

$$\rho = \frac{Cov(X,Y)}{SD(X)\ .\ SD(Y)}$$

- The Correlation coefficient 'r' lies between −1 (for Negative Correlation) and +1 (for Positive Correlation).
- There are no units for r and hence can be interpreted on the basis of the magnitude: i.e., higher the value of r, the closer is the linear relation between the variables.
- The minimum value of r is Zero and hence it can be tested for significance against 'Zero' value. Such a testing is essential to verify whether the two variables have a 'significant' linear relationship.

- The scope of correlation and hence the correlation coefficient is restricted to linear relation only. It never indicates whether the two variables have a non-linear relation also.

3.2 Regression :

Regression is the counterpart of the correlation. It is a linear relationship between a Dependent (uncertain/fluctuating) variable Y and an Independent (fixed) variable X and the relation is:

$$Y = a + bX$$

The regression parameters (a, b) are estimated from the sample data as :

$$\hat{a} = \quad Y + bX$$

$$b = \frac{\Sigma XY - [(\Sigma X)(\Sigma Y)/n]}{[\Sigma X^2 - (\Sigma X)^2/n]}$$

Correspondingly, the 'Population' Regression coefficient (β) is defined as :

$$\beta = \frac{Cov(X,Y)}{V(X)}$$

- Geometrically, 'a' represents the slope of the line $Y = a + bX$; whereas, 'b' represents the slope.
- Regression Coefficient (b) is a proportionality constant and hence has the same units as that of the dependent variable
- Limits of 'b' are from -8 (Negative Relation) to +8 (Positive Relation) with minimum value = <u>Zero.</u>
- Regression equation exists when there is significant correlation coefficient between (Y, X). i.e., significance of r is identical to that of b.
- Purpose of regression is to estimate the values of the dependent variable Y on the basis of the independent variable X. The estimation is however restricted to <u>interpolation only,</u> i.e., within the range of the X-values used for fitting the regression.

- Validity of the regression depends on the distribution of the (X, Y) values. Some times, certain pairs of (X, Y), particularly the 'Y' would form the 'clusters' at different levels. When these clusters are removed, there would be no evidence of any significant relationship. Such values are known as 'Influential Observations' and these affect 'b' considerably.

- Similar to these influential observations, there would be some values of Y which fall outside the general trend. These are known as 'Outliers' or 'bad' values and affect the constant 'a'. The outliers can be removed from the data but only after careful identification.

3.3 Multiple Regression :

Multiple Regression is a linear relationship between a dependent variable (Y) and several independent variables (X_i's) which influence the dependent variable :

$$Y = a + b_1X_1 + \ldots + b_kX_k$$

- The parameters (b_1, ... ,b_k) are known as the partial regression coefficients. It indicates the 'partial' contribution of an independent variable X_i in influencing the dependent variable. Specifically, the b_i can be interpreted as the quantity by which the value of Y increases (or decreases) for every unit increase in the value of X_i, when the other variables are at constant level.

- The estimate of the regression parameters (in vector form) obtained by applying the Least Squares approach is: $\beta = (X'X)^{-1}(X'Y)$.

- Tests of significance can be applied to the fitted regression. These are : a) Test for the Overall Fit of the Regression and b) Tests for the Partial Regression Coefficients.

- Test for the Overall Fit of the Regression involves applying the Analysis of Variance (ANOVA) procedure and the Null Hypothesis being verified is :

$$\underline{H_o: b_1 = \ldots = b_k = 0.}$$

ANOVA

Source	df	Sum of Squares	Mean Square	F
Regression	k	Reg. S.S.	S_1^2	S_1^2/S_2^2
Residual	N-k-1	Res. S.S.	S_2^2	
Total	N-1	Total S.S.		

The Sum of Squares of the different sources of variation are obtained from the identity :

Total S.S. = Regression S.S. – Residual S.S.

Where:

Total S.S. $= [\Sigma Y^2 - (\Sigma Y)^2/N]$

Regression S.S. $= [b_1\Sigma x_1^2 + \ldots + b_k\Sigma x_k^2]$, $\Sigma x_i^2 = \Sigma X_i^2 - (\Sigma X_i)^2/N$; $i = 1, \ldots, k$

Residual S.S. = Total S.S. – Regression S.S.

- The F-test in ANOVA indicates whether the fitted regression equation is capable of estimating the values of Y on the basis of the X-variables in the equation, or, alternatively, whether there exists a linear relationship between Y and the X-variables in the equation (collectively).

- The fit of the regression equation is measured with a quantity, known as the Coefficient of Multiple Determination, R^2, defined as :

$$R^2 = \frac{\text{Regression S.S.}}{\text{Total S.S.}}$$

- R^2 represents the proportion (percentage) of the variance in the dependent variable in the dependent variable explained by the set of independent variables in the equation.

- R^2 is an increasing function, which increases with the number of independent variables in the equation and is therefore often misleading.

- The Adjusted R^2 is therefore used for this purpose and is defined as :

$$R^2 = 1 - [(1 - R^2)(N-1)/(N-k-1)].$$

- Adjusted R^2 can be also used for comparing the fit of the two regressions with different or same number of independent variables.

- R^2 can be also tested for significance. The Null hypothesis is : H_o: $\underline{R^2 = 0.}$

  The test Criterion is :

$$F = \frac{R^2}{(1-R^2)} \frac{(N-k-1)}{k} \text{ ; df: k, N-k-1}$$

- Testing the significance of R^2 is identical to testing the Overall Fit of the Regression through ANOVA.

- Tests for Partial Regression Coefficients involve applying the t-test for which the Null hypothesis is: H_o: $\underline{b_i = 0}$

  The Test Criterion is :

$$t = \frac{|b_i|}{SE(b_i)} \qquad SE(b_i) = \sqrt{\text{Residual S.S. } (C_{ii})};$$
$$C_{ii} = \text{i-th diagonal element of } (X'X)^{-1} \text{ ; df: N-k-1}$$

- Testing is essential when the objective is to identify the 'most' significantly influencing independent variables.

- Testing is not meaningful when a 'logical' relation exists between a dependent variable and a set of independent variables, all of which are essential for the relationship.

Estimation Problems in Regression :

- Number of Observations less than Number of Independent

- High Order Correlations among the Independent Variables (Multicollinearity).

Screening of Independent Variables :

Screening of independent variables is required when the objective is to fit a regression with only 'significantly' influencing independent variables without much loss of R^2. The following two procedures are commonly applied for this purpose:

The Step Down Procedure : In this procedure, initially, a regression equation is obtained with a given set of independent variables which are 'supposed' to be influencing the dependent variable. In the next step the independent

variable with a statistically not-significant coefficient and relatively the least t-value is excluded and again the regression equation is obtained with the remaining independent variables. The procedure is repeated till the coefficients of most of the independent variables are statistically significant and there is no much increase in the R^2 value. This procedure is an excellent solution to the famous 'multicollinearity' problem.

The Step-Up (Stepwise) Procedure : This procedure is quite opposite to the step down procedure. This procedure 'builds' regression equation in steps, starting with a single independent variable. The entry of the new independent variable is based on relatively maximum and statistically significant partial correlation coefficient of the new variable with the dependent variable after eliminating the common correlation with the variable already existing in the equation. The partial correlation approach is also equally a 'better' solution for the multicollinearity problem. However, the basic limitation of the procedure is that the entire regression rests on the initially selected independent variable.

Path Analysis :

The method of path analysis was basically developed for studying the causal relations in Population Genetics (Sewell Wright, 1918).

- The aim of the path analysis is to provide explanations of observed correlations in the cause-effect type relations, i.e., the regression equations.

It is assumed that the correlation of an independent variable (X) with the dependent variable (Y) could be the combination of its 'direct' association with Y as well as its 'indirect' association with the other independent variables in the equation. The structure is as follows :

$$r_{1y} = (1)\, P_{y1} + r_{12}\, P_{y2} + \ldots + r_{1k}\, P_{yk}$$
$$r_{1y} = r_{12} P_{y1} + (1)\, P_{y2} + \ldots + r_{2k}\, P_{yk}$$
$$\ldots \qquad \ldots \qquad \ldots$$
$$r_{1y} = r_{1k} P_{y1} + r_{2k} P_{y2} + \ldots + (1)\, P_{yk}$$

i.e., $R_y = (R.'\, P_y)$ and hence,

$$P_y = R^{-1}\, R_y$$

The vector P_y refers to the vector of "Path Coefficients", popularly known as the Direct Effects. The Indirect Effect of i-th variable through the j-th variable on Y is obtained from : $(P_{yi} \cdot r_{ij})$ and the Residual Effect is obtained from: $P'^{2}_{ye} = 1 - (R_y' \cdot P_y)$. The path analysis thus provides additional information about the "within" and "between" relationship of the independent variables with the dependent variable. The following Example would clarify the basic idea about the path analysis:

Example :

$$R = \begin{matrix} 1 & 0.391 \\ 0.391 & 1 \end{matrix} \qquad R_y = \begin{matrix} 0.997 \\ 0.450 \end{matrix}$$

$$P_y = R^{-1} R_y = \begin{matrix} 0.969 \\ 0.071 \end{matrix}$$

Indirect Effect of X_1 through X_2 $= P_{y2} \cdot r_{12} = 0.028$
Indirect Effect of X_2 through X_1 $= P_{y1} \cdot r_{12} = 0.379$
Residual Effect $= (R.' P_y) = 0.002$

Variable	Indirect Effect	Direct Effect	Total
X_1	0.028	0.969	0.997
X_2	0.379	0.071	0.450

The influence of X_1 on Y is more of "direct" nature than through X_2; whereas, the 'cause' for the influence of X_2 on Y is 'indirect'- through X_1, instead of direct one.

II. EXPERIMENTAL DESIGNS

This category of statistical procedures deal with planning of experiments and the analysis of data obtained from these experiments.

The experiments have a common objective of comparing a given set of objects, commonly referred as "Treatments". The experiments are developed in the form of a 'Plan' or 'Design' to suit the requirements of available resources and the number of treatments to be compared. The design of the experiment provides a valid statistical base for comparison of the treatments.

The experiment involves a procedure for allotment of treatments to the given number of experimental units, which in the context of field experiments are the plots. The performance of the treatments is compared on the basis of their averages, i.e., the same treatment is repeated several times. It may be observed that the treatment may exhibit a varied response even under the controlled conditions. This variation in the responses is controlled through the various principles, known as "the basic principles of experimental designs".

The statistical procedure for comparing means (averages) of several treatments is the Analysis Of Variance(ANOVA) which is based on the F-test. Specifically, ANOVA is a procedure for decomposing (separating) the variation in the total observations into the variation due to the different sources (components) affecting the observations. These components are categorized as the sources which represents the variation due to: a) Assignable Causes and b) Non-Assignable (Random) Causes. The assumption is that the non-assignable causes represent the variation in the observations of the same treatment under controlled situation. This variation is referred as "random" or experimental error. The property of random error is that it vanishes on averaging. Hence, it is preferred to have more number of repetitions for the same treatment to eliminate the error. The error in the observations can be controlled through the following principles of experimental designs :

- **Randomization** controls the personal bias in allocation of treatments and gives a statistical base- 'random sample' to the data for applying suitable analytical procedures.
- **Replications** control the experimental error and provides estimate of 'Standard Error', a basis for comparison of treatment means at uniform level, through ANOVA. It also increases the precision.
- **Local Control** controls the heterogeneity among the experimental units for valid comparison of treatments under 'similar' situations. It involves Blocking of experimental units.

The assumptions of ANOVA and the basic principles which controls the variation, together form the basis for the development of Experimental Designs. There are three basic designs are :

1. Completely Randomized Design CRD)

2. Randomized Block Design (RBD)
3. Latin Square Design (LSD)

The characteristics of these designs are described below :

1. **Completely Randomized Design :**

- Treatments are applied randomly to experimental units (in sequence) to provide as far as possible uniformity in repetition of the treatments which is not guaranteed.
- The experimental units should be perfectly homogeneous
- Suitable for conducting Lab-experiments, Pot-experiments or preliminary screening of treatments when the number is considerably less.

2. **Randomized Block Design :**

- Treatments are applied randomly within blocks such that each treatment is repeated only once within each block.
- Size of the block = Number of treatments
- A block should not have more than 21 units.
- Most flexible design, suitable for conducting field experiments.
- Homogeneity is in one direction.

3. **Latin Square Design :**

- Treatments are applied in blocks formed in two directions – 'Rows' and 'Columns' - at right angles to one another. Treatments are applied such that each treatment is repeated only once within each row and within each column.
- Number of Rows = Number of Columns = Number of Treatments.
- Incomplete three way layout (Square type)
- Based on the most crucial assumption of 'no interaction' between the three sources: rows, columns and treatments.
- Optimum choice for number of treatments is only 5. Not suitable when number of treatments is less than 5 (low precision) or greater than 5 (expensive).

Comparison of Treatments :

The procedure followed for comparison of treatments in all the three designs is as follows :

- Compute Standard Error of Difference – **SED(Treatments)** and Critical Difference – **CD(Treatments)**, also known as the Least Significant Difference.
- Arrange the Treatment Means in descending order of magnitude.
- Group the Treatment Means together, whenever the difference in the corresponding means of the two treatments (in the order) is less than the CD; otherwise form another group.
- Identify the treatment / group having significantly maximum / minimum mean, as per the definition of the 'superior' treatment.

PROCEDURE FOR ANALYSIS OF COMPLETELY RANDOMIZED DESIGN

1. Mathematical Model : $Y_{ij} = \mu + \alpha_i + e_{ij}$;

Y_{ij} = j-th Observation corresponding to the i-th Treatment

μ = Overall Mean; α_i = Effect of i-th Treatment and

e_{ij} = Random Error

i = 1, ..., k; k = No. of Treatments; j = 1, ..., r;
N = rk = Total Observations.

2. Plan of the Experiment : (k = 5; r = 3; and N = 15)

A	E	C	B	D
E	B	D	A	C
C	A	E	D	B

3. Data (Table)

Treatments	1	2	3	Total	Mean
A				T(A)	A_
B	_	Y_{ij}	_	T(B)	B_
C				T(C)	C_
D				T(D)	D_
E				T(E)	E_
				GT	Overall

4. Steps :

1. GT $= \Sigma Y_{ij}$
2. CF $= (GT^2 / N)$
3. Total S.S. $= \Sigma Y_{ij}^2 - CF \quad = X^2$
4. Treatment S.S. $= (1/r)[T(A)^2 + T(B)^2 + -] - CF \quad = X_1^2$
5. Error S.S. = Total S.S. – Treatment S.S. $= X_2^2$

$\underline{H_o: \mu_1 = \ldots = \mu_k}$

ANOVA

Source	Df	SS	M.S.	F
Treatments	k-1	X_1^2	S_1^2	S_1^2/S_2^2
Error	N-k	X_2^2	S_2^2	
Total	N-1	X^2		

PROCEDURE FOR ANALYSIS OF RANDOMIZED BLOCK DESIGN

1. Mathematical Model : $Y_{ij} = \mu + \alpha_i + \beta_J + e_{ij}$;

Y_{ij} = Observation from j-th block consisting of the i-th Treatment

ì = Overall Mean; α_i = Effect of i-th Treatment; β_j = Effect of j-th block

and e_{ij} = Random Error

i = 1, ..., k; k = No. of Treatments; j = 1, ..., r; r = No. of Blocks

2. Plan of the Experiment : (k = 5 and r = 3)

Block-1	A	E	C	B	D
Block-2	E	B	D	A	C
Block-3	C	A	E	D	B

3. Data (Table)

Treatments	B-1	B-2	B-3	Total	Mean
A				T(A)	A_
B	-	Y_{ij}	-	T(B)	B_
C				T(C)	C_
D				T(D)	D_
E				T(E)	E_
Total :	B1	B2	B3	GT	Overall

4. Steps :

1. GT $= \Sigma Y_{ij}$
2. CF $= (GT^2 / rk)$
3. Total S.S. $= \Sigma Y_{ij}^2 - CF = X^2$
4. Treatment S.S. $= (1/r)[T(A)^2 + T(B)^2 + ---] - CF = X_1^2$
5. Block S.S. $= (1/k)[B1^2 + B2^2 + \ldots] - CF = X_2^2$
6. Error S.S. $=$ Total S.S. – Treatment S.S. $= X_3^2$

H_o: (1) : $\alpha_1 = \ldots = \alpha_k$ (Treatments) (2) : $\beta_1 = \ldots = \beta_r$ (Blocks)

ANOVA

Source	Df	SS	M.S.	F
Treatments	k-1	X_1^2	S_1^2	S_1^2/S_3^2
Blocks	r-1	X_2^2	S_2^2	S_2^2/S_3^2
Error	(k-1)(r-1)	X_3^2	S_3^2	
Total	rk-1	X^2		

PROCEDURE FOR ANALYSIS OF LATIN SQUARE DESIGN

1. Mathematical Model : $Y_{ijl} = \mu + \alpha_i + \beta_J + \chi_l + e_{ijl}$;

Y_{ijl} = Observation from i-th row and j-th column having l-th Treatment

μ = Overall Mean; α_i = Effect of i-th Row; β_j = Effect of j-th Column;

χ_l = Effect of l-th Treatment and e_{ijl} = Random Error

i ,j,l: 1, ..., k; k = No. of Treatments; No. of Rows = No. of Columns = No.of Treatments.

2. Plan of the Experiment and Data Table-1 (k = 5)

Rows :

			Cols.			
Rows :	1	2	3	4	5	Total
1	A	E	C	B	D	R1
2	E	B	D	A	C	R2
3	C	A	E	D	B	R3
4	B	D	A	C	E	R4
5	D	C	B	E	A	R5
Total :	C1	C2	C3	C4	C5	GT

Data Table-2 :

Treatments	1	2	3	4	5	Total	Mean
A						T(A)	A_
B						T(B)	B_
C						T(C)	C_
D						T(D)	D_
E						T(E)	E_
Total						GT	Overall

3. Steps :

1. GT $= \Sigma Y_{ijl}$
2. CF $= (GT^2 / k^2)$
3. Total S.S. $= \Sigma Y_{ijl}^2 - CF = X^2$
4. Row S.S. $= (1/k)[R1^2 + R2^2 + -] - CF = X_1^2$
5. Column S.S. $= (1/k)[C1^2 + C2^2 + -] - CF = X_2^2$
6. Treatment S.S. $= (1/k)[T(A)^2 + T(B)^2 + -] - CF = X_3^2$
7. Error S.S. = Total S.S. – Treatment S.S. $= X_4^2$

H_o: (1) : $\alpha_1 = \ldots = \alpha_k$ (Rows); (2) : $\beta_1 = \ldots = \beta_k$ (Columns)

(3) : $\chi_1 = \ldots = \chi_k$ (Treatments)

ANOVA

Source	Df	SS	M.S.	F
Rows	k-1	X_1^2	S_1^2	S_1^2/S_4^2
Columns	k-1	X_2^2	S_2^2	S_2^2/S_4^2
Treatments	k-1	X_3^2	S_3^2	S_3^2/S_4^2
Error	(k-1)(k-2)	X_4^2	S_4^2	
Total	k^2-1	X^2		

Data Transformations :

The distribution of data values in the experimental data affect the comparison of the treatments. The basic assumption in ANOVA is Normality. Hence the data are to be transformed to normality. Further, in certain situations, the 'observations' are qualitative such as 'counts'. These

are also to be transformed into 'numerical' scores. Some of the data transformations are given below :

DATA TRANSFORMATIONS :

S.No.	Type	Transformation	Applications
1.	Log	$Y = \text{Log}(X+1)$	Presence of 'Extreme' Values or skewed distribution
2.	Square Root	$Y = \sqrt{(X + 0.5)}$	Data are 'Counts' or the distribution is Poisson
3.	Angular/ Arc Sine	$Y = \text{Sin}^{-1}(\sqrt{p})$ p = Proportion	Data are in Percentages Percentages should be only of "Counts" data Unsuitable when percentages are percentage of Marks, Percentage of Protein Content in a Crop, Index, etc. Unsuitable when $p = 0$ or $p = 1$. The suitable choice for these proportions is: When $p = 0$; $Y = 1/(4n)$ and when $p = 1$; $Y = 1 - 1/(4n)$ n = Total number of observations/units/plots.

- **Role of Error df and Number of Replications in Planning of Experiment :** The Error df and the number of replications are directly related to the Precision. Precision = [No. of Replications / Error Mean Square] and Error Mean Square = [Error S.S. / Error df]. However, more replications imply large quantity of experimental material. The practical approach is to plan the experiment such that the Error df = atleast 12. The criterion of 12 df emerged from the following: The ANOVA involves F-test and for any fixed number of treatments df (>5), the Table Value of F stabilizes after 12 df for Error. Hence planning experiment beyond Error df = 12, it would be unnecessary waste of experimental material.

- **Performance of the Experiment :** The reliability of the experiment can be measured with Coefficient of Variation (C.V.), defined as :

$$CV = [\sqrt{\text{Error Mean Square}} / \text{Overall Mean}].\ 100.$$

- CV less than or equal to 20 per cent is an indication of 'better' precision of the experiment.
- CV greater than 20 per cent indicates that the experiment was not planned suitably and has to be repeated with proper care.

The basic designs deal with comparison of a given set of treatments. While studying its performance, the other factors which are essentially required, are maintained at 'fixed' (protective) level - such as irrigation, fertilizers and plant protection measures. The response recorded is thus the 'combined' effect of treatment at the constant level of the other factors. These designs are therefore the "Single Factor Experiments". There are, however, experiments for studying the combined effect or "Interaction" of Factors. The most commonly applied experiments are : The Factorial Experiments, The Split – Plot and The Strip – Plot Designs. However, these are not discussed in this brief review.

The data 'speaks' about itself! It is hoped that this brief overview may provide an insight into proper use of statistical procedures data analysis.

FIELD EXTENSION

ACHARYA N. G. RANGA AGRICULTURAL UNIVERSITY EXTENSION SERVICES OF ANGRAU - A GLANCE AT MACRO LEVEL

Dr. A. SATYANARAYANA[1], Dr. P. GIDDA REDDY[2] and Dr. PUNNA RAO[3]

It is generally recognised that to increase farm productivity and income access to new technology is quintessential. The role of University extension is one of adapting research recommendations to suit the varying needs of farmers and providing a technology delivery service to speed up farmers' access to and adoption of new technology. Keeping this in view, the University recognized the need for professional subject matter specialists who can devote their time to training staff and to learning from research and extension staff and farmers. They should also scientifically conduct on-farm trials and front line demonstrations to give more professional and flexible advice to farmers.

To promote agricultural development, information must reach the farm level in an usable form. Therefore, the major role of University extension is to translate this information into culturally usable and adopted to the farmers level of understanding and resources.

This University has developed strong extension services in the recent past to cover a multitude of activities ranging from sociological and economic studies of farm house holds to the design of completely new farming systems for a variety of agroecological situations. A multidisciplinary team, usually consisting, at a minimum specialization of crop production, crop protection and a social/TOT scientists, attempts to define the farmers' physical and economic resources, the factors that limit his production, and the interventions necessary to reduce or resolve those limitations.

It is now an accepted fact that sound agricultural development is essential to overall economic progress of the state as its economy is

1. Director of Extension, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad
2. Deputy Director of Extension, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad-30
3. Assistant Director of Extension, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad - 30

particularly dependent on sustained and healthy agricultural growth. At the same time there is an urgent need for most effective sectoral development programmes to improve food security and nutritional security among the poor.

For reasons of both production and equity, rainfed agriculture has risen in importance, as it comprises of major cultivated area in Andhra Pradesh. Sustainability of output now also has a high place on the agricultural agenda became of widespread deforestation and environmental degradation. The priority has become not just sustainable agriculture, but sustainable livelihoods based on agriculture. This calls for professionalism in extension education – the thinking, values, methods and behaviour of dominant in a profession. This professionalism has become a part of the problem in agricultural development. The resource – poor farmers which constitute a major percent in farming community are practicing complex, diverse and risk-prone agriculture, each season demands its own adoptive performance, depending on unpredictable weather.

One consequence has been that resource – poor farmers have been slow or unable to adopt many of the recommendations flowing from agricultural research. The problem is neither the farmer nor the farm for the non adoption, but the technology itself, and that the faults of the technology can be traced and modified to suit to the priority of the farmers and the extension services should be ready to take on to this responsibility.

Recognition of farmers' knowledge, priorities and innovative capacity does not necessarily mean that they do not need extension services. Rather, it points to needs to improve the interaction between extensionists and the farmers to reverse and balance conventional 'top down' communication and to overcome technology gaps and miscommunication.

Most professionals assume that they know what farmers' want and need but are often wrong. Not knowing farmers priorities and putting farmers agenda first mean that professionals are likely to address the wrong problems in their extension service. Conversely, identifying farmers priorities and helping farmer meet the deals to innovations, which are adopted by the farmers.

The current institutional framework for technology transfer to disseminate location specific technology to different farming situations in the wake of economic liberalization and this dynamic situation calls for comprehensive technology transfer. The concept of "AGRICULTURAL UNIVERSITY" on the bedrock of agricultural research with a mission of acquiring new knowledge and agricultural extension with a mission of applying new knowledge on the farmers' fields. The University therefore should have an integrated approach through a balanced development of research and extension education. The University cannot afford to do anything less than this if it should serve as an effective instrument in rapidly modernizing agriculture. Above all, an effective extension system is needed that is capable of diagnosing field problems and transmitting them to the research establishment.

To fulfill this, ANGRAU has established Directorate of Extension Education headed by a Director of Extension and assisted by two Deputy and one Assistant Directors with an overall responsibility of conducting extension education programmes of the University (structural flow diagram of Extension services of ANGRAU) with overall objectives.

1. Increase the quality and type of technologies being disseminated with an emphasis on
   - Location specific recommendations
   - Diversification and intensification of difficult farming systems
   - Sustainability enhancing technologies such as IPM, INM and NRM
2. Enable Research – Extension system to become more demand driven
3. Strengthen Research – Extension – Farmer (R-E-F) linkages
4. Increase the sustainability of public extension system
5. Generate replicable experiences that can be documented and repeated under similar farming situations.

In order to achieve the set objectives ANGRAU has reorganized its extension services, which are being financed by the State Government, ICAR and GOI. ANGRAU's Extension Services, focus mainly on First Line

Extension activities viz; testing and verification of new technologies generated at research stations in the farmers' fields through on-farm trials, on-farm research, adaptive trials, first-line demonstrations, kisan melas, exhibitions and farmer-scientists interaction meetings. It also undertakes campaign like programmes to create awareness among the farming community on the latest developments through print and electronic media and also through its own publications. The following ANGRAU extension services are entrusted with the onerous responsibility of training farmers through Agricultural Market Committee (AMC) Meetings and extension personnel of State Line Departments in subject matter and extension methodology areas.

- District Agricultural Advisory & Transfer of Technology Centres (DAATTCs)
- Krishi Vigyan Kendras (KVK)
- Kisan Melas
- Agricultural Information & Communication Centres (A1 & CC)
- Extension Education Institute (EEI)
- Institutional Village Linked Programme (IVLP)

DISTRICT AGRICULTURAL ADVISORY AND TRANSFER OF TECHNOLOGY CENTRES (DAATTCs)

The transfer and adoption of seed of new high yielding varieties and hybrids of important major crops in the state was speed and wide, the transfer of critical technologies, leave alone the entire package was rather poor. There is heavy technology transmission loss in several crops resulting in low yields and poor quality of produce fetching low price and returns leaving the farmers of the state high and dry. There are several technical and non-technical factors responsible for technology transfer. These include inadequacy or inappropriateness of technology, lack of suitable technology assessment & refinement, poor Extension-Farmer linkages, lack of focus on feedback, poor communication capacity of extension personnel, multiplicity of technology transfer agencies and lack of focus on farmers training.

The current institutional framework for technology transfer with its institutional and operational constraints severely limits the effectiveness of

the functioning of University extension system to disseminate location specific technology in different agro-climatic situations. Also the policy changes in the wake of World Trade Organization (WTO) and economic liberalization where several technological inventions are flooding into the state creating a piquant situation where farmers are put into a state of choas and confusion. This dynamic and vibrant situation calls for systemic reforms in the extension services of Acharya N.G. Ranga Agricultural University.

This University believes in the concept that every research scientist should also be an extension agent, when it is a question of serving the farming community. This enabled the scientists to carve a niche in the hearts of the farmers and earn their good will. The farmer scientist – extensionists interaction, which takes place frequently, strengthen linkages between research, extension and farmer and also to achieve better systems integration among the agencies involved in transfer of technology. Keeping inview the importance to achieve balanced agricultural development, the Directorate of Extension of ANGRAU has reorganized its extension services under non-plan and named it "District Agricultural Advisory and Transfer of Technology Centre" (DAATTC) and "Eruvaka" in Telugu language by locating these centres at 22 district headquarters of the state. These centres are operating with close collaboration and cooperation of all line departments in the district. These 22 DAATT Centres started functioning in Andhra Pradesh from 5-12-1998. Initially each DAATT Centre is positioned with 4 senior scientists in the areas of crop production, crop protection, transfer of technology and animal husbandry.

The Objectives of the DAATT Centres

- To assess and refine the technologies generated by the research scientists and their suitability to different farming situation.
- To assess the potentials of the district by developing database in order to exploit district resources and develop action plans in cooperation with line departments.
- To conduct field diagnostic visits, identify the field problems and provide scientific solutions.

- To organize Kisan Melas in coordination with line departments.
- To extend scientific expertise to the line departments in the conduct of training programmes to officials, farmers and input agencies.
- To organize T & V workshops.
- To establish linkages with research institutes and other district units.
- To assist and implement the RAWE programme, internship programme and RHWE programme for agriculture, veterinary and home science students, respectively.
- To maintain information corner at each centre in cooperation with the line departments of the district.
- To supply need based scientific/popular information to the line departments on enterprises for their printing/multiplication and distribution to the farmers.
- To coordinate with All India Radio, Television and print media for transmission of needed agricultural information in the district.
- To implement any other extension programme that may be taken by the University, from time to time, in coordination with the line department.

DAATT Centre is an independent unit with senior member as Coordinator. The centre is under the overall technical and administrative control of Associate Director of Research of the zone concerned who is in turn responsible to Director of Extension on extension activities of each district centre in his jurisdiction.

DISTRICT LEVEL COORDINATION COMMITTEE

The District Level Coordination Committee (DLCC) for each DAATTC is constituted to oversee the functioning of the district centres in planning, coordination, execution, mid term review and corrections of its programme. The committee consists of ADR as Chairman, coordinator as Convener, all district heads of development departments, farmer representatives from agriculture and allied enterprises, representatives from NGO's and input agencies as members.

District Level Coordination Committee meets twice in a year, one before each season to decide seasonal joint action plans to review the work

done in the previous season/year in the district and suggest improvements needed. Whereas the heads of concerned line departments of the district shall prepare their action plans for the district and present before DLCC for discussion and approval.

STATE LEVEL COORDINATION COMMITTEE

Similarly there shall be a State Level Coordination Committee headed by vice-chancellor, ANGRAU as Chairman Director of Extension as Convenor with all the Deans, Directors, ADRS, DAATTCs Coordinators of University and farmer representatives from three regions of the state NGOs as members to coordinate, plan, supervise and review the functioning of the District Centres in the State.

MAJOR AREAS OF FUNCTIONING OF DAATTCS

The District Agricultural Advisory and Transfer of Technology Centre (DAATTC) shall work on Farmer-Extension – Research interaction mode.

The DAATTC though an independent unit, works in coordination and cooperation with the line departments to avoid any duplication of functions.

Areas of functioning of the centre are decided by the District Level Coordination Committee (DLCC). However DAATTCs concentrate on following common areas/activities.

- Development of district database in relation to agriculture, horticulture & animal husbandry.
- Transfer of improved agricultural technology.
- Training of trainers & Development of training manuals
- Assessment and refinement of crop production technologies
- Soil, plant and animal problem diagnosis and remedies.
- Information Centres & Joint publication of information materials.
- Linkages with line departments, input & credit agencies, other development organizations working in the district.
- Organisation of farmers' clubs, Charcha mandals.
- Any other activity as suggested by SLCC from time to time

This new system came into operation commencing with rabi 1998-99. The result are highly fruitful, rewarding and up to the expectations. Already, it has received accolades from many people in the farming community.

In this novel approach of transfer of technology scientist gets an opportunity to work on field, identify location specific problems and to maintain good linkages with farming community of the district. Thus an effective collaboration and coordination of scientists, with extension personnel of State development departments and farmers. DAATTCs of the university effectively test, assess, refine introduce and disseminate the latest technologies developed by the research wing of University by demonstrating practical application of latest technologies in farmer's fields through adaptive, on-farm trials, and first line demonstrations. It is also responsible to organise diagnostic visits farmers – scientist interaction meetings at district level in cooperation with the line departments. DAATT Centre is entrusted with the onerous responsibility of training farmers through Agricultural Market Committee (AMC) Meetings and Extension personnel of State Level line departments in subject matter and extension methodology areas.

2. KRISHI VIGYAN KENDRAS (KVKs)

Krishi Vigyan Kendra, the grass root level vocational training institution designed to bridge the gap between the available technologies at one end and their application for increased production at the other and to increase self-employment opportunities among the farming communities. The krishi Vigyan kendras are fully financed by the ICAR. At present, ANGRAU has six (6) regular KVKs located at Anantapur, Amadalavalasa, Rastakuntabai, Malyal, Mahanandi and Undi and three (3) remandated KVKs at Agricultural Research Stations of Nellore, Darsi and Adilabad. The following are the broad objectives of KVKs.

- To promptly demonstrate the latest agricultural technologies to the farmers as well as extension personnel of State departments of Agriculture / Horticulture / Fisheries / Animal Sciences / Non-Government Organizations with a view to reduce time lag between the technology generation and its adoption.

- To test and verify the technologies in the socio-economic conditions of the farmers with a view to study the production.
- Constraints and to modify the technologies to make them appropriate.
- To impart training to the practicing farmers/farm women, rural youth and field level extension functionaries by following the method of "teaching by doing and learning by doing".
- To back-up with training and communication support to the district level development departments viz; Agriculture / Horticulture / Fisheries /Animal Science and NGOs in their extension programmes.

The mandate of KVKs as per the ICAR are :-

- Conducting "on-farm testing" for identifying technologies in terms of location specific sustainable land use systems.
- Organize training to update the extension personnel with emerging advances in agricultural research on regular basis.
- Organize short and long term vocational training courses in agriculture and allied vocations for the farmers and rural youth with emphasis on "learning by doing" for higher production on farms and generating self-employment.
- Organize Front Line Demonstrations (FLDs) on various crops to generate production data and feedback information.
- To develop and organize field days, farm visits, farmers' fairs (kisan melas), radio talks, charcha mandals, etc, with a view to strengthen the scientific information support to farmers.

These KVKs will have no uniform syllabus, the syllabus and programme of each KVK will be tailored to the felt needs, natural resources and the potential for agricultural growth of that particular area/district. This will be decided by the Scientific advisory committee, which consists of the following members.

Head of the host institution (Vice-Chancellor or his nominee Director of Extension)	:	Chairman
Zonal coordinator of zone	:	Member

Head of ARS located in the district	:	Member
Heads of the departments of the district	:	Member
Representative of the lead bank of the district	:	Member
Representative of Doordarshan Centre of district	:	Member
Two representatives of the farmers one small and one big nominated by the head, KVK	:	Member
Two representative of farm women nominated by the head of KVK	:	Member
Training organiser of KVK	:	Member Secretary

This committee should meet twice in a year for providing necessary guidance and leadership to achieve and fulfill the objectives and mandate of krishi vigyan kendra. These centres have carried out several FLDs and On-farm trials on production technologies of dry land crops, cereals, millets, oilseeds, pulses, mesta and horticultural fruit & vegetable crops. Organized vocational trainings in the areas of mushrooms, printing & dyeing, mesta handicrafts for school dropouts, youth both men and women. Participated in number of Agriculture Market Committee Meetings to train the farmers at mandal level and organize Kisan Melas in the districts.

3. AGRICULTURAL INFORMATION & COMMUNICATION CENTRE (AI & CC)

The A.I. & C.C. which was established in A.P.A.U. in a modest way in the year 1969 with the financial assistance of ICAR and State Government has been undertaking a number of activities to reach the farmers with the latest information on improved agricultural technology and other aspects of farm and home management. The Centre is equipped with a printing press, a recording studio and audio-visual unit and has been serving as a clearing house of information through literature, farm news bulletin on AIR, School – on – AIR, TV etc. It also takes up Press, photo and movie coverage of the various activities of the University. Following are the specified functions of A.I. & C.C.

FUNCTIONS :

a) To disseminate Agricultural information to the farmers and extension personnel on latest technology in agriculture, animal husbandry and home science through printed literature, radio and television.

b) To organize exhibitions in order to educate the farmers and general public on latest changes in the agriculture and allied fields.

c) To focus the various activities of the University through Press, Radio and Television.

d) To take lead to organize important functions like convocations, seminars etc, of the University.

e) To receive the visitors and to explain the activities of the University with the help of information centre.

f) To produce short films and video cassettes for educational purpose.

g) To take up the printing work of the bulletins, package of practices of crops, news letter, journal of research etc.

h) To answer the queries raised by farmers through mail.

i) To liaison between University, the AIR, T.V. Centre and other developmental departments in matters of agricultural information.

The Agricultural Information and Communication Centre actively involves in processing the relevant and timely information to support activities of the field functionaries of the State Department of Agriculture by broadcasting Farm Radio bulletins on the Radio everyday for about 10 minutes. The Centre also publishes package of practices and number of leaflets and folders based on the information needs of the extension personnel as well as farmers.

4. DISTANCE EDUCATION :

The University has started the telecast of Distance Education programme in Agriculture and allied fields under caption "Annadatha Velugubata" from 2nd October, 1998 through a private channel ETV. The programme is of 10-15 minutes duration and it televised twice weekly on Tuesdays and Fridays at 6:30 AM. This is a pioneering effort and first of its kind in the country to be undertaken by Agricultural University in the field of agriculture, animal husbandry and allied areas. More than 150 programmes have been telecasted so far. Presently scientists and teachers of the University are developing appropriate and relevant modules in areas such as crop husbandry, INM, IPM diary, poultry, fisheries sheep, goat, duck, rabbit, quail farming, sericulture, apiculture, mushroom culture, quality seeds

production, value addition, post harvest technologies etc, for telecast in coming schedule. Enterprise oriented topics are given utmost priority for the benefit of rural youth.

5. RYTHU MITHRA

An exclusive specialized television programme is being produced by the Department of Agriculture, Government of Andhra Pradesh in technical collaboration with ANGRAU for the benefit of the farmers of A.P from 6:00 to 7:00 pm everyday on "TEJA" T.V. channel. The programme has two important components viz; pre-recorded programmes of topical nature (scripts are being provided by Scientists of ANGRAU) is telecasted for 30 mts. From 6:00 to 6:30 pm and the other most fascinating and novel programme is "Phone-in live session where a scientist a day of ANGRAU interacts and offer solution to the questions raised by the farmers for another 30mts. i.e. from 6:30 pm to 7:00 pm. The scientists of ANGRAU participate in the session as per the schedule drawn & approved by the University. This programme started operating form 6th of August, 2001 inaugurated by the Honorable Chief Minister of A.P. The "RYTHUMITHRA" T.V. programme has become popular in the shortest possible time, which is quite evident from the number of farmers participating the phone-in live session everyday.

Publications for farmers :

Agricultural Information and Communication Centre of University process technical information generated by scientists and disseminate it for the benefit of farmers and extension personnel of line departments and bring out publication. Viz; crop wise bulletins and farmers Almanac.

Crop Wise Bulletins :

To aid farmers and extension personnel for quicker identification, diagnosis on control of pests diseases and nutritional disorders of different crops, colorful and easy to understand crop wise bulletins were published. Eighteen bulletins of Insect pests, diseases and nutritional disorders of thirty-four important crops like rice, mango, cotton, citrus, redgram, bengal gram, greengram, black gram, cowpea, tomato, brinjal, bhendi, cabbage, cucurbits, vegetables. grapes, maize, coconut, oil palm sunflower, safflower, gingelly, green leafy vegetables, ber, guava, sapota, pomegranate, cashew, jowar,

bajra and ragi were published. Good response has been received for these publications from both farmers and extension personnel.

Farmers Almanac :

A farmers' almanac providing valuable information on agriculture and allied subjects in Telugu published and released on the Telegu New Year day-Ugadi every year. This very useful and valuable publication has received wide accolades. Thousands of copies of this almanac are printed and supplied to the farmers every year on nominal cost.

6. EXTENSION EDUCATION INSTITUTE (EEI)

The Extension Education Institute, Rajendranagr is one of the premier institutes for training of extension personnel in Souther India It was established in September 1962 initially under the administrative control of the Osmania University and later transferred to Andhra Pradesh Agricultural University (APAU) when it was established in July, 1964.

Extension Education Institute, Rajendranagar started functioning from 17th September 1962 in the College of Agriculture, Rajendranagar, and later moved into its present buildings in July 1963.

The Institute is financed by the Directorate of Extension, Ministry of Agriculture and Cooperation, Government of India, New Delhi. It is under the administrative and financial control of the Acharya N.G. Ranga Agricultural University.

The Institute caters to the training needs of different line departments of its client states viz; Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, Orissa, Union Territories of Andaman and Nicobar Islands, Pondicherry and Laskhadweep. Besides extension personnel of line departments, the trainers of training institutes, like FTC's, KVK's and also the master trainers of ANGRAU are also trained at EEI.

OBJECTIVES OF THE INSTITUTE :

1. To improve the skill and professional competency of Extension functionaries of development departments, banks, private firms, and voluntary organizations.

2. To demonstrate the most effective training procedures and techniques useful for the personnel working in development departments.
3. To impart higher training in Extension Education leading to Ph.D degree
4. To conduct research and publish information on extension methodology.
5. To provide consultancy to development agencies.

Mandate :

- To train the middle level extension functionaries in areas of communication, extension methodology, extension management, training management, etc. so as to enable them to transfer the technology effectively.
- To teach the in-service candidates nominated by GOI, and new scholars in Extension Education leading to Ph.D.
- To takeup research both by faculty and students.

TRAINING

Training areas :

- Communication Techniques and Extension Methodology
- Training Management/Methods
- Extension Management
- Agricultural Journalism
- Project Management
- Participatory Rural Appraisal (PRA)/Participatory Learning Action (PLA)
- Information Management
- Communication and Media Strategy
- Monitoring and Evaluation
- Production and Use of Audio Visual Aids
- Photography and Operation of A.V. Equipment
- Production of Farm Broadcasts
- Production of Farm Video Programmes
- Instructional Technology

Main features of Training Approach

- Group interactions
- Training need assessment
- Talk-cum-discussions
- Participatory Sessions
- Coverdale's ASA approach
- Participant-presentations
- Wrap-up sessions
- Evaluation
- Follow-up
- Feedback sessions
- Group assignments
- Practice sessions, and
- Field visits

So far from the inception of the Institute 585 training programmes were organised covering 9063 participants.

Institutional Village Linkage Programme (IVLP)

In view of market liberalization particularly in relative agricultural development and in extent of growing public concern for globalization, household security, regional imbalance and wide variety of ecosystems, there is need to provide new direction in planning and promoting transfer of technology. This could be achieved by developing effective potential linkage between scientific institutions and the farmers for technology interaction and optimization to meet the growing demands of different production systems to increase productivity, augment income and improve the quality of life of rural people besides proper conservation of resources.

It is therefore, necessary to look at the technology not only from the point of view of productivity but also more from the point of view of stability, sustainability and equitability. With this backdrop, ICAR launched an innovative Technology Assessment and Refinement through Institution Village Linkage Programme (IVLP) during 1995-96 with the following objectives.

- To assess the needs and identify potentials of various technologies by understanding local agricultural and environment perceptions and knowledge in agro-ecological regions and production system perspectives.
- To assess and refine technologies with focus on
  - i) Stability and sustainability along with productivity of small production systems
  - ii) To sustain higher productivity and profitability taking environmental issues into consideration in well defined farm production systems
- On-farm value addition of agricultural products, by-products and wastes for greater economic dividends.
- To address gender specific issues.
- To assess the impart of refined technologies in different production systems
- To identify extrapolation domains for new technologies/technology modules based on environmental characterization at meso and mega levels.

Kisan Melas

Kisan Mela is an organized educational activity for involving and educating farmers by bringing together the farmers, scientists, extension workers, input agencies, developmental departments and non-governmental agencies on an agricultural or allied aspects at a Research Station or at an agriculturally important educational centre, where the farmers can see, interact and gain first hand knowledge about the latest technologies and developments in agriculture and allied aspect. It integrates several educational activities specifically directed to the farmers, a region, state or country. In the case of Andhra Pradesh Agricultural University, it may be limited to the agro-climatic zones and the jurisdiction of the Research Stations coming under the aegis of Andhra Pradesh Agricultural University.

Objectives :

1. To provide an opportunity for the farmers to practically witness the new production technologies demonstrated on the Agricultural Research Station and also to inform them about the on-going research in different aspects.

2. To enable the farmers to discuss with the University Scientists about the problems relating to agriculture and allied aspects directly.
3. To provide an opportunity for the farmers to directly come in contract with input manufacturers, dealers in agricultural machinery and implements to help the farmers know about the latest agricultural inputs, machinery, equipment etc. available in the market.
4. To help scientists to get feedback on recommended technologies as well as to sensitize them about the farmers' current problems on agriculture and allied aspects.
5. To develop a habit among farmers to visit Research Stations frequently to learn about latest technologies.

Dimensions of Activities

1. Organization of crop cafeteria and demonstrations on the Research Station
2. Organization of Exhibition
3. Organization of Field Visits
4. Organization of "Rytu Sadassu" (Question-Answer Session)
5. Arranging sale of seeds/seedlings, publications, processed products etc.

ANGRAU organizes 50 Kisan melas every year at all the Head Research Stations including a State Level Kisan Mela at the headquarters, which are being witnessed by thousand of farmers.

Village Adoption Programme

Every major and medium research station and the 13 colleges have adopted a village each for its overall development from Kharif 1998 onwards. Besides conducting on-farm research, attending to malady-remedy analysis, monitor and forecast pests, diseases, nutritional disorders, the scientists and teachers visits the villages regularly and render on the spot advice to the farmers on various aspects of agriculture, animal husbandry, horticulture, fisheries and women in agriculture, help them to get quality inputs of seeds, pesticides, fertilizers, arrange credit through banks and cooperatives, improve literacy and render assistance in maintaining better sanitation and health, and ultimately aiming the overall economic development and upliftment of the people. In other words, the University teachers and scientists serve as

guides to the farming community in the adopted villages. This is another novel programme implemented by the University from the year 1998.

JOB CHART OF PERSONNEL IN DIFFERENT EXTENSION SERVICES OF ANGRAU

DAATT CENTRES

Coordinator : (Asst/Assoc.Professor Cadre)

- Coordinate the activities of District Agricultural Advisory and Transfer of Technology Centre .
- Establish appropriate linkages and work in collaboration with the Line Departments and Agril. Research Stations
- Drawing and distributing officer
- Conduct DLCC meeting to finalize seasonal action plans.
- Organise Training Programme to Extension personnel and farmers.
- Timely submission of reports and diagnostic survey reports etc.
- Prepare action plans based on database and mandal wise and month wise cropping plans.
- Monitor and evaluate the day-to-day functioning of the staff and the centre.
- Any other work assigned by the University.

Scientist (Crop Production) : (Asst./Assoc.Professor Cadre)

- Prepare mandal wise, month wise crop plans of the district.
- Formulate technical programme based on the database, recommendations of DLCC/ZREAC/SLTP.
- Organizing trials/demonstrations as per the approved technical programme.
- Develop need based production technologies for the training programmes organised by the centre.
- Report weather and crop conditions
- Participate in the diagnostic surveys as a team member.

- Providing technical information to the Line Departments for printing, multiplication and distribution of information materials among the farmers and extension personnel.
- Extending technical expertise related to crop production in the training programmes organized by the Line Departments and T and V. bi-monthly workshops.
- Any other work assigned by the Coordinator/University.

Scientists (Crop Protection) : (Asst./Assoc. Professor Cadre)

- Formulating technical programme based on the constraints in crop production in the district as per the database and recommendations of DLCC/ZREAD/SLTP.
- Organizing trials/demonstrations as per the approved technical programme.
- Developing crop protection technologies for the training programmes organized by the centre
- Participating in the diagnostic team surveys as a team member and timely reporting and developing action plans to overcome malady
- Extending technical expertise related to crop protection in the training programmes organized by the line departments and T and V. bi-monthly workshops.
- Providing relevant scientific information to the Line Departments for printing, multiplication and distribution of information materials to the farmers and extension personnel.
- Any other work assigned by the coordinator/University.

Scientist (Transfer of Technology) : (Asst./Assoc. Professor Cadre)

- Development and updating database of the district
- Documentation of Indigenous Technical Knowledge (ITKs) items through PRA tools.
- Organizing T & V bi-monthly workshops and bringout impact points in collaboration with Line Department.
- Formulating the technical programme based on the recommendations of DLCC/ZREAC/SLTP.

- Organizing 'Kisan Melas' / Exhibition/Field days/ Rythusadassus/Group discussions.
- Developing and updating Agril. Information centre in the DAATTC's premises
- Coordinating with AIR, electronic media and print media for dissemination of need based technologies in the district.
- Compilation and preparation of monthly and annual reports of the centre.
- Organizing training programmes for farmers/extension personnel.
- Laying out OFD's and FLD's in the farmers' field in collaboration with other scientists of the centre.
- Monitoring and collecting feedback of minikits laid by the Department of Agriculture for discussion in DLCC/ZREAC/SLTP.
- Implementing of RAWE programme at field level under U.G. Programme of ANGRAU.
- Preparation of model lesson plan for training programmes and crop based training manuals to the extent possible.
- Any other work assigned by the Coordinator/University.

KRISHI VIGYAN KENDRA (KVK)

Training Organizer : (Assoc. Professor in Extension Education)

- Responsible to the ADR and DE in functioning of KVK.
- Administration – technical, non-technical, finance, labour etc.
- Development of database of the district
- Development of KVK farm depicting demonstration units of different enterprises viz, Agriculture, Animal Husbandry, Fisheries, Sericulture, Home Science, Horticulture & Farm Forestry.
- Coordinating the activities of centre.
- To establish appropriate linkages and coordinate with the line departments and Agril. Research stations in the district.
- Drawing and disbursing salaries and operation of the budget.
- Organizing Scientific Advisory Committee (SAC) meetings to finalize action plans.

- Timely submission of reports and returns to the University and to the Zonal coordinator.
- Managing conflicts, if any, for efficient functioning of the centre.
- Receiving farmers, farmers calls and arranging suitable replies.
- Monitor and evaluate of day-to-day functioning activities of the staff and the centre.
- Any other work assigned by the University and Zonal coordinator.

Training Associate (Agronomy) (Asst. professor Cadre)

- Responsible to, and assist the T.O. in functioning of the KVK
- Formulating technical programme based on the recommendations of SAC meetings, zonal workshops and SLTP meetings
- Laying out model demonstration units on the KVK farm.
- Organizing Front Line and other demonstrations.
- Designing need based vocational trainings for the youth and school dropouts.
- Developing and delivering need based crop production technologies for the training programme organized by KVK.
- Reporting weather and crop conditions to the T.O.
- Ensure timely submission of reports, returns and periodicals
- Maintenance & basic / permanent record of work and field note books
- Maintaining farm on commercial lines.
- Any other technical and administrative work assigned by the training organizer/University.

Training Associate (Extension) : (Asst. professor cadre)

- Responsible to, and assist the T.O. in functioning of the KVK
- Conduct village and family surveys using PRA tools.
- Identify technological gaps and training needs in the district
- Formulating technical programme work based on the recommendations of SAC meetings, ZREAC and SLTP.
- Assist the T.O. in compiling and preparation of reports.

- Organize skill and production oriented short & long-term training programmes both On and Off-campus for practicing farmers and field level extension functionaries.
- Organize vocational training programmes for youth and school dropouts in association with other training associates.
- Organize field days, farm visits, kisan meals and group discussions.
- Develop and update information centre at KVK.
- To bring out information materials on the latest technologies
- Timely submission of reports
- Preparate model lesson plans and training manuals.
- Any other work assigned by T.O./University.

Training Associate (Plant Protection) (Asst. Professor cadre)

- Formulating technical programme based on the recommendations of SAC/Zonal meeting/SLTP and constraints recorded in the database.
- Laying out model demonstrations on the KVK farm to serve as a resource material for training.
- Organizing need based demonstrations.
- Developing and delivering need based crop protection technologies for the training programmes organized by KVK.
- Timely reporting the results of the demonstrations including feedback from the farmers.
- Diagnostic surveys to identify problems early and suggest remedial measures.
- Designing need based vocational training courses for youth & school droputs.
- Any other technical and administrative work assigned by the T.O./ University.

Training Associate (Horticulture) : (Asst. Professor cadre)

- Formulating technical programme based on the recommendations of SAC, ZREAC and SLTP meeting.

- Laying out model demonstration units on KVK farm with improved horticulture management components as resource for training the trainees.
- Organizing field demonstrations as per the technical programme.
- Developing and delivering need based horticulture crop production technologies for the training programmes organized by KVK.
- Timely reporting crop condition and the results of demonstrations and feedback.
- Designing need based vocational training courses for youth and school dropouts.
- Any other technical and administrative work assigned by the T.O./ University.

Training Associate (Animal Husbandry) : (Asst. Professor cadre)

- Formulating technical programme based on the need and as per the recommendation of the SAC, ZREAC and SLTP.
- Laying out poultry, diary and other Animal related demonstration units on the KVK farm with improved management practices to use it as a resource for training the trainees.
- Developing and delivering need based animal husbandry technologies for the training programmes organized by KVK.
- Timely reporting of the results of technical programme of work and feedback.
- Designing need based vocational training courses of the youth and school dropouts
- Any other technical and administrative work assigned by the T.O. / University.

Training Associate (Home Science) : (Asst. Professor cadre)

- Formulating technical programme based on the recommendations of SAC, ZREAC and SLTP.
- Maintaining a model nutrition garden on the KVK farm.
- Implementing the technical programme of work.

- Reporting the results of technical programme of work including the feedback from clients.
- Designing needbased vocational training courses for rural women, youth and school dropouts.
- Any other technical and administrative work assigned by T.O.

AGRICULTURAL INFORMATION & COMMUNICATION CENTRE

I. Principal Agricultural Information Officer :

- Responsible to DE in the functioning of AICC and press
- Administration and supervision of AI & CC and press drawing disbursing and operation of budget.
- Managing Editor for ANGRAU Newsletter and Journal of Research, ANGRAU.
- Overall responsible for arranging mass-media coverage for all functions of the University.
- Publishing & printing of all ANGRAU publications
- Overall responsibility for maintenance and establishment of information centres at all research stations/colleges.
- Co-ordination with Doordarshan, All India Radio and press
- Arranging exhibitions, kisan melas, Seminars, Conferences and workshops etc.
- Production of audio and video cassettes on agriculture and allied fields
- Arrangements for preparation and supply of audio visual material to the faculty members of ANGRAU.
- Any other work assigned by the University.

II. Research Editor :

- Receiving of articles for journal of research, ANGRAU
- Sending of the research articles to the referees with the approval of Honorary Editor.
- Receiving of the articles from the referees
- Editing and proof reading of the articles
- Collection of subscriptions

6. Distribution of journal to the members
7. Any other work assigned by the PAIO/University

Drawing and disbursing, preparation budget estimates, prompt submission of reports

III. **Farm Radio Officer** :

- Preparation of Radio scripts for broadcast
- Assisting the Principal Agricultural Information Officer in finalization of Radio talks, topics for production of video films by Doordarshan and other channels.
- Assisting the PAIO in arranging press conferences and issue of press notes
- Arrangement of P.A. system during University functions
- Arrangement of media personnel for coverage of University functions
- Production of Audio & Video films on Agriculture and allied fields.

IV. **Agricultural Information Officer** :

- Responsible for production of various publications on Agriculture, Animal Husbandry and Home Science
- Replies to farmers letters
- Organizing Agricultural Exhibitions and Kisan Melas
- Advise to the visiting farmers on Agriculture and allied fields

V. **Editor And Translator** :

- Publication of 'ANGRAU News Letter' in both Telugu and English languages monthly
- Receiving of articles for the News letter
- Editing and proof reading the articles
- Sending the copies of News letter to the concerned

ELECTRONIC WING

Senior Scientist (Agril. Extension)

- Coordinate activities of Electronic wing of the Acharya N.G. Ranga Agricultural University.

- Establish appropriate linkages with the various institutions of the University for production of T.V. programmes.
- Plan and produce T.V. programmes with the assistance of other scientists of the Electronic wing.
- Act as a liaison between the University and State Department of Agriculture and other allied departments in production of Rytumitra programmes.
- Develop linkages with the various Mass media channels like Doordarshan, E.T.V, Gemini, Teja and other private channels.
- Finalisation of identified topics, Identification of suitable resources persons to the T.V. programme to be telecast through Rytumitra and Distance Education with the approval of the University.
- Finalisation of resource persons from the University for phone in live session for Rytumitra with the approval of the University.
- Organise Training Programmes to the resource persons in preparation and presentation of T.V. scripts.
- Developing evaluation mechanisms to improve the quality of the programmes.
- Responsible to the Director of Extension and Principal Agricultural Information Officer in the over all functioning of electronic wing of the University.
- Presentation of workdone report and getting technical programme approved in State Level Technical Programme Meetings.
- Attend to any other work assigned by the Director of Extension / Principal Agricultural Information Officer.

Scientists

(Crop production / Crop protection / Horticulture / Animal Husbandry)

- Collecting district wise data base and crop plans from Directorate of Extension, ANGRAU.
- Formulate the T.V. Programmes to be telecast through Rythumitra and Distance Education based on the prepared district wise crop plans.

- Identify the topics to be disseminated through Electronic media.
- Conversion of Scientific scripts received into suitable format (story board format)
- Assist the Senior Scientist (Extension) in Planning and production T.V. Programmes of the Electronic wing.
- Assist the Senior Scientist in conduct of Training to the University Scientists in story board preparation etc.
- Presentation of monthly and annual reports and submitting to the Senior Scientist (Extn.) for consolidation.
- Assist the Senior Scientist (Extn.) in evaluation of T.V. programmes.
- Monitoring the editing of video programmes produced by the electronic wing.
- Any other works assigned from time to time by the Director of Extension, Principal Agricultural Information Officer and Senior Scientist (Extn.).

Senior Scientist (Extension) – Associate Professor Cadre at RARS

- Establishing first stage/early demonstrations / FLDS on proven technologies
- Organizing specialized training programmes for progressive farmers and extension personnel
- Training the SMSs of State department of Agriculture under T & V system in the bi-monthly workshops.
- Providing advisory services to farmers in specialized areas
- Conduct of field extension studies on important problems
- Assist the Associate Director of Research in organizing Kisan Melas, Farmers days, Exhibitions, Field days, Farmers' study tours etc.
- Developing and updating information centres and disseminates agricultural technologies through publications, letters, farm radio and T.V. programmes.
- Assisting ADR in implementation of RAWE programme for U.G. Students of ANGRAU.
- Implementation of village adoption programme.
- Assist ADR in Planning and recording of Distance Education programmes

- Assist ADR in conduct of ZREAC meetings
- Implementation of any other extension programme that may be taken up by University from time to time.

E.E.I, RAJENDRANAGAR, Hyderabad

PRINCIPAL

- Planning, Implementation and monitoring of the training programmes of the Development Departments of Clientele States and Union Territories.
- Participation in National workshop Planning and Management of Agricultural Extension Training and getting the approval of the Training calendar of the Institute.
- Organisation of training programmes in the specialised areas
- Review and revision of curriculum and introduction of new courses in training and teaching
- Offering courses and monitoring of Academic programmes for Ph.D studies
- Guidance and counselling the P.G. Students in Research projects
- Administration and Financial Management of the Institute
- Arranging Management Committee Meetings, Regional Workshops and Professor Bhaskaram Memorial Lecture.
- Undertaking consultancy for research projects
- Any other activity assigned by the GOI and University from time to time.

PROFESSOR OF MANAGEMENT SCIENCES

The Professor of Management sciences mainly concentrated on three areas viz, Training, Teaching and Research

Essential duties

- Plan and organise effective training programmes viz,
- Communication Techniques and Extension Methodology
- Upgradation of Communication skills
- Upgradation of Managerial skills

- PRA
- Participatory training methods etc.
- Train and promote effective training and communication skills among middle level functionaries of development departments. In training sessions, teach techniques for effective person to person contact, group discussions, skill teaching, use of simple aids. Initiate and promote the use of mass media and other communication method to complement extension field activities.
- Teach Ph. D Students on courses viz.,
- Advanced management methods
- Organisation Communication
- Planned social change
- Developmental programmes in action
- Advanced Research methodology etc.
- Guiding Ph.D students for their doctoral programme

Supplementary duties

Attend to any other duties assigned by higher authorities of the ANGRAU that do not interfere with the essential duties outlined above.

PROFESSOR (EXTENSION MANAGEMENT)

- Conducting On-Campus and Off-Campus training programmes such as Upgradation of Managerial Skills, Personality Development, Training Management etc. to the middle level functionaries of the Development Department of Client States.
- Offering Ph.D courses in Extension Education.
- Providing research guidance to the P.G. Students
- Formulation and conduct of research projects in the areas of impact analysis.
- Involvement in conduct of Management Committee Meetings of the institute
- Involvement in organising the Regional Workshop on planning and Management of Extension Training Programmes.

- Any other activities assigned by the Directorate of Extension, GOI and ANGRAU.

ASSOCIATE PROFESSOR (INFORMATION TECHNOLOGY)

- Conducting Training programme on "Management of Agricultural Information System".
- Assisting the faculty in conducting computer related activities.
- Teaching P.G. courses related to Information Technology.
- Guiding and counselling P.G. students research programme.
- Acting as Course Director for other training programmes of the Institute.
- Attending to assignments given by the principal from time to time.

ASSOCIATE PROFESSOR (TRAINING MANAGEMENT)

- Assisting in formulation / finalisation of Training programmes (both On and Off-campus) for the calendar year in consultation with the Development Departments, faculty of EEI and Directorate of Extension, ANGRAU.
- Implementation of the Training programmes to the officers of Development departments as approved at National level, New Delhi.
- Bringing out EEI Training programmes brochure depicting both On Campus and Off-campus workshops, allocation of slots to line departments of the Client States.
- Providing advance intimation to the Directors of Development Department officials about the workshop to be organised at EEI and also obtain nominations from their end.
- Preparation of Agenda note related to Training programmes/workshops including International Training programmes for the Officers of Development departments of the client States in the Regional/National Workshops on Planning and Management of Agricultural Extension Training for Southern Region.
- Finalisation of budget required for the approved workshops/ Training programmes.
- Conducting follow-up visits for assessing the effectiveness of the Training programmes/workshops.

ASSOCIATE PROFESSOR (COMMUNICATION MANAGEMENT)

- Teaching P.G. Scholars.
- Training officials of different line departments of Agriculture and other allied fields working in five states and three union territories.
- Guiding P.G. Scholars in Research work.
- Developing strategy for communication management.
- Assisting the principal; EEI and Director of Extension in various training and other related activities and research projects etc.

MANAGER OF AGRICULTURAL TECHNOLOGY INFORMATION CENTRE :

- Submitting plan of a work for ATIC every year for approval.
- Implementing the objectives of ATIC through by selling technological products, information materials and providing diagnostic services through Scientists to the Rural People and other end users as a simple window system.
- Developing linking with the 4 project directors of ATMA working in Kurnool, Chittoor, Adilabad and Prakasam districts of A.P.
- Developing question-answer in various crops and enterprises for the use of the rural people and end users through Internet.
- Strengthening information centre through technological products and photo laminations.

ASSOCIATE PROFESSOR (HUMAN RESOURCE DEVELOPMENT)

- Designing and development of content and organising the training programmes in the areas of Human Resource Development (HRD), Human Resource management (HRM) and Human Resource Planning (HRP) etc.
- Offering courses on HRD for Ph.D students
- Developing training manuals related to HRD, HRM and HRP
- Research and guidance to the P.G. students in H.R.D.
- Keeping abrest with the HRD policies of Line departments of Clientele states.
- Undertaking consultancy projects in HRD
- Preparation of extension literature on HRD, HRM and HRP etc.

- Any other work assigned by the Principal, EEI and the University.

ASSOCIATE PROFESSOR (MULTI/PRINT MEDIA)

- Organising Training programmes viz. Multimedia, Agricultural Journalism, Computers etc.
- Undertaking courses of Ph.D students on Agricultural Journalism.
- Helping Ph.D students on courses and research pertaining multi-media and Agricultural Journalism.
- Any other work assigned by the Principal, EEI and the University.

ASST. PROFESSOR (MONITORING AND EVALUATION)

- Conducting training programme on "Monitoring and Evaluation" and other related courses.
- Evaluation of all training programmes.
- Involving in Teaching of P.G. Courses.
- Guiding and counselling of P.G. students including M.V.Sc (Extension) in the area of 'Research Methodology'.
- Assisting the faculty in their 'Research Projects'.
- Assisting the Principal in conducting the "Regional Workshops, Management Committee Meetings, Field visits etc.
- Attending all other office work assigned by the principal and Head from time to time.

ASSISTANT PROFESSOR (COMPUTER, ICVT)

- Planning, formulation, development of content, conduct of the training programmes on use of Computers and video technology in agriculture, Management of Agricultural Information systems, participatory techniques, Communication Management skills, HRD and Farming Situation Based Extension.
- Assist in implementation of Teaching, Research and Training programmes and projects.
- Conduct of practicals related trainings and teaching
- Development of Web site and keeping extension literature in Web site
- Assist in preparation of training manuals/Extension Literature

- Assist in liaisoning with line department officials
- Assist in organizing regional workshops
- Assist in preparation of agenda notes and proceedings of management committee.
- Participation in Seminars, Workshops, Training Programmes
- Assist in follow-up activities
- Any other assignment given by Principal from time to time

ASSISTANT PROFESSOR (ORGANIZATIONAL DEVELOPMENT/ BEHAVIOUR)

- Conduct of training programmes on organizational behaviour and related programmes.
- Assist in implementation of Teaching, Research, Training Programmes and projects.
- Assist in conduct of practicals of training programmes
- Assist in preparation of extension literature including EEI News letter.
- Any other work assigned by Principal from time to time.

ASST. PROFESSOR (EXTENSION)

- Assisting in organising various training programmes of E.E.I.
- Assisting the Professors in taking various classes for Ph.D students.
- Assisting the Professors in preparation of Extension literature
- Any other work assigned by the principal, EEI and the University.

FORMULATION OF TECHNICAL PROGRAMMES & PRESENTATION

*Dr. P. GIDDA REDDY**

In the last 3 decades, Indian farmers have not only shown great resilience in adversity but also tremendous opportunism in making the most of favourable conditions. The agricultural production has shown a very positive growth rate over the long term and brought India close to self sufficiency in food grains and considerable marketable surplus in most commodities. Thanks to the cutting edge of the science and technology which made possible self sufficiency with regard to food grain production. Agricultural technologies are instrumental in leading to green, white and blue revolutions in the country. This has been largely due to the phenomenal efforts of our agricultural scientists and extension officers who helped the farmers to overcome their problems and realise their potential.

The Liberalization – an opportunity

We already have the infrastructure, man power and resources. Economic liberalisation has changed our orientation from a pure public delivery system to a more facilitative role in channeling the increasing capabilities of the private corporate sector and non-governmental organisations. Our experience has taught us that sustainable agriculture requires not mere consultation but total involvement and participation of researchers, extensionist and farmers and getting farmers organised to manage their own natural and other resources. Research and Development (R & D) efforts have brought us on the threshold of a quantum jump in the availability of crop production technologies, value addition technologies, information-processing technologies and participatory extension and communication technologies.

Changing Phases in Agricultural Research, Extension and Development

Robert Rhoades (1989) reviewed and grouped under 4 phases :

- **Production** phase (1950-1975) in which pioneering disciplines were breeding and genetics, and farmers were seen as recipients of technology.

* Dy. Director of Extension, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad - 30

- **Economic** phase (1975-1985) in which Farming Systems Research)FSR) was pioneered by economists and agronomists and farmers were seen as source of information.
- **Ecological** phase (1985-19995) in which anthropology, agroecology and geography are pioneers and farmers contributed their indigenous knowledge (ITKs) and seen as victims of unsustainable development.
- **Institutional** phase (1995 onwards) in which pioneering disciplines are management specialists, psychologists, training specialists and extension educators, and farmers are full collaborators of research and extension.

Any vision for a future institutional phase/stage will best be grounded through participatory approaches, new professionalism and new institutional settings.

Robert Rhodes (1989) in the above phases has clearly brought out how the 'farmer' could adjust himself to become the stakeholder in the agricultural research-extension system. Farmer was a silent recipient of technology during 1950-1975 but has become a source of information for the research and extension in 1975-1985. The farmers with their ingenuity have contributed to the agricultural development through indigenous technical knowledge in 1985-1995. From 1995 onwards the farmer became full collaborator of research and extension system indicating that he is the most crucial link in the research-extension-farmer linkage chain.

What Makes Agricultural Research Out of Focus?

There are a variety of factors contributing to the existing situation.

There are :

- Researchers' inadequate knowledge of the farming situation, and low perception of farmers' circumstances and their needs.
- Widely differing conditions on the research stations (where research is conducted) as compared to farmers' fields (where technology is adopted)
- Excessive discipline-orientation of research instead of problem-orientation.
- Inadequate farmer participation in formulating research agenda, and lack of farmer pressure for relevant research and acceptable technologies.

- Recommending technologies based on the results at the research stations without adequate and proper testing in the farmers' fields under the farmers' resource and risk situation.
- The skewed value system, where career advancements are based on the number of years spent in the post and the number of papers published, and not on the contribution to technology generation and service to farmers.
- Inability of researchers to distinguish between science and technology.
- No accountability and hence, no efforts are made to fit research to the farmers' needs; it is simply easier to do what one likes than what is required.

Agricultural Extension is confronted?

- Extension is criticised for not doing enough
- Move to privatise public extension
- Institutional pluralism (Public extension, Private consultants, NGOs, Input extension)
- Frequent change of extension models leading to unsettlement
- Should technology and inputs delivery from single source
- Capacity of the extension staff (especially grass root workers)
- Use of indigenous knowledge, environment protection, sustainable agriculture and poverty alleviation etc.
- Extension has accumulated a fund of experience and valuable lessons

Formulating Technical Programme of Work

The basic purpose of Research or Extension in Agriculture is to develop technologies or prepare programmes for development based on the needs of the farmers and the problems faced by the farmers in actual field situation. As a general rule, diagnostic surveys should include representatives of commodity research programs for major enterprises in the target system, social scientists and representatives of other relevant disciplines to serve as a means of setting research priorities within and between commodities (Byerlee & Tripp, 1988).

Most of the research and extension programmes, if examined carefully, will be found not wholly relevant to farmers' needs (Cernea et al, 1985). Classifying the problems and defining the needs of the farmers is an important step in program planning in extension. But, this step was not at all followed while planning agricultural production programmes at village level.

Researchers are not generally geared to producing technologies applicable to very specific and quite different agro-climatic conditions (Crawford and Barclay, 1982). Peasants have not been given an opportunity to actively participate in the identification of their basic agricultural problems. "Non-involvement of farmers in problem identification has greatly contributed towards the inapplicability of most of the research and of the research findings". Identification of major problems in a representative technological zone is the first step in any research strategy. Recognition of the need or problem is the first step in the innovation development process (Rogers, 1995). Diagnosis to arrive at a common definition of the problem is the first and foremost step in the process of generating acceptable technology in agriculture. Most of the world's agricultural research is probably not profitable. It is often carried out without concern for urgent needs.

It is now well recognised that innovations emerge through multiple sources including public, private and even informal research carried out by innovative farmers. Likewise extension of new technologies is carried out not only by public sector but also by private sector, cooperatives, NGO, besides natural diffusion through farmers themselves. Hence, there is need to integrate various sources of innovations and extension in such a manner that they provide a proper synergetic effect.

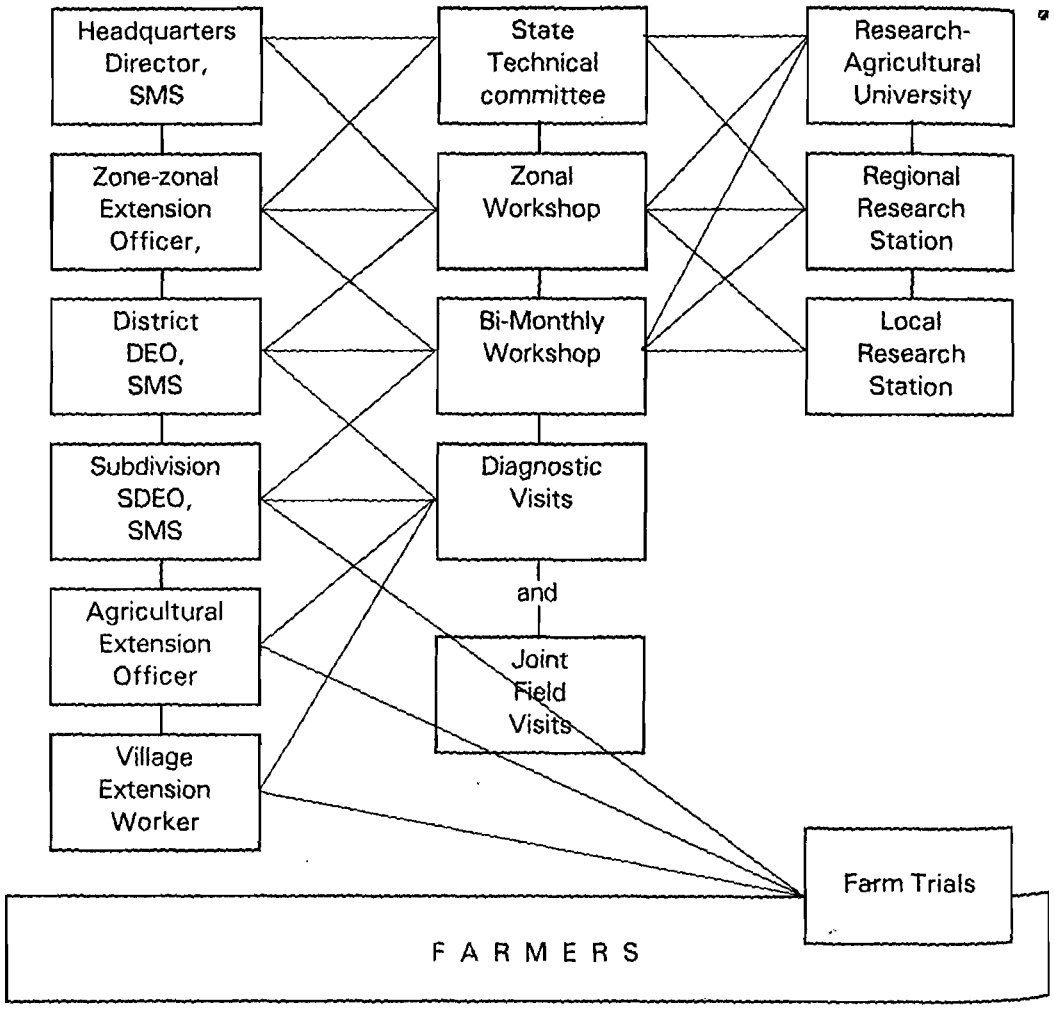
The ultimate objective of both research and extension system is to increase agricultural production Formulating research and extension agenda based on producers requirements results in technology that will be more acceptable to users. This also helps in allocation of resources to both research and extension activities to be taken up. Therefore, the strategic research and extension plan through the systematic mechanisms needs to be followed to address the specific problems of the farming community.

Mechanisms Facilitating in Formulation of Technical Programmes :

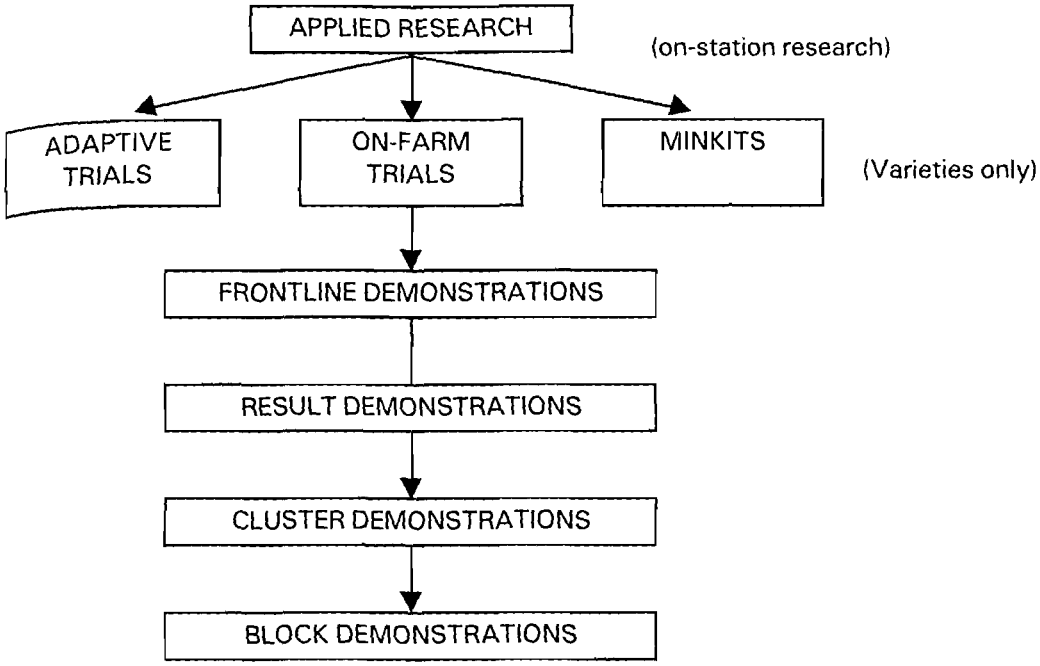
- State Level Technical Committee (SLTC)

- Zonal Research & Extension Advisory Council (ZREAC)
- Bi-monthly Workshop
- Diagnostic visits
- Joint field visits by research and extension
- On-farm trials
- Literature

MECHANISMS FACILITATING FORMULATION OF TECHNICAL PROGRAMME
(Participation at different levels)
Department of Agriculture



Mechanisms used in Technology Transfer



Adaptive trials :. It is a process of testing, evaluating and adapting applied research results in a specific locality or situation to a wider field.

- Replicated trials (2-6 treatments)
- Borrowed technology from applied research conducted elsewhere
- Data is generated
- Conducted at Govt. farms/progressive farmer fields when ideal farming situations are not available with existing ARSs
- Jointly conducted by Scientists, exténsionist and farmers
- Provide training and observation material for extension personnel

On-farm trials : A promising technology in the final stages of testing at research stations is selected as on-farm trial.

- Large scale single replicate of a promising technology

- Verification and fine tuning under farmers conditions
- Sufficient data is available on the technology
- Jointly by Scientists, extensionist and farmers
- Used to test the steps in technology; i.e, what happens when a component of a package is deleted/reduced to suit to farmers monitory resources

Minikits : are small sized plots designed to give rough and ready but nevertheless, reliable indications about the performance of a new variety laid out simultaneously in a wide geographical area comprised of several agro-climatic zones.

Two types : i) Research or multilocation trials

ii) Extension minikits

Frontline Demonstrations

Frontline Demonstration is the new concept of field demonstratin evolved by the Indian Council of Agricultural Research with the inception of the Technology Mission on Oilseed Crops during mid-eighties. The field demonstrations conducted under the close supervision of the scientists are called frontline demonstrations because the technologies are demonstrated for the first time by the scientists themselves before being fed into the main extension system of the State Departments of Agriculture.

Special Features

The front-line demonstrations are different than the normal demonstrations conducted by the extension functionaries. The special features of frontline demonstrations are :

- Fronline demonstrations are conducted under the close supervision of the scientists
- Only newly released technologies or those likely to be released in near future are selected for the frontline demonstrations
- Frontline demonstrations are organised in a block of two to four hectares involving all those farmers whose plots fall in the identified demonstration bolck;

- Only cirtical inputs and training are provided from the scheme budget, remaining inputs are supplied by the farmers themselves
- Training of the farmers associated with the frontline demonstrations is a pre-requisite for conducting such demonstrations
- The target audience of frontline demonstrations are both farmers and the extension officers. The purpose is to convince extension functionaries and farmers together about the potentialities of technologies for further wide scale diffusion; and
- Frontline demonstrations are used as a source of generating data on factors contributing higher crop yields and constraints of production under various farming situations.

Result demonstrations : It is a way of showing people the value or worth of an improved practice whose success has already been established on the research station followed by on-farm trials.

Cluster demonstrations : Organised in different clusters (about 10-25 ha.) within the same village to make large number of farmers visually get impressed about the successful technologies.

Block demonstrations : Demonstrating technologies on a large scale (50-500 ha) on small and marginal farmers' fields which are situated contiguously involving more than one village so as to convince everyone about the efficacy of new technologies.

METHODOLOGY IN PROBLEM IDENTIFICATION

A set of steps has been identified for identification of problems/ needs of farmers which can form the basis for developing client-oriented technology-generation projects for technology dissemination or extension project. The steps are described below.

- Identifying key informants in villages
- Ranking the problems
- Estimating the economic importance
- Contacting the required number of farmers and key informants
- Collection of data for area for the crops grown in the village

- Estimation of the magnitude value of the problem
- Separation of research and non-researchable problems
- Preparing the problem tree
- Preparing the technical plan of work
- Implementation of the action plan
- Feed back

FORMULATING TECHNICAL PROGRAMME OF WORK – GUIDELINES

The following guidelines are suggested for the scientists while preparing the technical programme of work.

- India being a global partner, Transfer of Technology needs a different approach in WTO regime and agriculture has become a trade at the international level.
- The extension programme should aim at soil health, profitability and quality of produce.
- The TOT scientists should address the location specific constraints at the field level.
- Recommend technologies based on farmers' resources and risk situations.

Paradigm shift from :

- Productivity to profitability
- Subsistence to commercial agriculture
- Crop oriented to farming systems oriented

Technical Programme of work need to be formulated based on :

- Mandal-wise, Month-wise cropping plans
- Resource based constraints of Micro-farming situations
- Diagnostic surveys be based on scientific principle of Survey & Surveillance
- Formulate technical programmes based on cost reduction technologies
- Programme of work on alternate high value crops

- Formulate action plans to discourage rice cultivation in well irrigated red soils; cotton on chalka soils
- Technical programmes to promote greenmanure crops, greengram, leguminous fodders in various cropping systems to enrich soil
- Formulate farmer interest groups/commodity based groups/SHGs for imparting training in specific areas.
- Focus on imparting of skills of new/innovative technologies
- Training programmes should have clear objectives supported by well drawn lesson plans and Training manuals

PRESENTATION SKILLS

1. SKILL OF INTRODUCING

- Beginning statement
- Questions to test the previous knowledge
- Devices used
- Concluding statement

2. SKILL OF PROBING QUESTIONS

- Prompting
- Seeking further information
- Increasing critical awareness
- Refocusing
- Redirection

3. SKILL OF EXPLANATION

- Beginning statement
- Coverage of essential points
- Explaining links
- Concluding statement
- Questions to test pupils correct responses

Undesirable

- Irrelevant

- Lack in fluency
- Continuity
- Inappropriate vocabulary
- *Use of vogue words and phrases*

4. SKILL OF ILLUSTRATING WITH EXAMPLES

- Simple
- Relevant
- Interesting
- Verbal/Non verbal approach/Media
- Inductive/deductive approach
- Sufficiency
- Pupils participation

5. SKILL OF STIMULUS VARIATION

- Movements
- Gestures
- Change in speech patterns
- Focus
- Deliberate silence – Pause
- Change in Interaction style
- Oral – Visual switching

PRESENTATION – USING VOICE

- PROJECTION
- ARTICULATION
- MODULATION
- PRONUNCIATION
- ENUNCIATION
- REPETITION
- SPEED

Dealing with difficult participants

• THE HECKLER	*	Probably insecure
	*	Get satisfaction from needling
	*	Aggressive and argumentative
What to do	*	Never get upset
	*	Find merit, Express agreement, move on
	*	Wait for a mis-statement from him and then ask the group to correct it
• THE TALKER/ KNOW ALL	*	A Chatterbox
	*	A show off
	*	Well informed and anxious to show it
• THE GRIPER	*	Feels "hard done by"
	*	Will use you as scapegoat
What to do	*	Get him to be specific
	*	Tell him presentation is positie and constructive
	*	Use peer pressure
• THE WSHIPERERES	*	Do't understand wht is going on
	*	Sharing anecdotes triggered by your presentation
What to do	*	Stop talking, wait for them to look up
	*	Use light house technique
• THE WRONG ONES	*	Has the facts wrong
	*	Is just plain stupid
	*	Is confused in verbal expression
What to do	*	Wrong? Thank and ask the group comment
	*	Tactfully restate his viewes

PREPARATION AND PRESENTATION OF TECHNICAL REPORTS

*Dr. P.Punna Rao**

Science is a body of systematized knowledge subject to verification and time. Science embodies theories, concepts, ideologies, and principles about a particular subject. It is a base and prerequisite for the technology generation. Technology is generated in the form of machines, tools, methods, procedures, implements and so on.

Scientific writing is writing about scientific subjects and about the subjects associated with it. Scientific writing is planning scientific information systematically, organizing skillfully and putting it in a logical sequence by following an effective style of communication.

The scientific report is a report, which contains relevant, adequate and logically arranged scientific information presented in a specific format. Thus thesis is a scientific report but the efforts, skill put in preparing it, is a process of scientific writing. Technical report writing is writing about the technical subjects and the associated areas. The writing procedures and style of reporting, however, do not have significant differentiation between scientific and technical report.

It may be remembered that scientific writing is presentation of scientific truth and not the opinion, views or personal feeling of the author. Hence, whatever has been observed through experimentation and investigation is reported. The scientific reporting is normally according to standard national and international norms of writing which we may not find in case of literal type of writing such as novels, stories and so on.

Thus comprehensive definition of scientific report writing is that "Scientific report writing about science characterized by use of scientific and technical vocabulary, use of graphical presentation and conventional report form. It is further characterized by impartial attitude of author, conveying correct and concise information without exaggeration.

---

* Asst. Director of Extension, Admn. Office, ANGRAU, Rajendranagar, Hyd-30.

The importance of scientific reports is relatively more from further research point of view, while that of technical report from actual use of technique at the field level.

It is necessary to look into the details of the characteristics of scientific report to understand its meaning.

The scientific report is characterized by following three aspects

- Nature of report
- Author's attitude
- Writing technique

Nature of Report

Understanding the nature of scientific and technical report is very essential. The nature of report is characterized by

Use of scientific and technical vocabulary
Use of graphical presentation and
Use of conventional report form

i) Use of scientific and technical vocabulary

Every subject has its scientific and technical vocabulary. The subject dictionaries and encyclopedia provide sufficient and relevant vocabulary. Social science dictionaries, medical dictionary, engineering dictionary are some examples in this regard. Author of a scientific report must develop his scientific vocabulary and often try to use it in writing. Scientific words, terms, concepts, phenomenon particular field of science hence writer must be aware about it. As the reports are circulated in various countries of the world, it is necessary to make the report understandable internationally.

Use of scientific vocabulary has following advantages

It avoids ambiguity and confusion
Clear and concise reporting possible
Help to convey perfect meaning to the reader
Accurate presentation possible

ii) Use of graphical presentation

In scientific reports the data is presented in various forms i.e. tables, text and diagrams. Diagrammatic/graphical presentation helps to simplify

presentation. For those who do not have time to read whole report, diagrams or graphs provide required information quickly. Graphs, bar diagrams, and pictographs are the common modes of presentation in the scientific reports.

iii) Use of conventional report forms

Several types of scientific reports are written and for every report there is a specific format. Thus, research paper, synopsis, popular article, each has a distinct format. Hence, author must know the detail format of the report he intends to write. The formats of different reports may slightly vary according to the norms laid down by the institution or the editors; however, the basic format remains the same and is as follows :

1. Preliminaries
2. Body or Main text
3. Summary

- **Author's Attitude**

The attitude of the author or the writer of a report is very important in report writing. There are following aspects regarding author's attitude which author has to remember.

a) Attitude of impartiality and objectivity

The scientific report is based on truth and data generated through systematic research hence care has to be taken to present data and related aspects without manipulation. The author should be impartial with observation and his personal bias should not be involved in data presentation. There has to be objectivity in presentation and hence what exactly the author is required to write must be written.

b) Convey information accurately and concisely

Quality of report in terms of its utility to audience depends on accuracy of subject matter. The methods used for research and the findings of research must be correctly presented. Clarity of thoughts and sound vocabulary avoids verbosity in the report. Similarly use of simple and direct sentences makes the reports concise.

c) Absence of efforts to arouse emotions

Scientific reports contain scientific truths. Hence any exaggeration or biases by the author would deteriorate the quality of report. Such reports

unnecessarily arouse audience emotions and make them use the methods or concepts to their disadvantage. Researcher sometimes tries to polish his presentation and in an effort to make the report more impressive, adds exaggerated and false information. It should be avoided. The credibility of the scientific presentation should be always maintained.

- **Writing Technique**

Relativity high concentration is necessary on writing technique. In particular, the description of methodology, definitions, classification and interpretation of the tabulated data must be most technically and correctly written.

Type of Scientific Reports

The scientific reports are of varied types and the teachers may be concerned with some important amongst them. Following are the most common reports.

1. Thesis/Dissertation/Comprehensive report
2. Research papers/articles
3. Review papers
4. Case studies
5. Synopsis or Outline of research work
6. Project reports
7. Seminar papers/reports
8. Minutes of the research meetings
9. Popular articles
10. Abstracts

Principles of Scientific Report Writing

Scientific report writing is usually based on following five principles :

Principle of understanding the audience or the reader
Principle of deciding the purpose or object of writing
Principle of use of proper language
Principle of effective communication of the information

1. **Audience or Reader**

Audience or reader means a person who uses the report. Scientific report should be useful to a particular type of audience. Every report may not be

useful to all the people because the scientific needs and comprehension of different audiences is different, hence, first understanding the audience, for whom report is to be written is essential. There are mainly following types of audiences or readers.

Academic audience

Scientists, students, teachers form the academic audience. These people are interested in knowing every detail of the experimentation and investigation and its findings. Therefore, reports written for such audience are in detail and in most scientific form. Thesis, research papers, review articles etc. fulfill requirements of such audience.

Lay audience

Lay audience means general public, farmers and so on, which do not possess formal education in a particular field of science. Their interests are mainly in practical use of science in their day to day living, in farming, health and sanitation etc. Hence, reports for lay audience are written in simple language and no methodological aspects of investigations are described.

For example : Farmer is interested in knowing what insecticide and what does should be applied for control of insects on crop, he may not be eager to know how insecticide is tested, in what way the dose is decided and how it reacts with insect in the field.

Administrators and policy makers

The administrators and the policy makers may not be interested in methodology used for research or the related techniques. They look to the use of result of a research for preparing policies for development of the people or for execution of a particular programme. Hence, reports for the administrators are usually less technical and scientific.

Sponsorers

Sponsorers are the agencies who offer funds for undertaking research, mostly for testing their products in the field situation.

For example : An insecticide company may sponsor a research project for testing its insecticide for control of insects on a certain crop. Such

audience is mainly interested in knowing about the comparative performance of their product and not about how research has been conducted.

Thus considering the requirements of the target audience the author has to emphasize the relevant subject matter and sections in the report and decide the nature and the details of information to be written in the scientific or technical report.

2. Purpose of Writing

Objective of writing a report and object of conducting research are different. Purpose or object of writing a scientific report may be :

i) To give detail information about methodology of research, its findings and recommendation in a scientific manner to facilitate further research and its validation or to facilitate use of recommendations at the field level.

ii) To give information for creating general awareness amongst readers about a particular subject.

Depending upon the objectives of writing the subject matter, the format and style of writing is to be decided. For example, the object of research article is to convey scientific information about the need and objective of research, methods and the findings etc. to the academic community. Whereas, in a popular article information of practical utility is given to that one can use it at the field level.

3. Use of Proper Language

Use simple language in report writing. Do not use very difficult and uncommon words or terminology. Remember that your interest is communication of information and not impressing or confusing the audience. Use of flowery or decorative language should be avoided. It conveys shallow thoughts. But while doing so standard technical and scientific vocabulary should not be avoided.

4. Effective communication

Here I am reminded of Gladstone's saying "what you say is certainly very important but how you say is even more important" and it is true for

oral as well as written presentation. In scientific report writing remember three tell story

First tell	What you intend to tell	Introduction
Then tell	What you have intended to tell (in details)	Main text
And finally tell	What you have already told	summary

Use of simple and direct sentences convey intended meaning. Avoid padding, unnecessary repetition, circumlocution and redundancies. Avoid long sentences that have many adverbial and adjective clauses.

Pre-presentation preparation

- Rehearsing for presentation

Once the report is ready it should be read thoroughly and carefully as many times as you feel necessary. Present it to your friends or alone. Then judge it against the time available, material covered, your speed of presentation and synchronization with visuals if any. It will help to correct the errors in text and style of presentation and also help to delete unwanted material and will give clear understanding about what to speak and how much to speak.

- Prepare short notes for yourself

Remember that you have not to read the report at the seminar therefore it is advisable to draw short notes on separate cards. Record important point on the cards, which you can easily refer during presentation. Prepare one card for introduction, a few cards for text and one for summary.

- Prepare a short note for audience

Prepare short notes for circulation to the audience. Do not include details in the note otherwise audience may not attend you with interest.

- prepare visual aids

To supplement your presentation with visuals prepare relevant visual material as per lesson plan such as slides, transparencies for overhead projector and see that they are properly arranged and tested before actual presentation. Check that black board, chalks and screeen is placed at proper place. The OHP should be at the right hand side of the speaker.

Presentation of Report

It is quite obvious that the beginners feel discomfort and nervousness during presentation. A very few people are able to stand up and speak to an audience in an informative and effective manner without discomfort and nervousness. However, it can be avoided by preparing well for presentation. There is of course a need of clarity of expression and good circulation of ideas. Skill of handling the questions is the most important aspect for the speaker and hence for effective presentation remember following.

1. Introduce the topic at the beginning
2. Present the topic in detail
3. Summarize the topic at the end

Following three questions must be kept in mind while presenting the report

a) What to present?

- Firstly write the title of topic on the blackboard or show it on the screen. Then state the underlying objectives of your topic.
- Concentrate on main concepts and eliminate irrelevant and confusing details.
- Present important points step by step and repeat if necessary to clarify the details. Frequent repetition is however not desirable.

b) How to present?

- Capture the full attention of the audience at beginning. Say good morning, Good evening, whatever is relevant, with a smile on your face. Establish relationship with the audience by introduction. Create interest in them by good impact of opening the topic. Do not be excited, be relaxed and sincere. Take some time to create rapport with the audience.
- Do not read the report. Remember not to read the report. You have to present and not to read it. Reading reflects poor presentation and also you loose contact with the audience.
- Do not begin presentation with apologies for shortcomings in yourself and shortcomings of the situation.
- Select proper words and compose meaningful sentences. Do not speak too slowly or loudly or too fast.

- Be careful about mannerism. Talking to blackboard or the roof, looking through windows, hand in pocket, easing hairs, playing with keys or pens etc. or any other awkward movements should be avoided. It disturbs the attention of audience and you may become a point of criticism.
- Use AV aids : Prepare good quality, clear, relevant and informative but concise visual aids. Usually transparencies on OHP, slides, posters, charts of different types, live samples, models, video programmes etc. are used to supplement the oral presentation. Before using the AV aids ensure that you know how to use it. Do not depend upon the operator because he is not always able to synchronize display of visual with your talk. Do not use many AV aids because AV aids are not to substitute you. Therefore select appropriate aid, practice it before use and then use it during seminar.
- Follow the given time : Complete the presentation in a given time limit. It does not matter if you finish a few minutes earlier, it can be covered in discussion. Do not speak too long and irrelevant. The distribution of time may be broadly as follows.

Introduction :	10 per cent of the time allotted
Main text :	80 per cent of the time allotted
Summary :	10 per cent of the time allotted

c) How to end?

Alike the beginning of seminar its end should also be impressive and effective. Remember the following points about it.

- Do not end abruptly and with apologies for, whatever, lacunae in the presentation.
- Keep the audience charged with what they have listened, allow them to ask questions and give their own suggestions.
- Do not get angry and excited if the audience asks questions. If you are well prepared you can make the question and the discussion session more interesting and meaningful.

To Sum up

Producing effective writing requires that people know how to :

- Think through their message and develop a supporting argument with details and examples

- Structure the document and its sentences to manage the reader's interpretation of the message and argument
- Choose precise words and language units that are based on content and desired impact and are understandable by readers who may not have comparable knowledge in the document's subject.

It is not true that writers who depend on short words and short sentences write effective. It is true that writers who place information in the right sequence and use effectively structured sentences, with many precise verbs, write effectively.

Rehearsing for presentation help in clear understanding about what to speak and how much to speak.

Selected Readings

Ingle PO 1999 Scientific Report wirting. Akola offset, Rautiwadi, Akola

Kroeger Lin 1994 Communication Training : Writing. In HR Management and Development Handbook 2nd Edition by William R Tracy. American Management Association, Newyork.

Tripathi PC 2002 A Textbook of Research Methodology in Social Sciences. Sultan Chand & Sons, New Delhi -2.

MANAGEMENT

MANAGEMENT - MEANING, COMPONENTS AND PROCESS

P. MARUTHI RAM *

Management concerns the process of putting human aims, knowledge and skills into effective action. It is decisive and produces actions that lead to successful accomplishment.

Management is accomplishing of predetermined objectives through efforts of other people. Motivate other people to develop right attitudes to accomplish the task.

Managing is the creation and maintenance of an internal environment in an organization, where individuals working together in groups can perform efficiently, and effectively towards the attainment of group goals. Management then be called 'performance environment design'.

All those persons responsible for extracting work from others are managers – low or high. All are managers. All types of organizations need managers. Managerial functions are universal.

Management manages, men, machines, money, materials etc given to them for efficient utilization and for achieving the objectives.

Management is essential ingredient of economic development. Management is dynamic. Its operating mode is flexibility and its essential resource is people with knowledge.

Management is decision-making function and administration is executive function.

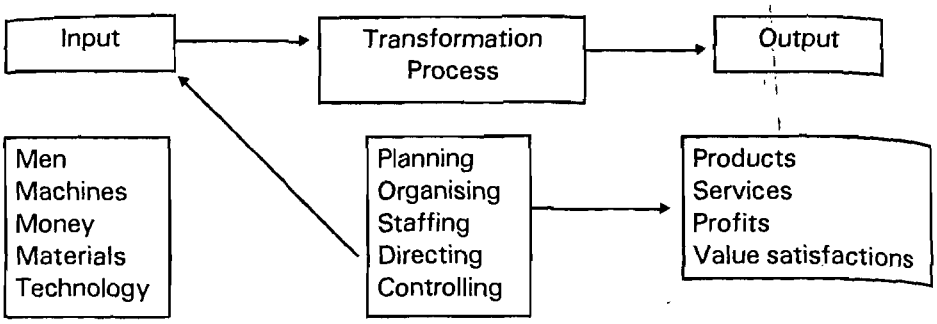
Management is a process made up of definite functions according to George R. Terry Viz. 1. Planning 2. Organizing 3. Actuating and 4. Controlling.

Luther Gullick described the function of manager with a catchword 'PODSCORB' which include planning, organization, directing, coordinating, reporting and budgeting.

Modern writers have included a. Innovation b. Representation and c. Communication as some other important functions of managers.

* Professor, Agri. business Management School, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad.

Management is a system & a process as shown below.



Nature and importance of management :

Management is universal in the modern industrial world. Every organization requires the making of decisions, the coordinating of activities, the handling of people, and the evaluation of performance directed towards group activities.

Management refers to a special group of people whose job it is to direct the effort and activities of other people toward common objectives.

Harbison and Myers in their management in industrial world observe management as (a) an economic resource (b) a system of authority (c) a class or elite (elite of brains and education).

Managers are leaders : Leadership involves personal qualities which endure one person to induce other to follow:

Roles of Managers :

Mintzberg grouped ten basic basic roles performed by managers as (a) Interpersonal (b) Informational and (c) Decisional. (Roles describe what managers actually do whereas functions describe what manager should do).

I. Interpersonal roles :

a) A figurehead – a symbol of positional authority (to sign, to attend to protocol etc.)

b) A leader – Hires, trains, encourages, fires, remunerates and judges.

c) Liaison – between publics.

II. Informational roles :

a) Monitors of information

b) Disseminators of information

c) Spokes persons or representatives of the organization.

III. Decisional roles :

a) Entrepreneurs – initiators, innovators, problem solvers.

b) Disturbance handlers

c) Resource allocators

d) Negotiators

Fundamental skills of managers :

Robert Ketz – Skills of an effective administrator – (a) Technical (b) Human and (c) conceptual (discovering new & unique ideas)

Charles E. Summer – Opines that the skills need be developed in manager are (a) knowledge factors (b) Attitude factors and (c) Ability factors.

Ability factors – skill, art, judgment, wisdom

Knowledge factors – Ideas, concepts, principles

Attitude factors – Beliefs, feelings, values.

Opportunities for management in 1980's :

1. Post industrial society – service oriented organizations are dominant
2. Growth in public sector
3. Women in management – the Role of woman is increasing.
4. Emergence of information society
5. Entrepreneurship – Small business units are providing leading edge.

Scientific management

F.W. Taylor defined scientific management as management characterized by science and scientific method. In Taylor's words 'scientific management is not any efficiency design nor is it any bunch or group of efficiency devices. In its essence, scientific management involves a complete

mental revolution on the part of the workingman and it involves equally complete mental revolution on the part of those on management side. Taylor believed that to manage effectively, management should adhere to the following principles. 1. replacement of rule of thumb method by scientific one, by the exact determination of each man's work on the basis of elementary motions or operations. 2. scientific selection, placement and training of workers 3. absolute co-operation between labour and management and 4. that management has to assume responsibility for activities which are of managerial nature. Taylor's contribution is chiefly in the sphere of factory management or shop floor management rather than in general principles of management.

Administration

Henry Fayol, whose contribution is chiefly in the sphere of general management, subdivided the function of management into five sub-groups concerned with a. prevoyance b. organization c. Co-ordination d. direction and e. control.

RECRUITMENT, TRAINING AND PLACEMENT

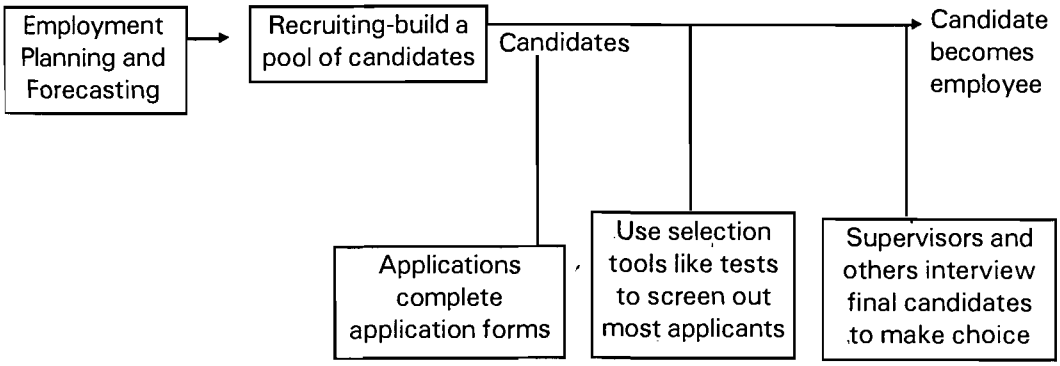
*Dr. P. MARUTHI RAM**

The recruiting and selecting process can best be envisioned as a series of hurdles/steps aimed at selecting and placing the right candidate for a specified job.

Specially, recruiting and selection require :

1. Doing employment planning and forecasting to determine the duties of the positions to be filled.
2. Building a pool of candidates for these jobs by recruiting internal or external candidates.
3. Having the applications fill out application forms and perhaps undergo an initial screening interview.
4. Utilizing various selection techniques such as tests, background investigations, and physical exams to identify viable job candidates.
5. Sending to the supervisor responsible for the job one or more viable job candidates.
6. Having the candidates go through one or more selection interviews with the supervisor and other relevant parties for the purpose of finally determining to which candidate (s) offer should be made.

Steps in recruitment and selection process :



The recruitment and selectionprocess is a series of hurdles aimed at slecting the best candidate for the job.

* Professor, Agri. business Management School, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad.

Employment planning and forecasting :

Employment planning in the process of formulating plans to fill future openings based on an analysis of the positions that are expected to be open and whether these will be filled by inside or outside candidates. Employment planning, therefore, refers to planning to fill any or all the firm's future positions, from maintenance clerk to CEO.

Some firms use the term succession planning to refer to the process of planning how the company's most important Executive positions will be filled.

Employment planning requires basically three sets of forecasts: one for personnel needs, one for the supply of inside candidates, and one for the supply outside candidates.

Recruiting job candidates :

Recruitment is a process to discover the sources of manpower to meet the requirements of the staffing schedule and to employ effective measures for attracting that manpower in adequate numbers to facilitate effective selection of an efficient working force.

As Kempner points out, recruitment forms the first state in the process, which continues with selection and ceases with the placement of the candidate. Recruitment does not merely involve an issue of a requisition from a manager's office accompanied by the advertisement of a vacancy or a circular to an employment exchange. Indeed, it embraces forward estimates of manpower requirements as an integral part of personnel policy as well as a consideration of organization health of an enterprise it is with this perspective that the source of supply will be tapped.

Factors affecting recruitment :

The factors affecting recruitment can classified as internal and external factors.

Internal factors include

i. Wage and salary policies

ii. The age composition of existing working forc

iii. Promotion and retirement policies

iv. Turnover rates

v. The nature of operations involved

vi. The kind of personnel required

vii. The level and seasonality of operations in question

viii. Future expansion and reduction programmes.

External determinants of recruitment are

i. **Cultural factors** : culture prevalent in the particular geographical area will influence the recruitment process. for example in certain situations foreign national may not be accepted for placement. (Sons of soil problems)

ii. **Economic factors** : tight or loose labour market, the reputation of the enterprise in the community as a good pay master or otherwise.

iii. **Legal factors** : regulation exert restraints in respect of nature and hours of work for women and children, and allied employment practices in the enterprises.

Elements in recruitment process :

Farmularo points out the five elements involved in the recruitment process

a. Recruitment policy

b. A recruitment organization

c. A forecast of manpower requirements

d. The development of manpower sources and different techniques for utilizing these sources

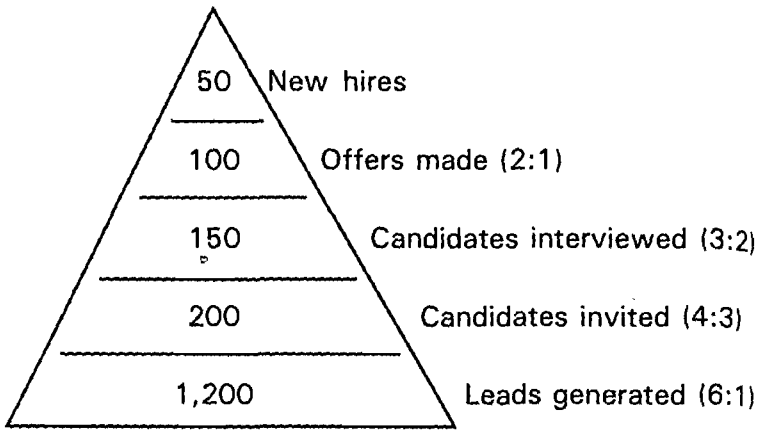
e. A method for assessing the recruitment programme.

Recruitment yield pyramid :

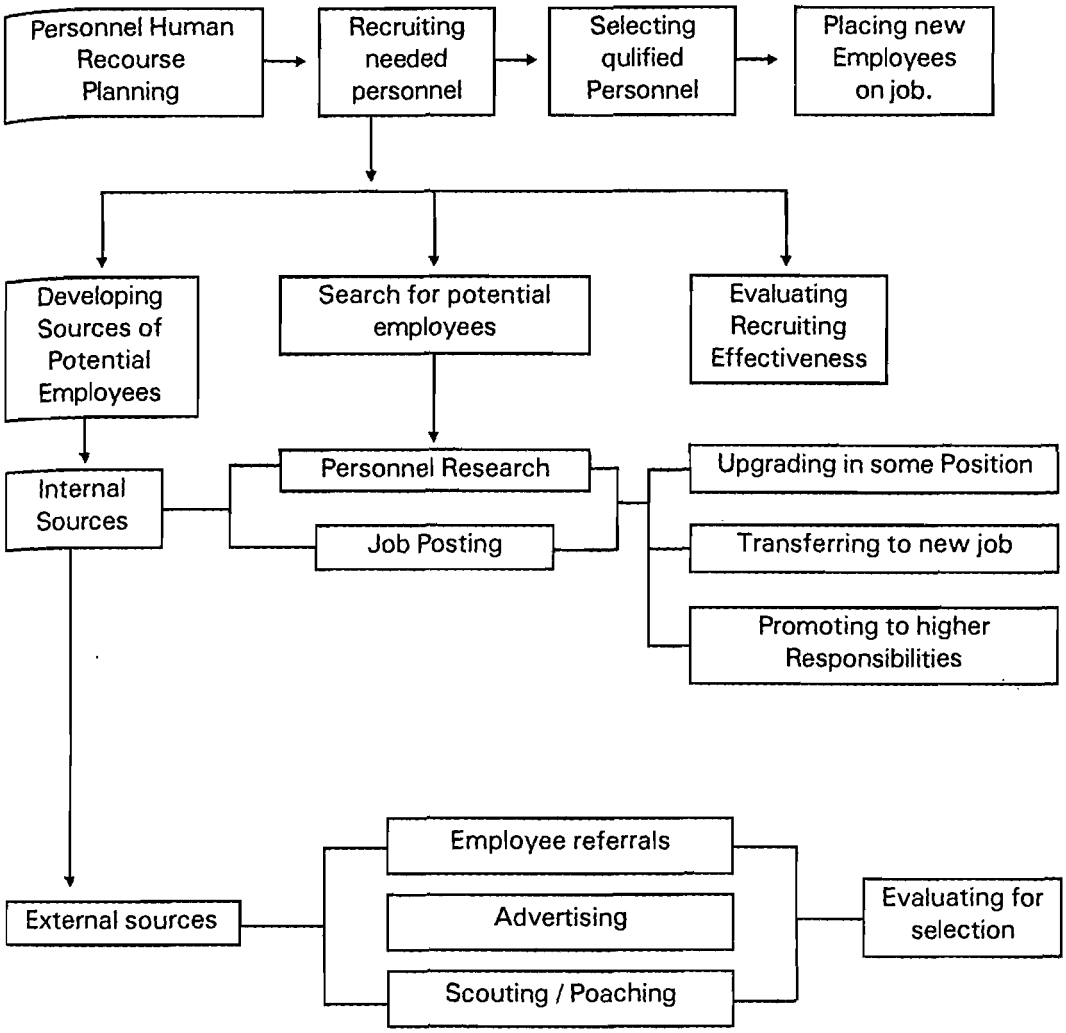
Some employer use a recruiting yield pyramid to calculate the number of applicants they must generate to hire the required number of new employees.

Eg. The company knows that it would require 50 new entry – level agricultural marketing managers. From experience, the firm also knows that

the ratio of offers made to actual new hires is 2 to 1; about half the people to whom offers are made accept. Similarly the company estimates the other ratios. Given these ratios, the firm knows it must generate 1, 200 leads to be able to invite 200 viable candidates to its offices for interviews. The firm will then get to interview about 150 of those invited, and from these it will make 100 offers. Of those 100 offers, half (or 50 new AMMs) will be hired.



Steps in recruitment process :



Methods or Techniques of Recruitment :

The methods of recruitment can be put under three categories.

i. Direct methods

ii. Indirect methods

iii. Third party methods

Direct methods :

i. **Campus recruiting / traveling recruiters :** Traveling recruiters are send to educational and professional institutions, they work in association with the placement Agencies of the Colleges.

ii. **Employee's contact :** many companies have found employee's contact with the public a very effective method.

iii. **Manned exhibits :** This includes sending recruiters to conventions and *seminars, setting up exhibits at fairs, and using mobile offices to go* to the desired centers.

Indirect methods :

Indirect methods involve mostly advertising in newspapers, on the radio, in trade and professional journals, technical magazines and brochures.

Higher the position is in the organization, or the more specialized the skills sought, the more widely dispersed advertisement is likely to be. The search for top Executive might include advertisements in a national periodicals; while the advertisement of blue collar jobs is usually confined to the daily newspaper or Regional trade journals.

Blind advertising, where there will be identification of the organization is used buy some companies. The large organizations with Regional or national reputation do not usually use blind advertisements.

One caution, which the companies should exercise while advertising is to avoid frilly advertisements, containing exaggerated claims and gimmicky appeals.

Other methods include advertising in publications, such as trade and professional journals and radio or television announcements, as is done by many Indian manufacturers. Professional journals are read by people with specialized backgrounds and interests. Therefore, advertisements in these are generally selective.

Advertising can be very effective if its media are properly chosen.

Third party methods :

Third party methods include

i. Use of commercial or private employment Agencies.

. State or public employment Agencies also known as employment or labour exchanges.

ii. Trade unions.

v. Casual labour or applicant at the gate.

v. Unconsolidated applications (applications received from candidates who make direct enquires about possible vacancies on their own)

vi. Voluntary organizations.

vii. Computer data banks.

SELECTION

Once a pool of completed application forms have been collected, the next step is to select the best person for the job. In most firms this means whittling down the applicant pool by using the screening tools, like tests, assessment centers, and background and reference checks. The prospective supervisor can then interview a handful of viable candidates and decide who will be hired.

The selection procedure is concerned with securing relevant information about an applicant This information is secured in a number of steps or stages. The objective of selection process is to determine whether an applicant meets the qualifications for specific job and to choose the applicant who is most likely to perform well in that job.

Selection procedure is carried in a series of steps, technique behind the procedure can be called as successive hurdles technique.

Why the selection process is important :

Employment selection is important for three reasons.

i. **Performance :** A supervisors performance is dependent up his subordinates performance in part. Employees who have'nt the right skills or who are abrasive or obstructionist will not perform effectively. The time to screen out undesirable is before they are in the door, not after.

ii. **Costs :** Effective screening is important because its costly to recruit and hire employees. Costs of hiring include costs like search fees, interviewing time, reference checking, and travel and moving expenses.

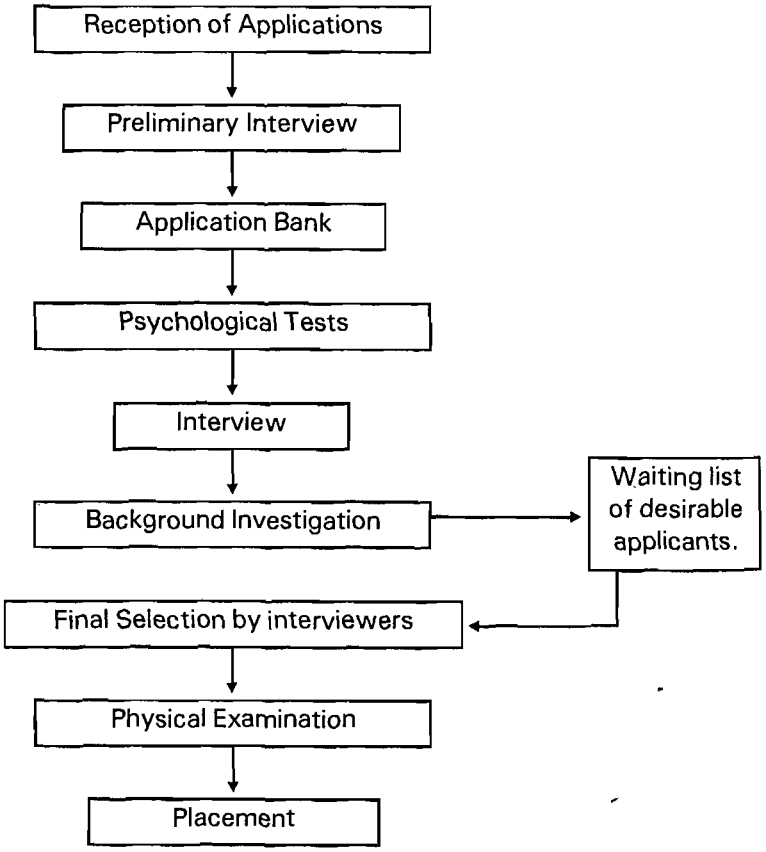
iii. Legal implications in negligent hiring: good selection is also important because of the legal implications of ineffective or incompetent

selection. Equal employment legislation, guidelines, and court decisions require the organization to systematically evaluate the effectiveness of selection procedures to ensure that the selection procedure is not unfairly discriminated against minorities, women, the elderly or the handicapped.

Second, courts are increasingly finding employers liable for damages when employees with criminal records or other problems take advantage of access to customers homes or other similar opportunities to commit crimes. Hiring workers with such backgrounds without proper safeguards is called negligent hiring.

Steps in selection procedure :

The following is a popular procedure though it may be modified to suit individual situation :



Selection process flow chart

Reception, initial or preliminary interview or screening : This interview is essentially a sorting process in which prospective applicants are given the necessary information about the nature of the jobs in the organization. Information that is elicited from the candidates will be relating to their education, experience, skill, salary demanded, the reasons for leaving their present jobs, their physical appearance age, 'drive' and facility in speech.\

Application blank or application form : The blank provides preliminary information as well as aid in the interview by indicting areas of interest and discussion. It is a good means of quickly collecting verifiable basic historical data from the candidate. It also serves as a convenient device for circulating information.

Weighted application blank : Some jobs companies analyse the information on an application blank and determine statistically its relation to latter success in the job. Such forms may speed both recruitment and selection.

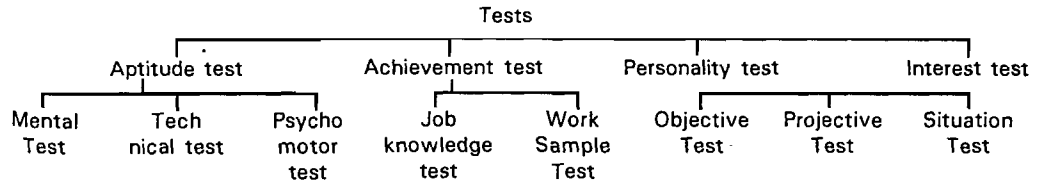
Physical examination : Certain jobs require unusual stamina, strength or tolerance of hard working conditions. A physical examination reveals whether or not a candidate possesses these qualities.

Reference checks : The use of references is common in most selection procedures, for it involves only a little time and money and minimum of effort. The procedure places reliance on the evaluation of former employers, friends and professional personnel. Checks on references are made by mail or by telephone, and occasionally in person, or by using a reference form.

Psychological testing : Tests are the most misused, the less understood, yet the most valuable sources of information about applicants.

Broadly, test may be defined as a systematic procedure for comparing the behaviour of two or more person's. in a narrow sense ' It is a sample of an aspect of an individuals behaviour, performance or attitude, and can be defined as a 'systematic procedure for sampling human behaviour'.

Classification of psychological tests



Interviews :

The interview is a selection technique, which enable the employer to view the total individual and directly appraise him and his behaviour. It is a method by which an idea about an applicant's personality, including his intelligence, breadth of interest, and general attitude towards life, can be obtained by a face – to face contact.

Types of interviews :

i. **Patterned or structured interviews :** Question would be asked in a particular order, with very little deviation. These are standardized interviews.

ii. **Non-directive or free interview :** It is unstructured and is relatively non-planned as to format. The purpose of such interview is to determine what kind of a person a candidate really is.

iii. **Depth Action Interview :** It is semi- structured in nature utilizes questions in key areas which have been studied in advance by the interviewer. The idea of such an interview is to get a free picture of the interviewee by intensively examining his background (candidates home life, education, previous experience aptitude recreational interests, and hobbies) so that a correct evaluation and decision may be made.

iv. **Group or discussion interview :** In this type of interview, groups rather than individuals are interviewed.

v. **Panel or board interview :** A candidate is interviewed by a number of interviewers. A question may asked in turn (Structured) or asked in random order as they arise on any topic (Unstructured).

vi. **Stress interview :** in the stress interview, the interviewer assumes a hostile Role towards the applicant. The purpose is to find out how a candidate behaves in a stress situation whether he loses his temper, gets confused or frightened. Stress interview is a highly dangerous tool in the hands of an unskilled interviewer.

Placement :

Once an offer of employment has been extended and accepted, the final stage in procurement function is concluded namely that of placement of the individual on the new job and orienting him to the organization.

'Placement' may be defined as 'the determination of the job to which an accepted candidate is to be assigned, and his assignment to that job. It is a matching of what the supervisor has reason to think he can do with the job demands (job requirement) : it is matching of what he imposes (in strain, working conditions)", and what he offers promotional Possibilities, etc. A proper placement of a worker reduces employee turnover, absenteeism and accident rates, and improves morale.

Typically placement, in the real sense of the term happens in the organization only after induction of candidates in the organization. (Eg. Management trainees selected, can be assigned specific jobs after induction, in which the aptitudes interests, and abilities of each candidates can be analyzed and matched to job requirements).

Placement is usually followed by induction / training of candidates which is a major area in the field of HRM.

References :

1. Personnel management – C.B. Momoria
2. Managing Human Resources – Arun Monappa
3. Personnel Management in Indian Enterprises – R.S. Dwivedi
4. Human Resource Management – Gary Dessler.
5. Personnel Management – Edwin E. Flippo.

1. A.P. CIVIL SERVICES (CONDUCT) RULES 1964

*Sri C.B. SANKARA NARAYANAN, I.A.A.S. (Retd.)**

GENERAL

Under the proviso to the Article 309 of the Constitution of India, which empowers the Governor to make rule regulating interalia, the conduct of Government employees, the A.P. Civil Services, (conduct) Rules 164 came to exist. These rules contain the 'does and don'ts' of Government servants.

SCOPE

Government employee is defined as any person who is a member of Civil Service of the State of Andhra Pradesh or holds any civil post under the state or in connection with the affairs of the state, whether he is on duty or under suspension or on leave or on Foreign Service, either within or outside the state.

Family

These rules are also applicable to the members of the family of the Government employee. "Member of the Family" includes the spouse, son, daughter, step-son or step-daughter of such employee whether residing with such employee or not and any other person related to, and residing with, such employee and wholly dependent on such employee; but does not include a spouse legally separated from such employee or a son, daughter, step-son or step-daughter who is no longer in any way dependent upon such employee or of whose custody such employee is deprived by law.

Part III Fundamental rights of Indian constitution

Article : 14 Equality Before law

Articles : 15 Prohibition of discrimination on grounds of religion race, caste, sex or place of birth

Article : 16 Equality of opportunity in matters of Public employment.

---

* Accountant General Office, Hyderabad.

Article : 19 Rights to Freedom

- Freedom of speech and expression
- Freedom of assembly
- Freedom of Association
- Freedom of movement
- Freedom of residence and settlement
- Freedom of Profession, Occupation trade or Business

RESTRICTIVE PROVISIONS OF CONDUCT RULES :

RESTRICTION ON CONSTITUTIONAL RIGHTS

- Taking part in politics and elections
- Joining of and Forming Associations
- Demonstrations and Strikes
- Connection with Press and Radio Criticism of Government
- Acquisition and Disposal of Property

RESTRICTION ON PERSONAL RIGHTS :

- Private Trade and Employment
- Investing, Lending and Borrowing
- Collection of Subscription
- Acceptance of Gifts
- Public Demonstrations
- Vindication of Acts and Character
- Canvassing of outside influence
- More than one marriage
- Consumption of Intoxicating drinks

The ultimate aim of such restrictions which forbid the Government servant to do certain acts is mainly intended to improve the tone of Public Service. The relationship between the Government and the Government servant is governed by the Law of Master and Servant relationship.

A Government servant is expected to maintain a reasonable and decent standard of conduct and not bring discredit to his service by his misdemeanor.

Thus neglect by a Government servant of his wife and his children in a manner unbecoming of a Government servant, may be regarded as a good and sufficient reason to justify action being taken against him.

If the Government were to sit back and permit its officials to commit any outrage in their Private Life, provided it falls short of criminal offence, the result may very well be catastrophic fall in the moral prestige of the Administration.

The state could demand a certain standard of conduct from the Government servant not only while performing their official duties but in their private life as well.

Arguments are often raised to the effect that in view of the complexities of modern life, the consideration of expediency should outweigh the considerations of Honesty. Consideration of expediency may be irresistible at times but their evils are merely to be put up with and not to be extolled or prescribed as standards of life and work.

A public Officer is not at liberty to amass fortune by taking illegal ratifications even though willingly given.

- Every Government servant should at all times :
- Maintain devotion to duty.
- Maintain absolute integrity, discipline, impartiality and a sense of propriety.
- Do nothing, which is unbecoming of such employee or derogatory to the prestige of Government.
- Not act in a manner, which will place his official position under any kind of embarrassment.
- Exercise his best judgement in the performance of his official duties except when he is acting under a direction from his official superior.
- Integrity is uprightness, honesty or purity.
- Devotion to duty is faithful service.

Unbecoming of a Government servant is unmannerly attitude, insubordination, lack of decorum, laziness, corrupt habits shrinking of responsibility and other things which are normally branded as unworthy of a government servant.

The dictionary meaning of misconduct is given as bad management, mismanagement, and culpable neglect of an official in regard to his office. It is a transgression of some established and definite rule of action. It is a violation of definite law or a forbidden act. It implies a wrongful intention and not a mere error of judgement. Misconduct is something more than mere negligence. It is the intentional doing of something when the doer knows to be wrong or which he does recklessly, not carrying what the result may be. It is a sufficiently wide expression and covers any conduct, which is any way renders a person unfit for his office or is likely to tamper or embarrass the administration. In this sense, grossly improper or unbecoming conduct in public life may also become misconduct and may render an Officer liable to disciplinary action.

Moral is concerned with right and wrong or duty which one owes to one's fellow beings or to the society in general.

Moral turpitude is a reprehensible act contrary to the accepted notions of right and customary rule or code of conduct accepted by the society. It would mean anything done contrary to justice, honesty, modesty or good morals.

Corruption includes all improper and selfish exercise of power and influence attached to a Public Officer.

No Government employee can associate himself with an association the object or activities of which are prejudicial to the interests of the sovereignty and integrity of India or public order.

He should not participate in strike or absent from duty or work, without permission, or neglect his duties with the object of compelling any superior officer or Government to take or omit to take official action or indulge in demonstrative fast like hunger strike or refuse to receive his pay.

No gifts can be accepted, the prominent exception being a gift of a value of less than Rs.200 (Rupees two hundred only) from personal friends on ceremonial occasions such as weddings.

Every Government employee (other than members of last grade service) should, on first appointment to the Government service, submit to Government a statement of all immovable properties irrespective of its value

and movable properties whose value exceeds Rs.10,000/- in the forms prescribed.

He should also submit before 15th January of every year, declaration in the forms of all immovable/movable property owned, acquired or inherited by him or held by him on lease/or on mortgage, either in his own name or in the name of any member of his family.

No Government employment should except after previous intimation to the head of the Department acquire or dispose of or permit any of his family member to acquire to dispose or, any immovable property by exchange, purchase, sale, gift or otherwise either by himself or through others. If such a transaction is conducted from a private dealer (not a regular or reputed dealer) the previous sanction of the head of the department/appointing authority/Regional Officers/district collectors/other district officers, as the case may be, should be obtained. Same is the case with the movable property exceeding Rs.10,000 in value.

The violation of above and or any of the following rules of conduct, would be treated as negligence/misconduct and is required to be dealt with under the A.P.Civil Services (CCA) Rules 1963.

Rule No.	**Nature of prohibition in the conduct rules**
4.	Strikes
5.	Demonstrations
6.	Acceptance of gifts, services, entertainments address and other forms of felicitations
7.	Collection of subscriptions or other pecunciary assistance in pursuance of any object
8.	Lending, borrowing and insolvency
9.	Acquiring or disposing of immovable or movable property
10.	Indulging in private trade, business and investment
11.	Promotion and management of companies in private capacity
12.	Private employment
13.	Publication of books
14.	Communication of official documents or information

15. Connection with press
16. Participation in radio broadcast and contribution to newspapers and periodicals
17. Criticism of the policy or action of Government or any other state Government or central Government.
18. Evidence before any committee, commission or other authority
19. Taking part in politics and elections
20. Vindication of acts and character of Government employee
21. Working with or under near relatives in Government service
22. Employment or a member of the family in a private firm
23. Government employee not to deal in his official capacity withi maters concerning himself his relatives or dependents
24. Influencing authorities for furtherance of interests
25. Bigamous marriages
26. Dowry
27. Drinking

2. IMPORTANCE OF BUDGETARY AND ACCOUNTING PROCEDURE

Accountability is the watchword in incurring expenditure from public funds. The need for upholding the principle of accountability starts from the stage of preparation and scrutiny of the budget proposals and takes us till it is ensured that the expenditure incurred has brought about the expected results for which the funds were approved by the appropriate authority. Traditionally budget has been viewed as a document containing only financial proposals with little emphasis on the benefits or results arising out of the proposed the budget proposals in the past. The traditional budgets were being prepared on an "Incremental Basis" year after year i.e., by adding certain percentage to the previous year's provision to arrive at the budget provision for the ensuing year accountability in its proper sense could not be enforced on the spending agencies in the traditional budgets, as the only virtue expected to them was that they should spend the budget provision in full without allowing any amount to lapse.

In the modern day financial administration there are four clear stages namely Planning, Budgeting, Accounting and Auditing. With the advent of five year plans which contain proposals for a programmed development in different areas on a long term basis the budget support became essential to translate these plan objectives into reality on an annual basis. The Role of budget became thus a performance-oriented budget where the financial provision is justified by the proposed achievement of results.

Performance budgetting has thus become the order of the day in most of the organisations in our country and it is no longer an optional method of budgetting. The traditional budget could not serve the requirements of the modern organisation, as they did not reflect;

- objectives of the programmes
- economics of operation
- benefits of operation and
- relation between resources and operations

The modern performance budget is integrated with the planning and programming processes and helps the organisation to;

- determine as to how given objectives can be attained with minimum resources

- evaluate the various activities of the organisation in terms of their contribution to the National goals
- Revise the objective/programmes in the light of experience and changing circumstances.

In preparation of modern budgets a zero based approach is adopted, which means that we do not accept the previous years level of expenditure as some thing automatically needed for the ensuing year without a re-examination and justification of such expenditure. Under Zero Based Budgeting (ZBB) the basis for allocation of funds is initially taken as zero and not the previous years allocation for any Department and a fresh start is made by making an in depth analysis of the existing programmes/activities to jettison those that are not relevant and allocations are thus made only for those programmes/activities which are retained after such scrutiny with reference to the current objectives and priorities. Some of the important aspects of ZBB are :

- identification and sharpening of objectives
- examination of various alternative ways of achieving those objectives
- selection of the best alternative through cost benefit and cost effective analysis
- prioritisation of objectives and programmes
- switching of resources from programmes with lower priority to those of higher priority and
- identification and elimination of programmes which have outlived their utility.

As part of ZBB a careful review of the various services which are being provided by the organisation has to done and the extent of the costs being recovered to consider any upward revision of the cost of such services. The ZBB must be used as an important management tool and should not be permitted to degenerate into a clerical form filling exercise so that the preparation of budget is made on a realistic and scientific basis.

The budget gives detailed information about the estimates of receipts and expenditure and other financial transactions for a particular year. the classification is the key to the understanding of the budget figures and hence a meaningful classification is essential for the ultimate objective of

the budget, namely planning, operation and control. The manner in which the items of Revenue and expenditure are grouped will be determined by and will also decide the character of the decision that can be made in the budgetary process. Classification structure has therefore been designed to facilitate programme formulation and effective budget implementation and thereby to secure accountability.

The first column in the format of the budget estimate gives the heads of account from the level of major head to detailed head each of them signifying a function, a program, an activity and the required inputs for carrying out the activities. These heads are prescribed by the University and no addition or variation can be made by the estimating officer. Whenever new schemes are sanctioned the appropriate heads of account will be communicated by the University authorities for adoption in the budget. The figures in the subsequent columns such as "Accounts of the previous year", "Budget estimate for the current year", "Revised Estimates" and the "Budget estimate for the ensuing year" must be indicated against the appropriate sub-detailed head of account. Some of the important points to be kept in view in preparing the budget estimate are :

- the time schedule prescribed by the University must be strictly adhered to from the level of the estimating Officer so that the higher authorities need not rush through the scrutiny of the proposals.
- Budget estimate should be prepared accurately as over-pitching without corresponding efforts to utilise them gainfully deprives resources meant for other vital sections of the organisation.
- Number statements should be prepared accurately indicating the permanent and temporary posts, sanctioned pay, salary that will be drawn on 1st April and number of officers at each rate of salary for whom provision has to be made under each scheme in the budget.
- estimates of Revenue receipts should be made after critically examining the trends in the past, the current activities and relevant data.
- Revised estimate should be prepared taking into account the actuals for the past six months and also the liabilities which require settlement in the subsequent period of the year. It may be noted here that mere

provision in the revised estimate does not authorise any additional expenditure unless approved by the appropriate authority.

- Estimates furnished by the estimating Officer should give precise and cogent reasons for variations between the budget and revised estimates of the current year and the next years budget estimates.
- The budget estimate should be prepared separately for plan and non-plan categories.
- The accounts figures relating to previous year and those of the first six months of the current year must be reconciled figures.
- Full details of the proposed expenditure must be furnished and no lumpsum provision should normally be allowed.

Apart from watching the receipt of budget proposals from the various estimating officers, the controlling officers are also required to scrutinise the proposals thoroughly and give proper justification for the variations. The number statements must be examined to ensure that they are complete in all respects and supported by sanctions of the appropriate authorities. After approval of the budget estimates the allocations are communicated to the spending officers.

When there is a budget which is the first level document of accountability, there must be an account to support the budget so that the securing of accountability can be watched in an effective manner. The present day concept of account is a 'Management Account' which covers not merely the financial accounting but also cost accounting and other relevant information on the progress of the schemes for making appropriate management decisions. While budget is a forecast of receipts and expenditures the accounts reflect the actual receipts and expenditure and hence the implementation of the budget can be monitored through the account documents prescribed for the purpose such as cash book, advances register, contingent registers, stores registers etc. It is essential to ensure that the accounts represent the correct picture of the actual receipts and expenditure so that the control over budget can be made realistic and meaningful. No expenditure can be incurred unless covered by a budget provision and it is necessary to monitor this aspect only with the help of the accounts.

In order to ensure that the account figures of receipts and expenditure are accurate it is essential to reconcile the figures with the related documents of the banks and paying officers. One of the cardinal principles of accountability is to ensure that the figures appearing in the monthly and annual accounts are supported by complete and correct details with reference to each receipt document and voucher to ensure that no item of receipt or expenditure is left out of account. As soon as any transaction arises it should be recorded immediately in the relevant record maintained in the office and this must be checked by the officers at different levels to oversee whether the system of maintenance of accounts and the quality thereof do not get diluted. By maintaining the accounts records properly and promptly the officers can ensure timely flow of information on receipt and expenditure to the higher officers. In the case of funds released by the state Government it is necessary to watch the progress expenditure to ensure that the sanctions are not issued beyond the amount available for the particular scheme and regarding the schemes approved by ICAR and Government of India similar watch over the program expenditure against the sanction is necessary and hence the maintenance of the accounts records in a prompt and proper manner will be helpful.

A major objective of maintenance of proper and correct account duly reconciled is to prevent any defalcation of the funds of the organisation. The financial rules provide that the senior officers of the organisation will have to inspect the account records periodically to ensure accuracy and completeness so as to prevent misappropriation of funds. Another important objective of account is to assist the management to see whether the schemes are being implemented within the anticipated costs so that necessary corrective steps can be initiated for early completion of the scheme without cost escalation. The ultimate test of accountability is to ensure that the funds authorised in the budget are not just spent, but spent to bring about fully the anticipated benefits and hence the budget and accounts are useful tools at the hands of the management to realise the required objectives. Keeping the importance of the accounts the finance code has cast a responsibility on the higher level officers.

- to ensure that the accounts are maintained properly and promptly for all financial transactions

- -to render accurately and promptly all accounting information to the higher officers
- to check the accounts as frequently as possible so that the subordinates will not have an opportunity of manipulating the accounts.

The financial code emphasises that the officers will be held personally responsible for any loss that may be found due to any neglect of the duties laid upon them by the financial provisions. The fact that the Officer has been mislead or deceived by the subordinates do not in any way mitigate the personal responsibility of the officers, as every Officer dealing with sanction and expenditure of the public funds is required to be familiar with the financial rules so that they can exercise a close control over the work of his officials in regard to use of public funds and maintenance of proper accounts.

SCOPE OF FINANCIAL MANAGEMENT AND EXERCISE OF FINANCIAL POWERS

The principles of financial management in any organisation are designed to secure accountability of the officers in the proper use of the funds authorised in the budget. Under section 40 of the AP Agricultural University Act the Board of Management has delegated certain powers of sanctioning expenditure to the University officers and other officers of the various institutions. These powers of sanction are to be exercised by ensuring that :

- there is a budget provision under the relevant haead of account for the institution/office concerned and the sufficient funds are left for other essential activities relating to the institutions/office in that financial year.
- no expenditure can be incurred over and above the budget provision and if any expenditure has to be incurred not covered by the budget prior specific orders on the University authorities should be obtained getting allotment of additional funds before sanction to expenditure is issued.
- No sanction is accorded in anticipation of re-appropriation of funds
- The purchase of articles by the practice of splitting up the purchase orders to overcome the need for obtaining the sanction of the higher authority is avoided
- All purchases costing Rs.500 or more are detailed in the budget estimates of the year.
- Besides the above requirements the procedure laid down in the AP financial Code are also tobe followed before exercise of the delegated powers.

Apart from the availability of the budget provision and necessary powers delegated for incurring expenditure it is necessary to keep in view the standards of financial propriety before according sanction or incurring expenditure.

- every Officer is expected to exercise the same vigilance and care in regard to expenditure of the public funds as a person of ordinary prudence would exercise in regard to his own money.

- The expenditure should not apparently be more than what the occasion demands.
- The Officer should not accord sanction or pass an order which will be to his personal advantage.
- The allowances granted to an employee should be so regulated that these allowances are not on the whole a source of profit to the recipients.

The financial code lays down that every Government servant should not merely observe complete integrity in financial matters but also be constantly watchful to see that the best possible value is obtained for all the funds spent by him or by the officers under his control and guard against every kind of wasteful expenditure.

Every drawing officer is primarily responsible for the correctness of the amounts for which each bill is drawn. If any amount is drawn in excess of what is due he will be required to make good the excess amount so drawn either by recovery from the person who received it or paying it himself. If the excess amount drawn cannot for any reason be recovered form the drawing Officer the higher Officer who countersigned the bill will be liable to make good the loss arising out of negligence on his part.

The officers sanctioning expenditure are also required to pay special attention to the following aspects to ensure accountability.

- whether the claims are genuine and relate to persons who are entitled to receive them.
- Whether the claims including refunds have been preferred on time, scrutinised and payments arranged to the persons concerned without much delay so that the problems arising out of dealing with arrears claims can be avoided.
- Whether proper acknowledgement has been obtained from the persons concerned in complete and full settlement of the dues so that a second claim is not made/paid on the same account.
- Whether the statutory recoveries such as income tax have been recovered and recoveries such as court attachment etc., are effected.
- Whether all the transactions have been accounted for immediately in one record or the other while preferring the claim and making payment.

- Whether the amounts drawn on AC bills are followed up by detailed contingent bills with full details within the stipulated time and submitted to the counter signing Officer.

Accountability would mean that the sanctioning/spending officer would not merely follow the financial provisions as prescribed but also give evidence having done so by maintaining proper account records to the satisfaction of an outside agency such as audit. It should be be shown to the satisfaction of the audit that the claim paid has been a genuine one, that the acknowledgement taken from the recipients has been so taken that the second claim on the same account is not possible and that the accounting of the transactions has been properly done.

Audit has an important role in overseeing whether accountability has been properly secured in the manner in which it is required to be done. There are internal audit and external audit. The internal audit is part of the management intended to scrutinise all the transactions right from the time of its sanction till it is paid and to make sure that the accounts represent the correct picture. It must be made clear here that the main responsibility for proper financial management rests with the officers who sanction and incur the expenditure and the role of the internal audit is only to highlight any omissions and commissions in according sanction and maintenance of accounts.

The external audit refers to the audit done by the Accountant General (AG) under a central Government act. The AG's audit has a dual Role of overseeing whether the funds provided in the budget have been applied for the purposes of which they were intended and also of examining whether the officers entrusted with the powers of sanctioning and spending have exercised their delegated powers in the prescribed manner. The basic thrust of modern day financial management as already referred to earlier, is that the officers according sanction and incurring expenditure will have to first ensure that the expenditure has been incurred according to the budget formulation and follow it up by ensuring that the expected results have been achieved conforming to the standards of efficiency economy and effectiveness. The external audit examines these aspects by taking up scheme reviews besides examining the various documents and records maintained by the officers at different levels.

3. RESPONSIBILITIES OF DRAWING AND DISBURSING OFFICERS TOWARDS MAINTENANCE OF ACCOUNTS

The provisions contained in the AP treasury code has been summarized in the following pages for general guidance and these rules must be read with the accounts manual compiled by the comptroller ANGRAU and the appropriate procedure followed by the university drawing and disbursing officers.

(i) Every government servant should see that proper accounts are maintained for all government financial transactions with which he is concerned and render accurately and promptly all such accounts and returns relating to them as are prescribed. He should check the accounts as frequently as possible in order to see that his subordinates do not commit fraud, misappropriation or any other irregularity. He will be held personally responsible for any loss that may be found due to any neglect of the duties laid upon him by the provisions of the financial code. The fact that a Government servant has been misled or deceived by a subordinate will in no way mitigate his personal responsibility since every Government servant should be familiar with the financial rules and exercise a specially strict and close control over his subordinates in regard to the use of public funds and the maintenance of proper accounts. (Art 5. Of APFC.I).

(ii) It is the duty of every Government servant not merely to observe complete integrity in financial matters but also to be constantly watchful to see that best possible value is obtained for all the funds spent by him or under his control and to guard scrupulously against every kind of wasteful expenditure from public funds. (Art. 4 APFC).

(iii) Every drawing Officer is primarily responsible for the correctness of the amount for which each bill is drawn. If any amount is drawn in excess of what is due, he will be required to make good the excess amount so drawn. If the excess amount cannot for any reason be recovered from him, the Government servant, if any, who countersigned the bill will be liable to make good the loss arising from culpable negligence on his part. (Art 56 APFC).

(iv) Recoveries may not ordinarily be made at a rate exceeding one third of pay – unless the Government servant affected has :

(a) in receiving or drawing the excess, acted contrary to orders or without due justification.

(b) taken an advance for a specific purpose and failed to utilise it for the purpose for which advance was sanctioned within the specified period and failed to refund the outstanding amount within the stipulated time. (Art 58 APFC).

Government servant means any person serving in connection with the affairs of the state, whether remunerated by salary or not, and includes every person who is authorised to receive, keep, carry or spend moneys on behalf of the Government (Art 6 APFC).

RECEIPTS

RESPONSIBILITIES TOWARDS REALISATION OF RECEIPTS

(a) to assess the demands accurately, in advance;

(b) to take steps to realise the demands promptly;

(c) to maintain proper account of collections;

(d) to watch the progress of collections against the demand by reviewing the demand, collection and balance statements.

(e) to take prompt steps to collect all arrears;

(f) to consolidate the figures in a register to show the total receipts for each month classified as per the budget estimates

(g) to compare the figures compiled in the register with-

(i) Computer figures received from the finance Department, and

(ii) those booked in the Accountant-General's records and reconcile the differences if any;

(iii) to effect necessary corrections before the accounts of the year are closed;

(iv) to take steps to apply to the competent authority for writing off the irrecoverable arrears

ACCOUNTING AND PAYMENT OF GOVERNMENT REVENUES INTO TREASURY

i. Money received by government servants in their official capacity should not be kept out as government account. They should be remitted in to Govt. account in treasury or bank as soon as possible or at periotical intervats or when the balance on hand reaches a certain amount in accordance with the instructions of superior authority.

ii. The revenues should not be appropriated to meet departmental expending excepting those cases specified in T.R.7.

iii. A government servant may not except with special permission of the government deposit/invest moneys withdrawn from government account in a bank.

PROCEDURE FOR ACCEPTANCE OF GOVERNMENT DUES

1. CASH RECEIPTS

a. Amounts payable to Government account which are below Rs.50/- should ordinarily be received in cash by the concerned Departmental officers and a receipt in APTC form 7 issued to the party.

b. The receipt shall be signed by the Head of Office or any G.O. Non-Gazetted government servant duly authorised by the head of the office;

c. At the time of signing the receipt the head of the office shall satisfy himself that the amount has been properly entered in the cash book on the receipts side.

d. Receipts should be written in figures and words and signed in full;

e. Receipt books should be machine numbered;

f. The receipt should be in triplicate – original copy to be given to the payer, duplicate to be retained in the office for checking the entries; triplicate copy will be retained in the receipt book itself.

g. Blank receipt books must be kept under lock and key in the personal custody of the Officer authorised to sign receipts;

h. Before a receipt book is taken for use, the number of forms contained therein shall be counted and the results recorded in a conspicuous place

in the book over the signature of the Head of the Office on the outer cover of the receipt book.

i. Record of receipt books received from the District Treasury, issued to subordinates, used and unused should be maintained.

j. The departmental officers should their requisitions for receipt books to the District Treasury Officers who will obtain the same from the Commissioner of Printing and Stationery and supply to the departmental officers.

k. Where it is not possible to collect the amount below Rs.50/- in cash by the departmental officers concerned at the place where he is stationed, the amount can be realise by way of demand drafts, drawn in favour of the departmental officers payable at any bank at the place where the departmental officers is stationed.

l. The amounts deducted on account of APGLI, General Provident Fund, Group Insurance etc., in respect of employees who are on deputation etc. may be paid through challan even though the amount is below Rs.50/-.

m. Amounts less than Rs.50/- also can be remitted by government departmental officers by way of challans.

n. The amounts deducted on account of APGLI, GPF and Group Insurance etc., in respect of employees who are on deputation are to be realised through bank drafts and remitted to government account through challans enclosing the bank drafts.

2. DEMAND DRAFTS AND CHEQUES

Whenever a demand draft/cheque is received in favour of a departmental officers towards the government duties, it should be entered in security register. It shall be treated as final payment, only after it has been met and the amount has been actually credited to the government account. Hence a temporary receipt in APTC form no. 4 should be issued by the departmental Officer of the draft/cheque. It should be recorded as a receipt in the cash book immediately on receipt. Final receipt should be given only after the value of the cheque/D.D. is realised at the bank.

If the cheque is not honoured by the bank payment in cash shall be demanded and the dishonoured cheque returned to the person and the preliminary acknowledgement should be taken back from him. The challan presented with the cheque shall be retained by the bank and destroyed in due course.

3. PROCEDURE WITH REGARD TO POSTAL ORDERS

The procedure as in the cast of D.D.s/cheques may be followed.

4. PROCEDURE WITH REGARD TO MONEY ORDERS

Immediately on receipt of money orders / cash an entry should be taken on receipt's side of the cash book.

PROCEDURE FOR CREDITING BANK DRAFTS/CHEQUES RECEIVE FROM AUTONOMOUS BODIES LIKE LTC, NCDC, GIC etc.,

The Bank draft/cheque received should be credited to government account by way of remittance into the bank on the same day or the next working day.

Any delay should be viewed seriously and the question of recovery of interest for delayed period from the persons responsible should be considered.

A register of valuables should be maintained in which the details of cheques/bank drafts (the number and date of draft, date of its receipt, the amount, the purpose for which received, the date of remittance with challan number) should be recorded.

This register should be reviewed fortnightly to ensure that the draft received are promptly credited to government account.

A government servant who receives an uncrossed cheque should immediately cross it and endorse the words "received payment by transfer credit to the need of account - - - - - - on the documents and sign the endorsement.

The amounts released by the Government of India and other central autonomous bodies through cheques, by debiting the expenditure to the

respective functional major head of accounts, have to be credited to the state government's account under the respective corresponding departmental receipt head of account.

The amounts released by the Government of India directly to the department through a cheque by debiting the expenditure to the major head "061 Grants-in-aid to state governments" have to be credited to the state government account under "Major 1601-Grants-in-aid form Central government"

ISSUES OF DUPLICATE RECEIPTS

No government servant may issue a duplicate or copy of receipt granted for money received by him on the allegation that the original receipt has been lost or is not available.

Requisition for certificates of credit in respect of refunds of deposits etc., should be entertained only when they are preferred by the departmental officers. The certificates of credit issued by S.T.Os based on such requisitions should be countersigned by the D.T.Os. Where the original challan is lost and the amount of refund is more than Rs.1,000/- the departmental officers should obtain an indemnity bond from the party concerned before requisitioning a certificate of credit.

REMITTANCE OF MONEY INTO GOVERNMENT ACCOUNT :

a) Responsibility of departmental officers :

Once in a week or at lesser intervals, challans should be prepared for the cash received at the departmental counters; through money orders; cash realised by cashing the postal orders; demand drafts, cheques and the amount remitted into bank duly making an entry on the payments side of the cash book.

After remittance in the bank, the govt. servant who remitted the money shall compare the challan received form the bank with the entry in the cash book and satisfy himself that the amount has been actually credited into the treasury/bank.

The challan number and date should be noted against the relevant debit entry in the cash book and also in the security register maintained in

the case of cheque and demand drafts. He has to get the remittances made reconciled with treasury accounts regularly to ensure that all the challans deposited are properly credited and there are no fictitious challans.

b) Procedure for Remittance

Every payment into the treasury or bank for credit to the government shall be accompanied by a challan in triplicate in form 10, supplied free of cost by the treasury, containing complete classification, the amount paid, remitter's name and address, purpose of payment, Officer at whose instance the amount is deposited and the date signature of the remitter.

If any further details are required in particular by any Department, they should be got printed on the reverse side of the challan in form 10 (newly introduced).

Every challan before it is presented to the bank/non-banking sub-treasury, should be got verified and endorsed by the treasury Officer/STO/or the departmental Officer authorised to do so, as to the correctness of the head of account and the amount as well as other particulars given in the challan. After such certification, the challan should be presented by the remitter in triplicate to the bank or treasurer of a non-banking sub-treasury.

The bank/treasurer will acknowledge the receipt of money in all the three copies. They will retain the triplicate copy and return the other to the bank to receive the payment and it is valid for 14 days only and thereafter it should be revalidated by the treasury.

Amounts creditable to different heads of account shall be paid through different challans.

When a payment is made partly in cash and partly by cheque, the amount paid in cash and by cheque respectively shall not be included in the same challan.

NON-GOVERNMENT CASH :

A government servant who is permitted to handle any money in his official capacity without including it in the government account, should take care to see that such money is kept separate and not mixed up with money forming part of the revenue of the state. Such amounts shall be accounted for separately by maintaining a non-government cash book.

1. In order to have effective control over handling and accounting of non-government cash book, the balance of non-government cash should be exhibited distinctly in the details of cash balance maintained in the government verification of cash;

2. The amounts recovered under different non-government recoveries shall be remitted within a period of 7 days from the date of recovery of such amount;

3. During the periodical verification of government cash balance, the non-government cash balance also shall be verified in order to ensure that the instructions are followed.

A government servant shall not place any private money in a government cash chest.

Responsibilities towards incurring of expenditure :

i) Every head of the office should on no account incur any item of expenditure from public funds unless the following conditions are satisfied.

a) The expenditure must have been sanctioned by a general or special order of the authority competent to sanction such expenditure;

b) Sufficient funds must have been provided for expenditure in the budget of the financial year or by way of reappropriation of funds sanctioned by competent authority and should have been released and placed at his disposal by the competent authority.

c) The fact that no budget has been provided for a particular item of expenditure is not a valid excuse for delaying payment of any amount indisputably due.

d) For want of a sanction of the competent authority a particular payment actually made should not be delayed in entering the accounts. Under no circumstances, any payment actually made should be kept out of government account a day longer than is absolutely necessary;

e) all appropriations lapse at the end of the financial year. on no account should funds be reserved or appropriated by transfer to a deposit head or kept in the cash chest to prevent lapse of appropriation. There should

be no undue rush of expenditure during March. Drawal of funds in advance of requirements when they are not required for immediate disbursement – just to avoid lapse of grant – is irregular.

ii. Further every government servant should strictly adhere to the following principles known as the STANDARDS OF FINANCIAL PROPERTY :

(a) The expenditure should not be prima facie more than the occasion demands. He should exercise the same deligence and care in respect of all expenditure from public moneys under his control as a person of ordinary prudence would exercise in respect of expenditure of his own money.

(b) He should not pass any order directly or indirectly to his own advantage.

(c) Public money should not be utilised for the benefit of a particular person or section or community unless-

i) the amount of expenditure involved is insignificant; or

ii) a claim for the amount would be enforced in a court of law; or

iii) the expenditure is in pursuance of a recognised policy or custom;

(d) the amount of any allowance such as T.A. granted to meet the expenditure of a particular type should be so regulated that it is not, on the whole, a source of profit to the recipient.

RESPONSIBILITIES OF HEADS OF OFFICES/DRAWING OFFCERS FOR MONEY DRAWN

1. A government servant is responsible for :

   (a) the safe custody of the moneys received by him from the treasury bank/and other sources;

   (b) for the maintenance of prescribed accounts;

   (c) for watching the correct disposal of the money;

   (d) for checking the cash balance in the office.

2. For ensuring the above he should :

   (a) obtain, for every disbursement which he makes a voucher setting forth full and clear particulars of the claim in the form prescribed at the time of making payment;

(b) obtain an acknowledgement either on the voucher or on a separate sheet signed by the payee by hand and in ink.

(c) He shall require the payees to not the actual date of payment in his acknowledgement.

(d) If the payee is not able to write his signature on the acknowledgement his thumb impression may be obtained, which should be attested by some known person;

3. A cash memorandum shall not be treated as a proper voucher unless it contains a specified signed acknowledgement of the receipt of the money by the signatory from the government servant concerned and is duly stamped with Rs.1/- Revenue stamp if the amount paid exceeds Rs.500/- (S.R. 2 (a).

4. If, in very exceptional circumstances, it is not possible to furnish a proper voucher with the payees acknowledgement, a certificate of payment, showing the particulars of the claim, signed by the Drawing Officer and endorsed by his immediate superior, shall be placed on record.

5. Whenever a payment is made by remittance, a note of the date and mode of remittance shall be made on the bill or voucher at the time of remittance. If the remittance is by Money Order, its purpose shall be clearly stated in the acknowledgement portion in continuation of the entry 'Received the sum specified above on' and sufficient space shall be left below the manuscript addition of the signature or thumb impression of the payee.

6. When an article is obtained by V.P.P. its cover together with the invoice of bill showing full details of the item paid for shall be treated as a voucher and the disbursing Officer shall note on the cover that the payment was made through the post office and includes the postal commission..

7. No voucher shall be treated as a valid voucher unless it bears a distinct pay order, specifying the amount payable both in words and in figures separately and signed or initialed and dated by hand an in ink by the disbursing Officer.

CUSTODY OF CASH

(h) The office cash balance should be kept in the iron cash chest having double key arrangements. The cash chest shall, if practicable be embedded in masonry so as to prevent removal by thieves. One key of the cash chest should be held by the head of the office and the other by the superintendent or any other senior most government servant of the office. They should personally hold the keys of the chest and the keys should never leave the possession of the government servants concerned. The cash chest should be opened and closed personally by them and should not be entrusted to the attenders. Whenever any government servant holding the key of the cash chest happens to be on camp or go on CL. He should personally hand over the key to any other government servant who is authorised to hold the same during the absence. It should not be sent through any other messenger who may unscrupulously prepare a duplicate key for its use at a later date without the notice of the head of the office and other government servant holding the keys.

ii) Whenever there is change in the incumbent of the government servant holding the key of the cash chest due to any kind of leave or transfer, the incoming government servant should personally verify the cash and record a certificate of verification in the cash book under his own hand and affix his dated signature.

iii) The duplicate keys of cash chest should be kept in a small packet, and the packet sealed and sent to the nearest treasury for safe custody. The receipt granted by the T.O. should be carefully filed. Thereafter once in three years, the sealed packet should be obtained from the treasury duly surrending the receipt obtained at the time of deposit, the contents of the sealed packet checked up and the duplicate keys again deposited in the treasury for safe custody.

iv) When leaving the office every day, after locking the cash chest, a paper seal duly signed by the head of the office should be pasted to the cash chest and the sealed cash chest handed over the night watchman under his acknowledgement. On the next day when the office is opened, the cash chest should be taken over by the Head of the office by furnishing the acknowledgement. A register should be maintained for this purpose.

The night watchman is expected to be awake during the nights and guard the office and cash chest. He should be provided with a torch light and stick. Once in a fortnight the head of the office should make surprise visits to the office to find out whether the night watchman is performing the duties or not and record the result in the register. If the night watchman is found sleeping or in drunken state deterrent action should be taken against him.

CASH ACCOUNTS TO BE MAINTAINED BY THE HEAD OF THE OFFICE

i) Cash book for government transactions/University transactions

ii) Cash book for non-govt. transactions

iii) Register of Cheques

iv) Undisbursed (UD) Pay register

v) Acquittance register

vi) Pay bill register

vii) T.A.Bill register

viii) Misc. bill register

ix) Treasury bills Register/Register of bills

x) Register of contingent charges

xi) Register of recoveries of advances like G.P.F.,A.P.G.L.I., P.L.I., festival advance, medical advance, bicycles, house building, marriage, motor cycle loans etc.

xii) Register of recoveries of advance on transfer

xiii) Tour advance register

xiv) Office copy of LPC register.

xv) Increment watch register (Gazetted and non gazetted separately).

xvi) Register showing the service books received from other offices and sent to other offices.

xvii) Register showing the temporary establishment of the office and their continuance;

xviii) File containing the original challans for the amounts remitted into the treasury;

xix) Register of actual expenditure incurred with progressive totals as prescribed in budget manual.

xx) Register showing the account of Printed receipt books for the issue of receipts for the amounts received from the parties;

xxi) Register of Valuables.

xxii) Register of Securities.

xxiii) Register of duplicate keys.

All the registers should be neatly bound up and kept as they are very important in nature. The following instructions should be followed for their maintenance;

i) All the pages of the register should be numbered and certificates appended on the front page under attestation of the head of the office showing the number of pages, the register contained;

ii) If the register is opened in manuscript for want of printed copy, the headings of the register should be typed and neatly pasted;

iii) There should be not register without proper headings.

iv) A register once exhausted should be withdrawn from the clerk concerned and sent to the record room for safe custody under proper acknowledgement;

v) In case of cash book, permanent advance register and U.D. pay register, the closing balance as appearing on the last page of the old register and a certificate to the effect should be appended in the new register under the attestation of the head of the office.

CASH BOOK

The following instructions should be followed in the maintenance of cash book.

(a) Every government office should maintain a cash book in APTC form No.5 with the following columns: I) Date of receipt ii) Particulars iii) Amount iv) Date of disposal or remittance to treasury; v) particulars vi) amount vii) remarks.

(b) There should be one cash book for government transactions and another for non-govt. transactions if the government servant is permitted to handle in is official capacity moneys received not on behalf of the government directly but in connection with affairs of a government institution. The cash balance relating to government transactions and non-government transactions should be kept separately in the cash chest.

(c) It is not correct to multiply cash books and as far as possible only one cash book should be maintained for all government transactions. Subsidiary registers may however be opened, if need be, taking their totals to the cash book.

(d) Money received on behalf of the government (with the exception of moneys withdrawn from treasuries on bills for pay, contingencies etc. which are accounted for and watched in other ways) should immediately be accounted for in the cash book.

(e) For each entry on the receipts side of the cash book there should be a counterfoil of printed receipt and the receipt number noted against each entry.

(f) Before an Officer signs a receipt he should be see that the receipt of the money has been duly recorded in the cash book and in token of his check the should initial with date the relevant entry in the cash book;

(g) When money is sent to the treasury/bank for remittance, entry should be made in the cash book while signing the challan. It should be attested only on receipt of the challan after remittance.

(h) In respect of amounts received on account of encashment of bills and cheques at treasury or bank, they should be supported by relevant entries in the treasury bills register, or U.D.P. or Permanent Advance Register etc.

(i) After totaling the receipts recorded in the cash book the opening balance of the cash book should be added an grand total struck;

(j) For every item of disposal on the charges side of the cash book, UDP/PA register there should be acquittance or payment receipt in proof of having disbursed the amount;

(k) At the close of business on each working day, the cash book should be enclosed duly verifying the cash on hand and the closing balance arrived at.

(l) A memorandum of verification should be recorded in the cash bok duly counting the cash and verified with the book balance as shown in the cash book and other registers after they have bheen closed for the day and then signed by the drawing Officer as below :

A. Balance as per cash book	- - - -
Balance as per U.D.P. Register	- - - -
Balance as per P.A. register	- - - -
	————————
Total book balance	- - - - -
B. Amount held in cash	- - - - -
Amount held in the shape of Cheques and drafts	- - - - -
	————————
Total	- - - -
	————————

C. Cash balance ascertained by counting - - - -

(m) If there is difference between the book balance and the physical balance, the same should be reconciled. If it could not be reconciled, action should be initiated accordingly.

(n) If the concerned officer happens to be in camp or leave the Officer who looks after his work or the ministerial head should check the cash book as above and the drawing officer should as soon as he returns verify the entries in the cash book and attest the same duly satisfying himself about the correctness of the transactions and entries.

TREASURY BILLS REGISTERS

Every office presenting bills at treasuries shall enter the particulars of all its bills in a treasury bill register in APTC form 70 with the following columns :

1. Number, date and description of bills.
2. Total amount of bill
3. In cash
4. By government drafts or book adjustment.
5. Name and designation of the person in whose favour the government drafts are to be issued.
6. Name and designation of the messenger authorised to collect token from the treasury and cash from the bank/treasury.
7. Signature of the drawing Officer.
8. Date of receipt of the bill in treasury and the initials of H.H.A.
9. Token no. allotted by the treasury.
10. Amount passed by the treasury.
11. Date initials of the head of the treasury in token of the treasury having passed the bill.
12. Remarks (date of receipt of money should be entered and initialled by the drawing and disbursing officer).

This register should be presented at the treasury along with each bill. The treasury will not accept any bill unless the treasury bills book duly filled in upto Col. 7 is presented with it.

The treasury official shall acknowledge the receipt of the bill col.8 of the register and then issue a 'paper token' to the messenger. This token number shall be indicated in col.9 of the register.

After scrutiny and passing of the bills, they will be sent to the bank in a locked box in convenient batches with a list of bills in duplicate. The bank will return one copy of the list to the treasury duly acknowledging the receipt of the passed bills.

The list of passed and returned bills will be exhibited on the notice board of the treasury to enable the messenger to know the bills sent to the

bank and the bills returned. In respect of bills passed the messenger will surrender the paper token issue by the treasury, at the bank and receive the cash/cheque/D.D. as the case may be. In respect of returned bills, the paper token should be surrendered at the returned bills counter of the treasury and the bills received back for further disposal. When they are represented fresh entry should be made in the treasury bill register.

Soon after passing the bill for payment, the treasury should fill up columns 10 and 11. The treasury bills register should not be allowed to remain in the treasury for long-time. If the bills are pending with the treasury for more than 3 days, the matter should be taken up with the treasury Officer for their expenditious disposal.

If the treasury passes any bill for a less amount disallowing certain amount according to the entry recorded by it in the treasury bills register, a memorandum of deductions from bills should be obtained from the treasury.

A treasury Officer may correct any arithmetical inacurracy or an obvious mistake in any bill presented to him duly intimating the drawing Officer may correction which he makes.

In respect of passed bills sent to the bank, the bank shall make payment strictly in accordance with the pay order of the treasury Officer, to the payee or a messenger duly authorised by the payee after satisfactory identification. The bank shall also verify before making the payment that the signature of the drawing Officer attesting the payees signature tallies with that on the bill as passed by the treasury Officer.

Payment order sissued by the treasury are valid for 10 days only and bank required revalidation of the pass order by the treasury for making payment of the bill beyond that period.

Reconciliation of figures by drawing officers

The treasury officers are required to communicate a list of bills paid during a month in duplicate to the drawing officers by 10th of the succeeding month. The drawing officers have to reconcile payments with treasury bill book and return the duplicate copy to the treasury officers with a certificate of acceptance by 15th of the succeeding month. If it is not returned within 15 days by the drawing officers, it shall be deemed to have been accepted

by them. The duplicate copy of such list should be kept in safe custody for verification in future by the treasures.

REGISTER OF BILLS

In twin cities, where the bills are presented at P.A.O. a register of bills in APTC 70-A should be maintained with the following columns :

1. Sl.No.
2. Bill No. & date
3. Particulars
4. Net amount
5. Name and designation of the messenger through whom the bill was sent or the name of the person or company in whose favour the bill is drawn (in case of contingent bills)
6. Signature of the drawing Officer
7. Date on which the bill was presented
8. Token no.
9. Date of return
10. Date of resubmission
11. Initials of the D.O.
12. Cheque no. and date
13. Amount
14. Amount disallowed (if any)
15. Reference to page no. of the register or name of the cash account in which centered
16. Initials of the D.O.
17. Remarks

Precautions should be taken to ensure that parallel treasury bills registers are not maintained.

The following certificates should be recorded when existing register is closed and a new register is opened.

1. Certified that this treasury bill book, register of bills contain pages serially numbered from - - - - to - - - - and brought into use with effect from - - - - (in words).

2. Certified that I am presenting the bills in the pay and accounts office/ dist. Sub-treasury through this register of bills/treasury bills book only, and I have personally satisfied my self that no other register of bills/ treasury bills book is currently in use for presenting the bills at the PAO/Dist. Sub-treasury.

3. Certificate to be recorded when the register is completed and lodged before a new register is brought into use.

   "Certified that I have personally satisfied my self that all the bills presented through this register of bills/treasury bills book have been either encashed or returned by the PAO/treasury Officer and have been properly and completely accounted for. This register is closed and kept under my personal custody".

To prevent presentation of fraudulent drawal of bills this register should be reviewed bi-weekly by the drawing Officer and the result of the review recorded in the form of the abstract as below :

1. Opening balance
2. Bills sent during 1st half/2nd half of the week
3. Total (1 + 2)
4. Bills passed during 1st half/2nd half of the week (from - - - - to - - - -)
5. Brief reasons for pendency.

DISBURSEMENT OF PAY AND ALLOWANCES :

I. The head of an office is personally responsible for all moneys drawn as pay, leave salary, allowance, etc. on an establishment bill signed by him or on his behalf until he has paid them to the persons who are entitled to receive them and has obtained their dated acknowledgements, duly stamped when necessary. These acknowledgements shall be taken as a rule on the office copy of the bill or on the separate acquittance roll.

II. In cases where a non-Gazetted government servant is on tour and payment has to be made to him at the Station where he is on tour, the D.D.O. shall remit the amount to him by a bank draft at par by registered post at government cost.

In case where a class-IV government servant proceeds on leave for a period exceeding one month, the net leave salary due to him, on his express may be remitted to him by means of a bank draft at par by registered post at government cost.

iii. When a government servant is on leave or camp, any money due to him may be remitted to him by postal money order at his expense, if he has made a written request for this to be done. If he requests in writing that the amount be paid to specified government servant belonging to the same office, payment shall then be made accordingly, provided that the government servant nominated produces an acknowledgement signed by the absentee (and stamped when the amount exceeds Rs.500/-) The government servant who received the money shall sign on the back of the absentees acknowledgement and acknowledgement shall be attached to the office copy of the bill or to the acqauittance roll and the remark 'separate receipt attached 'shall be entered in the appropriate place.

iv. If a government servant fails to claim payment before the end of the month, the moneys drawn for him shall ordinarily be refunded by short drawal in the next bill and drawn afresh when he claims them, if the rules regarding arrear claims permit it. When the drawing Officer considers that the earlier refunding of any such moneys would cause undue inconvenience, he may retain them for any period not exceeding three months but he will continue to be held personally responsible for them and must make satisfactory arrangement for keeping them safety Undisbursed pay, allowances and leave salary shall not, under any circumstances, be placed in deposit.

v. The drawing Officer shall either check the acquittance roll himself or have it so checked by a responsible government servant and sign.

vi. A disbursing Officer shall not make the last payment of pay allowances etc. to government servant who is finally leaving the service or is placed under suspension or to the heirs of the deceased government servant until he has satisfied himself that no amount is due to the government from the government servant.

vii. Undisbursed pay register :

1. To watch the disposal of undisbursed pay and allowances a register is to be maintained in APTC form No.20 with the following columns :

   1. Date
   2. Annual Sl.No.
   3. Description of bill
   4. Amount
   5. Amount undisbursed
   6. Date of subsequent disbursement
   7. Amount disbursed
   8. Balance
   9. Date
   10. No. of receipt item from which disbursed
   11. Particulars of payment
   12. Amount.

2. The Serial numbers in this register should be assigned consecutively for each financial year. the serial number against each item should be rounded off when the complete amount drawn under particular item is disbursed leaving no balance.

3. On each date of transaction, the totals under receipts and disbursements should be worked out and the balances struck. The undisbursed balance verified from the acquittance rule should be entered in Col5. And subsequent disbursement noted in Col.6 to 8 till the entire amount is disbursed and the item is finally rounded off.

4. The closing balance of U.D.P Register should be taken to the cash book.

5. The U.D.P. Register should be signed every day be the head of the office.

PERMANENT ADVANCE :

As a general rule, drawal of money from the treasury is only by presenting a proper voucher prepared in accordance with the rules and no money should be drawn until it is required for immediate disbursement. The P.A. system is an exception to general rules.

a. The P.A. is primarily intended for meeting emergent contingent expenditure. However, it may be utilised to meet any other bonafide expenditure on government account except for grant of advance of pay.

b. The accountability for the advance and its utilisation on bonafide government account in accordance with these rules and regulations shall rest wholly on the holder.

c. Copies of sanctions along with monthly statements of expenditure showing the amount of contingent bills cashed with classified details of items of expenditure should be furnished to the sanctioning authority in the following months.

d. The quantum of permanent advance for any organisation should not as a rule exceed the monthly average of contingent expenditure for the preceding twelve months. The application for the advance by the office/organisation should be accompanied by a statement showing month-wise contingent expenditure for the preceding twelve months. In case of a new organisation the amount of advance should be fixed on a conservative basis subject to review after six months.

e. The advance should be recouped at least twice a month so that the amount sanctioned does not exceed half the amount of the average monthly contingent expenditure. Calculated as in (d) above.

f. As these advances involve the permanent retention of money outside the treasury, the amount of such an advance must not be larger than is absolutely necessary.

g. These advances should not be multiplied unnecessarily.

h. For the sanction of P.A. initially or for revision of the existing P.A. application should be submitted by the Head of Department in respect of a government servant serving under him to the administrative

Department of Secretariat to sanction it with the concurrence of Finance and Planning (FW) Department.

i. It should be initially drawn after sanction on abstract contingent bill from 57 debitable to MH 8672- Permanent Cash Imprest -01 - Civil.

j. The amount of P.A. sanctioned, the order in which sanctioned and the amount drawn should be noted on the front page of the register and attested by the head of the office.

k. An acknowledgement should be sent to the sanctioning authority:

   i) When the P.A. is sanctioned for the first time;

   ii) When there is revision in the quantum of P.A.

   iii) On 15th April every year showing the position as on 31st March.

   iv) Whenever there is a change in the incumbent of the post.

   v) It should be in the form prescribed under article 98.

   vi) The acknowledgement should always be for the full amount sanctioned.

   vii) The drawing Officer should enclose a true copy of the P.A. acknowledgement sent to the sanctioning authority, to his own pay bill for April each year. otherwise, the PAO/'TO are empowered to return the bill.

l. Advance to peons for railway fares and advances for office expenses in camp can be made from P.A.

m. The P.A. register should be maintained in form 89 of APTC with the following columns.

CHANGES :
1. Date
2. Monthly S.No.
3. Description of expenditure,
4. Amount,
5. Mode of recoupment
6. Date of recoupment.

RECEIPTS : 7. Date

8. No. of bill

9. S.No. of the item of charge recouped;

10. Amount

11. Remarks

Each voucher for the expenditure incurred from P.A. should be entered in this register and its recoupment watched. The register should be closed every day of transactions with the following abstract.

1. opening balance
2. Receipts
3. Total
4. Deduct charges
5. Closing balance
6. Add Unrecouped expenditure
7. Total P.A.

The following 7 to 10 showing the receipts should be filled up whenever the contingent bills are encashed to recoup the P.A. and whenever cash is recovered from the persons concerned. Simultaneously column 5 showing the mode of recoupment (by cash or by cashed contingent bill) and column 6 showing the date of recoupment should be filled up under the attestation of head of the office.

n. Monthly serial number should be assigned to the vouchers for the amounts spent from P.A. and that number should find place both in the register and on the voucher.

o. When the contingent bill is prepared to recoup the P.A. with reference to paid vouchers, the vouchers should be cancelled to avoid the possibility of double drawal at a later date.

p. The unrecouped vouchers and cancelled vouchers should be preserved carefully serially arranged in the personal custody of the Head of the Office for production before the inspection parties. If any voucher is not produced the Head of the office will have to make the good the amount covered by vouchers so lost and nor produced.

q. The closing balance of P.A. register should be taken to the cash book.

r. Whenever there is change in the incumbency of Head of the office due to C.L./E.L. or transfer, the closing balance of P.A. register including unrecouped vouchers should be verified by the incoming government servant and the result of verification recorded in the register under his full signature.

PROCEDURE FOR DRAWAL OF MONEYS

I. COMMON TO ALL TYPES OF BILLS;

A claim against the government shall be made by presenting at the Treasury-A Bill in the form prescribed (Printed/Typed/Stencilled) dully receipted, and when necessary stamped. The bill should contain the following details :

i) Nature of the claim

ii) Period to which the claims relates

iii) Orders if any sanctioning the expenditure

iv) The authority for any deduction made in the bill

v) Complete classification also indicating boldly whether it is PLAN/ NON-PLAN/CENTRALLY SPONSORED SCHEMES/CONTINGENCY FUND

vi) Should be signed in full in ink or ball pen and should be legible and clear.

vii) The signature on the bill should tally with the specimen signature lodged at the treasury.

viii) Should be countersigned wherever necessary.

ix) Bill or voucher should bear the office seal.

x) The seal of the drawing Officer should be affixed below the signature

xi) The total amount claimed should be rounded off to the nearest rupee;

xii) The total amount claimed should be written in figures and words

xiii) The word 'only' should be written after the number of rupees;

xiv) No space should be left to prevent interpolation in writing amounts

xv) The spaces left blank either in the money column or in the column for particulars of bills shall invariably be covered by oblique lines.

xvi) A note to the effect that the amount of the bill is below a specified amount expressed in whole rupees shall invariably be recorded in the body of the bill in red ink. The amount so specified should be a sum slightly in excess of the total amount of the bill.

xvii) Bill should not contain erasures. Every correction or alteration in the total of a bill and in te payment order should be separately attested by the full signature of the person who signs the receipt.

xviii) Different bills may be presented for expenditure debitable to different heads of amount.

xix) No bill shall contain facsimile signature. The bills issued by Telephones/ Water/electricity. Departments with the facsimile signature are permitted as an exception to this Rule.

xx) The Head of the Office may authorise a Gazetted government servant serving under him to sign bills, vouchers and payment orders for him duly communicating his specimen signature to the Treasury. This delegation shall not in any way relieve the Head of the office of his responsibility for the accuracy of the bills etc. and for the disposal of the moneys drawn from the Treasury.

xxi) When a bill relates to a charge incurred under a special order or sanction, an attested true copy of it shall be attached to the bill duly recording the particulars of sanction in the bill.

xxii) A government servant shall not issue a copy of any bill, cheque or other voucher which has already been paid on the allegation that the payees copy has been lost or is not available. A certificate may however be given that on a specified day a certain sum was paid to a certain person on a certain account. A fee of one rupee shall be levied for each certificate issued to a private party.

xxiii) If a bill or other voucher that has been passed for payment at the Treasury is alleged to have been lost before payment, the government servant who drew the original bill or other voucher shall ascertain from the treasury whether payment has already been made on the original or not, and shall request the treasury not to make payment

on the original if presented subsequently. If the treasury has not made payment, on the original, he may issue a duplicate, which shall bear distinctly on its face the word 'duplicate' written in red ink.

xxiv) Every receipt for a sum exceeding Rs.20/- shall be duly stamped by the payee with 20 paise Revenue stamp.

xxv) No bill or payment order shall be signed by a clerk for the head of the office. The classes of non-gazetted government servants who may draw pay, leave salary and T.A. bills themselves and the conditions under which they may do so are specified.

NOTE (1) : As regards refunds, loans, advances etc. the bills should be signed or countersigned by the authorities competent to sanction the charges or should be drawn by the government servant concerned on the basis of the sanction accorded by the competent authority.

NOTE (2) *: The powers to draw contingent bills should be exercised only by* a non-gazetted government servant, who has got a substantive appointment in government service. A non-gazetted government servant who has no substantive appointment shall get his bills drawn by his superior gazetted Officer.

II. APPLICABLE TO PAY BILLS :

Separate pay bills for permanent and temporary establishment gazetted and non-gazetted, plan and non-plan should be presented in the Treasury.

The bills should indicate-

i) The name of the government servant.

ii) Rate of pay

iii) Changes in pay with brief narration

iv) G.O.No. and date in case of temporary establishment.

v) Certificate prescribed in respect of Temporary Establishment continued for 3 months beyond the period of sanction.

vi) The period for which sanction exists;

vii) Copies of order regarding promotions and similar changes or any correspondence regarding a claim shall not be attached to the pay bill.

viii) If payment for the month is postponed for any employee, it shall not be omitted from the bill, but shal be noted in red ink and omitted in the total;

ix) If claim is for the part of a month the number of days for which the claim is made shall be noted against the government servant's name

x) Totals may be indicated for each page separately and page wise totals entered in the last page and grand total is arrived at;

xi) Pay bill on first/regular appointment to Gazetted and supetior service shall be supported by a certificate of the Drawing Officer to the effect that the individual has submitted the health certificate prescribed.

xii) LPC has to be enclosed in respect of employees joined on transfer.

xiii) The Drawing Officer shall send within 3 days of encashing the connected pay bills a copy of schedule attached to the pay bills to the respective Executive Engineers wherever rent is recovered giving reference to the voucher number, the net amount and date of encashment.

xiv) The D.O. shall issue a monetary receipt in Form 41-B to the persons from whom Income Tax is deducted from the salary pay bills.

xv) Absentee statement – The Drawing Officer shall ordinarily attach an absentee statement in Form 48 to the monthly establishment pay bill, if any person in superior service has been absent during the month on leave (other than casual leave) or deputation or suspension, or without leave, or if a post has been left vacant substantively. If no government servant in superior service has been absent otherwise than on casual leave during the month, the Drawing Officer shall attach the relevant certificate to the establishment pay bill.

xvi) INCREMENT CERTIFICATES

a) An increment has ordinarily to be drawn as a matter of course unless it is withheld. In the absence of any specific order withholding an increment before the date on which it falls due for payment, the increment accrues automatically on that date.

b) The Drawing Officers are empowered to release the increments duly enclosing :

i) Increment Certificate in Form 49 signed by him;

ii) Additional certificate signed by him stating that the subordinate concerned has completed probation satisfactorily on a specified date indicating also whether he is a direct recruit or a promotee;

iii) Certificate of insurance with the APGLI

No increment certificate need to enclosed in respect of person whose names need not be shown in the pay bills presented in the Treasury/ P.A.O. However the increment certificate should be attached to the office copies of the pay bills to facilitate test check during local audit.

c) An increment watch register in APTC form 106, should be maintained by the Drawing Officers for Non-Gazetted and Gazetted Officer separately. Separate pages should be allotted for each month and the names of government servants, the rate of pay being drawn and the date from which it is drawn and date of next increment should be recorded in the register with reference to the Service Registers. Whenever the increment is preponed/postponed the name of the individual should be entered in the page allotted for the month to which it is postponed/preponed.

PROCEDURE FOR DRAWAL OF PAY AND ALLOWANCES BY GAZETTED OFFICERS

The system of issue of pay slips to Gazetted Officers by the A.G./ PAO and drawal of bills by the Gazetted Officers themselves was dispensed with from 1-1-1977 and 1-1-1980 in respect of officers working in the districts and twin cities respectively. However, the P.A.O. Hyderabad is the pay fixing authority in respect of All India Service Officers, A.P. Administrative Service Officers, select list officers holding cadre posts and Dist. and Sessions Judges working in the entire state.

The pay and allowances of all the Gazetted Officers including heads of offices, including those to whom pay slips are issued by PAO are to be drawn and disbursed by the Heads of Offices or the Drawing Officers who are delegated with the powers by Heads of offices as in the case of Non-Gazetted staff. The officers may opt to receive their salary either in cash or through Account Payee cheques.

The pay and allowances of the Head of the office are to be determined by his immediate superior Officer/head of the Department. In respect of

other Gazetted officers the Head of the office shall determine their pay and allowances. C.T.C.s of officers transferred, need not be sent to the A.G./ PAO or the Chief Secretary to Government excepting those of All India Service Officers and heads of departments.

MAINTENANCE OF PAY BILL REGISTERS

The following revised procedure has been introduced with effect from the month of March 1989.

1. Claims of All India Service Officers Gazetted Officers and Non-Gazetted employees should be drawn on separate bills;
2. The existing procedure of maintaining office copies of consolidated pay bills is discontinued;
3. The office copies of the pay bills should be maintained in a PAY BILL REGISTER IN APTC FORM 109.
4. The pay bill register is an individual's ledger indicting the pay and allowances drawn by the individual during a financial year, recoveries or deductions made from his pay bills, loans and advances taken and amount recovered in each monthly bill etc.
5. One Register will be used for each financial year. at the beginning of the Register, a suitable index should be provided. Numbering will be done at alternative pages since each individual's ledger will have two pages;
6. At the beginning of the financial year or during the financial year, when an individual joins in a particular office, the particulars of his L.P.C. and entitlements will be entered in the approximate box provided on the left side page. In case of existing employees, the ledger folio number of the previous year's pay bill register will also be entered.
7. The particulars of loans and advances sanctioned are to be entered in the approximate columns on the right side page in the box provided. In the case of employees transferred in, these details are to be posted from the LPC.
8. The pay and allowances drawn during a particular month will have to be entered in the column provided for that month and thereafter the entries are to be made in the original salary bill to be presented in the Treasury/ PAO/. The salary bill number given in the Treasury Bill Register will be indicated in column. 30 of the pay bill Register. The Drawing Officer will

have to attest each entry in the pay bill register while verifying the same as noted in the original pay bill to be presented at the Treasury.

9. Separate space has been provided for recording the particulars of arrears of pay and allowances, encashment of earned leave etc. At the close of the financial year or when the individual is transferred the grand totals of the payments and recoveries made will be entered in the appropriate column in the box for loans and advances and outstanding loan balances as on the close of the financial year or at the time of transfer will be noted in the appropriate column and the same will be noted in the L.P.C. to be issued or in the next year's ledger page allotted to the individuals.

10. An extract of the pay and allowances drawn and recoveries made and the balances of loans to be recovered will be furnished to each individual employee in the month of March every year, so that the employee can confirm the correctness of the particulars.

11. After the entries of the pay and allowances and deductions etc. are made in the pay bill register, which is to serve as an office copy of the pay bill of an employee and original pay bill is sent to PAO/'Treasury the particulars of any item disallowed or modified in the Audit, are to be entered in the Pay Bill Register of the individual by rounding off the existing figures in red ink and indicating the revised figures in red ink and attested by the Drawing Officer.

The pay bill register is a permanent record and should be preserved permanently

CONTINGENT BILLS :

Directions to be followed in preparing contingent bills :

In G.O.Ms.No.179, Finance and Planning (FW.TFR), dt.15-5-89 new bill forms have been introduced for various types of claims with effect from June 1989 in case of Ranga Redy District and August 89 in all other districts including twin cities. The salient features of these new bills are :

i) the practice of having pre-printed certificates on the bills is discontinued. The certificates essential for a particular type of claim

will have to be written in the space provided for the purpose and if space is not sufficient a separate sheet can be attached to the bills.

ii) The purpose for which the revised forms are to be used are specified in the above government order as follows;

1. Salary bill Form 47	I)	Drawal of pay and allowances of both G.O.s.and N.G.Os.
	ii)	Encashment of EL.
2. T.A. Bills Form 52	I)	T.A. of GOs. And NGOs.
	ii)	F.T.A.
	iii)	Conveyance Allowance
	iv)	Payments towards bus warrants
	v)	L.T.C.
3. Employees Form 40 Advances	I)	All loans and advances to employees, separate forms will be used for drawal of loans from GPF and APGLI.
	ii)	Pay/T.A. Advance
	iii)	Medical Advance
4. Abstract Form 57 contingent bill	I)	All types of advances for departmental purposes for which detailed bills are sent to the A.G./Comptroller.

4. LEAVE RULES

Leave is a permission granted to a government servant to be absent from actual duty.

The General Rules for the grant of leave are as follows :

The authorities competent to grant leave other than special disability leave to the Government servant working in each Department are detailed in FR 66.

Leave cannot be claimed as a matter of right. When the exigencies of the public service so require discretion to refuse or revoke leave of any description is reserved with the sanctioning authority. But at the same time the competent authority cannot compel a government servant to take leave on half pay when leave on full pay is permissible to him. Further under rule 6 of A.P. Leave Rules any kind of leave admissible may be granted in continuation with any other kind of leave (other than casual leave) so admissible or in continuation of leave already taken whether of the same or of any other kind.

Similarly vacation may be availed in combination or in continuation of any other kind of leave.

Leave ordinarily begins on the day on which transfer of charge is effected and ends on the day on which charge is resumed. Holidays can be prefixed or affixed to leave subject to the conditions.

A government servant on leave cannot take up any service or setting up of any private practice etc., except with the permission of competent authority.

A government servant who remains absent after the end of his leave is entitled to no leave salary for the period of such absence, and that period will be debited against his leave account as though it is leave on half pay unless extension of leave is granted by the competent authority.

The application for grant of leave should be specify the period of leave, nature of leave, leave address and in the case of leave on Medical Certificate, the Medical Certificate should be enclosed.

Vacation Department means a Department where vacation exceeds 15 days. Vacation is treated as duty for all purposes. If earned leave is taken in combination of vacation, the total period of leave and vacation should not exceed 120 days.

An employees transferred from vacation to non-vacation Department is treated as in non-vacation Department from the close of last vacation enjoyed and on transfer from non-vacation to vacation Department is treated as in vacation previous to such transfer.

Leave at credit will lapse if interruption in service other than leave occurs.

Leave at credit shall lapse on the date of retirement, death or resignation. However, earned leave at credit not exceeding 240 days can be encased in case of retirement or death.

While in service all regular employees both superior and Class IV are eligible to surrender earned leave of 15 days in each financial year and receive each benefit in lieu thereof equal to leave salary on full pay of 15/30 days.

Temporary and emergency employees are eligible to surrender 15 days of earned leave after completing twenty-four months of service in the first instance and thereafter 15 days during alternate financial year.

EARNED LEAVE FROM :

NON-VACATION DEPARTMENTS

Types of Employees	**Earning capacity**	**Accumulation**	**Availment**
Regular including (LGGS from 1-1-88)	Advance credit of 15-days for everyhalf year on 1st January & 1 July	180 days at a time upto 30-6-83. 240 days from 1-7-83	120 days at a time. 180 days if outside India, Pakistan, Burma and Nepal.
Others (Non Permanent)	Advance credit of 8 days per half year on 1st January & 1 July	30 days	Leave at credit

In respect of employees who join service in the middle of the half year, the advance credit will be as follows for each completed month of service :

Regular joined on 15-2-89 1st half year completed months – 4 months @ 2 ½ = 10 days. Others joined on 15-2-89 Ist half year – completed months – 4 months 1 + 1 + 2 + 1 = 5 days. Similarly for those retiring in the middle of the half year.

If the employee is on EOL during the preceding half year, the advance credit for the present half year will be reduced by 1/10 of the period of EOL taken during the preceding half year subject to a maximum of 15/8 days.

VACATION DEPARTMENT :

Regular employees in Superior Service. 1/11 of duty minus 30 days or a portion of 30 days equal to the vacation taken and full period of vacation. From 1-11-89 the reduction is 28 days instead of 30 days in respect of teachers. As in non-vacation Department.

Non-Permanent in Superior Service and Permanent and regular employees in LGS, 1/22 of duty minus 15 days or a portion of 15 days equal to the vacation taken and full period of vacation, 30 days, leave at credit.

Non-Permanent in LGS, not eligible for earned leave.

If the period of vacation enjoyed is not more than 15 days, he is deemed to have not enjoyed the vacation and hence no deduction will be made.

HALF PAY LEAVE :

(Both non-vacation and vacation – Regular & Temporary) 20 Days for each completed year of Service. There is no limit for accumulation of leave. Leave to the extent admissible can be granted at a time. However, in respect of temporary employees half pay leave can be granted on MC only after 2 years of service and 10- (a) (I) candidates are not eligible for half pay leave.

COMMUTED LEAVE to all on MC only: Half of Half Pay leave at credit can be commuted to leave on full pay to an extent of 240 days in entire service. The debit in the half pay leave account will be double the period of commuted leave taken.

LEAVE NOT DUE :

When half pay leave is not at credit, leave not due to an extent of 180 days during entire service can be granted on MC only. The debit will be in the half pay leave account to be set off against future credit. If any employee resigns or retires voluntarily after availing this leave and before wipping off the minus balance, the leave salary paid for the minus balance should be recovered. However, if it is on medical invalidation or death, recovery will not be insisted.

EXTRA ORDINARY LEAVE – RULES: 15-A, 16, 19 and 23 :

Permanent and approved probationers : Not exceeding 5 years including other kinds of leave at a time. Probationers 23(a) (ii): The duration of EOL on any one occasion shall not exceed the following limits :

a) Three months ordinarily

b) Six months if it is supporte by medical certificate and the employee has completed 3 years of service.

c) 18 months for treatment of TB or leprosy either as in patient and or out patient on a certificate issued by the authorised medical Officer and employee has put in a service exceeding one year.

d) 12 months for treatment of cancer, mental illness on the certificate from the recognised Institute or Doctor.

e) 24 months for prosecuting studies certified to be in public interest and to employees of SC and ST to join examination training course at the centre notified by the government to the extent necessary, provided the government servant has completed not less than one year of continuous service before processing on leave. The grant of EOL in item (b) to (e) is by government.

LEAVE SALARY :

1. Earned Leave : Equal to full pay drawn before proceeding on leave.
2. Leave on half Pay : Equal to half of the pay drawn before proceeding on leave and full pay for a period of 6 months in entire service if the leave is on MC, for treatment of TB, Leprosy, Cancer, mental illness or heart diseases and Renal (Kidney) failure.

3. Leave not due : Equal to half pay.

4. Commuted leave : Twice the amount admissible under (2) above.

5. EOL : No leave salary. However in respect of NGOs whose pay does not exceed Rs.700/-pm (1978 scales) if the leave is for treatment of TB, Leprosy. Cancer, mental illness. Eligible to exgratia equal to half the pay drawn before proceeding on leave subject to a minimum of Rs.220/- and maximum of Rs.350/- and employees of last grade service exgratia equal to half pay subject to a maximum of Rs.220/- pm.

Other leaves under FR allowed to employees covered by A.P. Leave Rules 1933 vide ruling 1 (ii) thereunder :

1. Special Disability Leave – : Grant by Government only : This leave is admissible to permanent and temporary government servants who is disabled by injury intentionally inflicted or caused or consequence of due performance of official duties or in consequence of his official position. This leave is granted on MC issued by the competent medical authority for a period not exceeding 24 months for any one disability. Leave salary equal to leave on full pay is payable for the first 120 days in respect of permanent employees and 30 days in respect of the temporary employees and half pay for the remaining period without debit to any leave account. If the employee requests for payment of leave salary on full pay, full pay will be paid for the period of earned leave admissible (120 days maximum) and half of the period will be debited in the earned leave account.

   Ruling : The disability does not include the disability caused in the road accidents while going to office from residence and vice versa, but includes road accident while proceeding on official duty from office to office, or court or a workspot on the field.

2. Study Leave : FR 84 (Not debitable to leave account) : The leave is granted by government only for the study of Scientific, Technical and other similar problems for a period not exceeding 2 years in entire service after a service of 5 years. If it is combined with leave with allowances this period should not exceed 28 months EOL may be taken in conjunction of this leave without any limit (Note under Rule 13 of study leave rules). He will draw during leave, leave salary on half pay.

3. Maternity leave not debitable to leave account : This leave is admissible to married women employees on the basis of medical certificate issued by the competent medical Officer for a period not exceeding 90 days for each confinement and not exceeding 6 seeks in case of abortions, including miscarriage and termination of pregnancy. Maternity leave for confinement is to be sanctioned to female government servant with less than two surviving children. This leave can be combined with other kinds of leave. If this leave falls during vacation, the residue of 90 days only will be sanctioned as maternity leave. Leave salary payable is equal to leave salary on full pay.

4. Hospital Leave : Not debitable to Leave Account: Applicable to all last grade service employees and certain subordinate service staff. This leave is on half pay for a period not exceeding 6 months in every 3 years of service when detained in hospital and receiving medical aid as out patient. It is not admissible when the treatment is necessiated by intemperance or irregular habits. Out of the above 6 months, 3 months can be full pay if the detention in hospital is due to injury received or disease constructed in the course of duty.

CASUAL LEAVE :

Casual leave is a concession to enable to government servant in special circumstances to be absent from duty for short period, without such absence being treated as leave.

Maximum period of casual leave that can be availed of in a calendar year is only 15 days. The unavailed part of leave will lapse at the close of the calendar year.

Casual leave may be combined with optional holidays or Sundays or other authorised public holidays provided the resulting period of absence does not exceed 10 days.

In the case of casual leave to purely temporary and emergency government servants the sanctioning authority will use its discretion having regard to the length of service put in by such government servants.

A government servant may be granted casual leave for half-a-day either from 10-30 to 1-30 PM or from 2.00 PM to 5-00 PM.

SPECIAL CASUAL LEAVE :

The following are the purposes for which special casual leave may be granted to a government servant.

Occasion	Amount of Leave
Summons to give witness in a court in which his private interests are not in issue	As per the certificate of attendance
For Family Planning Operation :	
Male Vasectomy 1st and 2nd Operations	6 working days
Female – Tubectomy	14 working days
Male-for tubectomy of wife	7 days
2nd Operation	14/7 days
Salpingactomy after medical termination of pregnancy	14 days
Male for above operation of wife	7 days
Insertion of intra uterence contraceptive	1 day on the day of IUD insertion

Leave for 2nd operation is permissible when the doctor certifies that the first operation was a failure.

Additional Special CL beyond above limits can be given on account of post operation complications subject to production of Medical Certificate.

RECANALISATION (BOTH) :

21 days or the actual period as per the certificate whichever is less plus to and fro journey days, if the operation is necessary as he is having less than 2 children or lost all his male children after operation.

The special CL for F.P. Operation can be prefixed or suffixed to regular leave/CL.

SPORTS :

1.	For participating in sporting events of National or International importance when selected by the All India Sporting Federation and also as Manager of the team.	Not exceeding 30 days in a calendar year. Excess to be treated as regular leave.
2.	Elected as President or Secretary of National Sports Bodies.	15 days in a calendar year.
3.	A.P. Secretariat Cultural Association Members for dramas enacted in Mufassil.	6 days in a calendar year.
4.	Office Bearers and members on the Purchasing Committee of the Government Employees Consumer Cooperative Stores to go to districts for making bulk purchases of various commodities for stores.	12 days in a calendar year plus 2 days for each trip of journey.
5.	Principal office bearers of the Regional Association and two Office bearers from each unit in the districts/city for representation in A.P. Civil Services Joint Staff Council.	7 days in a calendar year.
6.	Employees of Vacation Department in case of dire necessity or under the pressing family circumstances.	-do-
7.	Employees who participate in the rallies Camps etc., of the A.P. Bharat Scouts & Guides.	10 days in a calendar year
8.	Members of Institution of Engineers :	
a)	for attending annual meeting at Hyderabad.	7 days in a calendar year
b)	for attending annual convention in any part of the country	10 days in a calendar year.

GENERAL INSTRUCTIONS :

Casual leave cannot be combined with the regular leave/joining Time/ Vacation. Special Casual Leave can intervene between two spells of leave if certified by the Doctor.

6. DISCIPLINARY PROCEDURE IN BRIEF

Three aspects of disciplinary procedure mainly relate to suspension, enquiry and award of punishment by the appropriate disciplinary authority.

Following guidelines can be followed for keeping officials under suspension.

- Where the continuance in office of the official is likely to subvert discipline in the office.
- Where the continuance is against wider public interest, i.e., when if he has engaged himself in activities prejudicial to the interest of the security of the state or when any serious irregularity pertained to accounts has been committed by the official.
- Where allegations have been made against the official and preliminary enquiry has reviewed that a prima-facie is made out justifying prosecution/Department proceedings which is likely to end up in conviction/dismissal from service.
- Any offence or conduct involved in moral turpitude.
- Corruption embezzlement or misappropriation, possession of disproportionate assets, misuse of official power for personal gains.
- Serious negligence and dereliction of duty resulting in loss to government.
- Desertion of duty.
- Refusal or deliberate failure to carry out written orders of superior officers.
- Where a case against the official in respect of any criminal offence is under investigation or enquiry.
- An Officer is deemed to have been placed under suspension when he is detained by police in custody on a criminal charge or when he is convicted of a criminal offence exceeding 48 hours.
- Before ordering the suspension it can be considered by the appropriate authority whether sending the Officer on leave, if he is willing to take, it will not be appropriate or adequate in a given circumstance.

While issuing orders of suspension it should be made in public interest and the amount of subsistence allowance should also be indicated. No

retrospective effect of an order of suspension is possible. Where an Officer is under suspension he should not be granted leave. He is free to go any where but make available the address with the head of the office. He can be paid the subsistence allowance only when he certifies that he has not taken up another employment.

- In trap cases the official should be suspended immediately.
- In the case of losses and fraud the matter is usually reported to the police and officials involved are kept under suspension when they are apprehended by the police and prosecuted.
- A brief statement of allegations against the official should be prepared and kept on file.
- A review must be made periodically about the continued need for suspension of an official, which should not normally exceed 2 years.
- Enquiry has to be conducted by an Officer appointed specially for the purpose and assisted by a presenting Officer nominated by the organisation. The official charged with acts of negligence and against whom enquiry is being held can also take the assistance of another official as defence Council. The penalities come under minor and major categories.

Minor Penalities

- Censure
- Withholding of promotion
- Recovery from pay of the whole or any part of the pecuniary loss caused to the State Government or local authority or Corporation, by negligence or breach of orders;
- Withholding of increments without cumulative effect for a period not exceeding 3 years.
- Suspension where a person has already been suspended.

Major penalities

- Reduction to a lower rank in the seniority list, or to a lower post or to a lower time scale or to a lower stage in a time-scale.
- Compulsory retirement

- Removal
- Dismissal
- Withholding of increments with cumulative effect for any period and without cumulative effect for a period exceeding 3 years which may affect adversely the pension payable.
- The appointing authority of any higher authority may impose on a official the penalities withholding of promotion for any specific fault or misconduct, compulsory retirement, removal and dismissal.
- On receipt of the enquiry report the disciplinary authority furnishes a copy of the report to the person concerned allowing him 1 month time for making representations. After getting the representation the discipline authority can impose the appropriate penalty without giving another opportunity to the official against the proposed penalty.
- The final order containing the decision of the authority to impose the penalty should be a speaking order containing the relevant facts findings of the enquiry Officer and decision of the disciplinary authority thereon.

Following types of cases merit major penalities

- Possession of disproportionate assets
- Obtaining or attempting to obtain illegal gratification.
- Misappropriation of government property, money, stores.
- Obtaining any valuable from anyone without consideration for showing official favour.
- Falsification of government records
- Misuse of official position or power for personal gains.
- False claim like T.A. claim reimbursements etc.

5. STORES : PURCHASES, ENTRIES, VERIFICATION

The term "Stores" indicates articles and materials such as furniture, chemicals, scientific instruments, appliances, stationery articles, articles of diet in hospitals and jails, construction materials, manufacture stores, machinery, tools and plants but excluding books, publications and periodicals in a library.

All stores shall be purchased through the Director, Printing stationery and Stores Purchase Department who has been vested with a State wide jurisdiction with regard to purchase with certain exceptions and where special exemption has been obtained from the stores purchase committee. The following are some of the articles exempted which can be purchased by the indenting departments directly following the usual procedure prescribed.

a. Perishable articles

b. News papers, journals, periodicals, books, maps charts etc.

c. Articles in common use like goblets, brooms, khas khas, garden tools etc.

d. Consumable stores.

e. Stores covered by the rate contract of the DGS & DGOI provided they are purchased in accordance with procedure laid down by the GOI.

f. Articles in common use whose individual value does not exceed Rs.500/- per unit subject to a maximum of Rs.5,000/- at a time.

In cases of emergency, the Heads of Departments with the approval of the Stores Purchase Committee of the Government will make direct purchases to an unlimited extent subject to the revision in the budget.

Forecast of requirement and time of purchase

An estimate of the requirements in respect of items required so far as they can be foreseen should be prepared by the purchasing departments. As far as possible sufficient stock may be laid during the cheapest season by keeping close touch with other Government departments/undertakings.

Stores purchase Policy of the Government :

1. 1st preference should be given to products manufactured in Government Centres/Workshops/TCPCs

2. 2nd preference to be given – in respect of standard items to fully owned Government undertaking and Corporations; Tenders need not be called for in respect of items 1 & 2.
3. The Government undertakings and corporations shall however participate in the tenders along with others in respect of non-standard items produced by them.
4. 384 article have been reserved for exclusive purchase, 11 items for 75% and 15 items – for 50% purchase from registered SSI units within in the state;
5. SSI units are exempted from payment of Earnest Money Deposit for tender documents and Security deposits for performance upto specified limits of volume;
6. Tender sets may be given free of cost to APSSIDC & Regd. SSI units;
7. Each purchasing department should constitute a purchase committee and co-opt nominees of Industries Departments and APSSIDC. Presence of nominee of DIC or APSSIDC alone constitutes the quorum.
8. Whenever tenders are called for, for purchase of any of these items reserved they should specifically stipulate that the those tenders are being invited only from registered SSI units in the State;
9. Purchase should be from good manufactured and sold within the state by the SSI units in respect of these items;
10. In case there is no response to a tender or when the DIC certifies that there are no SSI units in the state manufacturing a particular product, than only action should be taken by the indenting Agencies to procure them by inviting open tenders from Medium and Large scale Industries within the State and outside the State – that too only after obtaining prior exemption orders of the State Level purchase Review Committee which meets on 1st Saturday every month;
11. Price preference upto 10% is allowed in respect of SSI units;
12. APSSIDC has been nominated as Sole Selling Agency in respect of 15 items. In regard to those items, outside purchase is allowed only after obtianing a non-availability certificate from the APSSIDC;

13. Certificate should be enclosed to every bill in stores purchases that the conditions regarding purchase of stores from SSI Sector covered by the bill have been fulfilled.
14. This policy applies to all government departments, autonomous bodies, local bodies, Municipal Corporation and APSEB also.

GOODS MANUFACTURED IN JAILS :

Government Department should place orders on the Jail Department for the following items :

i) Stitching of khaki uniforms, Attender liveries etc.

ii) Manufacturing of Ammunition boots for use of uniformed officials of Prisons, Police and Fire Services Departments.

iii) Wooden furniture of various specifications besides repairs and canning work.

iv) Durries of various sizes

v) Phenyle

vi) Toilet, Bar, Carbolic and Washing soap cakes

vii) Navar (i.e. cot types)

viii) Bed sheets, towels and green and red screen cloth

ix) Dyeing work of cloth and yarn

Orders should be placed on Jail Department sufficiently early to enable the manutacture of articles and their supply in time.

If the Jail Departments expresses its inability and furnishes a "No Stock Certificate" then alone intending departments can purchase the above articles from outside the Jail Department.

MODERN OFFICE EQUIPMENT :

1. Government have set up the A.P. Technology Services-
   a) to provide consultancy to the government departments in the purchase of modern office equipment including computer hardware:
   b) maintenance of hardware on contractual basis; and
   c) to provide the services to operate the system.

2. The APTS has been permitted to charge 2.5% towards consultancy/ Administrative charges over the cost of equipment.

3. The APTS Limited has been declared as the centralised agency for the selection in purchase and supply of the equipment.

4 The APTS has also been declared as the sole nodal agency for the development of software in Government Departments/State undertakings.

5 Orders have been issued for payment of 90% of the estimated cost of the Computer or other office automation equipment to the APTS along with indent and settle the balance of 10% within 60 days of satisfactory completion of supply of the said equipment.

CLOTH :

100% of cloth requirements – towards livery – should be from APCO only. In respect of remaining items such as bed sheets, towels, door curtains etc., 50% from APCO and 50% from A.P. Khadi and Village Industries Board.

WOOLEN CARPETS

to be procured from A.P. State Wool Industrial Cooperative Society Ltd., Hyderabad.

LEATHER GOODS

Foot-wear and leather articles may be purchased from LIDCAP.

STEEL FURNITURE

Government departments should obtain their requirements direct from the Jail Department the Government Centres (Like PWD Workshops), Hyderabad, Sithanagaram, Saw-Mill-cum Seasoning Mill-cum-Mechanical Wood Workshops, Sanathnagar T.C.P.Civil Service run by the government and private it is recognised by the government (Like boys Town I.T.I., Hyderabad) after exhausting each source referred above and lastly from rate contract firms.

SETWIN should be treated on par with all government undertakings and entitled to second preference in the matter of purchase and no tenders need be called for, for standard items. (Cane Weaving of

chairs, Woolen socks, printing and binding works, stationery articles etc.).

a. Stiching of Uniforms and ready-made garments including embroidery works to be entrusted to physically handicapped coop. Tailoring Industrial (P) Ltd.,

b. Caning of Chairs and manufacture of garden chairs to M/s Laxm Physically handicapped Coop. Cane and weaving Industrial Society.

(a) & (b) should be entrusted to the above societies after obtaining no objection certificate from jail dept.

(c) Blind and Lame candles manufacturing Society should be given preference over others in regard to procurement of Wax Candles as per existing rules.

(d) Govt. Departments/Corporations/Organisations/Local Bodies may purchase the requirements of wooden furniture Steel furniture and Printing works from the boys town Industrial Training Centre. Hyderabad after exhausting higher priority preference like jail and other departments.

(e) i) Commissioner of Printing and Stationery and Stores Purchase is required to procure the wooden furniture (along with the SSI units in States) file pads and envelops (along with SETWIN) from the units of A.P. Vikalanguala Coop. Corporation.

(ii) Government Departments/Corporations are required to entrust some job works in the Trades of Printing and Recanning of chairs to the above Corporation.

ENAMEL SIGN BOARDS :

In respect of Enamel sign boards consisting of all standard items preference should be given to the Government Enamel Wear Unit, Gudur, Nellore district while placing orders. In respect of non-standard items government undertakings and corporations should participate in the tenders along with the Small Industrial Units in the State which are actually engaged in the manufacturing of enamel wear items.

ELECTRICAL APPLICANCES :

Electrical appliances with ISI mark or government quality marked items only should be purchased to avoid any Electrical hazards.

TENDER INSTRUCTIONS

Tenders should be obtained-

i. By advertisement (open tender)

ii. By direct invitation to limited No. of firms (limited tender)

iii. By invitation to one firm only (single tender)

The open tender system should be adopted whenever the value of the order for purchase of stores is Rs.5000/- or more (Rs.10,000/- in the case of PWD and Electricity)

The limited tender system should ordinarily be adopted whenever the estimated value of the order to be given is less than Rs.5,000/- or where it is known that only very few firms deal in the required stores.

The single tender system may be adopted in the case of a small order which does not exceed Rs.1,000/- (Rs.2,000/- if more than one kind of article is ordered at one time and proprietary articles.

CIRCULAR COMMUNICATIONS

Cash deposit as Earnest Money should as a rule be demanded from all tenders even though they may claim to be firms of established repute. Heads of Departments may dispense with the lodging of EMD. EMD and Security Deposit should be credited to government under the head :

Security Deposit :	8443 Civil Deposits-103 – Security Deposits
EMD :	8443 Civil Deposits, 800 – Other Deposits – SH (02) Miscellaneous Deposits

The sales tax has be to credited to the Head

MH-0040-Sales Tax 102-State Sales Tax.

EMD may be collected at 1% with a maximum ceiling of Rs.1000/-.

Security Deposit is at 10% of the value.

The intending tenders must produce Income-Tax and Sales Tax verification certificates in the prescribe form from the ITO/CTO to the effect that Sales Tax and Income Tax upto the end of the previous accounts years had been duly paid.

OPENING OF TENDERS :

After opening the tenders at the specified time, a brief statement on the spot will be recorded giving the names of the tenderers and the amount of the tender and the dated signature of those tenders who are present should be obtained. (The prices quoted should be read out).

LOWEST OR LOWER TENDER

The financial status of the tenderers should be taken into account before a tender is selected. If other conditions are equal, the lowest tender should be accepted. When the lowest tender is not accepted the reasons should be recorded. Acceptance or rejection of a tender is a matter entirely within the discretion of the government servant responsible for purchase of materials. A superior authority or the A.G. may ask him to justify the manner in which he has used his discretion and to give his reasons for rejecting any tender. No tender should be accepted from any person directly or indirectly connected with the government servant.

While rejecting the lowest tender the competent authority should assign clear, specific reasons for not accepting the lowest quotation.

PASSING OVER THE LOWEST TENDER

The following factors generally justify the passing over of the lowest tender :

a. Stores not being upto specifications.
b. Delivery period not being suitable.
c. Previous performance not being satisfactory.
d. Inspection report conveying unsatisfactory remarks about capacity, technical equipment and financial position.

PLACING OF ORDERS WITH NEXT HIGHER TENDERERS

If the lowest tenderer is unable to supply full quantity within the delivery period order for the balance of stores or part thereof may be placed

with the next higher tenderer or tenderers, to supply the determined quantity, if necessary at different rates.

PAYMENTS

As a general rule, stores should not be paid for until the receiving Officer has taken delivery and checked the quantity and quality of stores supplied and found them satisfactory in every respect. In very exceptional cases, part of the cost of the stores may be paid in advance on receipt of railway receipt or other proof of dispatch. An agreement should be taken from the contractor to secure the government against all risks.

As an exception to the general rule, orders have been issued for making advance payment of 90% of the bill to the APSSIDC and the APTS along with the indent and to settle balance of 10% within 60 days of satisfactory completion of supply.

RESPONSIBILITY IN CASE THE PROCEDURE IS NOT FOLLOWED

A government servant who buys stores for use in the public service without calling tenders is liable to be called upon by a superior authority or the A.G. to justify the method of purchase, which he has adopted.

If there are sufficient reasons for holding that it is not in the public interest to call for tenders by advertisement the reasons should be recorded and sent to the A.G. confidentially.

When the indenting Officer certified that the demand is so urgent that the additional expenditure involved in the elimination of open competition must be incurred to avoid delay, the nature of urgency should be recorded and the reasons as to why the demand could not be anticipated should also be stated.

SECURITY

Security at 10% of the value of the contracts should be obtained. The security may be in cash, promissory notes, stock certificates, Post office Savings Bank Deposits, Post Office Cash certificates. The personal security of two persons of kown probity and satisfactory financial status may be accepted in exceptional and special cases.

SSI Units, Government Institutions, Federation of Industrial Cooperatives, Institutions of Central Government and other state Governments. (On reciprocal basis) are exempted from payment of Security Deposit.

The head of Department when he thinks desirable, exempt firms of established repute from lodging security deposit.

AGREEMENTS WITH CONTRACTORS

The successful tenderers should be required to execute an agreement in regard to supply of sotres.

A fixed price for each article is essential and no agreement should provide for a price fluctuating with the market price. Agreements are liable for stamp duty but registration is optional. The A.G. in exercise of his audit functions will examine the contracts.

STORES & STOCK ACCOUNTS

Government servant entrusted with stores of any kind should take special care for their custody and for maintaining suitable stock accounts. Separate stock accounts should be maintained for

a. Raw-materials and expandable stores in manufacturing departments.

b. Office furniture including office stores except books, forms and stationery. Form 10 is the form intended for stock accounts of furniture and other office stores.

1. INSPECTION OF STORES

Stores should be inspected with a view to seeing that they are not in excess of the quantity likely to be required during a reasonable period. Perishable stores should be inspected once in half year and the others once a year. a report about obsolete or stores in excess of reasonable requirements should be submitted to the competent authority.

Unserviceable Stores

Stores become unserviceable

a. in the ordinary course by wear and tear;

b. otherwise than by wear and tear.

The authority competent to sanction the purchase of "new stores" is the authority to condemn the unserviceable stores. The condemned stores should be written off accounts.

In the case of stores which have become unserviceable otherwise than by wear and tear, the above authority may also condemn them but not until after their value (as it involves a loss) is written off by the competent authority.

The value of stores should be taken to be their book value or their replacement value. Both the categories of stores referred to above should not be included in the same proceedings. Condemned stores should be disposed off by the sale in public auction.

VERIFICATION OF STORES

Verification of stores should not be entrusted - -

a. to a low paid subordinate; or

b. to the custodian, the ledger keep or the Accountant responsible.

c. to a nominee of the custodian or employee under him;

d. to one who is not conversant with the classification of stores;

Stores should always be verified in the presence of the Officer responsible for its custody. The Officer inspecting should be a responsible and independent of the superior Executive Officer- in-charge of the stores.

Whenever a government servant responsible for stores is transferred, the relieving government servant should verify the stock of stores with the stock accounts, certify about the correctness of the stock taken over and report the result to the immediate superior Officer.

DISCREPANCIES IN VERIFICATION OF STORES

Deficiency in stores may be due to - -

a. incorrect or careless accounting;

b. loss arising from fraud theft or negligence; or

c. an unvoidable cause e.g., wastage, shrinkage and spilling.

The head of the office should fully investigate the cause of any deficiency and send a full report to the controlling authority along with the verification report. Action should then be taken to fix up the responsibility or to obtain the necessary orders to write off. The stock account should show the orders of recover/write off as the case may be.

Any excess detected during stock-taking should after investigation, be taken to stock as a 'receipt' with the remark 'excess found' on stock verification.

LIBRARY BOOKS

Procedure for purchase, write off, disposal of multilated/damaged books and physical verification of books in the libraries attached to various departments/office.

Books may be purchased by heads of departments subject to financial powers from reputed and standard book-sellers. Tenders need not be called for.

PHYSICAL VERIFICATION

i. Libraries having not more than 20,000 volumes and	
a. with more than one qualified library staff	every year
b. with one qualified staff	At intervals of not more than 3 years.
ii. More than 20,000 volumes but not more than 50,000 volumes	At intervals of not more than 3 years
iii. More than 50,000	Sample physical verification at intervals of not more than 5 years. If any unusual and unreasonable shortage is noticed in sample verification shall be done.

The verification should always be subject to surprise test check by some independent officers.

Loss of 3 volumes per 1000 volumes in a year may be taken as reasonable if the loss cannot be attributed to dishonesty or negligence on the part of Librarian;

4. Loss of a book, the value of which exceeds Rs.200/- and books of special nature and rarity shall invariably be investigated and consequential action taken;

5. All such losses will however be written off only by a competent authority.

LOSSES

The government will hold a government servant personally responsible for any loss sustained by the government through fraud or negligence on his part and also for any loss sustained through fraud or negligence on the part of any other government servant to the extent to which it may be shown that he contributed to the loss by his own action or negligence.

CARRIAGE OF MONEY-PRECAUTIONS

Due regard should be paid to all relevant factors including the status of the messenger employed and the distance over which moneys have to be carried. As far as possible only a reliable permanent government servant

should be employed. In abnormal conditions such as disturbances, agitations, officers should use their discretion.

SECURITY DEPOSIT

This is a safeguard to minimise the risk of losses so as to enable recovery for the loss sustained from government servant and contractors.

Every cashier, store-keeper, sub-store keeper and other subordinate who is entrusted, whether permanently or temporarily, with the custody of government cash or stores should ordinarily be required to furnish security and to execute a security bond setting forth the conditions under which he government hold the security and ultimately refund or appropriate it.

The among of security to be furnished by such government servants should be fixed with due regard to circumstances and local conditions in accordance with the departmental codes or manuals. Specific orders of the government or the head of the Department should be obtained whether or not security should be taken, if so to what extent if no specification is made in the departmental codes or manuals.

When a government servant who has furnished security goes on leave or on O.D. substitute posted should furnish full security as his predecessor. This may be relaxed by the competent authority in exceptional cases subject to the following conditions :

1. Officiating arrangement does not exceed 4 months.
2. Substitute is a permanent government servant.
3. Government is satisfied that no risk is involved.

Whenever a private person or a firm contracts with the government to supply stores or execute a work, he should unless exempted by the competent authority, be required to give the security for the due fulfilment of the contracts.

FORMS OF SECURITY

1. Cash (no interest is payable)
2. Govt. Promisory Notes, Municipal, Debentures
3. Post office S.B. Deposits;

4. Post Office cash certificates, and savings certificates issued by the government;
5. Deposit receipts of Scheduled Banks
6. Fidelity bonds of Insurance Companies approved by the Government for this purpose;
7. Other forms of security (Mortgages on real property).

The form of security bond to be executed by a government servant at the times of furnishing security varies according to the form of security furnished.

Registration of security bond is compulsory if security is in the shape of immovable property registration is at government expense.

CUSTODY OF SECURITIES AND SECURITY BONDS

1. They should be kept in the safe custody of the departmental authority, which makes the security.
2. Post office S.B. Pass books should be sent to the post office after 15th June every year for adding interest;
3. The T.O. is responsible for safe custody of the bonds in respect of staff of Treasuries and they should be kept inn the double lock strong room of district Treasury.
4. Government Promissory Notes, stock certificates, Post office cash certificate and saving Certificates issued by the government, municipal debentures and Port trust bonds deposited as security should be lodged in the safe custody in the S.B.H. in Hyderabad city and with the DTO at other places.
5. The deposit receipt of the bank, should be kept in the safe custody of the departmental authority.

RETENTION OF SECURITY DEPOSITS AND BONDS

1. Security deposit of government servant should be retained for atleast 6 months from the date of vacating the post;
2. Security bond should be retained permanently or until it is certain that there is no further necessity for keeping it;

3. All the securities should be verified atleast once a year in May and result reported to the immediate superior Officer.

REPAYMENT OF SECURITY DEPOSIT

1. Under orders of the competent authority
2. In accordance with the terms of security bond
3. Depositors acknowledgement duly signed and witnessed should be obtained.

LOSS OF STORES

Losses due to depreciation should be analysed and recorded under the following:

1. Normal fluctuation in market prices
2. Wear and tear
3. Lack of foresight in purchase
4. Neglect after purchase

Losses not due to depreciation should be recorded as follows :

1. Losses due to theft;
2. Losses due to neglect;
3. Losses due to natural calamities like fire, flood etc.

Losses of stores should be duly recorded in the stock accounts and formal sanction of the competent authority obtained for writing them off or dealing with them.

When a contractor or a departmental employee fails to return any government tools, their value including the appropriate percentage charges should be recovered from him.

REPORT OF LOSSES

1. When a defalcation, loss of public money, stamps, stores and other movable or immovable property occurs or a serious accounting irregularity has been committed. It should be reported to the head of the office immediately.
2. If the head of the office finds that there is prima facie case concerning his office or his subordinate is involved a preliminary report should be sent to the A.G. and through proper channel to the head of the

Department who in turn should report to the government. This report should indicate so far as information is available at that time.

1. The exact nature of defalcation or loss
2. The circumstances which made it possible
3. In case of petty losses not exceeding Rs.400/- which does not appear to involve an embezellement, a serious account irregularity or any other important feature requiring detailed investigation and consideration, the preliminary and final reports need only be sent to the authority competent to write off the loss or deal with it otherwise.
4. When it proves to be impossible to recover the whole or part of public moneys that have been lost, the irrecoverable amount should be written off under orders of the competent authority.
5. After sending the preliminary report, the head of the office should then fully investigate into the case and a detailed report sent to the University authorities with the following details.

i) the nature and extend of loss or account irregularity:

ii) the circustances which made it possible;

iii) whether any amount lost was recovered or whether it is possible to recover it in any way:

iv) disciplinary action taken or is recommended;

v) steps taken/recommended to prevent recurrence;

vi) the head of the Department should also submit a final report to the government giving full information on all these points and when necessary making his recommendations.

6. When a loss occurs by way of damage to any immovable property due to any calamity such as fire or flood or any cause other than wear and tear, the government servant in immediate charge of the property should report the matter at once to his immediate superior and a preliminary report should be sent through the proper channel without delay to the head of the Department, who will report the loss to the government. When the cause of the loss has been fully investigated and it has been decided whether or

not the property should be restored, the head of the office concerned should sent a final detailed report to the head of the Department and at the same time an abstract of it in form 20 to the accountant general. The head of the Department should send a final detailed report to the government when he proposes that the government should write off the loss, recommends that the government should take disciplinary action or applies for funds to be specially provided to meet the cost of restoration of the property.

PROCEDURE FOR ENFORCING RESPONSIBILITY FOR LOSSES

1. The head of the office should at once start investigation;
2. For the purpose of investigation, if necessary A.G. may be requested to furnish relevant vouchers and documents;
3. If investigation is complex. Government may be requested to depute an audit Officer for the purpose:
4. Competent legal advice should be taken at once if recourse to judicial proceedings is likely;
5. Whenever government servant is held responsible for the loss it should be considered both whether to take disciplinary action. When recovery is ordered, the financial position of the employees should be considered so that the penality does not impair his future efficiency;
6. Whenever a loss is held due to fraud on the part of the government servant every endeavour should be made to recover the whole loss from the guilty.
7. The responsibility of supervisory staff should also be assessed and recovery may be made from him also in suitable proportion of the loss;
8. If the loss or damage of government property is due to government servant's carelessness then it should be considered whether the amount of loss should be recovered in full upto the government servant's capacity to pay.
9. The pension of an employee due to retire should not be settled unless his responsibility in the matter has been fully investigated and determined;

10. If the responsibility is fixed on an employee due to retire, the recovery should be made by deduction from the last pay and with his consent from his pension. If he declines to give in writing for recovery from his pension, recovery should be made directly from his pension or by making permanent reduction in the amount of pension.

11. If the responsibility is fixed on an employee who has retired already, and sanctioned pension, the matter should be reported to government for recovery by bringing a suit against him.

IF THERE IS REASONABLE SUSPICION OF CRIMINAL OFFENCE

1. Police should be informed;
2. Departmental proceedings should be instituted against those involved and conducted upto the point at which prosecution of any one of them begins;
3. If it is deemed practicable, proceedings may be carried further but not to the stage of finding and sentence;
4. Departmental officers should obtain photostat copies of the documents and handover the originals to the police, so that simultaneous action may be taken;
5. If the accused is convicted, the departmental proceedings should be resumed and formally completed. If the accused is not convicted the departmental proceedings should be dropped unless the competent authority feels that the facts of the case disclose adequate grounds for taking departmental action against him.

PROSECUTION FOR EMBEZZLEMENT OF PUBLIC MONEY / PROPERTY

1. In case of embezzlement of public money or property the matter should be reported to the Police and simultaneously the District Magistrate and Head of the Department.
2. When the case is heard by the Court, the Head of the office should see that all the witnesses serving in his Department and all documentary evidence are punctually produced. He should nominate a government servant to attend the court and assist the prosecuting staff.
3. If prosecution results in the discharge or acquittal or in the imposition of any sentence which appears to be inadequate the head of the office should at once send a full statement of facts to the district magistrate

or in Hyderabad City to the Commissioner of Police. If the District Magistrate or the Commissioner considers that further proceedings should be taken in revision or appeal he should proceed accordingly. Specific orders of government are necessary for filing on appeal against acquittal.

4. A report should be submitted to University authorities at each stage of criminal offence;

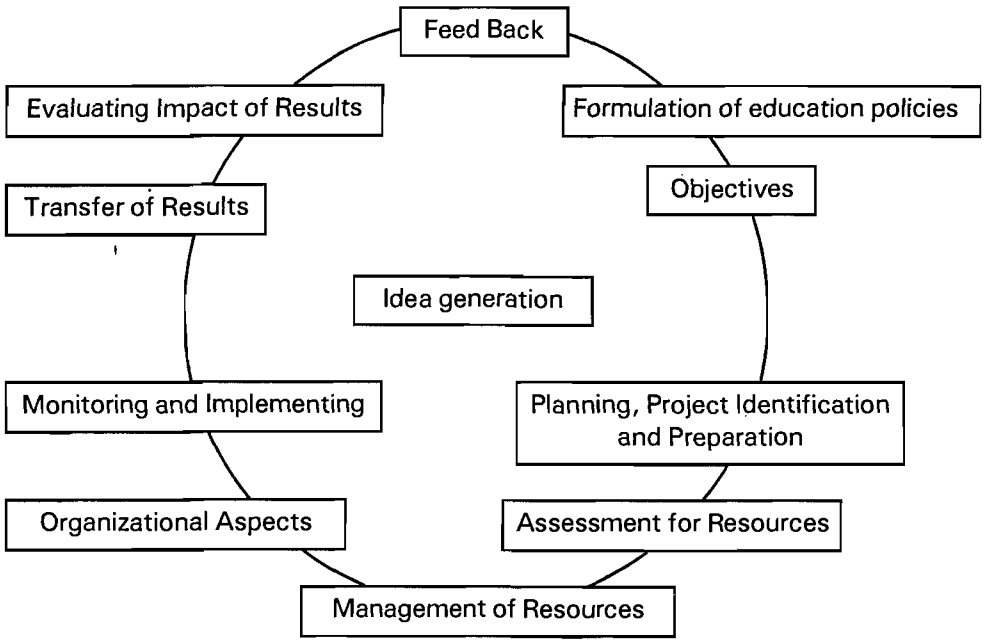
5. If the responsibility is fixed on an employee due to retire, the recovery should be made by deduction from the last pay and with directly from his pension or by making permanent reduction in the amount of pension.

6. If the responsibility is fixed on an employee who has retired already and sanctioned pension, the matter should be reported to government for recovery by bringing a suit against him.

IDEA GENERATION AND CREATIVITY

*Dr. B.V. SUDERSHAN RAO**

To improve the total system of agricultural education management it is essential to consider its components. Each component plays important role in order to bring about any change in beneficial manner for the whole system. All components need ideas due to dynamic nature of organisation. The various components of agricultural education management are given below showing the role of idea generation :



IDEA

When a person gets a sudden flash of new and effective idea, he will be in a surge of pleasure and it is a sort of cerebral high. The entire nervous system expresses the delight as a result of new idea. Even the least educated, least intellectually oriented person feels the same enjoyment when he or she gets a new idea.

Professor & Head, O & RT Unit, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad - 500 030

CREATIVITY

Idea generation is a function of creativity. High intelligence is not required to be creative but creative people generate many different ideas in a given period of time. Like justice, democracy, and liberty, creativity is a word with many different meanings for many different people. This is one of the reasons that every author on creativity has his own definition about creativity. It may be defined :

- As the ability to think fast, generate new ideas and deal with problems in effective way.
- As an art- an applied art, a workable art, teachable art, learnable art, an art which all of us can make ourselves more and more proficient, if we want.
- As the ability to process information in such away that the result is new, original and meaningful.
- Creativity is merely the generation of new ideas much of it exists.
- As to produce and express new novel and occasionally useful ideas.
- As the manifestation of uncommon talent in term of novel ideas and original products (whether ideas or effects) commanding high professional estimates of their worth.

One common factor to most of the definition is that is always involves a new association of existing elements as far as the creator himself concerned. What is new is the combination of these elements into new pattern of association. All of us are blessed with some degree of creativity. Creativity is normally distributed, just like height, weight, and intelligence.

CREATIVE PROCESS

The unfolding of creative process is still mysterious, many attempts have been made to analyse it but it remains little understood. However, there are certain obvious stages to the process that can be identified. They are called perception, incubation, inspiration and verification.

1. Perception

The person with originality tends to view society from a different Perspective than the custodial person. An analogy might that the

creative person sees the fish pond (water, fish, frogs, snakes, planktones etc.) which custodial person sees the water. The creative person is able to see the problems that others are not able to see or do not want to see, The differences between the custodial and creative person are illustrated in the following table.

	Custodial Person	Creative Person
a.	Enjoys routine	Enjoys variety
b.	Works for simplification	Speculates and guesses
c.	Predictable Personality	Unpredictable personality
d.	Enjoys the status quo	Wants to try something new
e.	Fair, firm and friendly	Enthusiastic
f.	Micro-orientation	Macro-orientation

As the first step towards solving problem, both pertinent and impertinent information is gathered. This analytical process is way of making the strange seem familiar. In search for originality he may poke at the material, shuffle it around, turn it upside down, look at it sideways. He is always borrowing ideas from other sources outside the confines of the problem. His broad outlook on situations and his desire to have many different experiences may classify him as some what of a cosmopolitan.

2. Incubation

The mysterious part of the creative process that takes place subconsciously is called incubation. There appears to be no activity whatsoever occurring, where, in fact the creative action is astonishing. This stage can last any where from a few hours to many years depending on the complexity of the problem.

3. Inspiration

The payoff for all the conscious and subconscious mental activity is usually experienced as a flash, an instant insight or, "Eureka, I found it as the answer" comes bursting through to consciousness. This stage is called inspiration or illumination. It is the moment representing the culmination of hours, days or years of thought, although actual time it lasts may be just a few moments. However, there is no way to predict when this movement of

illumination will occur.

4. Verification

In one sense illumination represents only the end of the beginning of the creative process. As Thomas Edison said "Creation is 1 per cent inspiration and 99 per cent perspiration". Now the innovator must elaborate on the new ideas. It must be tested, evaluated, reworked, retested and reevaluated. The idea must be fool-proof, no leaks, no loop-holes and no weaknesses. It is during this stage the innovator should work with others of a more practical nature. Scientific discoveries must be thoroughly tested in the laboratory. Often innovation will require many years of analysis and evaluation before it comes practically useful.

TYPES OF CREATIVITY

Creativity manifests itself in different forms. A person may be skillful in generating new ideas, other person may have a knack for recombining the other's ideas. We shall consider four types of creativity.

1. Origination

Thinking of some thing new is an important manifestation of creativity although it is not the only form. Newness, of course, is difficult to prove.

To originate an idea, you have to break with tradition. When you produce an original idea, your innovation may be resisted by your co-workers and superiors. People have a tendency to reject most ideas that depart radically from tradition.

2. Synthesis

Combining ideas from several different sources and integrating them into a useful pattern is not only worthwhile contribution; it is also a key manifestation of creativity. In fact, this is more common form of creativity than origination. Ex:- Combining computer knowledge with medical knowledge about symptoms of various diseases has led to advances in disease diagnosis.

3. Extension

Sound innovation are sometimes increased in value by extending their boundaries. In fact much research and development work is concerned

with expanding a previously recognised theory / discovery. A breakthrough scientific idea, the laser beam, has now been extended to different areas of application such as drilling holes in metals, in eye surgery, etc. Another example is the atomic fission energy, now being used for home and industrial sources of power. Use of radio isotopes for root growth and fertiliser uptake studies, and use of fermentation principle in the bio-gas plants are other examples.

4. Duplication

Many people live by the credo, "If you can't be original, at least copy good ideas". One way for any person to behave creatively on the job is to collect ideas from others and sort out those which you can use. For instance one junior executive earned himself a promotion by convincing his company to recycle scrap parts from its manufacturing activities. Asked by a friend, how he though such a brilliant idea, the young man replied he has it in the business section of local news paper.

CREATIVITY AND PERSONALITY TRAITS

It is not necessary to trace the history of personality traits, but it is necessary to define them. A personality trait is a learned pattern of behaviour that an individual consistently exhibits. The cause of personality trait is exactly not known and it is a debatable issue. Some psychologists believe that they are inborn and modified by life experiences, others profess that they are totally learned and relatively unaffected by heredity. There have been several scholarly attempts to find common personality traits among creative persons, traits that could then become basis for describing "the creative personality". The following are some of the personality traits associated with the creativity.

1. Perseverance

Creative person tend to become totally immersed in their work, forcing themselves to completion with a fierce determination. People who represent themselves as creative but never finish anything they start. Basic "stick-to-it veness" seems to be essential to creativity. It appears that a person's ability to see a research project through completion is as important as having a novel idea in the first place. Jumping from idea to idea project to project and never completing anything is not a trait of the creative person.

2. Tolerance for Ambiguity

High intolerance for ambiguity kills creativity. Creative persons tend to be relatively more comfortable than non-creative persons in situations where there is a little structure or where there are no clear directions. They do not need step-by step instructions or as much guidance as other persons. This is not to say that they do not adopt well to highly structured settings they do. Ambiguity does not cause as much as anxiety among creative persons, as it does among noncreative persons.

3. Internal Control

Creative persons tend to feel that they control what happens to them in their lives. Creative persons are internals (as in people who feel they personally determine what happens to them) whereas noncreative persons are externals (as in people who believe that fate, luck or "the odds" or "the power" control what happens to them)

4. Risk taking ability

Creative people in general are more likely to take risks than less creative persons-intellectual and emotional risks, that is not physical risks. A scientist who reports his or her newest research to a professional journal is taking an intellectual and emotional risk. Any person who commits time, energy and money to a project is taking a risk. Creative people do not tend to play it safe.

5. Humour

Creative persons by and large tend to have a strong sense of humour. One way psychologist characterize jokes and humourous situation in terms of incongruities. Creative persons seem to have a powerful ability to see the humour in situations that many of us miss. A careful check of the literature analysing the lives of creative persons does not reveal anyone we could call humourless.

6. Self-entertainment

Creative people have a great capacity, for self-entertainment. Creative people invent their own forms of amusement They have a great ability for

finding interesting activities even in the most boring settings. While many of us run around in circles looking for something or someone to entertain us, creative persons tend to use what is present to entertain themselves.

7. Ability to Fantasize

Creative persons have a strong fantasy life. Creative people tend to be daydreamers with more detailed and richer kinds of fantasies, than most people. Fantasy content vary naturally from one creative person to the next but most of them have the ability to totally immerse themselves in fantasy, turning off the outside world.

8. Focused Creativity

Creative persons are not necessarily creative in every facet of their lives. A highly creative writer may not necessarily have any creative abilities in music. A highly creative scientist may be a poor writer. However, some persons are creative in many or all facts of their lives, but this is unusual. With all these one can conclude that the creative person tend to excel in only one or two areas of their lives.

9. Unusual problem – solving strategies

Creative persons tend to employ unusual problem – solving techniques. They use more strategies in solving problems in more different ways than do noncreative persons. Most of us try two or three approaches to a given problem and are satisfied when you find a single solution. Creative persons frequently try several approaches to a given problem and are satisfied when you find a single solution. Creative persons frequently try several approaches to a problem, develop several solutions and choose one of the alternative solutions. Adopting this flexibility of thinking is one of the keys to becoming a creative person.

10. Complex relationships

Creative people to see complex relationships between apparently unrelated variables in problem situations. Some researchers, in fact, argue that much of what we call creative behaviour is basically the ability to take two seemingly unrelated ideas and put them together in a novel and useful way.

11. Redefine and Elaborate Concepts

Creative people have the ability to redefine and elaborate ideas, situations, concepts and problem, Redefinition and elaboration constitute the process of seeing problems from many different points of view. Given a problem, a creative person can redefine it in several ways and elaborate upon this redefinition.

12. Innovativeness

Creative people tend to be highly innovative or novel. Novelty must be necessary for a behaviour to be creative and so creative persons must be novel.

TECHNIQUES FOR IDEA PRODUCTION

The following techniques seem to work especially well in small group situations where the people have consciously chosen to generate mass quantities of idea on the conviction that quantify inevitably brings quality. You can also use them in your individual thinking process and even as a member of a group. For convenience the idea production techniques would be classified into three broad categories.

A. Suspended judgement

B. Practical Techniques

C. Skill-building games

In Suspended judgement all the ideas are listed first, irrespective of the ideas i.e. good or bad. Subsequently all the ideas are classified into good - bad and evaluated.

Practical techniques are used in real situations. These are group memory, brainstorming, structured association and hypothesizing.

The third group of idea production techniques consists of skill-building. This group allows you to free your association process and let them flow easily land finally develops flexibility which is a basic ingredient for creativity. This group includes techniques like memory search, forced association and hypothesizing.

Out of all techniques brain storming is important and will be discussed in detail.

BRAINSTORMING

It was designed by Alex Osborn to generate number of ideas by a group in order to solve specific problem. It provides creative thinking for all the participants in a group. It is very effective in many situations. During brainstorming session the following rules have to be strictly adhered to by each member :

a. Criticism is ruled out

b. Free wheeling is welcomed. The more unusual the idea the better it is.

c. Quantity and variety are welcomed. The greater the number of ideas expressed the greater the likelihood of there being a winner.

d. Combinations and improvements of already stated ideas welcomed.

In addition to the above participants must avoid the "verbal put downs" or "Non verbal-out downs". These are also called as Killer statements of ideas. A few Killer statements are mentioned below.

a. We have done that long back

b. That is impractical

c. Why are you wasting your time on this issue

d. I think that is not realistic

e. It is against policy

f. You cannot justify the costs involved here

g. It is too much of hassle

h. We don't do it that way here

i. We are not meant for this

j. If we do that in this case, we shall have to do it in every case.

By not using the Killer statements by any member of the group, the group comes out with a much larger supply of ideas. It will be appropriate to quote Jules Verne here "Anything one man can imagine, other man can make it real". So one need not hesitate to express whatever thought that comes in to his mind. Group brainstorming produces a number of ideas quickly, when ideas are shared in a group, and stimulates more ideas just by the power of association. Pooling thoughts has a chain reaction effect and

it is called as "hitchhiking". Group brainstorming may be as short a 10 minutes initially and it may be as long as one hour or more at later stages. Once all the ideas are accumulated then comes the time of judgement. The group can evaluate the ideas with the hope that at least one or two excellent ideas are available out of more than twenty or above.

IMPROVING YOUR CREATIVITY

Creativity can sometimes be improved through formal training programmes. At other times, do-it-yourself techniques can be equally beneficial. Here are some of them.

1. Loosen up Emotionally and Intellectually

You have to loosen up emotionally and intellectually if you want to become creative person. As long as you are 'tight' individual, it is difficult to give rein to your creative potential.

2. Overcoming perceptual blocks

People frequently cannot solve problems in a creative manner because they are bound by pre-conceived ideas, which tend to block out new way of looking at familiar things. Until a person can look beyond the normal way of doing things, he or she will not have a creative solution.

3. Discipline yourself to think creatively

Self-discipline is required for all forms of self-development, including the improvement of creatively. An important point towards becoming more creative is to develop the attitude that creativity is both important and desirable. Faced with a personal problem calling for creative response one effective starting point is to sit quietly with a pencil and pad and begin generate possible solutions. The type of exercises designed to measure your creativity described earlier can also develop effective approaches for improving creativity.

FACTORS THAT HINDER CREATIVITY

The following factors may inhibit the creative abilities and creative responses of individuals.

1. External Factors

a) Pressure : Pressurisation to confirm to rules, regulation, patterns of working, set precedences and the imposition of heavy punishments or penalties on deviations.

b) Authoritarian : Authoritarian attitudes on the part of the top management and senior managers. (Authoritarian culture, where people are expected to do things only after the approval of their superiors).

c) Obsession : Obsession with targets and too strong rewards or punishments associated with the achievement or nonachievement of targets and this creates anxiety which hinders creativity.

d) Specifications : Too much specifications of details of work, leaving no freedom for the person to try out his own ways of accomplishing tasks.

2. Personal factors

Intolerance for ambiguity, conformity, stereotyping, fear, resource myopia, starved sensibilities, touchiness etc. prevents the persons creative abilities.

IMPLICATIONS FOR SCIENTIFIC COMMUNITY

Scientists have two important roles to play to encourage creativity and creative problem solving. First of all every scientist should try to be creative himself in whatever role plays. For this he should think in so many directions before he takes UP a problem in order to obtain the optimal solutions. He might introspect and plant strategies of overcoming the blocks. When he faced with problems or opportunities to try out new things he should try to generate as many alternative ideas as possible before choosing a solution. For this he can use problem solving techniques. Secondly, every scientist should create such an atmosphere in his own Department that the creative abilities of his subordinates are not hampered. He should encourage subordinates to try out their own mechanisms of solving problems and give them adequate support. He should provide an atmosphere that encourages experimentation.

SUGGESTED READINGS ON CREATIVITY

Anderson, N.H. (ed.).	:	Creativity and its cultivation, New York:Harper and Row, 1959.
Albrichat, K.Brain Power	:	Learn to improve your thinking skills, New Delhi: Prentice-Hall In., 1980.
Du Brin, A J.	:	Human relations, a job oriented approach, New York : Reson Co. 1978.
Clark E M	:	Creative life, New York : Van Nostr and Reinhold Co., 1977.
Glover, J A and A L Gary	:	Behaviour modification, Chicago : Nelson-Hall., 1979.
Gulford, J P Creativity	:	Americal Psychologist, 1950 : 5I 444-454.
Halloran, J	:	Applied Human relations, an organisational approach. New Jersey : Prentice-Hall Inc., 1978.
Osborn, A	:	How to become more creative. New York charles Seribners & Sons, 1952.
Torrance E P	:	Guiding creative tolent. Englewood Cliffs, N.J:Prentice-Hall, 1962.
	:	Encouraging Creativity in the class room. Duberque, Jowa:Brown, 1971.

MOTOVATION - IN WORK ENVIRONMENT INTERPERSONAL BEHAVIOUR AND RELATIONSHIPS

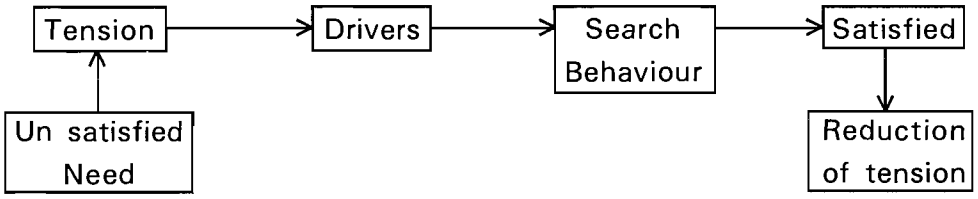
*MOHAMMED M. ANWER**

MOTIVATION - BASIC CONCEPTS :

Motivation literally means, incitement or inducement to move or act. In an organisation setting it means to make a subordinate act in a desired manner or the job. Motivation is the willingness to do the job well. The act of motivation may be directed towards ones self or towards others. Self-Motivation is the ability to change once own behaviour to strive for better performance, and the motivation of other is the ability to influence the behaviour of other people in such a manner as the get them to do what your expect them to do, because the person motivated enjoys doing it.

Motivation is the will to do, and the will to do well, Motivation may be self directed or, one may be motivated by others or by the environment, and one can motivate others as well. What motivates the self and how can one motivate the others? Since the entire emphasis of motivation is one's or others' action or good performance, it is worthwhile to see what performance (which is essentially behaviour) depends upon. Performance depends on two factors. (1) Competence which comes from knowledge, skill and experience and is an acquired character. (2). Motivation or the willingness to do the job well.

Underlying concept of Motivation is the willingness to do something and is conditioned by this action's ability to satisfy some need for the individual. A need is some internal state that makes certain out come attractive. The motivation process is illustrated as follows.



An unsatisfied need creates tension which stimulate drives within the individual. These drives generate a search behaviour to find particular

goals that, it attained, will satisfy the need and lead to the reduction of tension If action does not lead to satisfaction, it leads to dissatisfaction or frustration. To motivate, administrators have to show scientists how to satisfy their needs in the job context and not to get frustrated or demotivated.

The survival and growth of any organisation depends on the performance of its employees, which in turn depends on the ability and will to work of the employees. While education, training and experience increases the ability, it is motivation that ensures the willingness by changing the behaviour and attitude towards work. Motivation is thus very important and is greatly needed in any organisation.

All the employees of an organisation need to be motivated. The administrators supervisors as well as the scientists, technicians, administrative workers, all need motivation. Motivation and higher productivity go together most of the times. For effective motivation it is important that the administrators and the supervisors must take help and advise of the management specialists or behavioural psychologists. Standard theories of motivation apply to research management situation, however, sometimes their application may not be fruitful, because they have been developed on the study of human material other than research personnel.

Motivation may be intrinsic or Extrinsic as mentioned earlier. Intrinsic motivation is related to the urges within a person. They are what push them from within and satisfy the creative instinct in people. Extrinsic Motivations are external to an individual and his/her job or task. These may be financial incentives, praise, recognition, award, admiration on improved working conditions and other facilities.

Motivation is determined by three groups of factors. These are 1) individual factors 2) Organisational Components and 3) External or exogenous variables. To operate the first factor, one needs to understand the human behaviour and the needs on which it is based. A motivational role is also played by culture, customs and norms, images and attributes conferred by society on jobs.

Characteristics of Motivation : Individuals differ in their motivations. The energetic performance of one individual may be due to the money he/she

gets from it, while for another it might be a labour of love and service. For a third it might be because of a sense of achievement. Motivation is highly situational and may vary with working conditions, type of supervision or change of organisation. Motivation of an individual changes from time to time, the level of motivation as well as the reasons for motivation change. Motivation is expressed differently by different people. In the same situation, while one may get frustrated by failure, the other might redouble the effort. Sometimes the individuals himself/herself may not be aware of his/her motivation. The motivation or demotivation may result from some subconscious reasons, which a person may not be able to understand or explain. Motivation is a very complex matter and pertains to various factors. What works is one instance may not work in another.

The major emphasis of motivation is on change in behaviour, and it is pertinent to understand and the human behaviour. Not only to determine the 'whys' or past behaviour but to some extent to predict, to change, and even to control future behaviour.

Behaviour

Behaviour is need based and goal oriented. The basic unit of behaviour is an activity. In fact, all behaviour is a series of activities. As human beings, we are always doing something; walking, talking, eating, sleeping, working and the like why do people change in one activity and another? How can we understand, predict, and even control what activity or activities a person may engage in at a given moment? To predict behaviour, one must know which motives or needs of people evoke a certain action at a particular time.

Motives : People differ not only in their ability to do, but also in their will to do, or motivation of people depends on the strength of their motives. Motives are needs, wants, drives, or impulses within the individual. Motives are directed towards goals, which may be conscious or sub-conscious.

Goals : Goals are outside an individual; they are sometimes referred to as "hoped for" rewards towards which motives are directed. These goals are also called incentives, which may be tangible rewards, such as increased pay or intangible rewards, such as, praise or power.

Motive strength : All individuals have several needs and all of them compete for their behaviour. The need with the greatest strength at a particular moment leads to activity. Satisfied needs decrease in strength and no longer motivate behaviour to seek goals to satisfy them. In the figure 1 Motive B is the highest strength need, and therefore it is this need that determines behaviour.

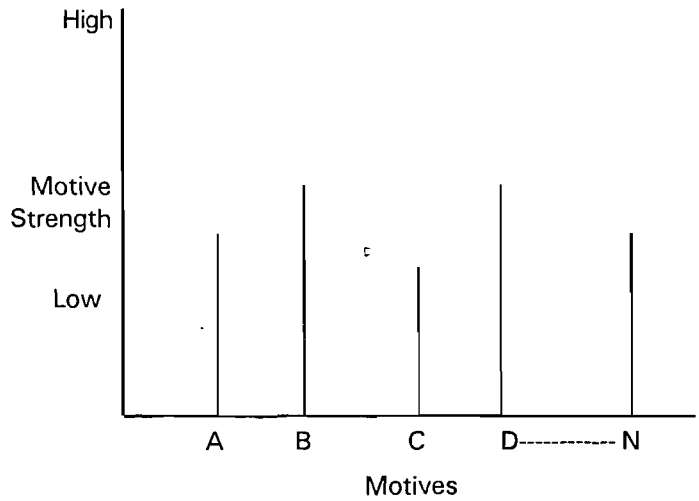


Figure 1 : The most prepotent motive determines behaviour – Motive B in this illustration

impossible or alternatively as virtually certain to achieve. Goals should be set high enough so that a person has to stretch to reach them but low enough so that they can be attained. Thus, goals must be realistic. The degree of motivation and effort rises until the probability of success reaches 50 per cent, then begins to fall even though the probability of success continues to increase.

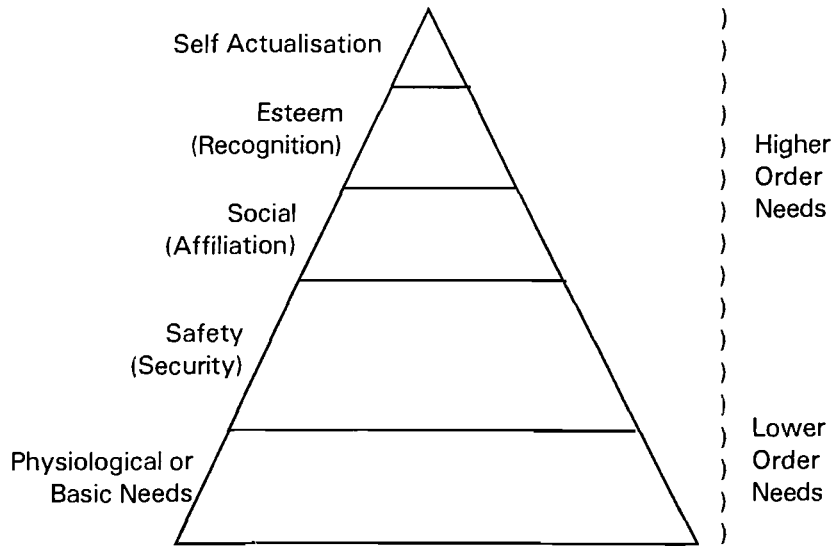
This relationship could be depicted in the form of a bell-shaped curve where the strength of motivation is marked on the X axis with low motivation at the bottom and high motivation at the top, and the probability of success is marked on the Y axis with 0.0 probability at the left, 0.5 in the middle and 1.0 to the right. The strength of motivation thus depends on the incentive, motive strength and probability of success.

Hierarchy of Needs : We have seen that behaviour at a particular moment is usually determined by the strongest need. It is thus significant, that one must have some understanding about the needs that are commonly important to people.

Maslow's Model of Needs

An interesting framework that helps explain the strength of certain needs was developed by Abraham Maslow. According to Maslow, there seems to be a hierarchy into which human needs arrange themselves, as illustrated in figure 2.

Figure 2. Maslow's hierarchy of needs



Maslow postulated two conditions. The first states that, the lower order needs must be satisfied to some extent before the higher order needs become activated. The second is the notion that a satisfied need is no longer a motivator or behaviour.

Lower Order and Higher Orders Needs

The physiological needs are the basic human needs to sustain life itself-the need to breathe, eat, sleep, reproduce (sex) etc. until these basic needs are satisfied to the degree needed for the sufficient operation of the body, the majority of a person's activity will probably be at this level, and

the other needs will provide little motivation. This is the case with those people in our country who live in extreme poverty.

Once physiological needs become gratified, the safety, or security needs become predominant. These needs are essentially the need to be free of the fear of physical danger and deprivation of the basic physiological needs. In addition to the present, there is also a concern for the future.

When the lower order needs are satisfied to some extent the higher order needs become important. The lowest among them are the social needs which refer to the need to belong and to be accepted by various groups, and to have meaningful relation with others.

After individuals being to satisfy their need to belong, they generally want to be more than just a member of their group. They then feel the need for esteem – both self – esteem and recognition from others.

Once esteem needs begin to be adequately satisfied the self – actualisation needs beocme more prepotent. This is the need to maximise one's potential, "what a person can be he/she must be". For what one can, the sky's the limit and success is the opportunity of a life time. A proper appreciation of the concept of self-actualisation is the basis self motivation. To actualise the potential, a musician must play music, a general must win battles, a professor must teach and a scientist must invent/discover. Perception of what you must be, determines what you will be.

Higher Order Needs :

It may be generally agreed that in the universities the lower order needs (psychological and security needs) of the individuals are met. Let us hence, examine the other needs in greater detail.

Social Needs (Affiliation) : People need affiliation to have their belief confirmed. They seek not just any company but with those who are 'in the same boat'. People from the same region, or those speaking the same language may come together in a group, just as the hard workers and the lones may form different groups. People form informal groups because of boredom, insignificance and lack of competence they feel. This is not a universal need as we cometimes find 'loners' who feel secure and competent enough.

Esteem needs (Recognition) : Two motives related to esteem are prestige and power. People with a concern for prestige want 'to keep UP with the Jonesses'. Prestige is a sort of unwritten definition of the kinds of conduct that other people are expected to show in one's presence : what degree of respect or disrespect, formality or informality, reserve or frankness. The ability to induce or influence behaviour is power. There are two kinds of power, positional and personal. While the former comes with the position one occupies, the later comes from personality and behaviour.

Self Actualisation : Two motives that seem to be related to self-actualisation are competence and achievement.

Competence : Competence implies control over environmental factors-both physical and social. It is a desire for job mastery and professional growth.

Achievement : Some people have an intense need to achieve; others, perhaps the majority, do not seem to be as concerned, about achievement. A high need for achievement may be acquired by studying the characteristics of the people with a high need for achievement. The characteristics of these people are :

a) They are moderate risk takers – not gamblers or conservative people
b) They are more concerned with personal achievement than with rewards of success.
c) They want concrete feed back.
d) They like to take personal responsibility.
e) They tend to be innovative.
f) They usually demonstrate some interpersonal competence.
g) They are oriented towards the future.
h) They tend to be mobile.
i) They are not completely content.

Satisfaction of the needs in a job situation – Motivated behaviour

A job situation must be so structured (or so perceived) that a person must be able to satisfy his/her work environment. Only then, will he be motivated for better performance.

The salary is a means to provide for the satisfaction of physiological and security needs, however, money is a peculiar motive as it may satisfy all the different levels of needs.

The security needs of employees may be influenced positively through pension plan, insurance programmes, and the like, and influenced negatively by arousing fears or being fired, demoted or transferred. The social needs may be fulfilled by allowing people to form groups whose objectives may also be encouraged as they not only have a motivating influence, but they also provide a balance between work and play. A well – rounded programme of recreational activities improves boss – subordinate relations, increases efficiency, encourages group spirit, and makes for healthy, satisfied scientists.

The satisfaction of esteem need is related to the fulfillment of two motives – prestige and power. The importance of each job must be clarified to impart certain prestige to the person doing it. Imagine a well run institute with demotivated technical staff. Each job is important and essential, and a sense of pride must be associated with it. The need for power is universal, though its intensity may vary from individual to individual delegation of authority in a job situation may be a way of providing for the satisfaction on this motive.

The need for self-actualisation is composed of the need for achievement. An organisation must recognise competence and provide for achievement in its work situation to satisfy this need. The jobs of scientists are ideally designed for self-actualisation. Here, competence may be demonstrated by matching one's ability and skills against the environment in a contest that is challenging but not overwhelming. The scope for achievement is also high, where the work provides for an accomplishment at the successful conclusion of an investigation and the acclaim it may provide, both at the national or international level.

Motivation in work Environment

The main needs and expectations to be taken into account in considering the motivation of people at work are described below :

Most of the working people have their physiological, security and belongingness needs satisfied. Their behaviour is mostly directed towards satisfying the fourth order needs of power prestige and status. These are also called 'ego needs' or 'esteem needs' or 'social motives'. These needs

have been found to influence work behaviour of people in different work settings. These needs are described below :

i) The need for activity is a desire for constantly doing things. This kind of person is a hard worker. The opposite of this is passivity, which is also a need to be relax and not to be disturbed.

ii) The need for extension is a desire to be helpful to others, and to provide one's services in the organization or nation. People dominated by this need will be good social workers and maintain good interpersonal relations.

iii) The need for dependence is the need to consult others before making any decision. Such people feel insecure and want to be protected. They lack initiative, and always look for direction from others.

iv) The need for independence is a desire to do things individually and to be one's own self. They prefer freedom, like to make decisions. They dislike interference. They may consult others but do not seek approval.

v) The need for power is a desire to influence others and gain control over them. Such people like to lead and enjoy giving directions to others. They are argumentative and seek leadership positions.

vi) The need for aggression creates a desire to dominate others and to demonstrate one's own strength at times, even physically. These people talk loud, are argumentative and may get into physical fights.

vii) The need for status and prestige is a desire to be respected and treated with difference specially by others in the social situations. These people are status conscious, they may run for officers and show authoritarian tendencies when working with others.

viii) The need for recognition demands recognition for one's accomplishments. These people may be completely demotivated if their work is not immediately recognized.

ix) The need for achievement is a concern for excellence. People dominated by this need are generally active, work hard, set high goals, take challenging tasks, desire pleasure from doing difficult things and look for quality.

In addition to the nine important needs mentioned above, there are two others that fall into second and third order needs that are important in the work place. There are the need for security and the need for affiliation.

x) The need for security is the need to be secure about one's own livelihood and to be sure to continue to have it. The domination by this need calls for economic security and causes frustration at lack of job. If people grumble about the job or save money for future, they are expressing a deficiency in this area, and the organizational policies are worth looking at.

xi) The need for affiliation is a concern for establishing or maintaining warm and affectionate relations with others. To fulfill this need, people join groups, invite people and develop attachment.

The satisfaction of these eleven needs mentioned above are important in the work place. The organization must provide opportunities to satisfy these needs to ensure a motivating environment in the work place. Understanding these needs and behaviour indicators of these motives help us to understand the people. Each person is different and unique, and has a different mix of these needs in different degree in him/her. This must be appreciated and the working environment must be so structured that it provides opportunities for satisfying these needs. If these are considered carefully then there can be high motivation of people at work.

It is important to create conditions where scientists and other workers energies are not expanded totally in meeting their basic needs, but where opportunities exist to satisfy higher order needs. Create a climate for inter-dependent work rather than dependency. In the work place, create a competitive climate through recognition of good work and a productive climate through personal example. The emphasis should be on problem solving rather than avoidance and attempt should be to motivate individually through guidance and counselling.

Motivation and work

The question asked is "How can, I increase motivation to work at our task?" We have to aim allowing employees to work on higher order needs

(achievement, self-esteem, self-actualization) while working towards organisational goals. Assuming that lower order needs are met, a motivating climate would have these factors :

i. The work itself must allow opportunities for employees to satisfy their higher-order needs.

ii. The employees must be involved in determining what needs are important and what will be done to satisfy those needs.

iii. The immediate work content must be supportive of these efforts at improvement.

Given these factors, three major types of interventions may be applied to work situations in an attempt to make them more motivating.

i. Data feed-back methods, in which information about the state of the organization is collected from employees, organized and fed back to them as a basis for collaborative problem solving.

ii. Job enhancement methods, which attempt to change the nature of job by broadening responsibilities, giving more autonomy for decision making and generally enlarging the scope of the job.

iii. Socio-technical system interventions, which attempt to match the necessary technology of the job with the social needs of the employees.

INTERPERSONAL BEHAVIOUR AND RELATIONSHIPS

Human beings are social animals. Among the various needs of human being the one to interact with fellow being is perhaps the most important. It establishes their relation with their associates, family and friends. Interpersonal contact is a source of both pleasure and plain. The situations of comradeship, healthy relationship with colleagues, love, affection, and group activities, or conflict, disagreement, are all manifestations of interpersonal behaviour.

Interpersonal behaviour is obviously very complex. In any interpersonal encounter, the behaviour is determined by the participant's conceptions of what are appropriate, since they have been taught that some behaviours are correct and others are not. But their behaviour is also determined by what other people pressurize them to do how much they enjoy or dislike this behaivour, what consequences they see connected with the behaviour,

and how much they value these consequences. In addition, what persons do in an encounter feeds on the behaviour that has just taken place. These previous behaviours are interpreted according to what are assumed to be the causes of these behaviours. The total social setting and some aspect of the personality factors may also modify the course of interpersonal relations.

Every human being, because he/she lives in a society, must establish an equilibrium between himself/herself and the physical world. This social nature of human beings give rise to certain interpersonal needs, which they must satisfy to some degree while avoiding threat to themselves. These interpersonal needs may be divided into three categories: issues surrounding inclusion, issues surrounding control, and issues surrounding affection. Although each individual has different intensities of need, and different mechanisms for handling people, the three basic interpersonal needs are common and are explained in the following narration.

THE NEED FOR INCLUSION

This is the need to maintain satisfactory relation between the self and other people with respect to interaction or belongingness. Some people like to be with other people all the time; they want to belong to organisations, to interact, to mingle. Other people seek much less contact; they prefer to be alone, to interact minimally, to stay out of groups; to maintain privacy. If a continuum were to be drawn between these two extremes, every personal could be placed at a point (or region) at which he/she feels most conformable. Thus, to a certain degree, each individual is trying to belong to a group, but he/she is also trying to maintain a certain amount of privacy. That is he/she wishes to some degree, to have people initiate interaction towards him/her through invitations and the like, and also wishes to some degree that people would leave him/her alone. For this dimension, the following two aspects may be distinguished. 1. The behaviour a person initiates towards others, i.e., his/her expressed behaviour; 2. The behaviour a person prefers others to express towards him/her, his/her wanted behaviour. This will help in considering the compatibility between people.

THE NEED FOR CONTROL

This is the need to maintain a satisfactory relation between oneself and other people with regard to power and influence. It will spell out the

extent an individual feels should have control over others and the extent he/she will allow others to control him/her. It is the people that create the environment and by controlling them a person wants to control the situation and make the environment predictable for him/her. This need varies from those who want to control no one in any situation, no matter how appropriate controlling them would be to those who wish to control their entire environment and all the people they come in contact with. People also vary with respect to the degree they want to be controlled by others. On one side are those totally dependent and want to be completely controlled by others, and on the other extreme are those who want to make all their decisions accepted and are not willing to be controlled by others. These two aspects illustrate the expressed behaviour and the wanted behaviour respectively.

THE NEED FOR AFFECTION

This is the need to maintain a satisfactory relation between the self and other people with regard to love and affection. In the scientific setting this need is seldom made overt, as it is done in family situation. It takes the shape of friendship or close cooperation between two associates. Affection is a relationship between two people. The intensity of the relationship varies on a continuum, where at one end an individual may like his/her personal relation to impersonal and distant, perhaps friendly but not close and intimate. At the other end, an individual may like to maintain close and personal relations with others. In between these two extremes, everyone has a level of intimacy which is most comfortable for him/her. This category also has an expressed and wanted dimension depending on the fact that a person is making the overture or is needing the other personal to make the moves.

SCHEME OF INTERPERSONAL BEHAVIOUR

The following table presents these three categories in their two dimensions of expressed behaviour and wanted behaviour, and shows the extreme positions that can be taken. Every personal will fit some where between the extremes, most in the middle.

Scheme of Interpersonal Behaviour

Type of behaviour	Level of behaviour	Inclusion	Control	Affection
Expressed behavoiur (E.B)	Extreme high	Over social	Autocrat	Over personal
	Extreme Low	Under social	Abdicraft	Under personal
Ideal behaviour		Social	Democrat	Personal
Wanted behaviour (W.B)	Extreme high	Social compliant	Submissive	Personal compliant
	Extreme low	Counter social	Rebellious	Counter personal

Given below are the brief discriptions of three types of behaviour : (1) excess-indicating that the individual is constantly trying to satisfy the need, (2) deficient-indicating that the individual is not trying directly to satisfy the need, (3) ideal-indicating satisfaction of the need.

INCLUSION TYPES

The over social and social compliant : the over social and social compliant person tends rewards extroversion in his/her interpersonal behaviour. Characteristically, this type of person seeks people incessantly and wants them to seek him/her out. This type person is also afraid they will ignore him/her this person's interpersonal dynamics are the same as those of the withdrawn person, but his/her overt behaviour is the opposite. This person's unconscious attitude is summarized by 'although no one is interested in me, I will make people pay attention to me in any way I can'. His/her inclination is always to seek companionship. This person is the type who 'can't stand being along'. All of his/her activities will be designed to be done 'together'.

The Under Social and Counter Social : The interpersonal behaviour of the under social and counter social person tends to be introverted and withdrawn. Characteristically, he/she avoids associating with others and does not like to accept invitations to join others. Consciously this person wants to get enmeshed with people and lose his/her privacy. This person biggest fears are that people will ignore him/her and generally have no interest in him/her – their attitude is 'no one is interested in me, so I am not to risk being ignored. I will stay away from people and get along by myself'.

The Social : To this person interaction with people does not present any problem. He/she is comfortable with people and comfortable being alone. He/she can be active or passive in a group, or can equally play a moderate role, without anxiety. This type of person is capable of strong commitment and involvement to certain groups and can also with hold commitment if he/she feels. This type of people feel that they are worth while, significant people and that life is worth living. They are is fully capable of being genuinely interested in others and feels that others will include them in their activities and that others are interested in them. These people have an 'identity' and an 'individuality'.

CONTROL TYPES

The autocrat and Rebellious : The autocrat and rebellious is a person whose interpersonal behaviour often tends towards dominating and non acceptance of the authority of others. Characteristically this person tries to dominate people and strongly desires a power hierarchy with himself/her self at the top. This type of person is the power, and is afraid people will not be influenced or controlled by him/her – that they will, in fact dominate him/her. Commonly, this need to control people is displaced into other areas. Intellectual or athletic or scientific superiority allows for considerable control, as does the more direct method of attaining political power. Basically, the person feels he/she is not responsible for capable of discharging obligation and that this fact is known to others. This type of person attempts to use every opportunity to disprove his feeling to others and to himself/ herself. This person's unconscious attitude 'no one thinks I can make decisions for myself, but I will show them, I am going to make all the decisions for everyone, always'.

The abdicrat and submissive : This is a person who tends towards submission and abdication to power and responsibility in his/her interpersonal behaviour. Characteristically this person gravitates towards subordinates position where he/she will not have to take responsibility for making decision, and where some one else taken charge. Consciously, these people wants others even when he/she should, and never take a decision that can be referred to some one else. This kind of person is usually a follower, or at most a loyal lieutenant, but rarely the person who takes the responsibility for taking the final decision. Unconsciously, this type of person has the feeling that he/she is incapable of responsible adult behaviour and others know it. Behind this feeling are anxiety, hostility and lack of trust towards others. This hostility is usually expressed as passive resistance, since actual overt rebellion is too threatening.

The Democrat : This individual successfully resolves his/her relations with others in the control area. Power and control present no problem to him/her. This type of person feels comfortable giving or not giving orders, and taking or not taking orders, as is appropriate to the situation. Unconsciously, this type of person feels that he is a capable and responsible person and therefore he/she does not shrink from responsibility or to try constantly to prove how competent he/she really is. Unlike the abdicrat and autocrat, he/she is not preoccupied with fears of his/her own helplessness, stupidity and incompetence. He/she feels other people respect his/her competence and will be realistic with respect to trusting him/her with decision making.

AFFECTION TYPES

The Over Personal and personal compliant : This type attempts to become extremely close to others. This person definitely wants others to treat him/her in a very close, personal way. They will be striving in their interpersonal relations primarily to be liked. Being liked is extremely important to them in their attempt to relieve their anxiety about being always rejected and being unlovable. There are two behavioural techniques for this types, the direct and the subtle. The direct technique is an overt attempt to gain approval, be extremely personal, intimate and confiding. The subtle technique is more manipulative, to devour friend and subtly punish any attempt by them to establish other friendships, to be possessive.

The Personal : for the individual, who successfully resolved his/her affectionate relations with other in childhood, close emotional relations with one other person present no problem. This person is comfortable in such a personal relation, and he/she can also relate comfortably in a situation requiring emotional distance. It is important for this person to be liked, but if individual is not liked, he/she can accept the fact that the dislike is the result of the relation between himself/herself and one other person. Unconsciously, this person feels that he/she is a lovable person who is lovable even to people who do not know/her well. This type of individual is capable of giving genuine affection.

Causes of Extreme Positions : The inclusion anxiety of over social under social compliant and counter social behaviour is due to the feeling that the self has no value is worthless and empty. The control anxiety of being autocratic, abdicratic, rebellious or submissive is due to the feeling that the self is stupid and irresponsible. The affection anxiety is that the self is nasty and bad leads to overpersonal, underpersonal, personal compliant or counter personal behaviour.

Compatibility : This refers to the successful operation of an interpersonal relation. The less compatible the relation the more time must be spent in finding ways of dealing with the difficulties. Thus, there is less energy available to devote to the task, and there is more internal dissatisfaction. It is more important to mention here, that compatibility does not necessarily imply liking. It has mainly to do with an ability towork together successfully.

Thus, a study of interpersonal relationship orientation is valuable to a administer for to understand the human interactions and effect appropriate interventions for effective cooperation and collaboration, while it is important to a research worker Tealer to gain valuable insights into his/her own interpersonal orientation and behaviour and the activities of others to allow for a better team work in research projects.

References

Hersey P and K H Blanchard 1982 Management of Organizational Behaviour; Utilizing Human Resources. 4th Edition. Prentice-Hall of India Pvt. Ltd. New Delhi 110 001 P.343.

Kolb D A, I M Rubin and J M Mc Intyre 1979 Organisational Psychology – an experiential approach. Third edition. Prentice-Hall, INC., Englewood cliffs, New Jersey 07632 P.496.

Reiffer, J W, Heslin R and Jones J E 1976 Instrumentation in human relations training. La Jolla, Calif; University Associates, Inc. 1976.

Robbins, S P 1994 Organisational Behaviour – Concept controversies and applications. Sixth edition. Prentice-Hall of India Pvt.Ltd., New Delhi 110 001 P753.

Ryan L R, 1970 Clinical interpretation of the FIRO-B, Palo Alto, Calif: Consulting Psychologists Press.

Schutz W C 1958 FIRO : A three-dimensional theory of interpersonal behaviour, New York; Holt, Rinehart and Winston.

Triandis H C 1977 Interpersonal Behaviour Monetary, Calif : Brooks/Cole Publishing Company.p.384.

CONCLUDING TOPICS

ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY LIBRARY AND INFORMATION SYSTEM

*Dr. (Smt.) C. SUGUNAVATHY**

Preamble

Libraries are the powerhouses of knowledge. Due to rapid technological, methodological changes and exponential growth of knowledge, it is increasingly becoming difficult to keep oneself abreast of current developments. Realizing the vital role of library and information services, the Acharya N.G.Ranga Agricultural University Library System has been organized with the following objectives.

- Be a clearing house of information in all aspects of Research and Development in agriculture and allied subjects in the State.
- To acquire organize and make available all types of documents including non-book materials on agriculture and allied subjects.
- To interact with other information transfer agencies.
- Act as an Agricultural Research Information Center.

Infrastructure :

The Acharya N.G.Ranga Agricultural University library system has been organized with Central Library at Rajendranagar and regional libraries at other two main campuses Tirupathi and Bapatla. All the other Colleges also have Libraries for in house use of books and periodicals. Over the years, there has been considerable increase in the professional and semi-professional staff component. The total staff strength at present is one hundred and two.

Budget :

State Government is the main source of funding for libraries. The ICAR has been providing about 15 lakhs under each of the plan period towards the development of libraries for the entire university.

* Assistant Librarian, Central Library, ANGRAU, Rajendranagar, Hyderabad

Collection :

The ANGRAU Libraries have a total collection of over 2,00,000 books and subscribes to 600 Indian and foreign periodicals. The central library receives 125 copies of "Research Journal-ANGRAU" from the University press to be exchanged with various National and International institute's publications. ANGRAU students have submitted about 6000 dissertations in three major libraries and all the copies are available at Central Library.

Book Bank Scheme

Under Book Bank scheme multiple copies of textbooks are purchased and made available to the students at a nominal rent for one semester.

BC Students Welfare Scheme

The state Government introduced special scheme by providing an amount of Rs.50,000 per annum during the seventh plan period to each of the professional colleges in the state. All the three campus libraries were benefited by the scheme.

SC/ST Students Welfare Scheme

In addition to the book allowance provided by the state government for SC/ST students, a separate provision was made to build up the collection of books useful for competitive examinations taken up by the SC/ST students.

Membership

To borrow the books in the library , the students and staff should become a member of the library. The membership forms are available at the counter. They are eligible to take the number of cards according to their class and designation. One book can be borrowed on each card.

Undergraduate students	2 cards
PG. Students	3 cards
Asst. Professors/ Scientist	3 cards
Associate Professors	4 cards
Professors	5 cards

The rules and regulation for borrowing, fines and the opening hours of the library etc., are indicated in small brochure available at the counter.

Documentation and Reprography :

The Central Library brings out a monthly bulletin of 'Recent Additions to ANGRAU Libraries'. 'Union Catalogue of Periodicals in ANGRAU Libraries' also has been brought out. The catalogue of the dissertations submitted to the university so far has been brought out under the title 'Agricultural Dissertation Index'. The abstracts of Ph.D. thesis have been published under the title 'Agricultural dissertation Abstracts'.

With a view to meet the information requirements of the scientists at the research stations a current awareness service under the title 'Current Agricultural Titles' backed up with the supply free photocopies of papers from foreign and Indian periodicals has been started.

Plain paper photocopiers have been acquired for all the campuses to provide reprographic service at a nominal cost of 50ps per page.

Computerization and Networking :

In order to provide effective and expeditious library and information services, modernization of libraries was thought of in 1993 it self. To start with personal computers have been installed in all the campuses.

Central Library at Rajendranagar started building up online public access catalogue (OPAC) by networking 12 computers using Local Area Network (LAN). Library Software LIBSYS has been purchased for this purpose and the bibliographical database of 6000 dissertations is available on OPAC along with library catalogue.

With a view to provide access to world agricultural literature CAB Abstracts on CD-ROM covering all the 57 abstracting periodicals starting from 1984 (volume I) to present have been acquired. The information retrieval service using the CAB CD is made available at Hyderabad, Tirupati and Bapatla. So far. over 9000 research scholars from ANGRAU and other universities have utilized the service.

Central Library at Rajendranagar has established Internet connectivity through VSNL. Number of terminals are provided and access given to students and staff at a nominal cost of Rs10/- per hour.

CORRECT USE OF ENGLISH

S.M. IQBAL *

If one wants to speak or write one has to be conversant with as many words as possible. Language is the vehicle of expression. To convey one's ideas effectively one has to choose proper words and arrange them in their proper places. Then only one express freely without giving scope for ambiguity. The words chosen should be simple and commonly used in spoken language. The moment he uses difficult and uncommon words the purpose of communicating his ideas to the other would be defeated.

The first and best way of increasing your vocabulary is to increase your knowledge by reading. Reading is the most indispensable means of improving your vocabulary.

The English language contains more than 600,000 words. It is practically not possible to learn all those words. A teacher does not know all the words that a lawyer knows and vice-versa. Certain words have special meanings in special profession. For eg : the words plaintiff, theft, summons, murder, revoke have special meanings to a lawyer which the layman may not know.

In the same way, the economist uses the words debit, credit, survey, utility, capital, shares etc. in a way that layman does not know.

It must be admitted that a person who has adequate command of words will command respect from his friends, associates and others.

It is clear that an ambitious person must work hard to enlarge his vocabulary. Teachers with a good vocabulary understand what they read more easily than those with a poor vocabulary. They in turn explain to the students in clear terms without any kind of hesitation. Vocabulary is of two kinds.

(i) Active and (ii) Passive

* Assistant Professor & University Head, Department of English, College of Agriculture, Rajendranagar - 30

The Active Vocabulary consists of the words we use everyday for daily needs. A teacher in a university uses a bigger active vocabulary than a teacher in a primary school.

The passive vocabulary consists of words we know in order to understand what we read and hear. A person's passive vocabulary is very much larger than his active vocabulary. This passive vocabulary should be enlarged to the maximum extent. Possession of a large vocabulary improves our thinking and mental capacity, for words are tools of thought. Besides it gives us moral courage as well when we speak to a group of people at any level in any place.

A person who wants to improve his vocabulary should read books on a variety of subjects, for each subject has its own special vocabulary. The same words have many different meanings in different subjects. Wide reading will therefore enable the reader to understand the various shades of meanings that particular words have to people with different professions and in different subjects.

There are many ways in which a person can enlarge his vocabulary. An interesting way of learning more words is to find the nouns, verbs, adjectives, adverbs, as the case may be, of the words the reader already knows or has just learnt. Let us see how many other words we can add to our own vocabulary from just three words, adopting this method.

The words we choose are : Poor, able, broad.

You will notice how the three words can have different forms and have become more than ten words.

	Adjective	**Noun**	**Verb**	**Adverb**
1.	Poor	Poverty	Impoverish	Poorly
2.	able	ability	enable	ably
3.	broad	breadth	broaden	broadly

It is evident from the above that a word can be used as a noun in one sentence and as verb in another sentence or an adjective or as an adverb.

For eg :

1. Birds fly in the sky (fly used as a <u>verb</u>)

2. There is a fly in the milk (fly used as a noun)
3. He is a fly customer (fly used as an adjective meaning active)

We shall also look for the words which have the same meaning as the three words poor, able, broad have.

Synonym :

The English language abounds in 'synonyms'. A synonym is a word having the same or almost the same meaning as another (different sound, different spelling).

We can add about 26 words to the vocabulary from a discussion of the same three words.

Word	Synonyms
Poor	bad, weak, humble, needy, penniless, unhappy, trifling, moneyless
able	efficient, clear, fit, skilled, powerful
broad	open-minded, general, extensive, wide, large spacious, clear, open ample, tolerant, full, comprehensive.

Antonym

An antonym is a word directly opposed to another in meaning. It is in contrast to a synonym. Let us look for the antonyms for the three words.

Word	Antonym
Poor	good, fortunate, strong, robust, excellent, well-to-do, wealthy, rich, lucky.
able	dull, weak, unable, unfit, stupid
broad	limited, negligible, narrow, intensive, short.

Now we have more than fifty words in all. Infact the three words have number of synonyms and antonyms but one concern here is only to increase the stock of words with this method.

We can also enrich our vocabulary with the use of homonyms and homophones. A homonym is a word identical with another in spelling and

pronunciation, but differing from it in origin and meaning. A list of homonyms is given below and these homonyms definitely contribute a great deal to our knowledge and use of words.

arm (n) : The limb of the human body from the shoulder to the hand

eg : She is holding her baby in her arms.

arm (n) : Weapons

eg : The solders had plenty of arms and ammunition

bank (n) : land along each side of a river

eg : My house is one the left bank of the river Godavari.

bank (n) : An establishment for keeping money

eg : I have an account with the State Bank of Hyderabad

bear (n) : Put up with

eg : I can't bear the pain

bear (n) : a large heavy animal

eg : The polar bear is very attractive

cabinet (n) : Piece of furniture with drawers

eg : I usually keep all my books in a wooden cabinet

cabinet (n) : council of ministers

eg : The Prime Minister reshuffled his cabinet last week

HOMOPHONE :

A homophone is a word identical with another in pronunciation, but differs from it in spelling and meaning. Here are some homophones and their usage for your information.

Principle (n) : truth or law

eg : it is not easy to live upto one's principles.

Principal (n) : head of an institution

eg : I must consult the principal before I take a decision

Principal (adj) : highest in order of importance.

eg : Rice is the principal food of our people

mettle (n)	:	Courage
		eg : He is a man of mettle
metal (n)	:	a substance like iron
		eg : iron is a useful metal
medal (n)	:	a flat piece of metal, given as an award
		eg : He is awarded a gold medal for his distinction
meddle (v)	:	Busy one self with the affairs of others
		eg : He always meddle with others' affairs
stationary (adj)	:	not moving
		eg : The express train collided with a stationary goods train
stationary (n)	:	Writing material like pen, paper etc.
		eg : He deals in stationery
Complaisant	:	Willing to please
		eg : he has a complaisant wife
Illegible	:	Unreadable (writing)
		eg : His handwriting is illegible
Eligible	:	fit, suitable, qualified
		eg : He is eligible for the post of professor

Another important feature of English language is pronunciation and spelling. The meaning of many words changes according to their pronunciation. The same words maybe pronounced differently to convey different meanings. It has one meaning when it is pronounced as a noun and another meaning when it is pronounced as an adjective or verb. The knowledge of grammar here proves useful to us. Let us examine the following words which can be nouns, verbs or adjectives, according to their pronunciation.

Word	**Part of Speech**	**Pronunciation**	**Meaning**
Conduct	Noun	Kondkt	Behaviour
	Verb	Kon-dkt	guide, lead

Word	Part of Speech	Pronunciation	Meaning
abuse	Noun	abews	wrong use
	Verb	abews	make a bad use of
refuse	Noun	refews	waste material
	Verb	refewz	say 'no'
lead	Verb	leed	guide, show the way
	noun	minite	60th part of an hour
	adjective	minute	very small

In addition to the above, the order of the words in a sentence we speak or write is very important. The words connected in meaning should be placed as near as possible to one another.

a. The car which is in the garage is smashed (not, the car is in the garage which is smashed) An adj. clause or phrase should be placed next to the noun it qualifies.

b. An adverb phrase or clause should be placed next to the word it modifies. eg. The girl is walking like an elephant.

c. Words or phrases in pairs must be kept immediately before the words referred to eg : I saw not only Ravi but also Raju.

d. The position of adverbs like only, solely and atleast is important as the meaning of a sentence is often antirely change when plancing them in different positions.

   i. Only I saw him (nobody else saw him)
   ii. I saw him only (I saw nobodyelse)
   iii. He atleast came (nobody else came)
   iv. He atleast came (thouhgh he did not bring anything)

e. An infinite should not, in general, be divided by an adverb

   eg : 'We wish to heartly thank you' may be better expressed thus 'we wish to thank you heartily'

f. Ellipses : This is the omission of some word or words from a sentence. If the words which are omitted are easily supplied, the ellipses may be allowed.

eg : She went but soon returned
('She' after but omitted)

The same words which should be repeated are omitted. These omissions do not cause any confusion. Such are omissions are permissible.]

But when doubt arises as to which words should be supplied in place of omission, then the ellipsis is incorrect.

eg : 'He is stronger but not so clever as his friend' should be written as 'He is stronger than but not so clever as his friend'

g. Redundancy is the use of unnecessary words in a sentence
eg : The reason of the failure is because of his laziness.

In this sentence 'The reason of' and 'because' of give exactly the same idea and therefore one of the phrases should be omitted.

Other eg : return back (return)
complete monopoly (monopoly)
resume again (resume)
return again (return)
free gratis (free)
round uniform (round)
very nunique (unique)
enter into (enter)

When we speak we ignore certain common errors in the use of certain words in english language. We must know the meaning of the word before we use it.

Common Errors in the Use of Certain Words

1. The word individual means a single person an not merely a person or man. It is wrong to say an individual came here.

The correct use of the word is as follows :

The rights of the individual must be protected by the Govt. of the country.

2. The word agravate means to make worse or more serious and not to make angry or to irritate though it is now often used to mean the latter.

   Correct usage : The food will aggravate you illness

3. The word mutual refers to something that is between two persons, such as love, friendship, respect etc. It is very wrong to say "They were introduced by a mutual friend". The correct use of the word mutual is given below :

   eg : There was mutual understanding between the two friends.

4. If a feeling is shared by more than two persons, the word common should be used instead of mutual

   eg : There is common understanding among the various races of the people in the country.

   Hanged is used for a person and Hung is used for a thing

   eg : i) The criminal was hanged
   (ii) The clothes were hung

5. Fewer is used for things which can be counted. Less is used for quantity.

   eg : i) There are fewer people in this town than that
   ii) There is less water in the glass than that

6. 'Due to' is an adjective not a preposition. It must qualify a noun or a pronoun. Owing to is used as a compound preposition.

   i) His acident was due to the rain
   ii) Owing to his illness, he could not walk

   Let is a transitive verb and must therefore take an object.

   eg : Let you and me go (not I)

In our bid to express effectively we commit some faults of style. Some of the main pitfalls into which we stumble are given below.

1. ***Pedantry :*** This is evident when we try our best to show off and pretend that we have great learning. We use long and supposedly learned words to give a high sounding quality to our work. We prefer to say the

custodian of law for policeman in all human probability instead of most likely or most probably.

The other uses of pedantry are as follows :

Feature	for	nose
expression	for	word
donate	for	give
impeccable	for	faultless
metamorphosis	for	change

Colloquialisms : are words and phrases which belong only to conversation

The expressions like thanks awfully, Iam awfully sorry, stop this eternal chatter should not be in a composition.

Irrelevance : is unnecessary repetition of the same word, idea or phrase which has nothing to add to the subject under the discussion

eg : As I am ill and as I have visited the doctor, I cannot meet you today

The clause as I have visited the doctor in the above example, is clearly not necessary.

Everyone of us wants to write and speak good english. Simply wishing to speak or write will not in any way help become good speaker or write, *unless you improve certain important article skills of english language. The* "the correct use of english" is written keeping in view certain write students and teachers who want to speak and effectively. The knowledge of certain skills of english language certainly will enable students and teachers who are shound in the science can subjects but not express themselves in simple and clear language.

Printed at ANGRAU Press, Rajendranagar, Hyderabad.