AN EVALUATIVE STUDY ON INTEGRATED PEST MANAGEMENT IN RICE OF OPERATIONAL RESEARCH PROJECT, MEDCHAL IN RANGA REDDY DISTRICT

BY

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B.Sc. (Ag.)

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CERTIFICATE

Sri Umesh Kumar Vajpai has satisfactorily prosecuted the course of research and that the thesis entitled **AN EVALUATIVE STUDY ON INTEGRATED PEST MANAGEMENT IN RICE OF OPERATIONAL RESEARCH PROJECT, MEDHCAL IN RANGA REDDY DISTRICT** submitted is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that the thesis or part thereof has not been previously submitted by him for a degree of any University.

Date: 21-12-92

Dr. N. MRUTYUNJAYAM
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CERTIFICATE

This is to certify that the thesis entitled **AN EVALUATIVE STUDY ON INTEGRATED PEST MANAGEMENT IN RICE OF OPERATIONAL RESEARCH PROJECT, MEDCHAL IN RANGA REDDY DISTRICT,** submitted in partial fulfilment of the requirements for the degree of Master of Science in Agriculture of Andhra Pradesh Agricultural University, Hyderabad is a record of the bonafide research work carried out by **Sri UMESH KUMAR VAJPAI** under my guidance and supervision. The subject of the thesis has been approved by the Students Advisory Committee.

No part of the thesis has been submitted for any other degree or diploma or has been published. All the assistance and help received during the course of the investigations have been duly acknowledged by the author of the thesis.

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(UMESH KUMAR VAJPAI)

DECLARATION

I, **UMESH KUMAR VAJPAI**, hereby declare that thesis entitled **AN EVALUATIVE STUDY ON INTEGRATED PEST MANAGEMENT IN RICE OF OPERATIONAL RESEARCH PROJECT, MEDCHAL IN RANGA REDDY DISTRICT** submitted to Andhra Pradesh Agricultural University for the degree of **Master of Science in Agriculture** is the result of the original research work done by me. I also declare that my material contained in the thesis has not been published earlier.

Date: 21-12-92

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ABSTRACT

Andhra Pradesh is called as rice bowl of India More than 100 insects and 45 diseases are known to attack rice at different stages of growth. The basic approach under the Operational Research Project has been to identify and attack a common problem on a community basis. One such Operational Research Poject for Integrated Pest Management in Rice was estabblished in Ranga Reddy district of Medchal and Qutbullapur Mandals since 1987 and implemented for a period of 5 years. Keeping in view proper implementation of such programme an attempt has been made to conduct an evaluative study on Integrated Pest Management in rice of Operational Research Project , Medchal. The present study focuses in terms of personal, socio-economic and psychological characteristics, knowledge, adoption and increase in yield of beneficiaries and non-beneficiaries.

Ex-post-facto research design was followed in 9 villages of beneficiaries and 6 villages of non-beneficiaries of Medchal and Qutbullapur mandals of Ranga Reddy district to evaluate the knowledge, adoption and increase in yield by adoption of Integrated Pest Management in rice, with sample of randomly selected 60 beneficiaries and 60 non-beneficiaries. A pre-tested interview schedule with the measurement of selected variables was used for collection of required data. The following findings emerged out of the study.

Majority of the beneficiaries belonged to young age, illiterates, possessed small farms, wells, fell under the high category of mass media exposure, contact with research scientists and extension agency with high cosmopoliteness, had low farm power and material possession, they were trained and possessed membership in more than one organisation. Whereas majority of the non-beneficiaries were middle aged, possessed small farms, wells, fell under the low category of farm power and material possession, mass media exposure and contact with research scientists and extension agency. Majority of them belonged to high category of cosmopoliteness, having no membership in any organisation and they were untrained.

Majority of the beneficiaries fell under high category of knowledge of Integrated Pest Management in rice, whereas non-beneficiaireis fell under medium category of knowledge. Further findings revealed that the beneficiaries were significantly differed from the non-beneficiaries.

Majority of the beneficiaries fell under high category of adoption of Integrated Pest Management in rice whereas majority of the non-beneficiaries fell under low category of adoption. Further findings revealed that beneficiaries differed significantly from the nonbeneficiaries.

The beneficiaries obtained increase in yield both in kharif and rabi seasons of post-project period over the pre-project period. Further study revealed that the yield of beneficiaries of post-project period differed significantly from the pre-project period in both the corresponding kharif and rabi seasons.

The selected independent variables of beneficiaries namely education, farm size, mass media exposure, contact with research scientists and extension agency, training and cosmopoliteness were found positively significant with knowledge whereas farm power and material possession and social participation were found non-significant and age was found negatively non-significant with knowledge.

The selected independent variable of beneficiaries namely education, farm size, mass media exposure, contact with research scientists and extension agency and training were found positively significant with adoption and whereas age was found negatively significant. Cosmopoliteness was found non-significant with knowledge. Farm power and material possession and social participation were found negatively non-significant with adoption.

Problems perceived by the beneficiaries were, frequent breakdown of electricity, non-availability of labour in crop season, non-availability of recommended high yielding varieties of paddy seeds, lack of credit facilities, non-availability of pesticides and fungicides and timely advice on recommended varieties.

Suggestions offered by the beneficiaies and non-beneficiaries were regular supply of electricity, evolving of cheap and simple machineries, timely supply of seeds, fertiliser, pesticides on credit providing marketing facilities and timely technical advice.

The Integrated Pest Management in rice programme of Operational Research Project, Medchal had created impact on the beneficiaries in the selected villages of Medchal and Qutbullapur mandals in Ranga Reddy district.

CHAPTER - 1

INTRODUCTION

Food the basic need of the people is already in short supply in our country. The shortage is going to be more pronounced by the end of this century as the population is going to be doubled and tripled in near future. There is need to find out permanent solution and step up production to make the country self sufficient. This calls for the development of agriculture on most modern lines, as a long term policy and involves the optimum use of every drop of water and every inch of cultivable land. The production programme must emphasise the need for searching various alternatives to increase in production and it can be realised through two ways:

i) Increase through the introduction of new varieties and technology, either on a package deal or in a step wise process, and

ii) Minimising losses during the various stages of growth.

Rice the staple food of over 55 per cent of India's population, is grown under diverse agroclimatic conditions. To cater to the varietal demands of varied growing conditions of the country resulted in identifying about 150 improved varieties. All these varieties are

characterised with tall stature, prone to lodging and gave poor response to high yielding varieties with the introduction of semi-dwarf indica type - Taichung native-1. In India after 1965 the breeding programmes were re-oriented and the main emphasis was laid on physiologically efficient plant type with short stature and energy on one hand and the native and applied nutritive on the other hand developed for translating these inputs into higher grain yield.

Grain yield remains the primary emphasis in all breeding programmes and the other objectives included (1) improvement of grain size appearance, cooking and nutritional qualities (ii) wide range of maturity (iii) incorporation of resistance to major diseases and pests (iv) special physiological attributes like grain dormancy, thermosensitivity, photosensitivity/ in-sensitivity etc. (v) suitable for ecological situations like deep flooded upland, saline/alkaline and other soil problems etc.

A marked change occured in the varietal pattern with the evolution of short **statured** high potential varieties responses to nitrogen. The research centres situated in the different States and/or attached to the Agricultural Institutions, State Department of Agriculture and Central Institute launched upon a programme for evolving new varieties to suit the

different situations, simultaneously, changes in agro-technology were introduced. The rapid developments brought about increase in productivity and production. The All India Coordinated Rice Improvement Project (AICRIP) now designed as Directorate of Rice Research was started in 1965 to enable unifom testing of all India basis of varieties and agro-technology generated at various centres.

The cooperative endeavour and the linkage forged at the national level enabled the identification of 36 varieties by the Central Variety Release Committee.

During the same period, 294 varieties had been released by the State Department of Agriculture through Agricultural Universities.

There was phenomenal increase in productivity of rice compared to 1950s while production of rice in 1950-61 was only 20.5 million tonnes with a national average yield as 668 kg/ha. Out of 320 varieties mentioned earlier the varietal situation is different for different ecosystems. The rainfed low land rice occupies 41.4 per cent of the total area (17 million hectares) of the area. The rainfed low land may be subjected to drought and flood control may be inadequate. The crop may also be subjected to intermittant submergence at different growth stages, of the plant, water depth in low land rice is usually not a static factor. It depends on total rainfall, its distribution pattern, topography and soil texture.

More than 100 insects and 45 diseases are known to attack rice crop at different stages of its growth. Of late some of the minor insect pests and diseases have gained major importance causing serious damage. Brown plant hopper, leaf folder, cut worm among the insects, sheath blight, sheath rot, among the diseases, are some of the examples. Stem borer, gall midge and blast continue to be serious problems in some parts of the country. Depending on the variation in climate and cropping pattern, the insect pests and diseases vary in different regions. Consequently, the extent of damage and loss to the rice crop varies depending upon various factors.

The following varieties were released/identified for release with reference to resistance to pests and diseases shown against their names.

1. Rasi (IET 1444) - (Blast and bacterial leaf blight)
2. IR 36 (IET 4555) - (Brown plant hopper and gall midge)
3. Surekha (IET 2902) -(Gall midge)
4. Phalguna (IET 2911) - (Gall midge)
5. Chandana - (Brown plant hooper)
6. Nagarjuna (IET 6315) - (Brown plant hopper)

There are also other 15 varieties which have promising multiple resistance to pest & diseases like gall midge, brown plant hopper, white hopper, plant hopper, sheath blight, blast, bacterial leaf blight and rice tungro virus.

Multinational trials conducted under the All India Coordinated Rice Improvement Project (AICRIP) (now Directorate of Rice Research) had shown that on an average pest managed plot yielded nearly 30 per cent more than the unprotected plots. There are also instances where the individual pest or pest complex or diseases were responsible for total failure of the crop. The time of incidence of insect pests and diseases is difficult to predict with certainity, as this depends on several factors, however, information has accumulated giving an opportunity to minimise such losses through various approaches. With an effective survey and surveillance programme coupled with our knowledge on the economic threshold level (to the extent that is useful), it should be possible to economically control the diseases and pests through a combination of practices. Directorate of Rice Research has developed compatible techniques for integrated pest management with a view to minimise the environmental pollution as well as in adverse effects on natural enemies. The prevalence of insect pests and diseases and their form of incidence in Andhra Pradesh are as shown below:

1. Stem borer (Severe)
2. Gall midge (Moderate)
3. Brown plant hopper (Severe)
4. Greenleaf hopper (Severe)
5. Leaf folder (Severe)
6. Whitebacked plant hopper (Low)
7. Cutworm (Moderate)

The Indian Council of Agricultural Research (ICAR) extended this concept a step further by introducing Operational Research Project, these above pests and diseases are being looked after by Operational Research Project through operation of Integrated pest management programme. They are performing extension activity and as well as research activity and the research has been categorised into:

1. Basic/fundamental (creative knowledge)
2. Applied/mission oriented (problem solving) and
3. Adaptive (field trials/verification)

Operational Research Project aims at field testing of research results, dessemination of technical know-how The first line extension work in agricultural and allied areas in the country is undertaken by research and educational institutions under the umbrella of " ICAR Extension System ".

This function is intended to promptly demonstrate the research results by the scientists to the farmers as well as the extension functionaries specially around institutions and their stations and sub-stations. The first hand feed back to scientists on the field performance of their technology is another objective of ICAR extension system. There are six transfer of technology projects launched by the ICAR including Operational Research Projects.

The concept of first line extension role of the institution/scientists need proper recognition and strengthening in all the developing countries as a foundation to the main extension system by Ministry and Department of Agriculture. Such efforts in India, even though on a limited scale have solitary effect on the extension agencies as well as on the farmers and is a direct approach to achieving integrated functioning of research, education and extension.

The experience of national demonstration led to build confidence among the farmers and scientists have to believe that the demonstration of a particular technology or a combination of them, on an area of watershed (a whole village or a cluster of villages)

basis would be more effective in convincing famers and would provide greater scope for field testing and also analysing the constraints. Thus how the Operational Research Project concept was introduced in 1975.

The basic approach under this extension project has been to identify the common problem and find a solution on a community basis. For instance, Operational Research Projects on improving dry land farming system, popularising composite fish culture and integrated management of rice pests. Some Operational Research Projects are also devoted to all round development of an area and transformation of rural economy through technological changes.

Objectives of the Operational Research Project

1. Comparing traditional chemical control method vis-a-vis integrated management of rice pests.

2. Determining the economic threshold limits of the pests and evaluation of minimal and regulated plant protection schedules.

3. Minimising the environmental pollution by avoidance of excessive use of chemicals.

4. Working out the cost benefit ratio between the two methods

5. Assessing the increase in crop yields and

6. Finding out the impact of the project on socio-economic condition of the rice farmers of the operational areas.

This programme was implemented on whole village approach basis by adopting the pest prone areas. During 1975-85 and about 480 hectares were adopted in Ghanpur village of Warangal district. The extent of adopted area near Tenali at Kolakaluru village of Guntur district was 800 hectares in 1981-82 which was later extended to adjacent villges like Halfpeta and Gudivada villages making upto 4800 acres. After gaining popularity and taking need into account this programme was implemented in Ranga Reddy district in kharif 1987 in a cluster of 9 villages. Out of which 8 villages pertaining to Medchal Mandal namely (1) Medhcal (2) Atvelii, (3) Nutankal (4) Railapur (5) Girmapur (6) Dabilpur (7) Sri Rangapuram (8) Bandamadaram and one village Dundigal of Qutbulapur Mandal were taken covering an area of 5558 hectares. Later on in kharif 1989 the village Nagulu of Qutubullapur mandal was included making the total area of the project to 5694 hectares in both the mandals.

Rice after rice and vegetable after rice are two crop rotations followed in this area. Insect pests and diseases, lack of dependable irrigation, shortage of labour are major constraints. Zinc deficiency, rodent damage and input supply are also the other constraints in rice production. Thus the Operational Research Project on Integrated Pest Management in rice was launched to overcome these constraints in rice production in the selected villages with the following objectives.

1. To take up Integrated Pest Management of Rice.
2. To improve rice crop and rice crops based programme;
    a) To take up varietal replacements of rice crop.
    b) To take up improvement of rainfed paddy crop to irrigated crop.
    c) To take up direct sowing in puddled land.
    d) To rectify zinc deficiency in paddy fields.
    e) To take up weed control.
3. To take up training programmes for farmers.

Operational Research Project on Integrated Control of Rice Pests is Centrally sponsored scheme with 100 per cent assistance from Government of India and the scheme was sanctioned from 1985 to 1990 vide G.O.Ms. No. 422 of Food and Agril. (FP II) also the Government has sanctioned Rs. 3.50 lakhs for the year 1990-91 and it is continued upto 28.02.1992 with the following staff:

1. Dy. Director of Agriculture .. 1 post
2. Asst. Director of Agriculture .. 1 post
3. Agricultural Officer .. 5 posts

This scheme is a joint venture of Directorate of Rice Research and State Department of Agriculture of Andhra Pradesh. Besides above, following staff of Directorate of Rice Research are working in the scheme.

1. Principal Scientist and Head (TOT) Entomologist .. 1 post
2. Plant Pathologist .. 1 post
3. Technical Assistant .. 4 posts
4. Mechanic .. 1 post

This project is operational research oriented and serves as feedback from extension staff to work in the farmers fields, in order to test the technology of integrated pest management in rice crop and to simultaneously persuade the farmers for adoption, utilisation of resources according to needs, relative priority that has to be given to a particular area for proper division of labour among scientists.

Need and importance of the study

Constant monitoring and evaluation is essential for successful implementation of any programme so that constructive measures and suggestions can be made for proper functioning of the programme with respect to its objectives and suitable modifications can be made accordingly.

Several agricultural programmes for the upliftment of farming community have been taken up by the Government and keeping in view the increasing importance of the proper implementation of such programmes, an attempt has been made in this study to evaluate the impact of implementation of Integrated Pest Management in rice for the farming community particularly with reference to level of knowledge and extent of adoption of recommended practices based on the following specific objectives of the study:

1. To analyse the personal, socio-economic and psychological factors of beneficiaries and non-beneficiaries.

2. To study the extent of knowledge of beneficiaries and non-beneficiaries about Integrated Pest Management in rice.

3. To determine the extent of adoption of improved practices on pest management by beneficiaries and non-beneficaries.

4. To study the difference between the the beneficiaries and non-beneficiaries in relation with knowledge and adoption.

5. To study the increase in yield of beneficiaries during post-project period over pre-project period.

6. To unearth association between personal, socio-economic and psychological factors with knowledge and adoption of beneficiaries.

7. To elicit problems in implementing the programme of Operational Research Project and suggestions to overcome the same.

CHAPTER II

REVIEW OF LITERATURE

This chapter deals with the review of literature. Every effort was made to review the literature available. The literature helps to acquire general background knowledge in the given field. It helps to find out the available information which is related to the objectives of the proposed research. It also helps the researcher to find out gaps in knowledge in selecting the topics for research. Besides finding out available techniques which can be used to measure the factors under study and to compare the results of research with those of previous research. it provides help to the researcher to understand the weaknesses of previous research and to avoid repetition of similar mistakes etc. Hence the review of literature is essential.

In this chapter an attempt is made to review the available literature in light of objectives of the study. However it was found that there was not much literature directly available in the study area and there are certain dimensions of the study in which either very few or no studies have been reported. Inspite of these limitations an attempt has also been made to present the related research in review of literature which was found to be

meaningful and having direct or indirect bearing on the present research done by the investigator. The review of literature is presented in the following (8) sections.

2.1 Distribution of farmers on their personal, socio-economic and psychological characteristics.

2.2 Extent of knowledge of the beneficiaries and non-beneficiaries about improved practices of cultivation.

2.3 Extent of adoption of improved practices of cultivation by the farmers.

2.4 Difference between beneficiaries and non-beneficiaries in relation with knowledge and adoption.

2.5 Increase in yield of beneficiaries.

2.6 Association between personal, socio-economic and psychological factors with knowledge.

2.7 Association between personal, socio-economic and psychological factors with adoption.

2.8 Problems of farmers in adoption of improved practices of cultivation.

2.1 DISTRIBUTION OF FARMERS ON THEIR PERSONAL, SOCIO-ECONOMIC AND PSYCHOLOGICAL CHARACTERISTICS

2.1.1 Age

Rao (1981) in his study on adoption of high yielding varieties of paddy found that majority of the respondents belonged to middle age group followed by young age and old age groups.

Rao (1988) found that majority of farmers (62.67%) fell under old age group followed by middle and young age groups in adopted village group whereas majority of the farmers (54.67%) fell under middle age group followed by old and young age group.

Bhoite and Barve (1984) concluded that most of the respondents were in the middle age group i.e., below 50 years of age.

Prasad (1987) found that majority of the contact farmers belonged to middle age group.

Ramachandran (1988) reported that majority (60.83%) of dryland farmers were in old age category followed by middle and young age categories.

Rao (1990b) identified that majority (60.00%) of groundnut growers belonged to middle age group followed by young and old age groups.

Jabeen (1991) found that majority (51.1%) of chilli growing farmers belonged to middle age category follwed by young (32.3%) and old age (16.6%) categories.

2.1.2 Education

Manivannam (1980) concluded that 90.00 per cent of the sunflower growers were educated and only a small portion (10.00%) were uneducated.

Rao (1981) in his study on adoption of HYVs of paddy revealed that majority of the respondents studied upto primary level of education followed by illiterates.

Rao (1988) found that the educational level of the farmers were more in graduate level (28.00%) followed by intermediate, primary school, middle school, illiterates and post graduates respectively in adopted village group whereas in case of control village group the educational level of the farmers were more in primary school level (26.67%) followed by Intermediates , middle school, high school, illiterates and graduates respectively.

Senthil (1983) observed that 94.55 per cent were educated and only a small portion (5.45%) were uneducated among hybrid cotton seed growers.

Bharathi (1988) revealed that 89.00 per cent of groundnut seed growers were educated and small portion (11.00%) were uneducated.

Lakshmi (1990) observed that majority (62.00%) of the respondents of farmers training programme were illiterates.

Balabhaskar (1991) reported that majority (51.33%) of the respondents had primary school level of education.

Reddy (1992) reported that 35.83 per cent of respondents were illiterates.

2.1.3 Farm size (land holding)

Manivannam (1980) reported that 50.84 per cent of the sunflower growers operated medium sized farms.

Senthil (1983) indicated that 51.82 per cent of the hybrid cotton seed growers operated big sized holdings, whereas 31.82 per cent of them operated medium sized holdings and 16.36 per cent of them operated small sized holdings.

Bharathi (1988) noted that 46.00 per cent of groundnut seed growers operated medium holdings, 35.00 per cent of them operated small holdings, while 19.00 per cent of the respondents operated large holdings.

Rao (1988) reported that 62.67 per cent of respondents of adopted village group had large holdings whereas 54.67 per cent of respondents of control village group were had small holdings.

Biswas (1990) reported that majority (76.67%) of the respondents had medium land holdings followed by small (20.00%) and big (3.33%) size land holdings.

Balabhaskar (1991) observed that majority (49.13%) of the respondents were small farmers.

Raju (1991) observed that 40.83 per cent of the respondents were small farmers, followed by 38.33 per cent of big farmers and 20.84 per cent of medium farmers.

Chandrashekhar (1991) reported that majority of the beneficiaries (66.66%) belonged to small category, followed by marginal (28.34%) medium (3.34%) and semi medium (1.66%). Whereas in case of non-beneficiaries majority of them belonged to small category (45.00%) followed by medium (31.66%), marginal (18.34%), semi medium (3.33%) and large (1.67%) categories of farm size.

2.1.4 Farm power and material possession

Desai (1981) found a significant relationship between material possession and economic performance .

Ramachandran (1988) reported that more than half (52.56%) of the farmers had medium level and one third per cent had high, while 14.77 per cent had low level of material possession.

Biswas (1990) revealed that 58.33 per cent of the respondents had medium material possession followed by 26.67 per cent had low material possession and remaining 15.00 per cent of respondents were having high material possession.

Chandrashekhar (1991) reported that majority of the beneficiaries were grouped under medium (70.00%) category followed by high (21.67%) and low (8.33%) categories. Whereas in case of non beneficiaries majority were grouped under low (46.67%) category followed by medium (43.33%) and high (10.00%) categories of farm power.

Raju (1991) reported that majority (78.33%) of the respondents had medium material possession followed by low (11.67%) and high (10.00%) material possession categories.

2.1.5 Social participation

Vasant and Sudhakar (1982) reported that only 28.02 per cent of farmers participated in one or more organisations.

Vijaya (1982) reported that majority of the respondents belonged to less social participation category.

Satyanarayana (1983) found that most of the respondents had medium social participation followed by low and high social participation

Manjula (1985) reported that majority of the respondents had no social participation and only few participated in social activities.

Surgeon (1989) reported that majority of the farmers had below average social participation.

Biswas (1990) observed that majority (43.34%) of respondents had no social participation, whereas 32.50 per cent of respondents had membership of one organisation, 10.83 per cent were found as member of more than one organisation and equal number as office bearer in organisations.

Jabeen (1991) found that majority (62.2%) of respondents had low social participation. While 25.6 per cent and 12.2 per cent of them had medium and high social participation respectively.

2.1.6 Mass media exposure

Rao (1981) studying on adoption of HYVs of paddy reported that most of the respondents had medium mass media exposure followed by low and high mass media exposure.

Satyanarayana (1983) found that most of the respondents had medium mass media exposure followed by low and high mass media exposure.

Reddy (1985) noted that majority of the respondents under lab to land programme had low mass media exposure followed by high mass media exposure.

Mrutyunjayam (1987) in his study reported that most of the respondents had low mass media exposure followed by medium and high mass media exposure.

Verma (1988) reported that majority (66.00%) of the contact farmers were distributed in the medium mass media exposure category followed by 18.00 and 16.00 per cent under low and high mass media exposure categories, respectively.

Lakshmi (1990) reported that majority (65.22%) of the respondents under farmers training programme had medium exposure to mass media.

Balabhaskar (1991) indicated that majority (61.33%) of the respondents had medium mass media exposure followed by low (22.00%) and high (16.67%) mass media exposure categories.

Chandrashekhar (1991) found that majority of the beneficiaries (51.66%) had medium level of exposure to mass media followed by high (33.34%) and low 15.00%). In case of non-beneficiaries majority of the respondents (43.34%) had medium exposure to mass media followed by low (35.00%) and high (21.66%) categories.

2.1.7 Extension contact

Rao (1981) in studying adoption of HYVs of paddy reported that most of the respondents had medium extension contact followed by low and high extension contact.

Mrutyunjayam (1987) reported that majority of respondents had medium extension contact followed by low extension contact and high extension contact.

Verma (1988) reported that majority of the contact and non-contact farmers were having medium extension contact.

Rao (1990b) found that majority (55.00%) of the respondents had medium level extension contact followed by low (33.89%) and high (11.11%) extension contact.

Balabhaskar (1991) reported that majority (60.00%) of the respondents had medium level of extension contact followed by 25.34 per cent with high level and 18.06 per cent with low level of extension contact.

Chandrashekhar (1991) reported that majority of the beneficiaries were districted under high (50.00%) extension contact category followed by medium (41.67%) and low (8.33%) categories, whereas in case of non-beneficiaries majority of them were grouped under medium (66.67%) and followed by low (23.33%) and high (10.00%) extension contact categories.

2.1.8 Training

Shashikumar (1978) while analysing the farm women training in Bangalore concluded that training was responsible for increasing knowledge and skills, leading to farmer to adoption stage.

Rao (1988) reported that 46.67 and 40.00 per cent of farmers of adopted village group were found in medium and high categories of training.

2.2 EXTENT OF KNOWLEDGE OF THE BENEFICIARIES AND NON-BENEFICIARIES ABOUT IMPROVED PRACTICES OF CULTIVTION

Sangle (1962) in a study conducted around Nagpur observed that 48 per cent of the farmers had poor knowledge about rice production technology followed by 39 per cent with average knowledge and 13 per cent with high knowledge.

Rajvanshi (1965) in his study at Bichpuri Block near Uttar Pradesh found that majority of the farmers (45.53 per cent) had poor knowledge, while 28.12 per cent had high knowledge on rice production technology.

Sinha (1966) in his study at Bulandshar reported that 62.36 per cent had average knowledge and 24.46 per cent had low knowledge on package of practices of paddy, 13.18 per cent farmers had high knowledge.

Singh (1967) concluded that majority of the farmers 58.35 per cent possessed average knowledge about improved rice production technology.

Badkas (1968) reported that only 18per cent of the farmers had very high knowledge on improved rice production technology followed by average knowledge 30 per cent low knowledge 31 per cent, and very low knowledge 21 per cent.

Tomer (1968) in his study on impact of package programme at Baraut (Meerut) Community Development Block observed that 69.50 per cent had average knowledge, 18.50 per cent had low knowledge and only 12 per cent farmers possessed high knowledge.

Mishra (1970) concluded that majority of the farmers in community development block possessed average to poor knowledge on rice production technology.

Patel (1970) in his study at Anand Taluk of Gujarath State reported that only 28.35 per cent farmers possessed low knowledge, 3.75 per cent had high knowledge and rest belonged to average group.

Jama (1972) reported that while 25.72 per cent of the farmers of Jabalpur reported to have high knowledge only 12 per cent had average knowledge and rest had low knowledge on rice production technology.

Vijayaraghavan and Somasundaram (1981) reported that 72.18 per cent farmers scored medium knowledge followed by 24.70 per cent with low knowledge and only 3.12 per cent with high knowledge on rice production technology.

Rao (1987) reported that majority the farmers 57 per cent belonged to high knowledge followed by 29 per cent medium knowledge and 14 per cent low knowledge on package of practices of rice.

Rao (1987) found that 25 per cent of beneficiary farmers were in high knowledge group, 21.67 per cent of the beneficiaries in low knowledge group and remaining were in medium knowledge group regarding groundnut cultivtion,

2.3 EXTENT OF ADOPTION OF IMPROVED PRACTICES OF CULTIVATION BY THE FARMERS

Bose (1961) reported that 42.93 per cent of the farmers adopted the practices and rest have not adopted the recommended practices of paddy crop.

Pandit (1962) concluded that 13 per cent of the farmers adopted rice practices whereas 62 per cent partially adopted and 25 per cent did not adopt the recommended rice practices.

Shawney (1962) observed that 28.13 per cent farmers adopted the rice practices 33.81 per cent partially adopted and 38.69 per cent have not adopted the rice practices recommended by village level workers.

Sinha (1963) reported that majority of the farmers 68.25 per cent partially adopted the practices, 20 per cent fully adopted and 11.75 per cent have not adopted any practices of rice cultivation.

Agarwal (1966) reported that majority of the farmers 43 per cent adopted the rice practices followed by 35.00 per cent partially adopted and the rest of the farmers have not adopted the recommended rice practices.

Ratanchand and Gupta (1966) concluded that the village level workers did not succeed in persuading the farmers to adopt the recommended practices and observed that only 7.8 per cent adopted the rice practices whereas, 26.6 per cent of farmers found average adopters and 65.6 per cent low adopters.

Motilalkar (1967) observed that 51.87 percent of the farmers in West Bengal village adopted the rice practices but concluded that more or less equal number of the farmers still pratice the traditional methods.

Singh (1968) concluded that though 31.37 per cent farmers adopted the rice practices given by the village level workers, still 68.63 per cent farmers have yet to come into the main stream.

Kulkarni (1970) in his study at Kolhapur district of Maharashtra observed that though 47 per cent of the farmers fully adopted the rice practices as per the recommendations of village level workers, still 53 per cent left out to be brought into the full adoption category.

Patel (1970) in his study found that 61.32 per cent farmers partially adopted the rice practies whereas, 30 per cent fully adopted and 8.68 per cent have not adopted any practices.

Sonware (1971) reported that majority of the farmers (48 per cent) adopted the rice practices and the rest were either partially adopters or non-adopters.

Singh (1971) also reported that majority of the rice growing farmers (51 per cent) adopted the recommended practices, followed by 25 per cent partially adopted and 24 per cent not adopted.

Nawagire (1972) found that though 48.41 per cent adopted the recommended practices of paddy still more or less equal number of farmers, were non-adopters or partial adopters.

Reddy (1975) in his study observed that only 13.82 per centhave adopted the rice cultivation practices followed by 53.32 per cent average adopters and the rest 33.66 per cent were low adopters.

Arulraj and Knight (1977) found that the percentage of adoption scores obtained by small farmers were the lowest in all practices except nitrogenous fertilizers application in paddy crop.

Sarkar in West Bengal (1979) reported that majority of the farmers fully adopted the recommended practices on rice production technology.

Kulhari (1980) observed in his study in Rajashtan that majority (44.50 per cent) of the farmers in Chambal command area adopted the rice recommended practices, followed by 38 per cent average adopters and the rest were low adopters.

Manivannam (1980) observed that 25 per cent and 14.17 per cent of the respondents were found to be low and high adopters respectively.

Ratnakar (1981) reported that 62 per cent of the farmers in Sriramsagar command area adopted fully the recommended rice practices whereas 38 per cent not adopted the practices.

Rao (1987) in his study at Khammam district of Andhra Pradesh observed that majority of the farmers (68 per cent had high adoption on package of practices of paddy.

2.4 SIGNIFICANT DIFFERENCE BETWEEN BENEFICIARIES AND NON-BENEFICIARIES IN RELATION WITH KNOWLEDGE AND ADOPTION

Rao (1988) reported that mean knowledge level of adopted village farmers was higher than that of control village group in respect of improved practices of paddy

and the farmers of adopted village group differed significantly from the farmers of control village farmers.

Rao (1988) reported that the mean adoption level of farmers of adopted village group was higher than that of the farmers of control village group and the farmers of adopted village group differed significantly from the farmers of control village group.

2.5 INCREASE IN YIELD OF BENEFICIARIES

Reddy (1985) stated that majority of the families got high income due to increased yields obtained by them by following the know how given to them after the introduction of lab to land programme.

Chandrashekhar (1991) reported that mean yields obtained per hectare in quintals obtained by the beneficiaries in respect of pulse crop under National Pulses Development Project in Nalgonda district of Andhra Pradesh was significantly higher than the mean yield per hectare obtained by the non-beneficiaries and concluded that there was significant difference in mean yields in quintals per hectare as obtained between beneficiaries and non-beneficiaries.

2.6 ASSOCIATION BETWEEN PERSONAL, SOCIO-ECONOMIC AND PSYCHOLOGICAL FAACTORS WITH KNOWLEDGE

2.6.1 Age

Wilson and gallup (1955) stated that there was an increasingly good response to learning, as the age of the farmers advanced upto 45 years but the response was less in comparison to young age group, as the advanced above 45 years.

Veeraaiah (1989) found that young farmers (18 - 30 years) acquired more knowledge than old farmers.

Relationship between knowledge and selected independent variables is shown below.

Rajvanshi (1965), Singh (1967), Tomer (1968), Patel (1970), Vijayaraghavan and Somasundaram (1979), Vinayakarao (1979), Pathak (1981), Ratnakar (1981) and Zotwana (1987) Rao (1988) and Chandrashekhar (1991) reporte significant and positive correlation of age with knowledge.

Sangle (1962), Sinha (1966), Badkas (1968), Mishra (1970), Kulhari (1980) and Rao (1983) reported negative but non significant relations.

On other hand, Somasundaram and Singh (1978) and Sarkar (1979) Katarya and Singh (1987) and Biswas (1990) reported negatively significant correlation between age and knowledge of farmers.

2.6.2 Education

Researchers like Singh (1962), Sangle (1962), Rajvanshi (1965), Sinha (1966), Singh (1967), Badkas (1968), Patel (1970), Somasundaram and Singh (1978), Vijaya Raghavan and Kulhari (1980), Ratnakar (1981), Katarya and Singh (1987), Zotwana (1987), Rao (1988), Biswas (1990), Chandrasekhar (1991) reported a positive and significat correlation between education and knowledge.

2.6.3 Farm size

Rajvanshi (1965), Sinha (1966), Badkas (1968), Patel (1970), Jama (1972), Sarkar (1979), Ratnakar (1981) Rao (1988) and Chandrashekhar (1991) reported a positive and significant relationship betwen farm size and knowledge. While, Singh (1962), Singh (1967), Tomer (1968), Mishra (1970), Kulhari (1980), Rao (1983), Zotwana (1987) reported non-significant relationship.

Biswas (1990) reported a negative and non-significant relationship between farm size and knowledge.

Katarya and Singh (1987) and Rao (1988) observed positive and significant association between farm size and gain in knoweldge.

Mundhwa and Patel (1987) observed a significant association between farmers knowledge and their size of holding.

2.6.4 Farm power and material possession

Yesurathnam (1985) found that there was no significant association between farm power of trained rural youth club members and gain in knowledge.

Chandrashekhar (1991) found α positive and significant correlation between farm power and knowledge.

Rao (1991) reported that farm power was positively and significantly related with gain in knowledge of the beneficiaries in his study about Oilseed Production Thrust Programme.

2.6.5 Social participation

Sangle (1962), Sinha (1966), Badkas (1968), Mishra (1970), Jama (1972), Kulhari (1980), Ratnkar (1981), Katarya and Singh (1987) established positive and significant relation between social participation and knowledge. Whereas, Singh (1962), Rajvanshi (1965), Singh (1967), Tomer (1968), Patel (1970), Rao (1983) established non significat relationship. Somasundaram and Singh (1978) reported a negative correlation.

Biswas (1990) reported a positive and significant relationship with social particiption and knowledge.

2.6.6 Mass media exposure

Patel (1970), Jama (1972), Kittur (1980), Ratnakar (1981) and Chandrashekar (1991) found positive and significant correlation of mass media exposure with knowledge.

2.6.7 Contact with research scientists and extension agency

Kulhari (1980), Ratnakar (1981)and Rao (1988) Chandrashekhar (1991) found positive and significnt correlationship of knowledge with the extension contact.

2.6.8 Training

Sukumaran (1972), Raju (1978), Zotawna (1987), Rama Rao (1988), Dharma Rao (1988) reported that trained farmers had higher knowledge than the untrained farmers on package of practices.

Rao (1988) and Biswas (1990) reported that training was positively significant with knowledge of farmers on improved practices.

2.6.9 Cosmopoliteness

Vijaya (1982), Nambela (1987) observed a significant association between urban contact and knowledge, whereas, Sarkar (1979), Reddy (1983) and Biswas (1990) concluded that there was no significant relationship between knowledge and cosmopoliteness.

2.7 ASSOCIATION BETWEEN PERSONAL, SOCIO-ECONOMIC AND PSYCHOLOGICAL FACTORS WITH ADOPTION

2.7.1 Age

A positive and significant corrlation was observed between age and adoption of farmers by Pandit (1962), Ratanchand and Gupta (1966), Mishra (1967) and Ratnakar (1981).

No significant correlation was observed by Coleman (1951), Shankaraiah (1965), Reddy and Singh (1965), Bose (1962), Thakur (1966), Sharma (1967), Vidyarathi (1967), Veerabhadraiah (1969), Sahoo (1970), Singh (1971), Reddy (1971), Chowkidhar and George (1972), Jha and Saktavat (1972), Avatigar (1974), Singh (1974), Gangappa (1975), Kittur (1976) Sarkar (1979), Rao (1979), Kulhari (1980) Rao (1983) and Chandrashekhar (1991) .

Wadkar et al (1988) reported that there was no significant relationship between age and adoption.

Reddy (1988) and Biswas (1990) observed a negatively non-significant correlation between age and adoption.

2.7.2 Education

Pandit (1962), Sinha (1963), Thakur (1966), Mishra (1967), Sharma (1967), Singh (1967), Singh (1968), Sahoo (1970), Singh (1971), Sharma and Nair (1974), Reddy (1975), Kulhari (1980) and Ratnakar(1981) Rao (1988)

Chandrashekhar (1991) reported a positive and significant correlation between education of farmers and his extent of adoption of rice practices. Whereas, Shawney (1962), Bose (1962), Singh (1974), Sarkar (1979) reported no significant relationship between these two variables.

Dube et al (1988) reported significant association between level of education and adoption of recommended wheat technology.

Ramachandran (1988), Rao (1988), Jabeen (1991) and Wadkar et al (1988) found highly positively significant relationship between education and adoption.

Biswas (1990) reported that there was a negatively significant relationship between education and adoption of rice production technology by farmers in Andaman district.

2.7.3 Farm size

Pandit (1962), Sinha (1963), Thakur (1966), Mishra (1966), Sharma (1967), Singh (1968), Singh (1974), Reddy (1975), Sarkar (1979), Kulhari (1980), Ratnakar (1981), Rao (1988) and Chandrashekhar (1991) observed a positive and significant correlation between farm size and extent of adoption, whereas Sahoo (1970), Singh (1971) and Vinayaka Rao (1979) did not observe any significant relationship between these two variables.

Biswas (1990) observed a negatively non significant relationship between farm size and adoption of rice production technology in Andaman district.

2.7.4 Farm power and material possession

Yesuratnam (1985) found that there was no significant association between farm power and adoption.

Chandrashekhar (1991) found a significant correlation of farm power with adoption.

2.7.5 Social participation

A positive and significant correlation was observed between social participation and adoption by Sinha (1963), Thakur (1966), Sharma (1967), Sahoo (1970), Sharma and Nair (1974), Reddy (1975), Kulhari (1980), Mrutyunjayam (1980), Ratnakar (1981) and Biswas (1990).

Ratanchand and Gupta (1966) and Singh (1968) have also observed a positive and significant relationship between social participation and adoption.

Mishra (1967) and Singh (1967) and Mannivannam (1980) have observed no significant relationship between social participation and adoption.

2.7.6 Mass media exposure

The following studies reported by Reddy (1971), Gangappa (1975), Kittur (1976), Desai (1977) and Chandrashekhar (1991) have indicated the presence of positive relationship between the mass media exposure and the adoption of practices.

Rao (1991) reported that mass media participation was found positively and significantly associated with adoption of recommended practices of groundut crop under Oilseed Production Thrust Programme.

2.7.7 Contact with research scientists and extension agency

Singh (1967), Kulhari (1980), Rao (1988), Ratnakar (1981) and Biswas (1990) reported a positive and significat correlation, whereas, Thakur (1966), Mishra (1967), Singh (1968. Singh (1974), Sarkar (1979) reported no significant relationship between extension contact and adoption of farmers.

A positive and significant correlation between extension activities, participation and adoption behaviour of farmers was established by Kulhari (1980), Rao (1988), Biswas (1990) and Chandrashekhar (1991). No such significant relationship was reported by Thakur (1966), Mishra (1967), Singh (1968) and Singh (1974).

2.7.8 Training

The researchers like Sukumaran (1972), Raju (1978), Satyanarayana (1983), Zotawna (1987) observed that there was significant difference in adoption between trained and untrained farmers.

Rao (1988) and Biswas (1990) observed a significant relationship between training and adoption of rice production technology.

2.7.9 Cosmopoliteness

Researchers like Chauhan and Sinha (1976), Reddy (1983), Nambala (1987), Ramarao (1988) and Biswas (1990) observed a non-significant associationship between cosmopoliteness and adoption. The above review suggests that there was no relationship between urban contact and adoption behaviour.

2.8 PROBLEMS OF THE FARMERS IN ADOPTION OF IMPROVED PRACTICES OF CULTIVATION

Patel (1970) reported that poor financial facilities, lack of timely inputs, lack of technical guidance, poor ext ensions activities, lack of irrigation facilities and high cost of inputs are the main reasons that lead to the non-adoption of recommended paddy practices.

Sahoo (1970) reported high cost of inputs, non-availability of adequate inputs in time, poor technical guidance, lack of timely guidance by VLW were the few reasons expressed by the farmers for partial and non adoption of recommended paddy practices.

Reddy (1971) found that lack of capital was the most important reasons for non adoption of fertilizers to rainfed ragi by the non-adopters. Other reasons were found to be their lack of complete knowledge about the practice, experience and conviction about the practices.

Singh (1971) reported that poor irrigation facilities, lack of timely technical guidance, poor farmer's training facilities, lack of finance and untimely supply of inputs were the important reasons for non-adoption of paddy cultivation practices by Allahabad farmers.

Kittur (1976) stated that majority of the marginal farmers hesitated to adopt practices like farm yard manure, fertilizer application and plant protection measures (except seed treatment) on a wider scale, due to lack of knowledge high cost and non-availability of inputs.

Vijayaraghavan (1977) reported that inadequate irrigation facilities were the main reasons for non-adoption of recommended paddy practices followed by high cost, poor extension contacts, non-availability of good inputs in time.

Sarkar (1979) found that non-availability of the inputs in sufficient quantity in time, lack of finance, lack of knowledge were the most important reasons for non-adoption of recommended paddy practies.

Ratnakar (1981) reported that lack of knowledge, high cost of inputs, lack of proper technical guidance, high labour requirement, lack of remunerative price to the produce, non-availability of credit in time and non-availability of inputs intime were the most important reasons for partial and non-adoption of the recommended rice practices.

Rao (1983) reported that high cost of practices, non-availability of good inputs in time, lack of required skills, lack of credit and lack of knowledge were some of the important reasons expressed by the farmers

of Intensive Agricultural Extension Programme (IAEP) for their partial and non-adoption of recommended high yielding rice cultivation practices.

Satyanarayana (1983) reported that non-availability of seed in time, lack of water supply, non-availability of chemicals in time, high cost of fertilizers, non-availability of equipment were some of the reasons for non-adoption of recommended practices of paddy by the tribal farmers of Visakhapatnam District of Andhra Pradesh.

Zotawana (1987) reported the reasons for non-adoption of package of practices of paddy by farmers of Aizwal West District of Mizoram were lack of timely technical guidance, non-availability of inputs in time, lack of conviction.

Rao (1988) pointed out that non-availability of high yielding variety of paddy seed tends to first problem followed by lack of credit facilities. sufficient knowledge of field staff and indifference of farmers in receiving the knowledge.

DEFINITIONS

KNOWLEDGE

Bloom et al (1958) considered knowledge as the behaviour of test situations which emphasises the remembering either by recognition and recall of ideas, material or phenomenon.

English and English (1961) defined knowledge as the body of understood information possessed by an individual or by people or by a culture. They further explained that knowledge is that of person's information which is in accordance with established fact.

ADOPTION PROCESS

Lazer et al (1969) defined adoption process means the acceptance of new ideas and products. It concerns from the time of awareness that a new idea or product is available until it is accepted. In consumption terms it is congruent with the problem solving steps taken by innovations. Five progressive processes have been delineated: (1) Awareness (2) Interest (3) Evaluation (4) Trial and (5) Adoption.

ADOPTION

Adoption is the last stage in the process of adoption where a person decides that the new idea, product or practice is good enough for full scale and continued use and a complete change is made with that end in view.

INTEGRATED PEST MANAGEMENT TECHNOLOGY

In the context of pest control, there are three main types of control:

1. Prevention - keeping a pest from becoming a problem;
2. Suppression - reducing pest numbers or damage to an acceptable level; and
3. Eradication - destroying or removing a pest completely from a target or area.

The control of an animal pest, disease or weed can generally be achieved either by natural control forces or control practices applied by man.

INTEGRATED PEST MANAGEMENT

The concept of 'Integrated Pest Management' has relatively recently come up as a topic of prominent interest and study among agricultural scientists because of the wide spread concern about environmental pollution inherent in the use of pesticides and for a score of other reasons.

Examining components of the term 'Integrated Pest Management' may help in understanding its meaning.

Pest:

A pest is an organism causing harm to man or his property and includes insects, nematodes, rodents, weeds, fungi, bacteria and viruses.

Management:

The word management implies the directing of the pest situation by a judicious use of various methods of control with the intention of decreasing the harm caused by pests to a level which is determined by man as being economically acceptable.

Integrated:

The word integrated means the bringing together of individual control methods into a whole operation that takes due care of a sound environment.

Integrated Pest Management:

Lastly, integrated pest management refers to the farming system. Integrated also implies that the combined control operation should be compatible (should blend well with the complex farm production unit) and its social (knowledge, customs), physical (weather, equipment, labour, agro-chemicals) and economic (financial resources, poverty) conditions.

The overall definition thus developed states: Integrated pest management considers any and all combinations of various tehniques for the management of pest problems such as those caused by weeds, insects, diseases and rodents within the context the farming system.

ECONOMIC THRESHOLD

In the process of deciding upon the necessity and degree of pest control to be carried out, the concept of 'Economic Threshold Level' has been introduced. This involves the judgement of the extent to which a particular pest population can be allowed to grow before a pesticide must be applied to prevent further crop loss. Various definitions have been proposed by entomologists originally and modified by economists later to describe the concept. A definition by Headly (1972) that is well accepted, states " The economic threshold indicates the pest population that produces incremental damage equal to the cost of preventing that damage."

The presence of pests may not always be harmful. Low level of pests infestation are often beneficial because in some cases they can stimulate plant growth or, for example, allow a lesser amount of fruit to grow to greater size, thus preventing the need for chemical fruit thinners. Cereal plants can take up the space of dead plants by increased tillering and thus allow these larger plants to produce more grains.

Under Integrated Management of Pest Control following are the important methods for control of pests excluding the natural control being done by nature.

1. Cultural control:

Under this method soil tillage, adopting the time of planting and harvesting of a crop, water management, crop rotation (with or without inclusion of fallow) will control certain pest species.

2. Mechanical control:

Under this method, collection of larvae by hand and destruction. For rodent control, trapping rats by use of rat traps, exclusion of pests by wire fences or screens, use of light traps, nets and suction devices for monitoring and destruction are included.

3. Biological control:

I. Control of pest by this method involves
Use of sex harmones like installation of pheromone traps for monitoring and for mass trapping of male, moths of pests eg. Heliothis armigera and Spodoptera litura etc.

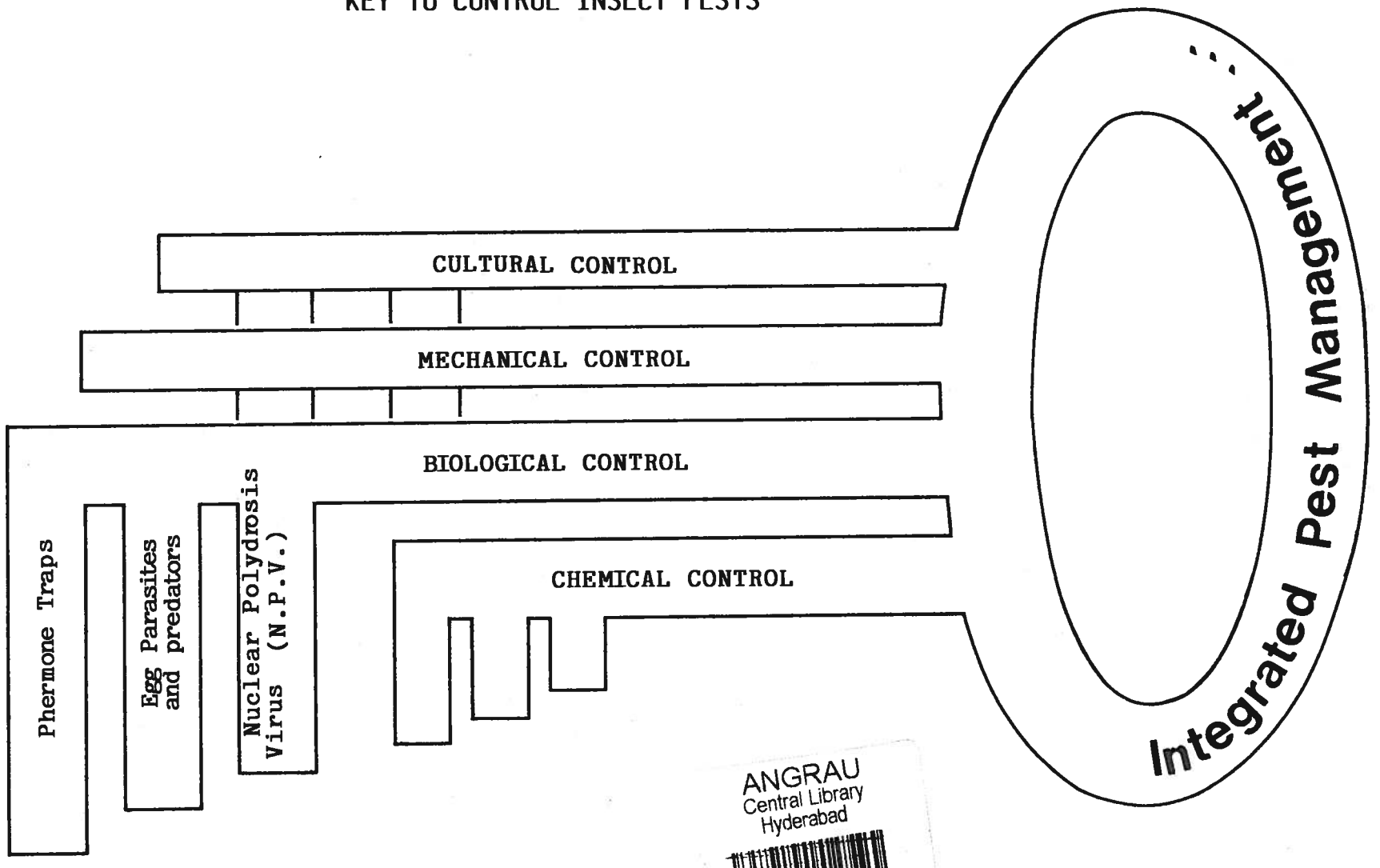
II. Use of natural enemies, predators, parasites.

III. Use of pathogens i.e. Fungus, Bacteria like Bacterium thurengenesis and virus like Nuclear poly hedrosis virus.

4. Chemical control:

This is the last resort of pest control. Under this method only such pesticides are used which are friendly to natural enemies, predators, parasites etc. and are harmful to pests eg. endosulfan. Avoiding the use of synthetic pyrethroids, which are harmful to natural enemies, predators and parasites.

KEY TO CONTROL INSECT PESTS



BIOLOGICAL CONTROL

What is Biological Control?

It is essentialy the use of one living organism to control another living organism.

This is a method of pest control that relies on natural enemies, parasites, predators and pathogens to reduce pest population to a tolerable level.

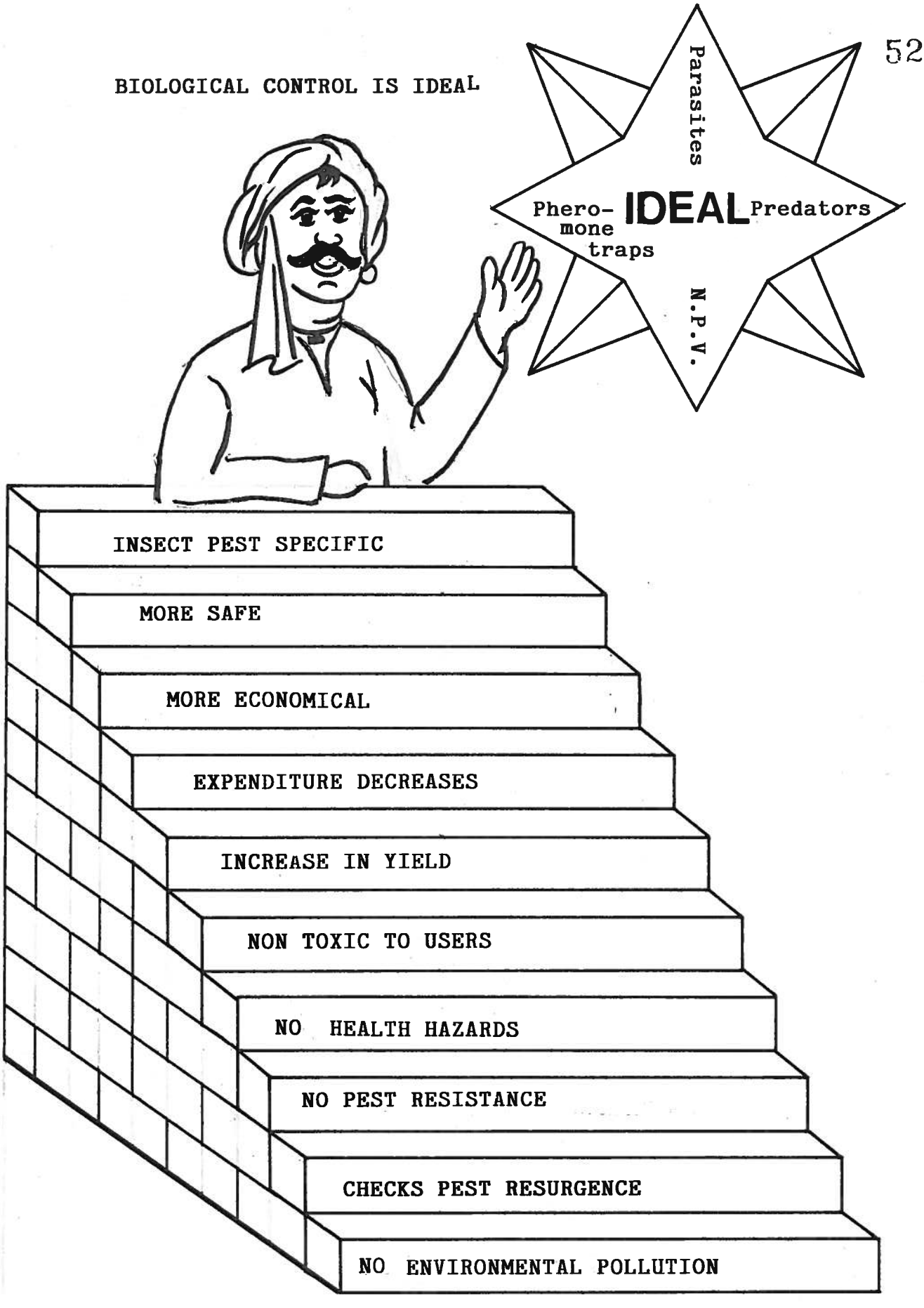
WHY WE NEED BIOLOGICAL CONTROL?

1. Most of the insects and mites are rapidly becoming resistant to many chemical pesticides introduced.

2. Serious out breaks are being developed subsequent to the use of chemical pesticides resulting from inhibition of existing natural enemy population, causing serious upsets in balance of nature.

3. Several health hazards were noticed by use of toxic chemicals to human beings, livestocks and wild life.

BIOLOGICAL CONTROL IS IDEAL



CHAPTER III

MATERIALS AND METHODS

The present investigation was carried out to know the knowledge, adoption and increase in yield due to the programme of Integrated Pest Management in rice of Operational Research Project, Medchal of Rangareddy district.

An Ex-post-facto research design was followed for the present study. The chapter is divided into four parts, the first part deals with sampling procedure, the second part deals with variables of the study, the third part deals with the instruments used for collection of data while the last part deals with suitable statistical methods used for analysis of data.

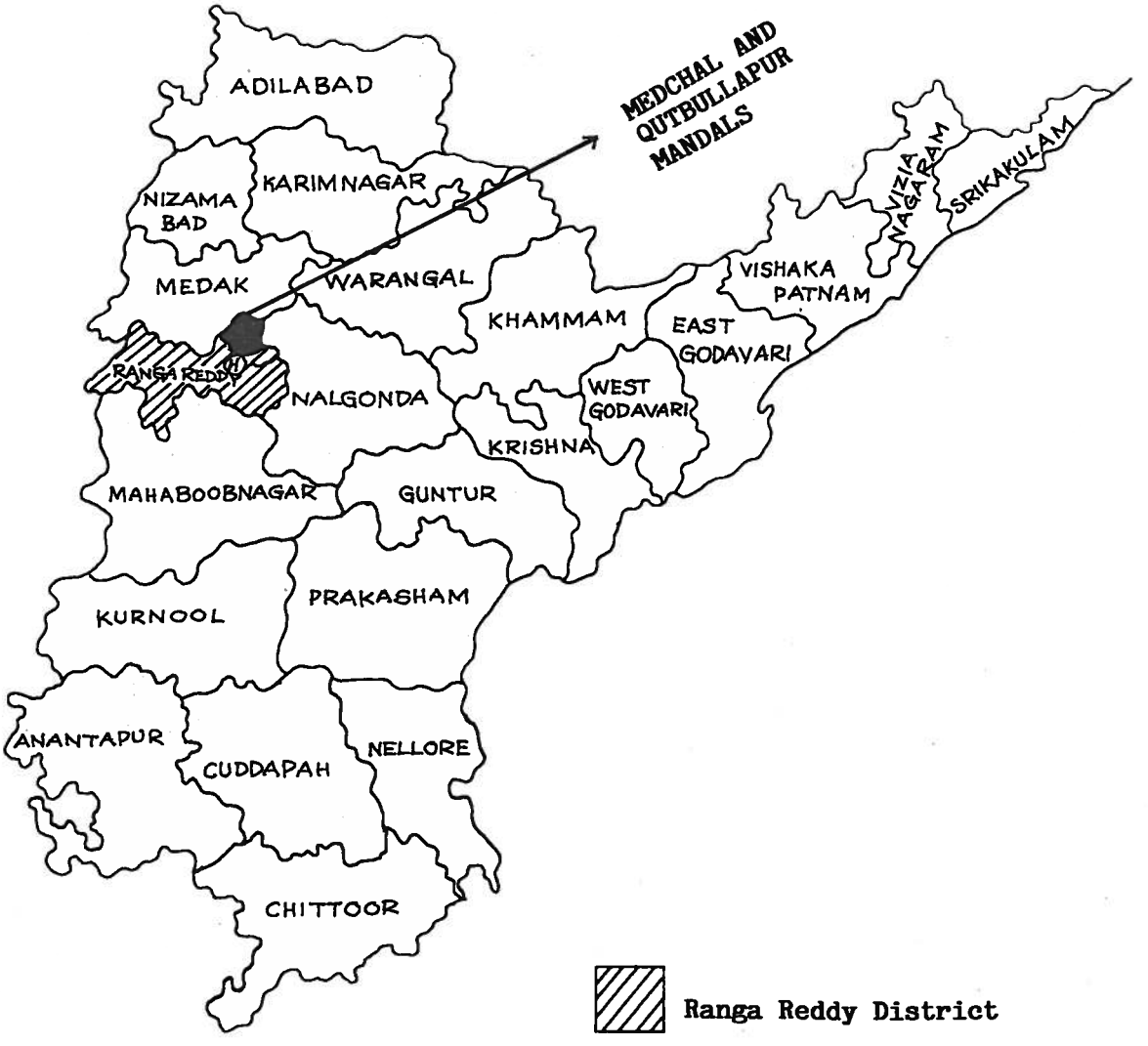
3.1 SAMPLING PROCEDURE

3.1.1 LOCALE OF THE STUDY

The State of Andhra Pradesh was chosen as locale of study purposively for the following reasons:

1. Researcher hails from Andhra Pradesh State, hence the study in this area would benefit the farmers of the State.

FIG. 1 MAP OF ANDHRA PRADESH SHOWING RANGAREDDY DISTRICT AND LOCATION OF MEDCHAL AND QUTBULLAPUR MANDALS.



2. Since the researcher is familiar with local language, it would help to build a quick rapport and also enable indepth study coupled with personal observation.

3. The study would help in effective implementation of the programme in Andhra Pradesh and other areas where similiar socio-economic conditions exists.

The sampling procedure followed involved (1) Selection of district (2) selection of project (3) selection of mandals (4) selection of villages (5) selection of respondents.

3.1.2 SELECTION OF THE DISTRICT

Ranga Reddy district of Andhra Pradesh was purposively selected due to the following reasons since the programme was implemented only in this district.

It is neighbouring district of Hyderabad from where the researcher hails.

Officers and field staff of the project are known to the investigator and also to get official cooperation in coducting the field investigation.

3.1.3 SELECTION OF PROJECT

As there was only one such project i.e. Operational Research Project on Integrated Pest Management of Rice crop, therefore the investigation was carried out in the project and was implemented only in 2 mandals namely Medchal and Qutbullapur of Ranga Reddy district.

3.1.4 SELECTION OF VILLAGES

The programme of Integrated Pest Management in Rice of Operational Research Project was implemented in selected villages of Medchal and Qutbullapur mandals as whole village approah basis in the selected 9 villages of Operational Research Project and beneficiaries have been selected randomly for the present study. The villages of the mandals from the non-operational research project having similar socio-economic conditions and similar type of farming were selected by quota random sampling method for selection of non-beneficiaries.

The Integrated Pest Management Programme of Operational Research Project was implemented to control the pest in rice crop only. Rice is cultivated on 5558 hectares in 9 villages of these two mandals. Prior to implementation of programme, farmers were cultivating mostly local varieties of rice and very few farmers were using high yielding varieties with local practices. The particulars of selected villages are shown in Table-1.

FIG. 2 MAP OF MEDCHAL AND QUTBULLAPUR MANDALS AND SELECTED VILLAGES OF BENEFICIARIES AND NON-BENEFICIARIES

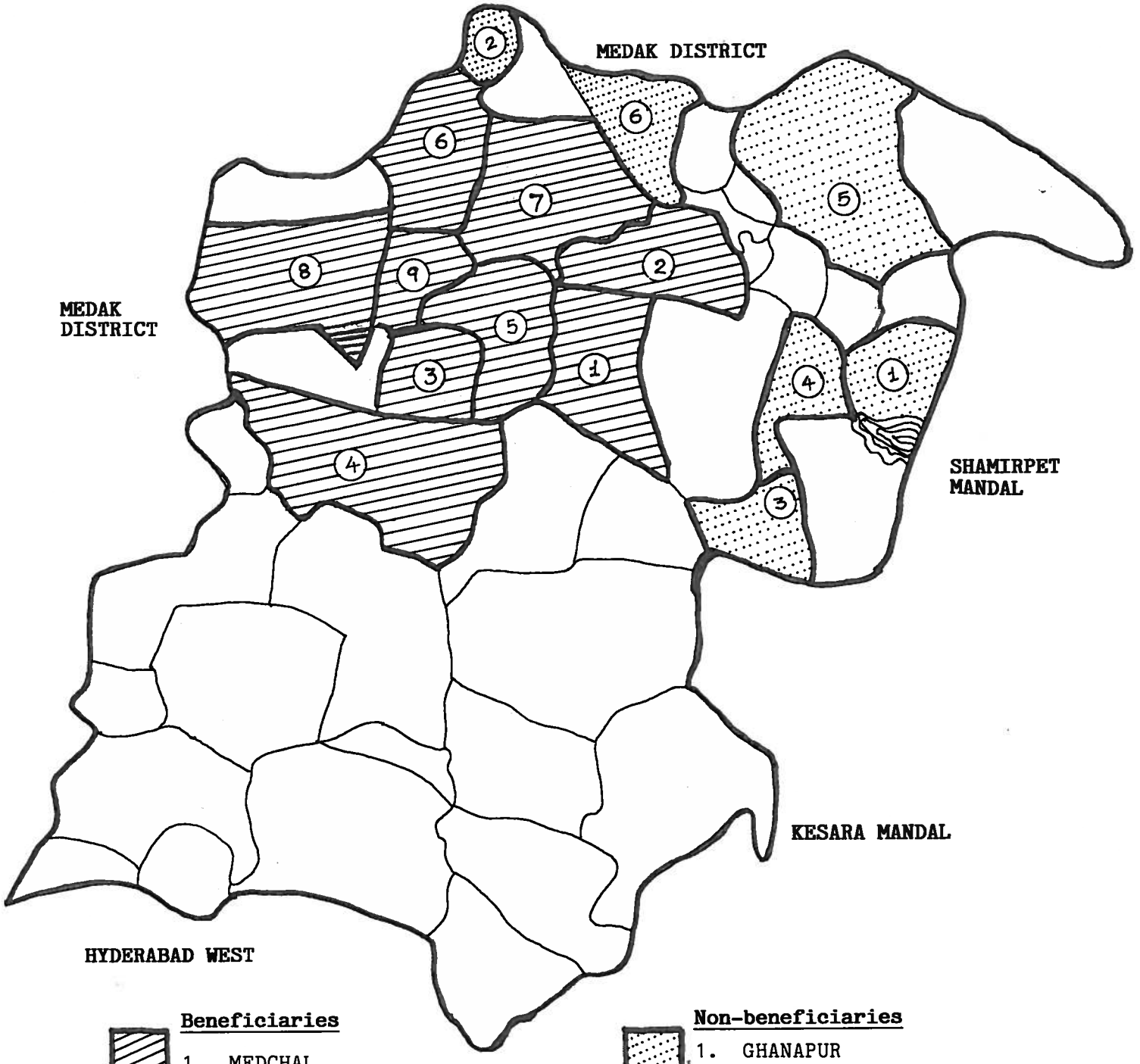


Table-1 : Farmers population in sample villages and respondents selected.

Beneficiaries			Non-beneficiaries		
Mandal/Village	No. of rice growing farmers	No. of respon-dents selected	Mandal/ Village	No. of rice growing farmers	No. of respon-dents selected
I. MEDCHAL MANDAL			I. MEDCHAL MANDAL		
1. Atveli	98	2	1. Ghanapur	206	10
2. Bandamadaram	124	3	2. Masireddi-palli	72	10
3. Dabilpur	751	16	3. Muneerabad	225	10
4. Girmapur	203	6	4. Poodur	442	10
5. Medchal	359	8	5. Ravalkole	393	10
6. Nutankal	200	5	6. Yellampet	133	10
7. Railapur	260	6			
8. Srirangavaram	231	6			
II. QUTBULLAPUR MANDAL					
9. Dundigal	399	8			
TOTAL:	2625	60		1471	60

3.1.5 SELECTION OF RESPONDENTS

The list of the rice growing farmers was obtained from the selected villages and the names were alphabetically arranged and serially numbered. Proportionate random sampling technique was adopted to select a total of 60 beneficiaries from all the 9 villages of Operational Research Project (ORP) being operated. 60 non-beneficiaries at the rate of 10 each from 6 non-Operational Research Project villages were selected for the study randomly. The particulars of respondents selected is shown in Table-1.

3.2 VARIABLES AND THEIR MEASUREMENT

Based on the available literature and opinion of the experts in the field of agricualtural extension, the variables were selected to achieve the objectives for the present study and their empirical measurement is furnished in Table-2.

Since majority of the respondents were falling in medium category by using mean and standard deviation, the categorisation of respondents of all the selected dependent and independent variables was done on class interval method.

Table-2: Variables and their empirical measurement

S.No.	Variables		Empirical Measurement
DEPENDENT VARIABLES:			
1.	Knowledge	..	Inventory developed for the study.
2.	Adoption	..	Inventory developed by Rao (1988) with slight modification.
3.	Increase in yield	..	Inventory developed for the study.
INDEPENDENT VARIABLES:			
1.	Age	..	Chronological age
2.	Education	..	Schedule developed by Pareek and Trivedi (1963) with modification.
3.	Farm size	..	Schedule developed for the study.
4.	Source of irrigation	..	Schedule developed for the study.
5.	Farm power and material possession	..	Scheduled developed by Trivedi (1963) with some modifications.
6.	Social participation	..	Schedule developed by Byra Reddy (1977) followed by Prasad (1990).
7.	Mass media exposure	..	Schedule developed by Seshachar (1980) with some modifications.
8.	Contact with research scientists and extension agency.	..	Inventory developed by Rao (1988) with slight modification.
9.	Training	..	Schedule developed for the study.
10.	Cosmopoliteness	..	Index developed by Satyanarayana. (1983)

DEPENDENT VARIABLES

3.2.1 KNOWLEDGE

Knowledge is defined as " those behaviours and test situations which emphasised the remebering either by recognition or by recall of ideas and materials on some phenomenon. (Bloom et al. (1958).

To measure the knowledge of the farmers about the Integrated Pest Management in rice, a test consisting of 32 items, was developed including 8 negative items. For this purpose the literature published by Operational Research Project, Medchal, regarding the Intensive Pest Management in Rice and different package of practices recommended by Department of Agriculture for Ranga Reddy district taken into account. Test items contained correct or incorrect type of questions. For each correct answer a score of 'One' was given and for incorrect answer 'zero' score was given. For negative items the score was reversed. These items were differentially weighed by taking jury opinion. The final weightages assigned to each item of knowledge test, has been indicated in the Appendix. The summated scores of overall correct answers

formed total score of the individual. Based on the total scores, the respondents were grouped into three categories of knowledge, based on class interval method. The minimum and maximum score were from zero to thirty two.

Category	Score range
High	More than 22
Medium	Between 12 - 22
Low	Below 12

3.2.2 ADOPTION

This was measured by adoption quotient developed by Sengupta (1961). The scale was based on full use of recommended practices by the farmers of Operational Research Project under Integrated Pest Management of Rice. This test consisted 20 items. The main point which deserves consideration is the farmers. The term "applicability" referred to the total number of agricultural practices that a cultivator would possibly adopt. Under applicability two aspects were considered which are as follows:

a) The total number of agricultural practices communicated to the farmers.

b) The total number of agricultural practices which the respondents could adopt.

The above aspects were considered and the number of applicable practices were taken in consultation with the scientists and staff of Operational Research Project which are given below.

1. Use of improved seed of high yielding varieties.
2. Recommended seed rate
3. Seed treatment
4. Transplanting in time.
5. Recommended spacing
6. Intercultivation
7. Timely and adequate plant protection measures for pests and diseases.
8. Growing resistant varieties.
9. Keeping the nursery fields free from pests and diseases.
10. Major portion of stubles in situ.
11. Use of light traps for pest monitoring.
12. Removal of left over nursereies and bund clearance.
13. Formation of alley ways.
14. Pest surveillance in evey 3 to 4 days.
15. Spraying selective pesticides on need basis and observing economic threshold level.
16. Control of field rats on whole village approach.
17. Conducting varietal minikits/adaptive trials.
18. Correction of zinc deficiency.
19. Conservation of natural enemies of rice insects.
20. Following crop rotation and sowing of alternate crops.

Adoption quotient (A.Q.) was calculated as follows:

$$AQ = \frac{\text{Number of practices followed}}{\text{Number of practices applicable}} \times 100$$

SCORING PATTERN

All the practices adopted were given one mark each and zero mark was given to the practices not adopted. Thus the adoption score of farmer is the summation of number of practices adopted items, in terms of adoption.

The respondents were grouped into three categories based on frequency distribution.

Category	Score range
High	**14 and above**
Medium	Between 7 - 14
Low	Below 7

3.3 INCREASE IN YIELD

The Operational Research Project started functioning from kharif 1987 in 9 selected villages. The researcher intended to make an evaluative study on the Integrated Pest Management Programme of the Operational Research Project. 60 respondents, were selected by using proportionate random technique out of 2625 agricultural farmers of 9 selected villages of the project.

To know the increase in yield obtained by all the 60 respondents (beneficiaries) of Operational Research Project were asked the yield obtained by them during pre-project period and post-project period both in kharif and rabi seasons, and the beneficiaries themselves were considered as non-beneficiaries for asking them about yield data during pre-project period. It was found not neessary to select seperately 60 non-beneficiaries from the villages of non-operational research project for the yield obtained by them during pre-project period. The increased yield comprising the difference between the post-project period and the pre-project period was operationalised as increase in yield per hectare. It was possible to compare the impact of integrated pest management in rice.

The data were collected, tabulated and presented in average and percentage.

Sl.No.	Item	Season	Yield (kgs/ha)
a)	Yield of rice during pre-projeect period	Kharif	.....
		Rabi	.....
b)	Yield of rice during post-project period	Kharif	.....
		Rabi	.....

3.4 INDEPENDENT VARIABLES

Based on the review of literature and suggestions of the experts in the field of extension the following variables were selected for the purpose of study.

3.4.1 AGE:

It was operationalised as the number of years of age completed at the time of enquiry. For categorisation, the respondent's age, the norms of maximum age admissible for the members in youth clubs or in government service viz. 35 years and the superannuation age for retirement in Govenment organizations 58 years have been taken as guidelines. Based on the above criteria the respondents were grouped as:

Category	Range
Young age	35 years and below
Middle age	36 to 58 years
Old age	59 years and above

3.4.2 EDUCATION:

Education of respondents were operationalised by allocating weightage for different qualifications as given below:

	Item	Score
a)	Illiterate	(0)
b)	Primary school	(1)
c)	Middle school	(2)
d)	High school	(3)
e)	Intermediate	(4)
f)	Graduate	(5)

3.4.3 FARM SIZE (OPERATIONAL HOLDINGS)

Farm size variables was operationalised as number of standard hectares* and** possessed by respondents at the time of enquiry.

From middle of 1970's all field level research data examined. Five farm size classifications viz. marginal (less than one hectare), small (1 - 2 hectares), semi medium (2 - 4 hectares), medium (4 - 10 hecatres) and large (over 10 hectares) has been adopted for research study.

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* as per section 8, sub-section (1) B of the Andhra Pradesh Land Reforms (Ceiling on Agricultural Holdings) Act No. 1 of 1973; the section 8 (1) B reads as follows:

** .....and for the purpose of computing the specified limit in case where holdings of any person both wet and dry land, 1 hectare of wet land shall be deemed to be equal to 2.5 acres of dry land.

The old classification of 4 size groups has been discarded, since the absolute number of marginal and small holdings have been increasing at much faster rate and as also the earlier classification does not give a sensitive picture of land productivity in different land ownership-land use context.

The respondents were grouped in 5 categories depending uponn the number of acres of land possessed by them as small, marginal, semi medium,medium and large and scores were given as follows. The possible minimum and maximum score were from one to five.

	Item	Score
1.	Marginal (less than 1 ha.))	(1)
2.	Small (1 - 2 ha.)	(2)
3.	Semi-medium (2- 4 ha.)	(3)
4.	Medium (4 - 10 ha.)	(4)
5.	Large (more than 10 ha.)	(5)

3.4.4 Farm power and material possession

The variable farm power and material possession was operationalised based on the socio-economic status scale developed by Trivedi (1963) with some modifications. The item No. 7 and 8 shown in appendix pertaining to farm power and material possession of the respondents as considered here.

Six items were taken in farm power and six items were taken in material posesssion and scores were given from one to six. The measurement was done based on the total score of farm power and material possession of the respondents and they were grouped into 3 categories as high, medium and low. The possible minimum and maximum scores were from zero to forty two.

Category	Range
High	More than 29
Medium	Between 15 - 29
Low	Below 15

3.4.5 SOCIAL PARTICIPATION

Social participation was operationalised based on the degree of involvement of the respondents in formal organisation as a member or as an office bearer because this variable was quantified by using the method followed by Byra Reddy (1971) and Gangappa (1975) with slight modifications in the items and weightages used by them.

The following items and weightages were used for quantifying the social participation.

	Category	Score
a)	No membership in any organization	(0)
b)	Membership in one organization	(1)
c)	Membership in more than one organization	(2)
d)	Office bearer	(3)

The scores on each item was summed upto to estimate the social participation score of the respondent. The score range was from zero to three.

3.4.6 MASS MEDIA EXPOSURE

The quantification of exposure to the mass media by respondents was done by taking into consideration of the different mass media sources available like Radio, television, news papers, books and magazines on farming. The frequency of exposure was scored as two, one and zero for daily, occassionally and never respectively. By adding the scores of all the items of the individual total score was worked out.

The procedure followed by Kittur (1976), Desai (1977) and Seshachar (1980) with slight modification was adopted in this study. The relevant mass media items included in the study and the weightages given are shown below.

Mass media exposure	Extent of participation		
	Daily (2)	Occassionally (1)	Never (0)
a) Read news paper	—	—	—
b) Read farm magazines	—	—	—
c) Read books on agriculture	—	—	—
d) Listen to rural radio programme	—	—	—
e) Attend to programme on television	—	—	—

The possible minimum and maximum socres were from zero to ten.

Based on the total scores obtained by respondents they were grouped into three categories.

Category	Score range
High	More than 7
Medium	Between 4 to 7
Low	Below 4

3.4.7 CONTACT WITH RESEARCH SCIENTISTS AND EXTENSION AGENCY

Contact with research scientists and extension agency was operationalised as how often the respondent is in contact with research and extension personnel considered for the study. To know about the exact contact of the respondents the schedule developed for the study followed by B. Dharma Rao (1988) was used.

The different research and extension personnel considered for the study and the weightages allotted for frequency of contact were as follows:

S.No.	Research and	Frequency of contact			
		Once in a week	Once in a fort-night	Once in a month	Never
		(3)	(2)	(1)	(0)
A.	**Research personnel**				
	Scientists	—	—	—	—
B.	**Extension personnel**				
i)	Dy. Director and Asst. Director of Agriculture	—	—	—	—
ii)	Agril. Officers	—	—	—	—
iii)	Field Technicians	—	—	—	—
iv)	Others - Fertilizer and pesticides agencies etc.	—	—	—	—

Based on the scores obtained by respondents they were grouped into three categories as high, medium and low. The possible minimum and maximum scores were zero to fifteen.

Category	Score range
High	More than 9
Medium	Between 5 - 9
Low	Below 5

In this chapter, findings related to different aspects of problems have been discussed at length. Inferences and guidelines were derived for future research.

3.4.8 TRAINING

To know about the training aspect, a simple structured schedule was prepared and the respondents were asked to state whether they were trained by extension personnel or the staff of Operational Research Project or not. The respondents were grouped into two categories and scores were given as below:

Categrory	Score range
Trained	(1)
Untrained	(0)

3.4.9 COSMOPOLITENESS

Cosmopoliteness has been operationalised on the basis of extent of contact to the nearest town or city and the main purpose of the visit by the individual was taken into consideration for frequency of visits in last six months to mandal headquarter/town.

The index developed by Satyanarayana (1983) followed by Prasad (1990) with slight modification was adopted to find out the cosmopoliteness behaviour of the respondents. The categorisation has been done and scores were given as shown below:

---

a) Please indicate the no. of times of making visit to the nearest town or city?

Category	Score
i) Very often	3
ii) Often	2
iii) Rare	1
iv) Never	0

b) Generally what could be the main purpose of your visit?

i) All relating to agriculture	5
ii) Some relating to agriculture	4
iii) Personal/domestic	3
iv) Entertainment	2
v) Other purpose	1
vi) No response	0

Based on the total score obtained by the respondents as per their visits and the purpose, they were grouped into 3 categories as high, medium and low. The possible r ange of score in this scale was zero to eight.

Category	Score range
High	More than 5
Medium	Between 3 - 5
Low	Below 3

3.5 DATA COLLECTION:

This aspect of study is presented in four subheads viz. development of schedule, pre-testing, administration of the same and analysis of data.

3.5.1 DEVELOPMENT OF SCHEDULE

The interview schedule developed for collection of data consisting of structured items was used. This information was collected by going through the relevant literature on the subject, conducting discussions with the respondents in the relevant field of study, the subject matter (knowledge, adoption and increase in yield) items were taken from the State Department of Agriculture and literature furnished by Operational Research Project wing of Directorate of Rice Research and Manual for Rice production. The schedule was designed in six parts, each dealing with a part of study as given below:

The first part pertained to the personal, socio-economic factors of the respondents.

The part II contained the items of knowledge about the cultivation aspects of rice crop.

Part III pertained to adoption of aspect of package of practices.

Part IV contained the items pertaining to increase in yield i.e. per hectare yiled obtained in pre-project and per hectare yield obtained in post project period i.e. after implementation of the Integrated Pest Management Programme.

Part V pertained to problems experienced by respondents regarding the Operational Research Project and

Part VI contained the suggestions for improving the working of Operational Research Project in their area.

3.5.2 PRE-TESTING:

The interview schedule thus prepared was administered as detailed below:

Before giving a final shape to the interview schedule, pre-testing of the schedule was carried out in village situation other than sample area selected. Care has been taken to select suitable farmers for pre-testing who did not belong to sample area but were belonging to the similar socio-economic conditions. Thus 32

items in knowledge, 20 items in adoption and 2 items in increase in yield were taken for the study. Based on the experience gained in the pre-testing, the interview schedule was modified and suitably worded wherever needed. A copy of the interview schedule thus finalised in annexed in the appendix.

3.5.3 ADMINISTRATION OF INTERVIEW SCHEDULE

The researcher interviewed each respondent in person and filled the responses for all questions contained in the schedule.

3.5.4 ANALYSIS OF DATA

The collected data were analysed and presented in tables to make the interpretation of results meaningful. Based on the classified data, results were disussed and interpreted finally and then summary and conclusions were drawn.

3.5.5. STATISTICAL TESTS AND PROCEDURES FOLLOWED

For analysing the data of this investigation, the following statistical tests and procedures were used.

3.5.6 FREQUENCIES AND PERCENTAGES

Some of the data were subjeced to and interpreted in terms of frequencies and percentages.

3.5.7 ARITHMETIC MEAN

The arithmetic mean is the sum of the scores divided by number of respondents.

$$\bar{x} = \frac{\Sigma x}{n}$$

Where

$\bar{x}$ = mean

Σx = sum of the scores

n = number of respondents

3.5.8 STANDARD DEVIATION (S.D.)

The standard deviation is the square root of the mean of the sum of the squares of the deviation taken from the mean of the distribution.

$$\sigma = \sqrt{\frac{1}{n} \left(\Sigma x^2 - \frac{(\Sigma x)^2}{n} \right)}$$

Where

σ = Standard deviation

Σx^2 = Sum of the squared deviations from the mean.

Σ = Summation

n = Number of items

3.5.9 PEARSONS CORRELATION COEFFICIENT (r)

Pearson's correlation coefficient was used to find out the relationship between the scores of independent variables and the scores of dependent variabales.

$$r = \frac{\Sigma xy - \frac{(\Sigma x)\ (xy)}{n}}{\sqrt{\left[\Sigma x^2 - \frac{(\Sigma x)^2}{n}\right]\left[\Sigma y^2 - \frac{(\Sigma y)^2}{n}\right]}}$$

Where

n	=	Number of observations
Σx	=	Sum of scores of independent variables
Σy	=	Sum of scores of dependent variables
Σx^2	=	Sum of square of scores of independent variables.
Σy^2	=	Sum of square of scores of dependent variables.
Σxy	=	Sum product of the scores of independent and dependent variables.

The computed 'r' values were then compared with the tabulated values of coefficient of correlation at n-2 degrees of freedom at 5 and 1 per cent levels of significance.

3.5.10 'Z' test

'Z' test has been used to find out significant difference between two sample means in respect of dependable variable of respondents i.e. beneficiaries. 'Z' test has been calculated by dividing the difference between the sample means by its standard error.

$$Z = \frac{\left[\bar{x}_1 - \bar{x}_2\right]}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_1^2}{n_2}}}$$

Where

$\bar{x}_1$ = Mean of the first sample

$\bar{x}_2$ = Mean of the second sample

S_1^2 = Variance of first sample

S_2^2 = Variance of second sample

n_1 = Number of individuals in first sample

n_2 = Number of individuals in the second sample.

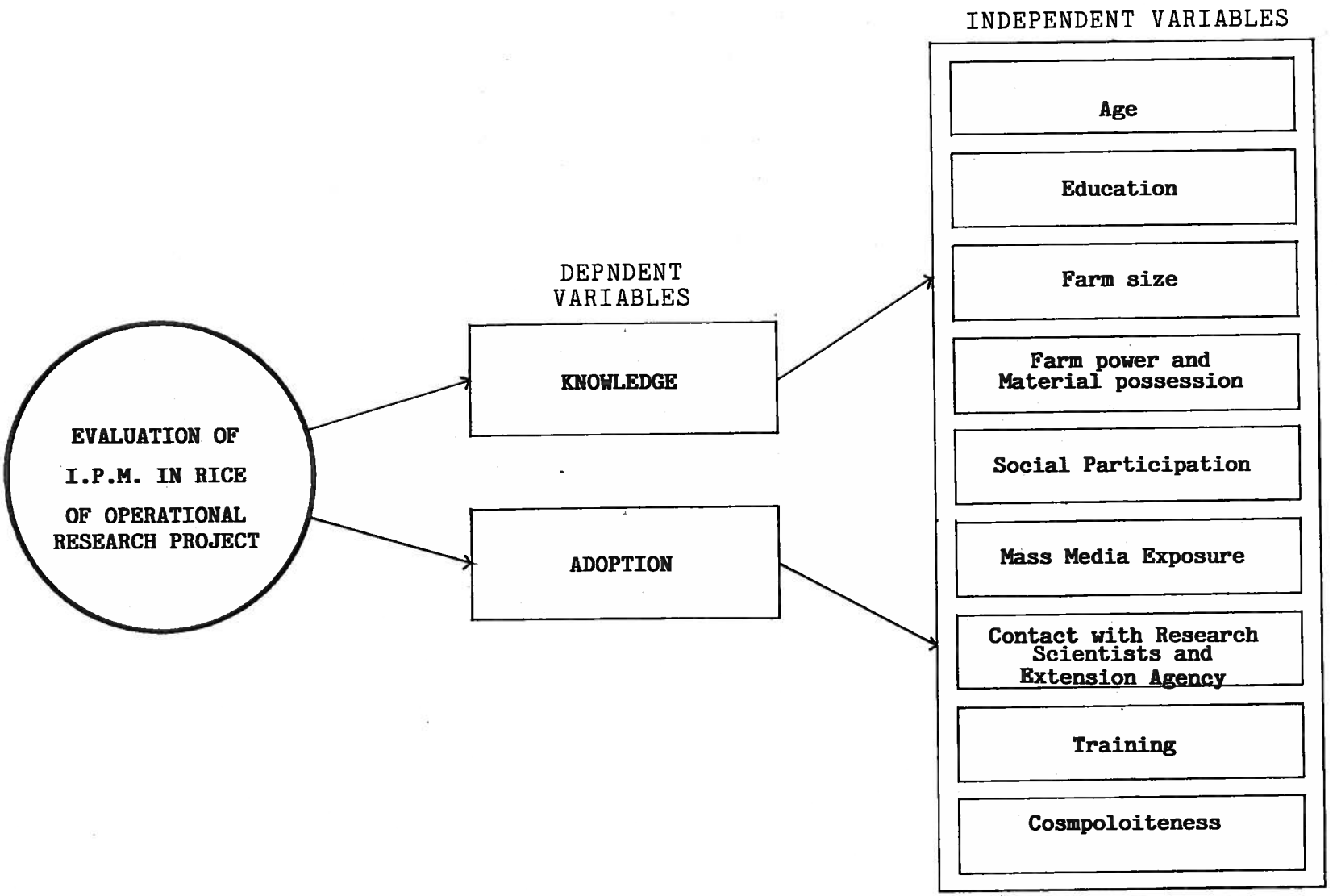
CONCEPTUAL MODEL OF THE STUDY

In the light of the inferences derived from the recorded evidences in liteature, conceptual frame work has been developed for the study which diagramatically represents the important dimensions and postulated relationship among variables. Integrated Pest Management in Rice of Operational Research Project is evaluated on the important indicants of beneficiaries in knowledge and Adoption. Nine important variables representing the personal-socio-economic and psychological factors of beneficiaries were chosen based on the review of relevant and recent literature and consultation with experts to examine their extent of relationship with knowledge and adoption.

The model was hopefully conceived to be given an objective assessment for the factors associated with the knowledge and adoption by rice growing beneficiaries expressed in respect of Integrated Pest Management in rice of Operational Research Project.

The relationship between independent variables and dependent variables were represented diagramatically (Fig. 3) which helped to derive hypothesis for the empirical testing.

Fig. 3 CONCEPTUAL MODEL OF THE STUDY



CHAPTER - IV

RERSULTS AND DISCUSSION

This chapter presents the findings of investigtion carried out on the objectives formulated for the study. The findings and discussions are presented under the following section.

SECTION-A : Distribution of respondents on their personal, socio-economic and psychological factors.

SECTION-B : Extent of knowledge of beneficiaries and non-beneficiaries about Integrated Pest Management in rice.

SECTION-C : Extent of adoption of improved practices of Integrated Pest Management in rice.

SECTION-D : Difference between beneficiaries and non-beneficiaries in relation with knowledge and adoption scores.

SECTION-E : Increase in yield (per hectare) of beneficiaries during post-project period over pre-project period.

SECTION-F : Association bet-ween personal, socio-economic and psychological factors with knowledge and adoption scores.

SECTION-G : Problems in implementing the Programmes of Operational Research Project and suggestions to overcome the same.

SECTION - A

4.1 DISTRIBUTION OF RESPONDENTS BASED ON THEIR PERSONAL SOCIO-ECONOMIC AND PSYCHOLOGICAL FACTORS OF BENEFICIARIES AND NON-BENEFICIARIES

The objective of the study was to find out the personal, socio-economic and psychological factors of the beneficiaries and non-beneficiaries. The data were collected through interview schedule. This was tabulated and analysed to find out the personal, socio-economic and psychological characeristics of the respondents namely age, education, farm size, source of irrigation, social participation, mass media exposure, contact with research scientists and extension agency, training, cosmopoliteness and risk orientation.

The data were presented in (11) sub-heads with tables and interpreted through frequencies and percentages.

4.1.1 Age

The sample respondents were classified into three groups as young, middle and old on the basis of their chronological age on the date of interview. The Table-3 shows the distribution of respondents according to their age.

Table 3 : Distribution of respondents according to their chronological age

n = 60 + 60

S.No.	Category	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	Young age (upto 35 years)	29	48.33	14	23.33
2.	Middle age (36 to 58 years)	27	45.00	27	45.00
3.	Old age (abve 58 years)	4	6.67	19	31.67
	Total:	60	100.00	60	100.00

From the table it could be observed that 48.33 per cent beneficiaries belonged to young age group followed 45.00 per cent by middle age group and 6.67 per cent by old age group. Whereas in case of non-beneficiaries 45.00 per cent belonged to middle age group followed by 31.67 per cent by old age group and 23.33 per cent by young age group.

4.1.2 Education

For finding out the extent of education of the respondents they were classified into six categories on the basis of socio-economic status scale developed by Pareek and Trivedi (1963) and data were presented in Table-4.

Table-4 : Distribution of respondents according to their education

n = 60 + 60

S.No.	Category	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	Illiterate	19	31.67	32	53.33
2.	Primary	6	10.00	7	11.67
3.	Middle	13	21.67	18	30.00
4.	High school	13	21.67	3	5.00
5.	Intermediate	5	8.33	-	-
6.	Graduate	4	6.66	-	-
	Total:	60	100.00	60	100.00

The Table-4 shows that 31.67 per cent of beneficiaries fell under illiterate category followed by 21.67 per cent in high school and 21.67 per cent in middle school education. Subsequently the primary

category was 10.00 per cent. Intermediate category was 8.33 per cent and, graduate category was 6.66 per cent. Whereas in the case of non-beneficairies 53.33 per cent fell under illiterate category followed by middle school category 30.00 per cent, primary school category 11.67 per cent and 5.00 per cent under high school category of education.

4.1.3 FARM SIZE

The farm size was defined as the number of standard acres of land owned by the farmers. The size of the holdings of farmers was arrived by converting the dry land and wet land owned into standard acres. Two and half acres of dryland is equal to one hectare of wet land according to Andhra Pradesh State Government Land Reforms Act. 1973. For the purpose of the study, the respondents were grouped as shown in Table-5 and the data is presented in Table-5.

Table-5 : Distribution of respondents according their farm size

n = 60 + 60

S.No.	Category	Beneficiaries		Non-Beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	Marginal	14	23.33	15	25.00
2.	Small	19	31.67	20	41.67
3.	Semi medium	12	20.00	20	33.33
4.	Medium	15	25.00	-	-
5.	Large	-	-	-	-
	Total:	60	100.00	60	100.00

From the Table-5, it was observed that 31.67 per cent of beneficiaties fell under small category followed by 25.00 per cent by medium category, 23.33 per cent by marginal and 20.00 per cent by medium category. Whereas in case of non-beneficiaries 41.67 per cent belonged to small category followed by 33.33 per cent by semi medium category, 25.00 per cent by marginal category according to the farm size of respondents.

4.1.4 SOURCE OF IRRIGATION

For this purpose thedata was divided into three groups based on the source of irrigation possessed by the respondents and presented in Table-6.

Table-6 : Distribution of respondents according to their **source of irrigation**

n = 60 + 60

S.No.	Category	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	Well	31	51.67	60.00	100.00
2.	Tank	12	20.00	-	-
3.	Borewell	17	28.33	-	-
	Total:	60	100.00	60	100.00

The Table-6 indicates that 51.67 per cent of beneficaries possessed wells for irrigation purposes followed by 28.33 per cent with bore well and 20.00 per cent of beneficiaries used tanks as source of irrigation. Whereas 100.00 per cent non-beneficiaries possessed wells for their source of irrigation.

4.1.5 Farm power and material possession

Farm power and material possession was operationalised based on the socio-economic status scale developed by Trivedi (1963) with some modifications. The items under farm power (7) and material possession (8) of the respondnets were taken into account as per interview schedule shown in Appendix and data were presented by grouping into 3 categories shown in Table-7.

Table-7 : Distribution of respondents according to their farm power and material possession.

n = 60 + 60

S.No.	Category	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	High (More than 29)	3	5.00	-	-
2.	Medium (Between 15-29)	21	35.00	4	6.67
3.	Low (Below 15)	36	60.00	56	93.33

The Table-7 shows that 60.00 per cent of beneficiaries belonged to low category of farm power and material possession followed by 35.00 per cent by medium category and 5.00 per cent by higher category. Whereas 93.33 per cent of non-beneficiaries belonged to low category of farm power and material possession followed by 6.67 per cent by medium category.

4.1.6 SOCIAL PARTICIPATION

This variable was operationalised based on the method followed by Trivedi (1963), Byra Reddy (1971) and Gangappa (1975) with slight modifications as shown in Table-8.

Table-8: Distribution of respondents according to their social participation

S.No.	Category	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	No membership in any organisation	9	15.00	21	35.00
2.	Membership in one organisation	-	-	19	31.67
3.	Membership in more than one organisation	50	83.33	18	30.00
4.	Office bearer in an orgnisation	1	1.67	2	3.33
	Total:	60	100.00	60	100.00

The Table-8 depicts that 83.33 per cent of beneficiaries had dual membership and 15.00 per cent beneficiaries had no membership in any organisation. Whereas in case of non-beneficiaries 35.00 per cent had no membership in any organisdation, 31.67 per cent had single membership in one organisation and 30.00 per cent had dual membership in organisations.

4.1.7 MASS MEDIA EXPOSURE

For the purpose of categorisation of respondents for mass media exposure the procedure followed by Kittur (1976), Desai (1977) and Seshachar (1988) with modifications. was followed. The data were presented in frequency and percentages shown in Table-9.

Table-9 : Distribution of respondents according to their mass media exposure

N = 60 + 60

S.No.	Category	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	High (More than 7)	54	90.00	1	1.66
2.	Medium (Between 4-7)	5	8.34	14	23.34
3.	Low (Below 4)	1	1.66	45	75.00
	Total:	60	100.00	60	100.00

The Table-9 reveals that 90.00 per cent of beneficiaries were highly exposed to mass media sources whereas 75.00 per centofnon-beneficiaries were exposed to low mass media sources.

4.1.8 CONTACT WITH RESEARCH SCIENTISTS AND EXTENSION AGENCY

The schedule developed and followed by Dharma Rao (1988) was used. Data were tabulated and presented in frequency and percentage in Table-10.

Table-10 : Distribution of respondents according to their contact with Research Scientists and Extension Agency

N = 60 + 60

S.No.	Category	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	High (More than 9)	24	40.00	-	-
2.	Medium (Between 5-9)	16	26.67	-	-
3.	Low (Below 5)	20	33.33	60	100.00
	TOTAL:	60	100.00	60	100.00

The Table-10 indicates that 40.00 per cent of the beneficiaries were having high contact with research scientists and extension agency personnels followed by 33.33 per cent low contact and 26.67 per cent medium contact whereas all the 100.00 per cent of non-beneficiaries had low contact with research scientists and extension agency.

4.1.9 TRAINING

To know the training aspect of the selected respondents, they were grouped into two categories as trained and untrained. The data were interpreted in frequency and percentage as shown in Table-11.

Table-11 : Distribution of respondents according to their training aspect

N = 60 + 60

S.No.	Category	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	Trained	60	100.00	18	30.00
2.	Untrained	-	-	42	70.00
	Total:	60	100.00	60	100.00

The perusal of Table-11 reveals that all the 100.00 per cent beneficiaries were trained whereas 70.00 per cent were untrained and 30.00 per cent were trained in case of non-beneficiaries according to training aspect of the respondents.

4.1.10 COSOMOPOLITENESS

The variable was operationalised according to Satyanarayana (1983) with slight modification. The cosmopoliteness of the respondents were grouped into three categories based on the scores obtained by the respondents and data were presented in the Table-12.

Table-12 : Distribution of respondents based on their cosmopoliteness

N = 60 + 60

S.No.	Category	Beneficiaires		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	High (More than 5)	48	80.00	30	50.00
2.	Medium (Between 3-5)	11	18.33	29	48.33
3.	Low (Below 3)	1	1.67	1	1.67
	Total:	60	100.00	60	100.00

The Table 12 reveals that 80.00 per cent of the beneficiaries had high cosmopoliteness followed by 18.33 per cent medium cosmcpoliteness. Whereas in the case of non-beneficiaries 50.00 per cent had high cosmopoliteness followed by 48.33 per cent medium cosmopoliteness.

DISCUSSION

On perusal of the Table 3 to 12 it is clear that majority of the beneficiaries belonged to young to middle age, illiterates, had small farm holdings and had wells for irrigational purposes. The distribution indicated that majority of the beneficaries fell under the low category of farm power and material possession with membership in more than one organisation. Majority of them were highly exposed to mass media sources and had medium to high contact with research scientists and extension agency. All of them were trained. Majority of them possessed medium to high cosmopoliteness.

Whereas in case of non-beneficiaries as shown in the Table from 3 to 12 it is also clear that majority of them fell under middle age group, were illiterate, belonged to small farmers category and fell under the low category of farm power and material possession, Majority of them had no membership in any organisation and they had low exposure to mass media sources. The distribution also indicated that majority of them had low contact with research scientists and extension agency and they were untrained.

The distribution indicated that majority of the beneficiaries were young to middle aged group and non-beneficiaries were middle aged. These were the farmers who had sufficient experience in rice cultivation but it is necessary to motivate the middle age group to take up improved package of practices of cultivation like integrated pest management in rice crop. Young farmers are more enthusiastic whereas middle aged are less enthusiastic and future agriculture will be wholly dependent on them.

Regarding education level majority of the beneficiaries and non-benefiaries were illiterates but the education level of remaining 61.33 per cent of beneficiaries was also found to be from primary to graduation level. Whereas in case of non-beneficiaries majority of them were illiterates and 46.67 percent of them were found to be from primary to high school level of education. The illiterateness of beneficiareis and non-beneficiareis might be due to their economic condition. Therefore efforts are needed to establish more schools in the villages, adult education and functional literacy must be given priority, since they are individuals who may bring their progeny to the right direction of education. This finding is in confirmity with the findings of Prasad (1987), Laxmi (1990) and Reddy (1992).

The distribution indicated that majority of the beneficiaries and non-beneficiaries had small farm size. This might be due to the low productivity and low social status.

This finding is in similarity with Prasad (1990) Balabhaskhar (1991) and Raju (1991).

Majority of the beneficiaries had wells for irrigation purposes of their cultivation and rest of them had borewells and tanks respectively. Whereas in case of non-beneficiaries all of them had wells for irrigation purposes.

Majority of the beneficiaries and non-beneficiaries belonged to low category of farm power and mateial possession. This might be due to their small farm size and low socio economic status.

Majority of the beneficiaries had membership in more than one organisation. Whereas majority of non-beneficiaries had no membership in any organisation and but just in lesser percentage of them had membership in one or more than one organisation as shown in Table-8. This may be due to the reason that the respondents got enrolled into the Village Level Youth Clubs to participate in social activities of villages and also in institutions like Primary Agricultural Co-perative Society and multipurpose cooperative society etc. for obtaining the short term credit to meet their cultivation expenses due to low socio economic status.

Majority of the beneficiaries were exposed to high mass media sources whereas majority of the non-beneficiaries were exposed to low mass media sources. The possible reason for this type of behaviour is due to the sufficient mass media sources being available in the selected villages of Operational Research Project. The extension and research personnel might be providing sufficient literature on cultivation practices to the beneficiaries. Whereas in case of non-beneficiaries the sources of mass media may not be available to that extent in their concerned villages or it may be due to lack of education and ignorance. Therefore there is a need for providing mass media support like supply of literature on improved practices of cultivtion, farm magazines, etc. so that educated farmers may acquire better kowledge and diffuse their knowledge to illiterate farmers in village level meetings. The Farmers Training Centre may conduct training in these villages and supply literature to them for updating the knowledge on farming.

Majority of the beneficiaries had medium to high contact with research scientists and extension agency. Whereas non-beneficiaries had low contact. Hence there is a need to educate the non-beneficiaries through success stories of beneficiaries about scientific way of cultivtion. The Farmers Training

Centre and extension personnel to give preference to such villages where mass media sources are not available. Similar findings were reported by Rao (1981) Mrutyunjayam (1987), Verma (1988), Rao (1990b), Balabhaskhar (1991) and Chandrashekhar (1991).

Majority of the beneficiaries were trained in the improved practices of Integrated Pest Management, whereas majority of non-beneficiaries were untrained. This is due to fact that Integrated Pest Management programme was operated only in selected villages of Operational Research Project and beneficiaries were trained by them. Whereas non-beneficiaries had not received any kind of training either through Operational Research Project or extension personnels. Therefore there is a need to arrange training programmes to the non-beneficiaries through extension agency.

Majority of the beneficiaries belonged to high category of cosmopoliteness whereas in case of non-beneficiaries majority of them belonged to high to medium category. This might be due to nearness to town and city and conveyance may not be a problem both for beneficiaries and non-beneficiaries.

SECTION B

4.2 EXTENT OF KNOWLEDGE OF BENEFICIARIES AND NON-BENEFICIARIES ABOUT INTEGRATED PEST MANAGEMENT IN RICE

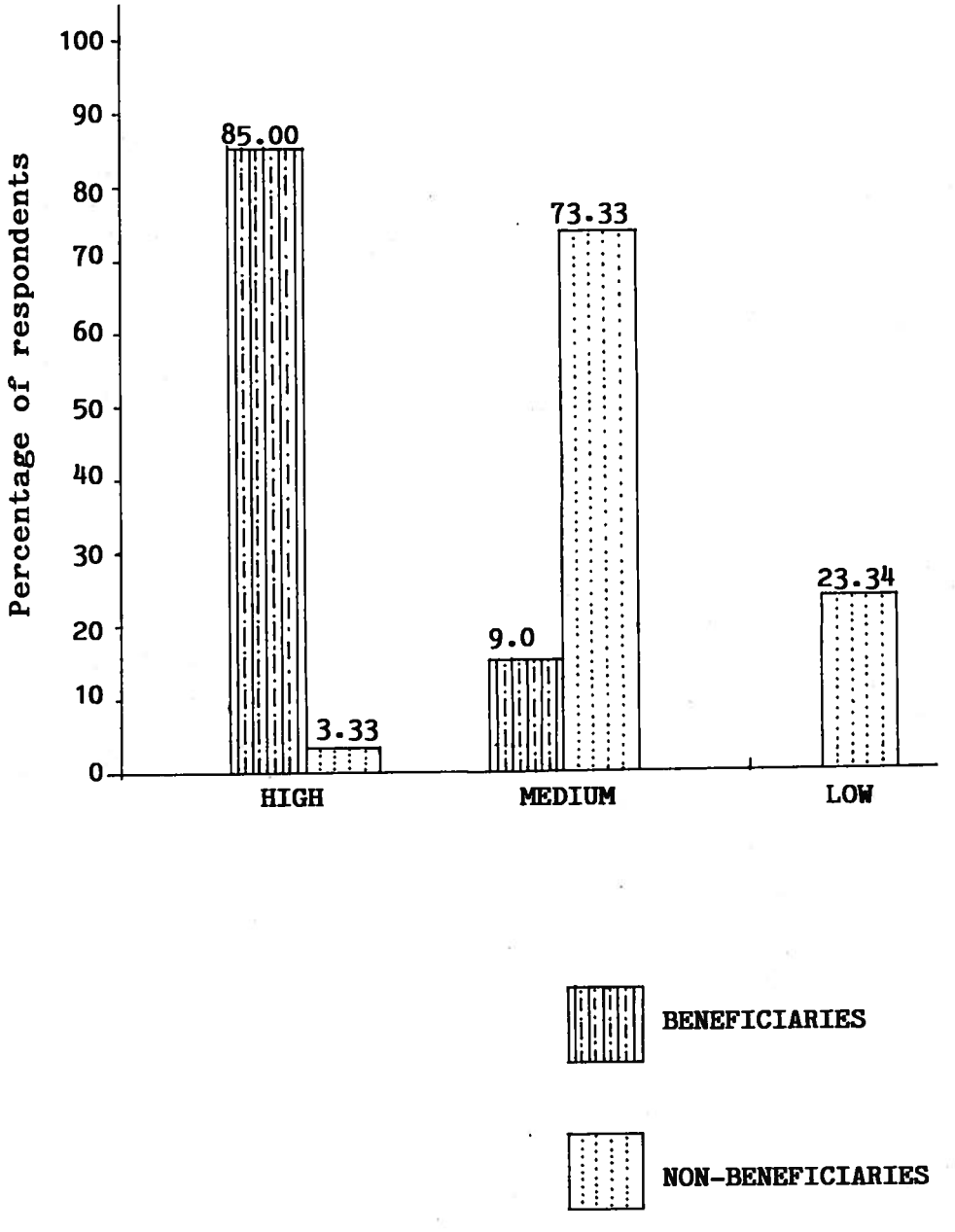
In this section an attempt was made to find out the extent of knowledge among the beneficiaries and non-beneficiaries with respect to Integrated Pest Management in rice, the data collected through schedules prepared, were tabulated and analysed. Extent of knowledge possessed by the respondents and scores obtained by them were grouped into three categories as high, medium and low. The data were presented in Table-13.

Table-13: Distribution of respondents according to their knowledge.

N = 60 + 60

S.No.	Category	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	High (More than 22)	51	85.00	2	3.33
2.	Medium (Between 12-22)	9	15.00	44	73.33
3.	Low (Below 12)	-	-	14	23.34
	Total:	60	100.00	60	100.00

FIG.4 EXTENT OF KNOWLEDGE OF RESPONDENTS



The Table13 indicates that 85.00 per cent of beneficiaries belonged to high category and 15.00 per cent belonged to medium category of knowledge. Whereas 73.33 per cent of non-beneficiaries belonged to medium category followed by low category 23.34 per cent and high category 3.34 per cent in respect of knowledge level.

DISCUSSION

The results of extent of knowledge of bene-ficiaries shown in Table 13 revealed that 85.00 per cent of beneficiaries fell under high category of knowledge whereas 73.33 per cent of non-beneficiaries fell under medium category of knowledge. The result indicates that the beneficiaries had high knowledge about the improved practices of Integrated Pest Management (I.P.M.) in rice due to the implementation of Integrated Pest Management programme by beneficiaries, whereas such opportunities could not be availed by the non-beneficiaries. This indicates there is every need to take up such programmes in the villages of non-beneficiaries so that their knowledge could be improved.

The result of data also indicate that there is a great need to increase the knowledge level of non-beneficiaries and bringing them to more scientific side of farm cultivation. There is a need to create awareness among the non-beneficiaries and providing them with better sources of information including extension agency and media support. There is a need to provide training to the farmers through Farmers Training Centres for equipping them with better knowledge. This finding of level of knowledge is in confirmity with the findings of Rao (1988).

SECTION C

4.3 EXTENT OF ADOPTION OF IMPROVED PRACTICES OF CULTIVATION BY THE FARMERS

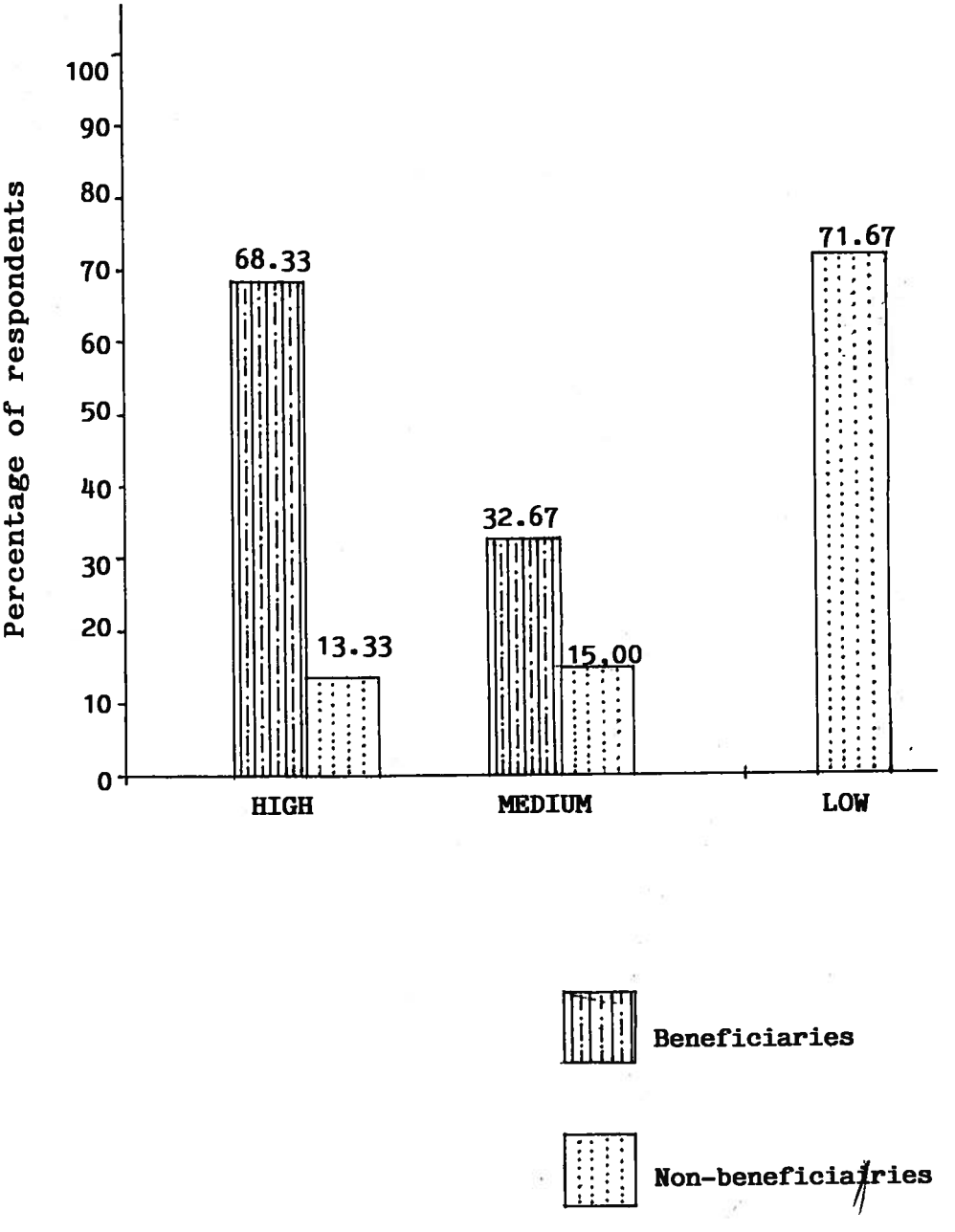
To determine the extent of adoption of practices of Integrated Pest Management in rice by the respondents, schedule developed by Rao (1988) with slight modification was followed. The extent of adoption by respondents was determined based on the total scores obtained by them. The scores of extent of adoption of practices by the respondents were classified as high, medium and low based on the class interval method. The data were presented in frequency and percentage in Table 14.

Table-14: Distribution of respondents according to their adoption

N = 60 + 60

S.No.	Category	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	High (14 and above)	41	68.33	8	13.33
2.	Medium (Between 7-14)	19	32.67	9	15.00
3.	Low (Below 7)	-	-	43	71.67
	Total:	60	100.00	60	100.00

FIG. 5 EXTENT OF ADOPTION OF RESPONDENTS



The Table 14 indicates that 68.33 per cent of beneficiaries belonged to high category of adoption and rest 32.67 per cent of them fell under medium category whereas in case of nonbeneficiaries 71.67 per cent of them belonged to low category, 15.00 per cent of them fell under medium and 13.33 per cent in high category of adoption level.

DISCUSSION

The result of the extent of adoption of bene- ficiaries shown in Table 14 revealed that 68.33 per cent of beneficiaries fell under the high category of adoption whereas 71.67 per cent of non-beneficiaries fell under the low category of adoption of the practices of Integrated Pest Management in rice crop. The result indicates that beneficiaries had high level of adoption due to the implementation of improved practices of Integrated Pest Management in rice crop advocated by the Operational Research Project whereas such opportunity did not prevail in the villages of non-beneficiaries for adoption of scientific way of cultivation and thus they could not adopt these practices. Therefore there is a need to implement such programmes in the villages of non-beneficiaries also. This finding is in confirmity with Rao (1988).

SECTION D

4.4 DIFFERENCE BETWEEN BENEFICIARIES AND NON-BENEFICIARIES IN RELATION WITH KNOWLEDGE AND ADOPTION

The difference between beneficiaries and non-beneficiaries in relation with knowledge and adoption, is presented in the following two sub-heads.

4.4.1 MEAN KNOWLEDGE SCORES OF BENEFICIARIES AND NON-BENEFICIARIES

Mean knowledge score of beneficiaries and non-beneficiaries in respect of improved practices in rice shown in Table-15. To find out the difference between beneficiaries and non-beneficiaries in relation with knowledge 'Z' test was used.

Null Hypothesis : There will be no significant difference between the mean knowledge scores of beneficiaries and non-beneficiaries regarding Integrated Pest Management in Rice.

Empirical Hypothesis : There will be significant difference between mean knowledge scores of beneficiaries and non-beneficiaries regarding Integrated Pest Management in rice.

Table 15 : Difference in mean knowledge scores of respondents in rice

S.No.	Category	Mean	Standard deviation	Z-value
1.	Beneficiaries	27.1833	4.6242	13.8786**
2.	Non-beneficiaries	15.5800	4.4132	

** Significant at 1 per cent level of probability

It is seen from the Table 15 that the mean knowledge score of beneficiaries was higher than that of non-beneficiaries in respect of improved practices of Integrated Pest Management in rice. To find out the difference between the mean knowledge scores of beneficiaries and non-beneficiaries, statistically, the Z-test was used.

The calculated 'Z' value indicated in the Table 16 was greater than the table value at 1 per cent level of probability. Hence the null hypothesis was rejected and empirical hypothesis was accepted. Therefore it was concluded that the beneficiaries differed significantly from the non-beneficiaries with respect to the knowledge of improved practices of Integrated Pest Management in rice. This indicates that the beneficiaries had higher level of knowledge than the non-beneficiaries in respect of Integrated Pest Management in rice.

4.4.2 MEAN ADOPTION SCORES OF BENEFICIARIES AND NONBENEFICIARIES.

Mean adoption scores of beneficiaries and nonbeneficiaries in respect of adoption of improved practices in rice is shown in Table 16. To find out the significant difference between the beneficiaries and nonbeneficiaries 'Z' test was used.

Null Hypothesis : There will be no significant difference between the mean adoption scores of beneficiaries and non-beneficiaries regarding Integrated Pest Management in Rice.

Empirical Hypothesis : There will be significant difference between the mean adoption scores of beneficiaries and non-beneficiaries regarding Integrated Pest Management in Rice.

Table-16 : Difference in mean adoption scores of selected respondents

N = 60 + 60

S.No.	Category	Mean	Standard deviation	Z-value
1.	Beneficiaries	15.5666	2.7164	11.2250**
2.	Non-beneficiaires	8.6666	3.9101	

** Significant at 1 per cent level of probability

The calculated 'Z' value was compared with the table value, it resulted in rejection of null hypothesis. This indicates that there was significant difference between beneficiaries and non-beneficiaries in respect of adoption level. Therefore it is inferred that the beneficiaries have adopted more number of improved practies advocated in Integrated Pest Management Programme of Operational Research Project when compared with non-beneficiaries.

DISCUSSION

The results of knowledge and adoption shown in Table 15 and 16 indicated that the mean knowledge and adoption scores of beneficiaries was higher than the mean knowledge and adoption scores of non-beneficiaries. The 'Z' test also revealed that the beneficiaries differed significantly from the non-beneficiaries in respect of knowledge and adoption of the practices of Integrated Pest Management in rice. The result of significant difference in knowledge and adoption was found in case of beneficiaries and this revealed that the impact of the Integrated Pest Management programme was higher in case of beneficiaries than the non-beneficiaries. This may be due to higher exposure to mass media, high cosmopoliteness and higher level of contact with research scientists and extension agency and knowledge imparted through the trainings conducted by the staff of Operational Research Project in respect of practices advocated under the programme of Integrated Pest Management in rice.

The findings of significant difference in the knowledge and adoption are in confirmity with the findings reported by Rao (1988).

SECTION E

4.5 INCREASE IN YIELD OF BENEFICIARIES

The variable increase in yield of beneficiaries was operationalised by formulating a schedule shown in Annexure. The yield obtained by the beneficiaries was tabulated and data were presented in mean and percentage.

The variable increase in yield of beneficiaries was found out by the difference in yield obtained both in corresponding kharif and rabi seasons of pre-project period and post-project period.

Table-17 reveals that the beneficiaries got 3978 kgs in kharif and 4150 kgs of mean yield in rabi season and total mean yield (kharif + rabi) 8127 kgs in pre-project period, whereas the mean yield obtained was 4771 kgs in kharif and 5084 kgs in rabi season and total mean yield (kharif + rabi) 9855 kgs in post-project period of Operational Research Project.

The table indicated that there was 793 kgs and 934 kgs increase in mean yield in corresponding kharif and rabi season respectively and total (kharif + rabi) mean yield was 1727 kgs in post project period and pre-project period

Table-17: Increase yield of selected beneficiaries of Operational Research Project.

N = (Pre-project period) = 60

N = (Post-projectperiod) = 60

Yield = kgs/ha

Item	Season	Pre-project period	Post-project period	Increase in yield	Percent increase in yield
Mean yield of beneficiaries	Kharif	3978	4771	792	19.92
	Rabi	4150	5084	934	22.50
	Total (kharif + rabi)	8128	9855	1727	21.24

	Pre-project period		Post-project period	
	Minimum yield	Maximum yield	Minimum yield	Maximum yield
Kharif	3375	4500	4300	5210
Rabi	3500	4800	4713	5215
Total (kharif + rabi)	6875	9300	9013	10460

Fig.6 INCREASE IN YIELD OF SELECTED

BENEFICIARIES OF OPERATIONAL RESEARCH PROJECT

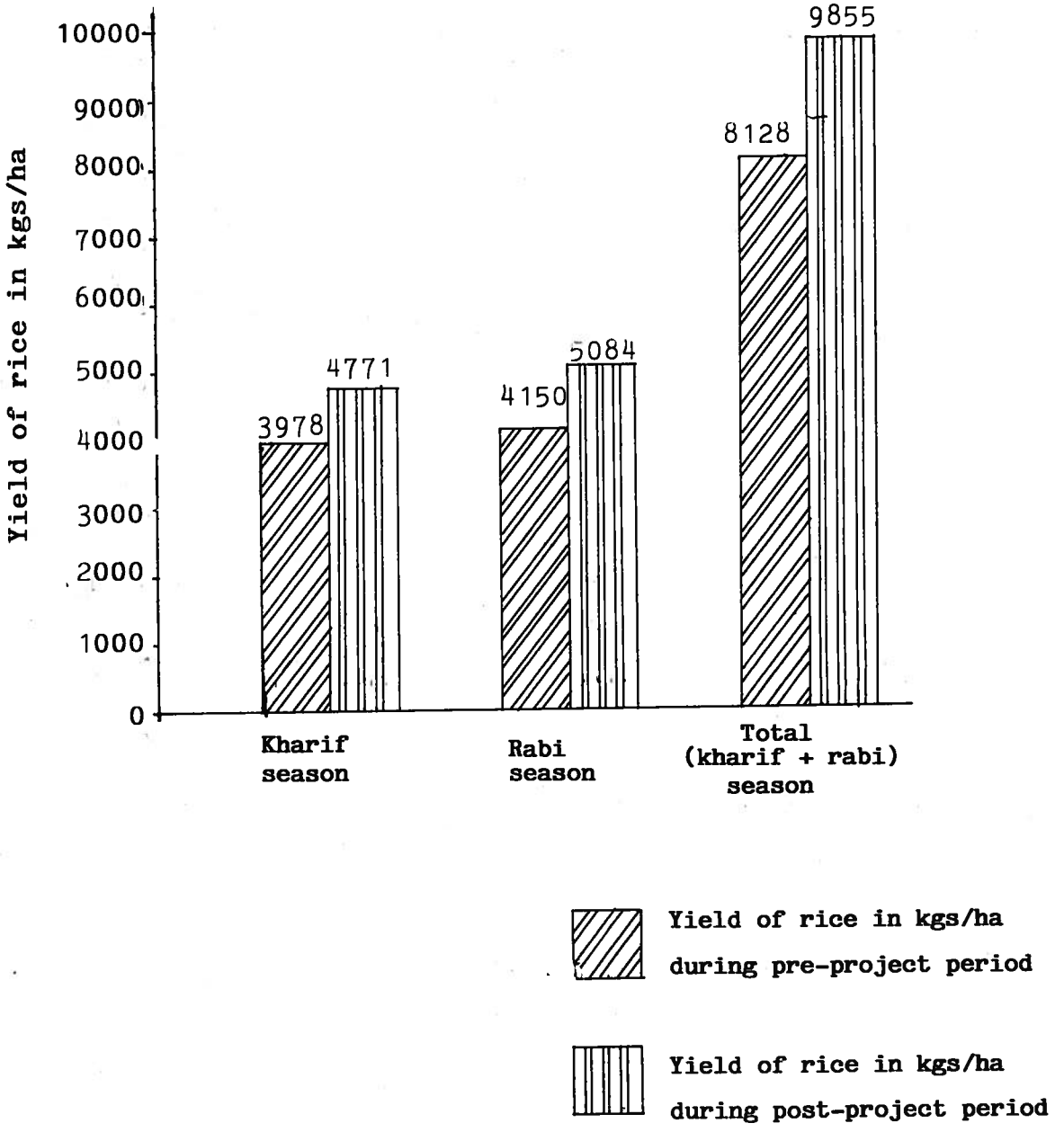
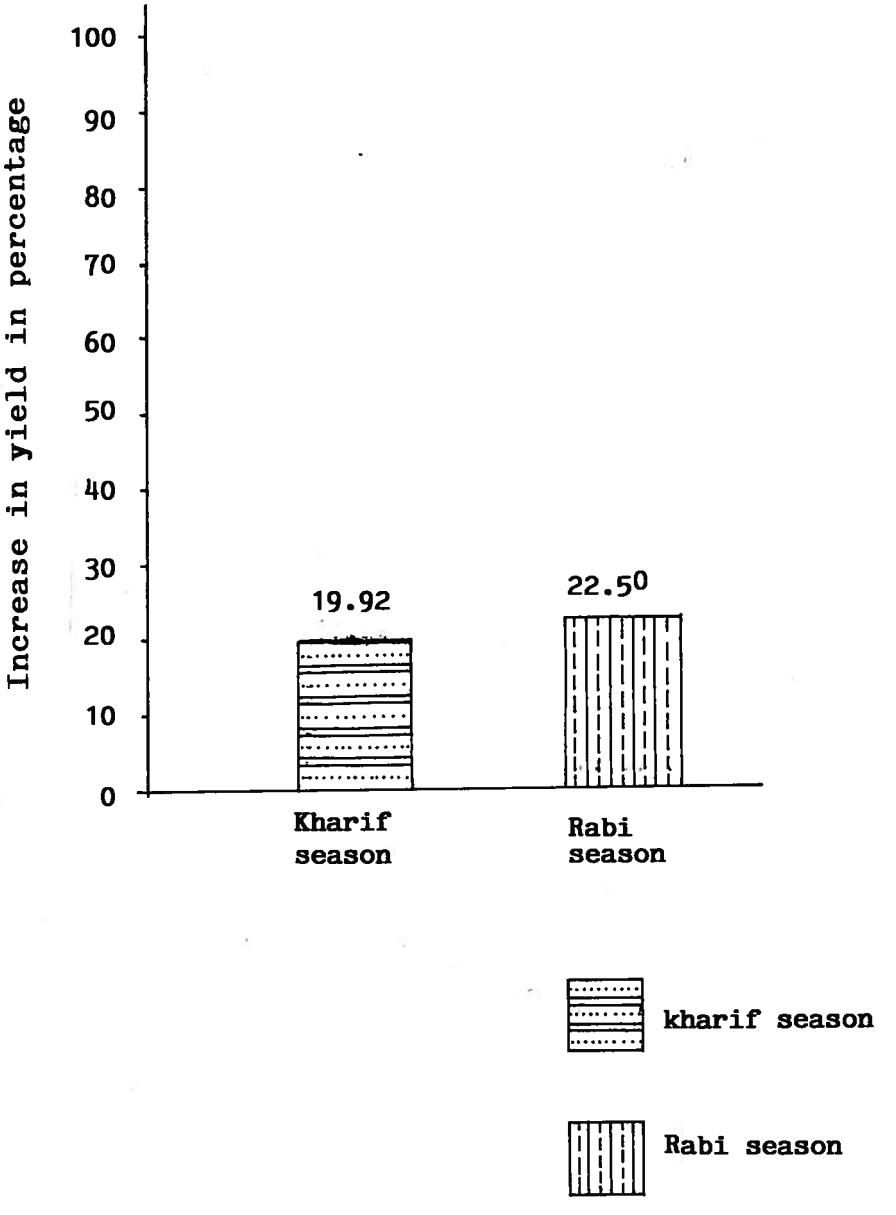


Fig. 7 PERCENT INCREASE IN YIELD OF RICE IN POST-PROJECT PERIOD OF OPERATIONAL RESEARCH PROJECT DURING KHARIF AND RABI SEASONS



The table also revealed that there was 19.92 per cent and 22.50 per cent mean increase in yield and total (kharif + rabi) mean yield was 21.24 per cent in post-project period over pre-project period.

4.5.1 Difference in mean yield of beneficiaries during pre-project period and post-period in kharif season,

For the purpose of assessing the difference in mean yield of beneficiaries in corresponding kharif seasons of pre-project period and post-project period 'z' test was computed.

Table-18 showed the difference in mean yield of beneficiaries in kharif season of pre-project period and post-project period of Operational Research Project.

Null hypothesis : There will be no significant difference in mean yield of beneficiaries in kharif season of pre-rpoject period and post project period of Operational Research Project.

Empirical Hypothesis : There will be significant difference in mean yield of beneficiaries in kharif season of pre-project period and post project period of Operational Research Project.

Table-18 : Difference in mean yield of beneficiaries in kkharif season of pre-project period and post-project period.

N = 60 + 60

S.No.	Item	Mean yield (kgs/ha)	Standard deviation	'Z' value
1.	Pre-project period	3978	284.2203	18.5452**
2.	Post-project period	4771	173.1366	

** Significant at 1 per cent level of probability

As observed from the Table-18 that the calculated 'Z' value was more than table value and was found to be statistically significant at 1 per cent level of probability. Hence the null hypothesis was rejected and empirical hypothesis was accepted. It was therefore concluded that there was significant difference in the

mean yield of beneficiaries in corresponding kharif season of pre-project period and post-project period of Operational Research Project.

4.5.2 Difference in mean yield of beneficiaries in rabi season of pre-project period and post-project period.

To find out difference in mean yield of beneficiaries in corresponding rabi season of pre-project period and post-project period 'z' test was conducted.

Table-19 shows the **difference in the** mean yield of beneficiaries in rabi season of pre-project period and post-project period of Operational Research Project.

Null hypothesis : There will be no significant difference in mean yield of beneficiaries in rabi season of pre-project period and post-project period of Operational Research Project.

Empirical hypothesis : There will be significant difference in mean yield of beneficiaries in rabi season of pre-project period and post-project of Operational Research Project.

Table- 19: Difference in mean yield of beneficiaries in rabi season of pre-project period and post project period.

N = 60 + 60

S.No.	Item	Mean yield (kgs/ha)	Standard deviation	'Z' Value
1.	Pre-project period	4150	263.1816	16.3122**
2.	Post-project period	5084	131.8268	

** Significant at 1 per cent level of probability

As revealed from the Table- 19 that the calculated 'z' value was more than the table value and was found to be statistically significant at 1 per cent level of probability, the null hypothesis was rejected and empirical hypothesis was accepted. It was therefore concluded that there was significant difference in mean yield of beneficiaries in corresponding rabi season of pre-project period and post-project period of Operational Research Project.

DISCUSSION

Based on the mean yield and mean increase in yield obtained by the beneficiaries in both the corresponding kharif and rabi seasons of preproject period and postproject period of Operational Research Project of Medchal, the findings from the analysis of relevant data were given as under:

The findings from the Table-17 indicated that the mean yield of beneficiaries in corresponding kharif and rabi seasons of post-project period was higher (kharif = 4771 kgs and rabi = 5084 kgs) than the pre-project period (kharif = 3978 kgs and rabi = 4150 kgs) of Operational Research Project. This finding is in similarity with the findings reported by Rao (1991).

The results from the table also indicates that the total mean yield (kharif + rabi) in post project period (9855 kgs), was higher than the total yield (8128 kgs) in pre-project period of Operational Research Project. The yields shown above are mean yield per hectare.

The investigation from the Table-17 also revealed that the percent increase in yield in kharif and rabi season of post project period was higher (kharif : 19.92 per cent and rabi : 22.50 per cent) and total (kharif + rabi) 21.24 per cent over the corresponding yield, kharif and rabi season of pre-project period. The

investigation revealed that the increase in yield was due to high level of adoption of practices of Integrated Pest Management in rice advocated by the scientists and extension agency personnels of Operational Research Project after the introduction of the operational resesearch project in post project period.

The 'z' test shown in Table-18 and 19 revealed that there was significant difference in mean yields of beneficiaries both in kharif and rabi seasons of pre-project period and post-project period of Operational Research Project.

This finding is in similarity with the findings reported by Rao (1991).

SECTION F

4.6 ASSOCIATION BETWEEN PERSONAL SOCIO-ECONOMIC AND PSYCHOLOGICAL FACTORS OF BENEFICIARIES WITH KNOWLEDGE AND ADOPTION.

To unearth the association between personal, socio-econonomic and psychological factors of beneficiarries with knowledge and adoption, the Pearson's coefficient of correlation was calculated. For this purpose the data collected through interview schedule, were tabulated and analysed to find out the degree of relationship between dependent and independent variables and the results were presented in two sub-heads shown below:

1. Relationship between personal, socio-economic and psychological factors of beneficiaries with knowledge.
2. Relationship between adoption and personal, socio-economic and psychological factors pertainingto beneficiaries.

The relationship between knowledge and personal, socio-economic and psychological factors found by correlation coefficients are presented in Table-20.

Table-20 : Correlation coefficient (r) between independent varaibles and dependent variable 'Knowledge'

N = 60

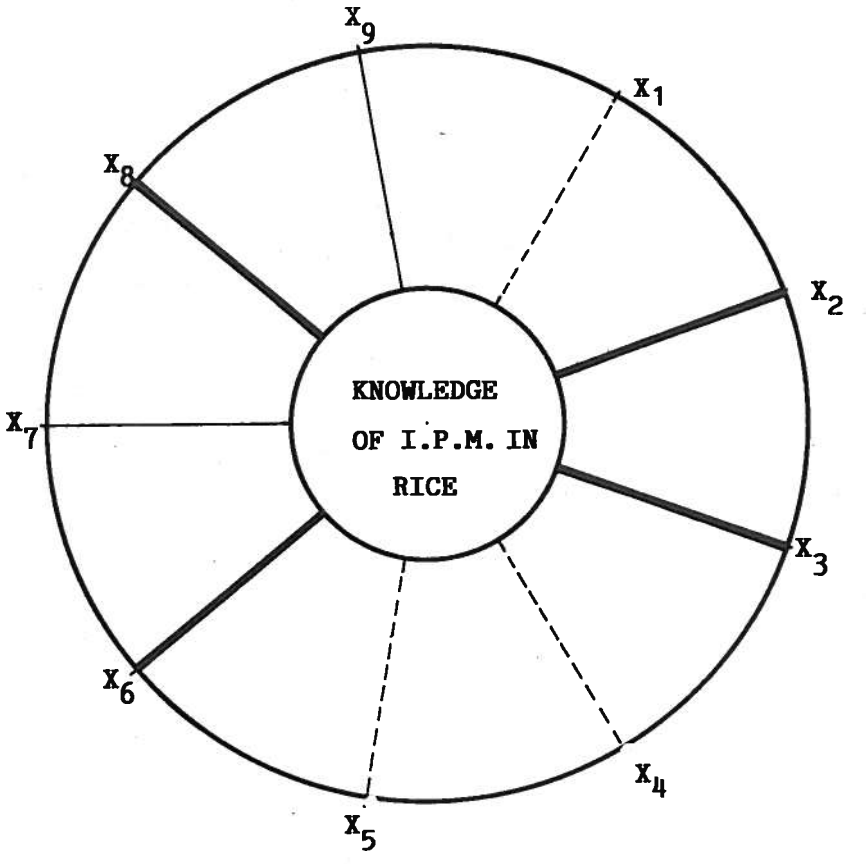
S.No.	Independent variable	Correlation coefficient (r) with knowledge
1.	Age	-0.0432 NS
2.	Education	0.5127**
3.	Farm size	0.4047**
4.	Farm power and material possession	0.1638 NS
5.	Social participation	0.0119 NS
6.	Mass media exposure	0.7040**
7.	Contact with research Scientists and extension agency	0.3283*
8.	Training	0.4297**
9.	Cosmopoliteness	0.3092*

* Significant at 5 per cent level of probability

** Significant at 1 per cent level of probability

NS = Non-significant

Fig. 8 RELATIONSHIP BETWEEN PERSONAL SOCIO-ECONOMIC AND PSYCHOLOGICAL FACTORS OF BENEFICIARIES WITH KNOWLEDGE



X_1 = Age
X_2 = Education
X_3 = Farm size
X_4 = Farm power and material possession
X_5 = Social participation
X_6 = Mass media exposure
X_7 = Contact with Research Scientists and Extension Agency
X_8 = Training
X_9 = Cosmoploiteness

Significant at 1 per cent level of probability

Significant at 5 per cent level of probability

Non-significant

4.6.1 Extent of Knowledge vs Age

Null hypothesis : There will be no significant association between the scores of age and scores of knowledge about the practices of Integrated Pest Managdement in rice.

Empirical hypothesis : There will be **positive** and significant association between the scores of age and scores of knowledge about the practices of Integrated Pest Management in rice.

The computed 'r' value (-0.0432) between knowledge and age was found to be statistically non-significant hence the null hypothesis was accepted. which means that there was negative and non-significant association between knowledge and age.

4.6.2 Extent of Knowledge vs Education

Null Hypothesis : There will be no significant association between the scores of education and scores of knowledge about the practices of Integrated Pest Management in Rice.

Empirical Hypothesis : There will be positive and significant association between the scores of education and scores of knowledge about the practices of Integrated Pest Management in Rice.

The computed 'r' value (0.5127) between knowledge and education was found to be statistically significant at 1 per cent level of probability, hence the null hypothesis was rejected and empirical hypothesis was accepted, which means that there exists a positive and highly significant association between education and knowledge of the beneficiaires.

4.6.3 Extent of knowledge vs farm size

Null Hypothesis : There will be no significant association between the scores of farm size and scores of knowledge about the practices of Integrated Pest Management in rice.

Empirical Hypothesis : There will be positive and significant association between the scores of farm size and scores of knowledge about the practices of Integrated Pest Management in Rice.

The computed 'r' value (0.4047) was found to be significant at 1 per cent level of probability hence the null hypothesis was rejected and empirical hypothesis was accepted. Thus, it indicates that there exists a positive and highly significant association between the knowledge level and farm size of beneficiaries.

4.6.4 Extent of knowledge vs farm power and material possession.

Null Hypothesis : There will be no significant association between the scores of farm power and material possession and scores of knowledge about the practices of Integrated Pest Management in rice.

Empirical Hypothesis : There will be positive and significant association between the scores of farm power and material possession and scores of knowledge about the practices of Integrated Pest Management in Rice.

The coefficient of correlation between extent of knowledge vs farm power and material possession was found to be significant and hence the null hypothesis was accepted. and the empirical hypothesis was rejected. This means that there was no degree of association between the extent of knowledge with farm power and material possession. Therefore it can be inferred thatknowledge is not dependent upon farm power. and material possession.

4.6.5 Extent of knowledge vs social participation

Null Hypothesis : There will be no significant association between the scores of social participation and scores of knowledge about the practices of Integrated Pest Management in rice.

Empirical Hypothesis : There will be positive and significant association between the scores of social participation and scores of knowledge about the practices of Integrated Pest Management in rice.

The value of 'r' in Table-20 revealed that the knowledge of Integrated Pest Management in rice pertaining to benefificiaries was not significant with knowledge and hence the null hypothesis was accepted. This shows that there exists a non significant relationship between Knowledge and social participation. This indicates that the knowledge is not dependent on social participation.

4.6.6 Extent of knowledge vs mass media exposure

Null hypothesis : There will be no significant association between the scores of mass media exposure and scores of knowledge about the practices of Integrated Pest Management in rice.

Empirical Hypothesis : There will be positive and significant association between the scores of mass media exposure and scores of knowledge about the practices of Integrated Pest Management in Rice.

The computed 'r' value (0.7040) was found to be positively significant at 1 per cent level of probability and hence the null hypothesis was rejected and empirical hypothesis was accepted. It indicates that there exists a positive and highly significant association between knowledge and mass media exposure.

This is due to the reason that the respondents were exposed to different types of sources of mass media, like news paper, farm magazines, books on agriculture, rural radio programmes and T.V. programmes.

4.6.7 Extennt of knowledge vs contact with research scientists and extension agency

Null Hypothesis : There will be no significant association between the scores of contact with research scientists and extension agency and scores of knowledge about the practices of Integrated Pest Management in rice.

Empirical Hypothesis : There will be positive and significant association between the scores of contact with research scientists and extension agency and scores of knowledge about the practices of Integrated Pest Management in Rice.

The computed 'r' value (0.3283) was found to be positively significant at 5 per cent level of probability and hence the null hypothesis was rejected and empirical hypothesis was accepted. Thus it was inferred that there exists a positive and significant association between knowledge and contact with research scientists and extension agency.

4.6.8 Extent of knowledge vs training

Null Hypothesis : There will be no significant association between the scores of training and scores of knowledge about the practices of Integrated Pest Management in rice.

Empirical Hypothesis : There will be positive and significant association between the scores training and scores of knowledge about the practices of Integrated Pest Management in Rice.

The positively significant 'r' value (0.4297) at 1 per cent level of probability clearly indicates that there is positive and highly significant relationship between knowledge and training imparted to the beneficiaries by research and extension agency of the Operational Research Project.

4.6.9 Extent of knowledge vs cosmopoliteness

Null Hypothesis : There will be no significant association between the scores of cosmopoliteness and scores of knowledge about the practices of Integrated Pest Management in rice.

Empirical Hypothesis : There will be positive and significant association between the scores of cosmopoliteness and scores of knowledge about the practices of Integrated Pest Management in Rice.

The computed 'r' value (0.3092) was found to be positively significant at 5 per cent level of probability. Hence the null hypothesis was rejected and empirical hypothesis was accepted. This shows that there is positive and significant association between the knowledge and cosmopoliteness.

DISCUSSION

It is evident from the Table-20 that education, farm size, mass media exposure, contact with research scientists and extension agency, training and cosmopolitenes were significant with knowledge of beneficiaries. On the other hand, farm power and material possession and social participation were found, non-significant with knowledge of beneficiaries and age was found to be negatively non significant with knowledge.

Positive and significant relationship was observed between education and knowledge. The reason might be that the higher the education coupled with scientific orientation, risk orientation might have motivated the farmer to plan the rice cultivation well in advance to become production oriented combined with marketing news to gain more profits. It could be concluded that the more the education on the part of the farmer, the higher would be his farm management. These findings were foun in confirmity with the findings of Sangle (1962), Sinha (1962), Badkas (1968),Mishra (1970), Kulhari (1980), Rao (1983) and Rao (1990b).

Farm size and knowledge of farmers had a positive and significant relationship with each other. The possible reason for such relationship might be that a person with more land holdings, have enough money with him to spend on agriculture in time and utilisation of many

sources to manage effectively. It could be concluded that more the land holding of the farmers, more would be gain in his knowledge by taking several types of trials on his land. Similar findings were reported by Ratnakar (1981), Rao (1988) and Chandrashekhar (1991).

Mass media exposure and knowledge of the farmers had shown a positive and significant relationship with each other. This might be due to the reason that exposure to mass media by an individual consciously meant that he was ready to enlarge and enrich his existing knowledge and he is a changed man afterwards. It is reasonable to think that when a farmer uses various mass media sources like news papers, farm magazines, books on agriculture, radio and TV programmes etc. he could be able to know which variety is going to be more remunerative under the existing conditions and plans accordingly. Hence it could be concluded that more the exposure on the part of a farmer, more would be his knowledge. This finding was in agreement with the findings of Ratnakar (1981) and Chandrashekhar (1991).

Contact with research scientists and extension agency was found to be significant with knowledge. This might be due to the reason that the beneficiaries were in contact with extension agency and research personnels since they are reliable and right sources of information for the farmer in disseminating the latest

messages. Hence the farmers who got more extension contact would gain more knowledge which in turn leads to adoption of improved practices. As the contact increases the farmer's knowledge also increases and he becomes changed individual thereafter. This might be the possible reason for this type of relationship. This result is in confirmity with Kulhari (1980), Ratnakar (1981), Rao (1988) and Chandrashekhar (1991).

Training was found to be positively significant with knowledge. This indicates that more number of farmers were trained and gained knowledge. Training influences his behaviour and in turn leads to adoption of improved practices. Training imparted through the extension personnel and research scientists improves the knowledge of farmers and they find solution to their problems by exchange of ideas with the trainers. Their attitude towards latest technology increases and creates confidence for adoption of practices in a more scientific way. This finding is in confirmity with Sukumaran (1972), Raju (1978), Zotawana (1987), Dharma Rao (1988), Rama Rao (1988) and Biswas (1990).

Cosmopoliteness has shown a positive and significant relationship with knowledge. This type of relationship found in this investigation might be due to reason that when a farmer visits more number of

times to nearest town or city, he meets several extension personnels and different personnels of fertilizer and pesticides, agro based agencies for purchase of the inputs of farm, he enquires about the latest innovation, varieties, pesticides and fertilizers etc. which would suit for his cultivation and thus he gains knowledge. Vijaya (1982) and Nambala (1987) reported similar findings.

Farm power and material possession was found to be non-significant with knowledge. This type of relationship indicates that majority of the farmers did not have enough farm power and material possession. The non-significant relationship between farm power and material possession did not make kind impact in gain in knowledge and they are independent in nature. Chandrashekhar (1991) found similar relationship.

Social participation was found to be non-significant with knowledge. This indicates that an individual was independent of his social participation. This may be due to the reason that majority of the respondents did not have social participation. This finding is in confirmity with Rajvanshi (1965), Singh (1967), Tomer (1968), Patel (1970), and Rao (1983)

Age was found to be negatively non-significant with knowledge. This kind relationship was existed in the present investigation. The possible reason for this type of relation might be that the sample represented

for the beneficiaries belonged mostly of young age farmers. Farmers with lower age gropup generally want to gain more knowledge due to their enthusiastic nature. Individuals with lower age groups are progressive in nature and want to find out the solution to their problems, since they want to gain more profits by use of latest scientific cultivation. Mishra (1970), Kulhari (1980) and Rao (1983) reported similar findings.

4.6.2 RELATIONSHIP BETWEEN ADOPTION AND PERSONAL SOCIO-ECONOMIC AND PSYCHOLOGICAL FACTORS PERTAINING TO BENEFICIAIRES.

The relationship between personal, socio-economic and psychological factors with adoption was found by Pearson's co-efficient correlation (r) test which is indicated in Table-21.

Table-2: Correlation coefficient (r) between independent variables and dependent variable 'Adoption'

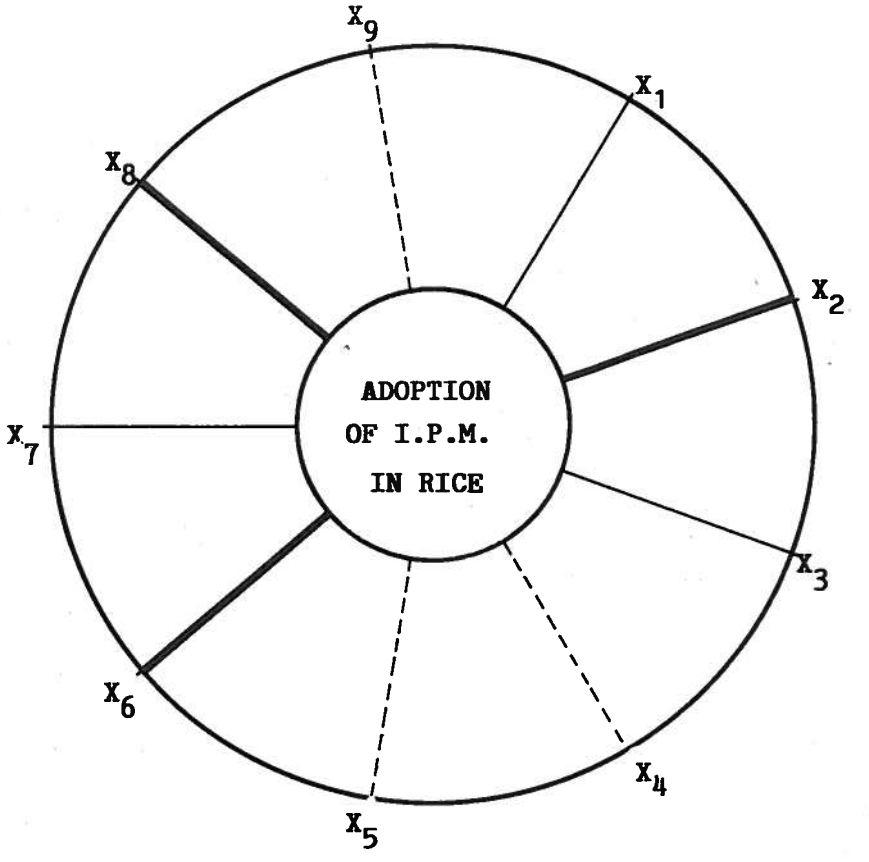
S.No.	Independent variable	Correlation coefficient (r) with 'adoption'
1.	Age	-0.3837*
2.	Education	0.6147**
3.	Farm size	0.3029*
4.	Farm power and material possession	-0.1007 NS
5.	Social participation	-0.1030 NS
6.	Mass media exposure	0.6017**
7.	Contact with research Scientists and extension agency	0.2835*
8.	Training	0.3860**
9.	Cosmopoliteness	0.1641 NS

* Significant at 5 per cent level of probability

** Significant at 1 per cent level of probability

NS = Non-significant

Fig. 9 RELATIONSHIP BETWEEN PERSONAL, SOCIO-ECONOMIC AND PSYCHOLOGICAL FACTORS OF BENEFICIARIES WITH ADOPTION



X_1 = Age

X_2 = Education

X_3 = Farm size

X_4 = Farm power and material possession

X_5 = Social participation

X_6 = Mass media exposure

X_7 = Contact with Research Scientists and Extension Agency

X_8 = Training

X_9 = Cosmoploiteness

Significant at 1 per cent level of probability

Significant at 5 per cent level of probability

Non-significant

4.6.1.1 Extent of adoption vs age

Null hypothesis : There will be no sginficiant association between the scores of age and the scores of adoption of the practices of Integrated Pest Management in Rice.

Empirical Hypothesis : There will be positive and significant association between the scores of age and scores of adoption of the practices of Integrated Pest Management in Rice.

The computed coefficient of correlation (r) value (-0.3837) as shown in Table-21 was found to be significant at 5 per cent level of probability. Hence the null hypothesis was rejected. Thus it could be concluded that age had a significant association with adoption practices of Integrated Pest Management in Rice.

4.6.1.2 Extent of adoption vs education

Null hypothesis : There will be no sginficiant association between the scores of education and the scores of adoption of the practices of Integrated Pest Management in Rice.

Empirical Hypothesis : There will be positive and significant association between the scores education and scores of adoption of the practices of Integrated Pest Management in Rice.

The computed 'r' value (0.6147) was found to be positively significant at 1 per cent level of probability hence the null hypothesis was rejected and empirical hypothesis was accepted which indicates that there exists a positive and highly significant association between education and adoption behaviour of beneficiaries.

4.6.1.3 Extent of adoption vs farm size

Null hypothesis : There will be no sginficiant association between the scores of farm size and the scores of adoption of the practices of Integrated Pest Management in Rice.

Empirical Hypothesis : There will be positive and significant association between the scores farm size and scores of adoption of the practices of Integrated Pest Management in Rice.

The computed coefficient of correlation (r) value (0.3029) was found to be significant at 5 per cent level of probability, inferred that there exists significant

association between adoption and farm size. Hence, the null hypothesis was rejected and empirical hypothesis was accepted. Therefore it could be concluded that there is association between farm size and adoption behaviour of beneficiaries.

4.6.1.4 Extent of adoption vs farm power and material possession

Null hypothesis : There will be no sginficiant association between the scores of farm power and material possession and the scores of adoption of the practices of Integrated Pest Management in Rice.

Empirical : There will be positive and significant association between the scores farm power and material possession and scores of adoption of the practices of Integrated Pest Management in Rice.

The negative non-significant 'r' value shown in Table-22 inferred that there exists a negative and non-significant association between farm power and material possession and adoption. Hence, the null hypothesis was accepted.

4.6.1.5 Extent of adoption vs social participation

Null hypothesis : There will be no sginficiant association between the scores of social participation and the scores of adoption of the practices of Integrated Pest Management in Rice.

Empirical Hypothesis : There will be positive and significant association between the scores of social participation and scores of adoption of the practices of Integrated Pest Management in Rice.

The computed 'r' value shown in Table-21 inferred that there exists negative and non-significant association between adoption and social participation. Therefore null hypothesis was accepted and it is concluded that there is no association between adoption and social participation.

4.6.1.6 Extent of adoption and mass media exposure

Null hypothesis : There will be no sginficiant association between the scores of mass media exposure and the scores of adoption of the practices of Integrated Pest Management in Rice.

Empirical Hypothesis : There will be positive and significant association between the scores of mass media exposure and scores of adoption of the practices of Integrated Pest Management in Rice.

The computed 'r' value was found to be positively significant at 1 per cent level of probability. Therefore the null hypthesis was rejected and empirical hypothesis was accepted. This shows that there eixsts positive and highly significant association between mass media exposure and adoption of practices of Integrated Pest Management in Rice.

4.6.1.7 Extent of adoption vs contact with research scientists and extension agency

Null hypothesis : There will be no sginficiant association between the scores of contact with research scientists and extension agency and the scores of adoption of the practices of Integrated Pest Management in Rice.

Empirical Hypothesis : There will be positive and significant association between the scores of contact with research scientists and extension agency and scores of adoption of the practices of Integrated Pest Management in Rice.

The computed 'r' value at 5 per cent level of probability was found to be positively significant. Therefore the null hypothesis was rejected and empirical hypothesis was accepted. Thus it is inferred that there exists positive and significant association between the contact with research scientists and extension agency with adoption.

4.6.1.8 Extent of adoption vs training

Null hypothesis : There will be no sginficiant association between the scores of training and the scores of adoption of the practices of Integrated Pest Management in Rice.

Empirical hypothesis : There will be positive and significant association between the scores of training and scores of adoption of the practices of Integrated Pest Management in Rice.

The 'r' value (0.3860) computed at 1 per cent level of probability was found to be positively significant. Therefore, the null hypothesis was rejected and empirical hypothesis was accepted. Hence it is inferred that there exists positive and highly significant association between training and adoption of practices of Integrated Pest Management in Rice.

4.6.1.9 Extent of adoption vs cosmopoliteness

Null hypothesis : There will be no sginficiant association between the scores of cosmopoliteness and the scores of adoption of the practices of Integrated Pest Management in Rice.

Empirical : There will be positive and significant association between the scores of cosmopoliteness and scores of adoption of the practices of Integrated Pest Management in Rice.

The non-significant 'r' value as shown in Table-21 inferred that there is no significant association between cosmopoliteness and adoption of practices of Integrated Pest Management in Rice.

DISCUSSION

It is clear from the Table-21 that education, farm size, mass media exposure, contact with research scientists and extension agency and training was found to be positively significant with adoption. On the other hand age was found to be negatively significant with adoption. Cosmopoliteness was found to be non-significant with adoption. It was also found that farm power and material possession and social participation were found to be negatively non-significant with adoption.

Education and adoption level of farmers had shown positive and significant relation with one another. With increase in education farmers had more information seeking habits resulting better access to farm information sources, such as extension personnel, farm literature and had better understanding of new innovations. It was

adoption of new farm technology. Hence this type of trend was observed. This finding is in cofirmity with Vijaya (1982), Sainath (1985), Goud (1988), Balabhaskar (1991), Chandrashekhar (1991), Rao (1991) and Reddy (1992).

A positive and significant relationship was observed between adoption and the contact of the beneficiaries with research scientists and extension agency. Extension agency and research scientists are the reliable and right sources of information for the farmers in dessiminating the latest messages. Hence, the farmers who have got more extension contact, have more knowledge and they may develop favourable attitude which in turn leads to adoption of improved technology. This might be the possible reason for this type of relationship. Similar findings were reported by Kulhari (1980), Rao (1988), Ratnakar (1988), Biswas (1990) and Chandrashekhar (1991).

Adoption is influenced by training and shown a positive and significant relationship. When more number of times and individual is trained by different training agencies it provides enormous education and it definitely helps the individuals to interact in a better way with an opportunity for repeated exposure to lectures on new technologies and various innovation, which help them in innovating and encourage the farmers for adoption of new technology. Contact with research scientists and extension agencies officials have helped the beneficiaries in successful adoption of integrated pest

also a fact that educated farmers receiving more attention of various extension agencies. Hence there was a positive and significant relationship between these two variables. This finding is in cofirmity with the findings of Ratnakar (1981), Sudheendra (1986), Rao (1988) Wadkar et al (1988) and Jabeen (1991).

Farm size and adoption level of farmers had shown a positive and significant relationship with each other. In general, big farmers are economically sound. They will have willingness to adopt regardless of cost, whereas small and medium farmers, due to limited sources cannot afford to adopt costly innovations. This might be the possible reason for the significant relationship. This finding was in agreement with the findings of Kulhari (1980),Vijaya (1982), Suryanarayana (1985), Rao (1988) and Chandrashekhar (1991).

Mass media exposure and adoption level of farmers had shown a positive and significant relationship with each other. Increased mass media exposure by different sources provide enormous opportunity for repeated exposure to new technologies. These sources expose the individuals to the various programmes and improved farm technology which acts as reinforcement for development of favourable attitude and help in innovating the farmers for the

management in rice due to timely advice made available to them and training help them in a better way for implementation of improved practices. This finding is in confirmity with Rao (1988) and Biswas (1990).

Age was found negatively significant with adoption. This might be due to the reason that farmers with lower age group are more enthusiastic and risk oriented and thus may adopt more technologies due to the development of favourable attitude rather than age increases. As the age increases at a certain age level even individual do want to take risks. Thus this type of trend was observed in the present investigation. This finding is similar as reported by Rao (1988), and Reddy (1992).

Cosmopoliteness was found to be non-significant with adoption. This indicates that any number of making a visit to the nearest town or city with whatever purpose may be, may not affect the adoption behaviour of an individual. This finding is in confirmity with Rao (1988) Biswas (1990) and similar with Reddy (1992).

Farm power and material possession was found to be negatively non-significant with adoption. This indicates that a trend with increase in farm power and material possession, the possibility of low adoption. But due to non significant rlationship it is not the characteristic which influences the adoption behaviour of farmers.

Social participation was found to be negatively non significant with adoption. This indicates that any increase in social participation, there is a possibility of low adoption because due to increase in social participation an individual will waste his time in social particiption which influences low adoption.

SECTION G

4.7 PROBLEMS IN IMPLEMENTING THE PROGRAMME OF OPERATIONAL RESEARCH PROJECT AND SUGGESTIONS.

Problems:

This section deals with the problems faced by the respondents and also suggestions as perceived by them in order to overcome them. During the interview, the respondents were asked to enumerate their problems being faced under Integrated Pest Management of Rice under Operational Research Project.

Table-22: Problems perceived by selected rerspondents

N = 60 + 60

S.No.	Item	Beneficiaries		Non-beneficiaries	
		Frequency	Percentage	Frequency	Percentage
1.	Non-availability of recommended high yielding varieties of paddy seed in time.	42	70.00	30	50.00
2.	Non-availability of pesticides and fungicides.	31	51.66	25	41.66
3.	Lack of credit facilities.	37	61.66	32	53.33
4.	Non-availability of timely advice on recommended practices.	15	25.00	50	80.33
5.	Indifference of farmers in receiving the knowledge.	40	66.66	35	58.44
6.	Frequent breakdown of electricity.	49	81.66	38	63.33
7.	Non-availability of labour in crop season.	44	73.33	40	66.66

From the Table-23 it could be clear that following are the major problems which are in order of sequence:

1. Frequency breakdown in electricity causing lot of hardship to irrigate the paddy crop.

2. Non-availability of labour in crop season at reasonable wages.

3. Non-availability of recommended high yielding variety of paddy seed in time insufficient quantities.

4. Lack of credit facilities for getting higher returns under Integrated Pest Management Programme of Operational Research Project.

5. Non-availability of pesticides and fungicides at reasonable rates at nearest station.

Suggestions:

1. Timely and regular supply of electricity during crop season for running their electric motors.

2. Cheap **simple machinery** be evolved to reduce the hardship faced by the respondents due to non-availability of labour in crop season

3. Majority of the respondents suggested that recommended seed of high yielding varieties should be supplied in sufficient quantities in time at reasonable rates.

4. Majority of the respondents suggested that the seeds, fertilizers and pesticides should be made available at reasonable rates on credit at nearest station.

4. All the primary agricultural cooperative socieities in the areas of Operational Research Project are defunct and they should be revived and credit be provided at low rates of interest for short, medium and long term loans.

6. Timely technical advice be arranged by extesion agency and research scientists.

7. Training programme be arranged for farmers in every village before commencement of the seasonand latest technology be explained by extension staff and research scientists.

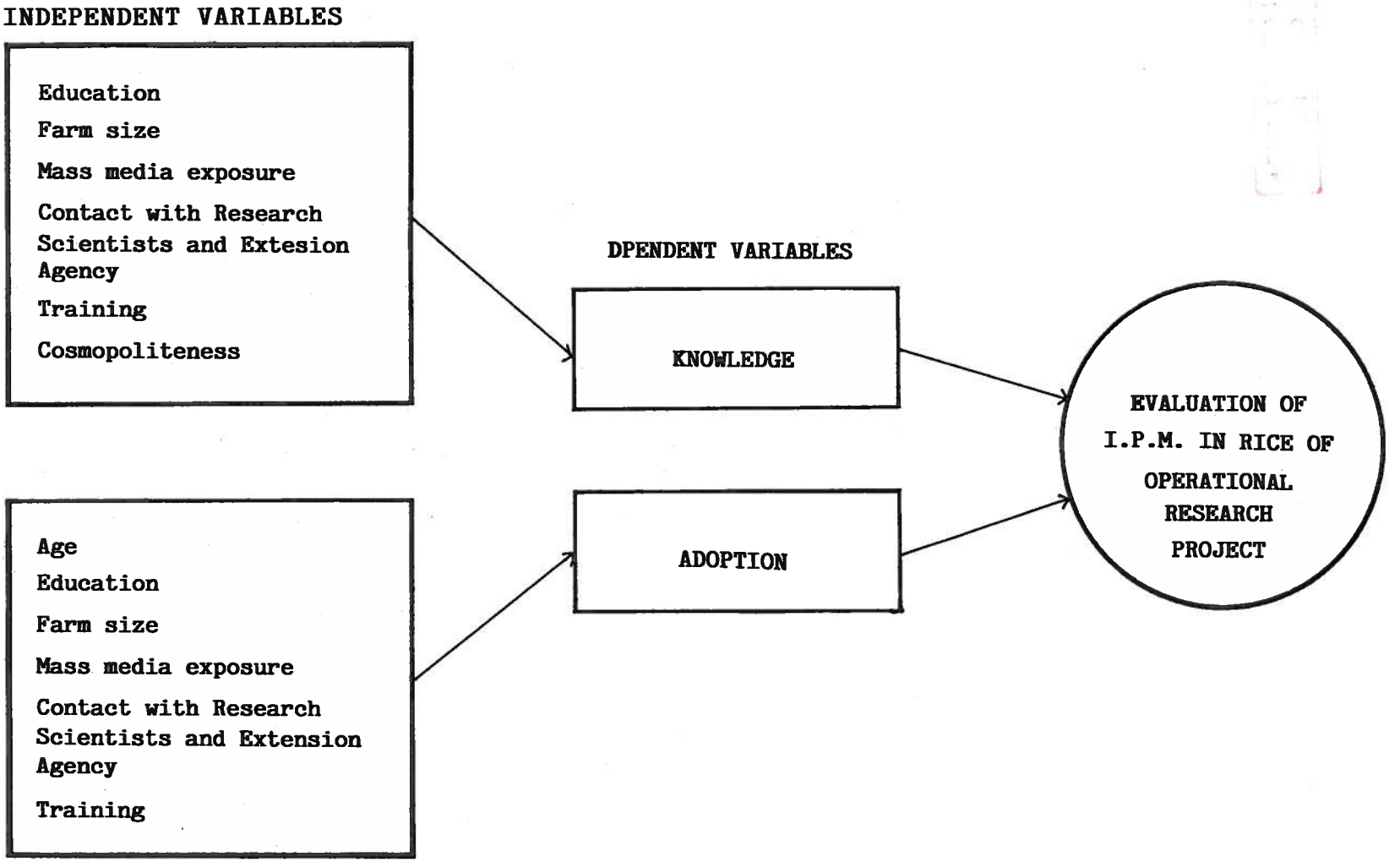
EMPIRICAL MODEL OF THE STUDY

A conceptual model was developed (Fig. 3) to study the factors related with knowledge and adoption of Integrated Pest Management in rice by means of correlation coefficient analysis, the Empirical Model (Fig. 10) indicated that the knowledge and adoption were associated to Integrated Pest Management in rice.

It was observed that independent variables associated with the knowledge in the Integrated Pest Management in rice of Operational Research Project were education, farm size, mass media exposure, contact with research scientists and extension agency, training and cosmopoliteness.

With regard to association between adoption of practices of Integrated Pest Management in rice and independent variables, age, education, farm size, mass media exposure, contact with research scientists and extension agency and training, it was found that they were associated with the adoption practices of Integrated Pest Management in rice of Operational Research Project. Thus it was evident that majority of the selected independent variables, could associate with the dependent variables.

Fig. 10 EMPIRICAL MODEL OF THE STUDY



CHAPTER V

SUMMARY AND CONCLUSIONS

Rice is the staple food for 55 per cent of India's population which is grown in diverse agroclimatic conditions. Rice is the principal cereal crops in Andhra Pradesh and as such Andhra Pradesh is called as rice bowl of India. More than 100 insects and 45 diseases are known to attack rice at different stages of growth, insect pests like brown plant hopper, leaf folder, cutworm, stem borer and gall midge are causing serious damage in some parts of the country. Among the diseases sheath blight, sheath rot and blast continue to be serious problems. The extent of damage and loss to rice crop varies from region to region depending upon various factors. Several varieties have been identified/released which resistant to pests and diseases.

The experience of National Demonstrations lead to believe that demonstration of a particular technology or a combination of them on area or watershed (whole village or cluster villages) would be more effective in convincing the farmers and would provide greater scope for field testing and constraint analysis. Based on the experience of National Demonstrations the concept of Operational Research Project in Rice in India have contributed significantly in augmenting rice production.

The basic approach under this project has been to identify and attack a common problem on a community basis One such Operational Research Project for Integrated Pest Management in Rice was established in Ranga Reddi district in 9 selected villages of Medchal and Qutbullapur mandals. The fundamental concept underlying the approach to extension reforms is to serve the farmer with selective and relevant messages and to teach him how to make the best use of available resources.

A period of nearly five years have elapsed since the introduction of Operational Research Project in Ranga Reddi district, which has taken up Integrated Pest Management Programme in Rice crop. Farmers have been exposed to the Integrated Pest Management in Rice of Operational Research Project for a considerable period of time to reckone if any positive beneficial change is occuring from that. It is the farmers and scientists/extension staff will decide and estimate how they have been benefitted from it. It will surely be reflected in the gain in knowledge, adoption and increase in yield of the farmers.

With the end an evaluation study on Integrated Pest Management in Rice of Operational Project, Medchal in Ranga Reddy district of Andhra Pradesh was conducted by the investigator with following specific objectives.

1. To analyse the personal, socio-economic and psychological factors of beneficiaries and non-beneficiaries.

2. To study the extent of knowledge of beneficiaries and non-beneficiaries about Integrated Pest Management in rice.

3. To determine the extent of adoption of improved practices on pest management by beneficiaries and non beneficiaries.

4. To study the difference between the beneficiaries and non-beneficiaries in relation with knowledge and adoption.

5. To study the increase in yield of beneficiaries during post-project period over pre-project period.

6. To unearth association between personal, socio-economic and psychological factors with knowledge and adoption of beneficiaries.

7. To elicit problems in implementing the programme of Operational Research Project and suggestions to overcome the same.

An ex-post-facto research design was adopted for the study with the beneficiaries, since the respondents were already exposed to improved practices of Integrated Pest Management in Rice.

The programme was implemented only in Medchal and Qutbullapur mandals of Ranga Reddy district of Andhra Pradesh. 60 respondents from the adopted 9 villages of Operational Research Project and 60 respondents from the surrounding 6 villages other than Operational Research Project were selected. Thus a total of 120 respondents were interviewed. Proportionate random sampling was done in case of beneficiaries, keeping in view of the objectives of the study and quota random sampling was done in case of non-beneficiaries representing al the groups in the sample. Since similar socio-economic conditions prevailed in these villages. Available literature was reviewed, experts consulted and finally draft schedule containing dependent and independent variables and their measurements was prepared. The schedule was pre-tested with 30 respondents who did not form the sample for the study. Based on the experience gained in pre-testing suitable modifications were made and final interview schedule was prepared for collecting the data. The data collected from respondents were tabulated and subjected to suitable parametric statistical tests for analysing the data and necessary inferences were drawn. The following are the findings emerged out of the investigation..

5.1 SOCIO ECONOMIC AND PSYCHOLOGICAL CHARACTERS OF RESPONDENTS

Majority of the beneficiaries belonged to young age to middle age group, illiterates, having small farm holdings and doing irrigation by wells. Majority of the beneficiaries fell under low category of farm power and material possession, with membership of more than one institution. Majority of beneficiaries were exposed to high mass media sources and had medium to high contact with research scientists and extension agency. They were trained in improved agricultural practices of Integrated Pest Management in rice. Majority of the beneficiaries were possessing medium to high cosmopoliteness.

Whereas in case of non-beneficiaries majority fell under middle aged group and they were illiterates. Majority of them were small farmers fell under the low category of farm power and material possession and had no membership in any organisation. Majority had low exposure to mass media sources and low contact with research scientists and extension agency. Majority of the non-beneficiaries were untrained with medium cosmopoliteness.

5.2 EXTENT OF KNOWLEDGE OF BENEFICIARIES AND NON-BENEFICIARIES ABOUT INTEGRATED PEST MANAGEMENT

Majority of the beneficiaries, 85.00 per cent possessed high knowledge about Integrated Pest Management in Rice

whereas in case of non-beneficiaries, majority 73.33 per cent had medium knowledge about Integrated Pest Management in rice.

5.3 EXTENT OF ADOPTION OF INTEGRATED PEST MANAGEMENT IN RICE BY THE BENEFICIARIES AND NON-BENEFICIARIES

Majority of the beneficiaries 68.33 per cent had high level of adoption of improved practices of Integrated Pest Management in rice whereas the majority 71.67 per cent non-beneficiaries had low level of adoption of improved practices of Integrated Pest Management in rice.

5.4 DIFFERENCE BETWEEN THE BENEFICIARIES AND NON-BENEFICIARIES IN RELATION WITH KNOWLEDGE AND ADOPTION.

The 'z' test used shown in Table-15 inferred that the beneficiaries differed significantly from the non-beneficiaries in relation with knowledge level of improved practices of Integrated Pest Management in rice.

The 'z' test used shown in Table-16 has confirmed that the beneficiaries differed significantly from the non-beneficiaries with respect to the adoption level of Improved Practices of Integrated Pest Management in rice.

5.5 INCREASE IN YIELD OF BENEFICIARIES DURING POST PROJECT PERIOD AND PRE PROJECT PERIOD

The data in yield collected for kharif season shown in Table-18 pertaining to pre-project period and post-project period of beneficiaries showed that the average per hectare yield of rice in pre-project period, which was 3978 kgs increased to 4771 kgs in post-project period, which showed an increase of 792 kgs per hectare over the yield of pre-project period i.e. 19.92 per cent increase in yield was obtained.

The 'z' test shown in Table-18 has revealed that there was significant difference in yield of beneficiaries in post-project period of corresponding kharif season with that of pre-project period of Operational Research Project.

The Table-17 indicated that the average per hectare yield of rice of beneficiaries which was 4150 kgs in rabi season of pre-project period increased to 5054 kgs in rabi season of post-project period and showed an increase of 934 kgs per hectare over the yield of pre-project period i.e. 22.50 per cent increase in yield was obtained.

The 'z' test used as shown in Table-19 it revealed that there was significant difference in yield of beneficaires in rabi season of post-project period with that of pre-project period. of Operational Research Project.

5.6 ASSOCIATION BETWEEN PERSONAL, SOCIO-ECONOMIC AND PSYCHOLOGICAL FACTORS WITH KNOWLEDGE AND ADOPTION OF BENEFICIARIES.

The correlation coefficient value (r) shown in Table-20 revealed that education, farm size, mass media exposure, contact with research scientists and extension agency and training was significant with knowledge. Age was found negatively non-significant and farm power and material possession was non-sigificant with knowledge.

Whereas the correlation coefficient values (r) shown in Table-21 have revealed that, education, farm size, mass media exposure, contact with research scientists and extension agency and training was found significant with adoption. Farm power and material possession and cosmopoliteness were found non-significant with adoption. The age was found negatively significant with adoption.

5.7 PROBLEMS PERCEIVED BY THE RESPONDENTS IN THE IMPLEMENTATION OF THE INTEGRATED PEST MANAGEMENT IN RICE OF OPERATIONAL RESEARCH PROJECT

The important problems of beneficiaries in adoption

of Integrated Pest Management in Rice indicated in Table-22 were in the rank of order of frequent breakdown of electricity, non-availability of labour in crop season, non-availability of recommended high yielding varieties of paddy seeds, lack of credit facilities, non-availability of pesticides and fungicides and last in order was non availability of timely advice on recommended varieties.

The important problems of non-beneficiaries in adoption of Integrated Pest Management in Rice shown in Table-22 were in the order of non-availability of timely advice on recommended varieties, non-availability of labour in crop season, frequent breakdown of electricity, indifference of farmer in receiving the knowledge, lack of credit facilities and last in order was non-availability of pesticides and fungicides.

5.8 SUGGESTIONS MADE BY THE RESPONDENTS TO OVERCOME THE PROBLEMS.

The suggestions made by the respondents to overcome the problems in adopting the improved practices of Integrated Pest Management in Rice were as follows:

1. Timely and regular supply of electricity during crop season for running the electric motors.

2. Cheap and simple machinery be evolved to reduce the hardship faced by the respondents due to non-availability of labour in crop season.

3. Timely supply of recommended varieties of paddy in sufficient quantities at reasonable rates.

4. All the inputs i.e. seeds, fertilizers and pesticides be made available at reasonable rates on credit at nearest station.

5. Credit be arranged for short, medium and long term at low rates through primary agricultural cooperative societies.

6. Marketing facilities be provided for discouraging the role of middle men or brokers.

7. Timely technical advice be arranged by extension and research scientists.

IMPLICATIONS OF THE STUDY

The findings of the present study had several practical implications mostly in the nature of suggesting change in manipulable variables so as to contribute to effective implementation of the programme of Integrated Pest Management in Rice of Operational Research Project.

1. The knowledge level of farmers was high mostly with the young age and middle age group, whereas the old age group had very little knowledge about the programme, therefore there is a need to educate the old age group also who can transfer the technology to their progeny.

2. The illiterate farmers who form majority in the sample be educated by imparting non-institutional training by way of taking up more number of trainings on different aspects of Integrated Pest Management.

3. The semi-medium category of the farmers be tackled alongwith the small and marginal farmers who contribute to 33.33 per cent in respect of non-beneficaries for imparting knowledge on Integrated Pest Management in order to control the pest on community approach.

4. Since most of the farmers belong to low farm power due to social status and do not have any kind of social participation. Hence they may be given priority in imparting knowledge on Integrated Pest Management.

5. Most of the farmers belonged to medium category of the cosmopoliteness and hence they may be given opportunity to meet urbanities and other allied people so that they can have better contacts with the different categories of people.

6. Most of the farmers belonged to low category of mass media expsoure in respect of non-beneficiaries. If programmes are taken up on large scale and enough publicity through mass media channels must be given for a better exposure to Integrated Pest Management.

7. It is also found that the non-beneficiaries were afraid of to take risk in adoption of any new programme due to lack of knowledge and social status. If they are trained and provided with better credit facilities through the Government or commercial banks then they can take up the new practices like Integrated Pest Management and increase their production.

8. It was found that adoption of package of practices under Integrated Pest Management was low with the non-beneficiaries, this indicates that if such programmes are taken up on large scale to the non-beneficiaries the adoption level of farmers may increase.

9. It was found that there was overall increase of 21.24 per cent in production of rice by the beneficiaries due to implementation of Integrated Pest Management Programme during a period of five years. Such programmes should be continued for a minimum period of 15 years at same place. Such programmes can be taken up in every district in order to teach the latest technology of Integrated Pest Management to the farmers.

10. Labour problem was found by the respondents, therefore labour saving implements be evolved and supplied to the farmers.

11. One of the important aspect of Integrated Pest Management is 'Biological Control', which has not been included in the practices recommended by the Operational Research Project of Rice, viz. parasites and

and predators, which can control the pests like stem borer, gallmidge, brown plant hopper etc. The Operational Resarch Project may adopt the biological control methods under Integrated Pest Management and may involve the staff of Central Integrated Pest Management Centre, Somajiguda, Hyderabad and the staff of Biological Control Laboratories of Department of Agriculture and may arrange demonstrations of biological control on large scale under Integrated Pest Management Programme.

12. Now the Government of India is stressing the need for Integrated Pest Management Programmes, so planners, may plan in such a way that every Operational Research Project may possess one Biological Control Laboratory which will rear the parasites and predators and release in the area of operation of Operational Research Project. Such Operational Research Project with a unit of Biological Control laboratory may be established at each district headquarters to identify

parasite predators which are naturally available and take up mass production and release them in fields.

13. Training aspect may be given priority while planning every programme **and**several training camps be organised for farmers before commencement of the season to teach them latest technologies devloped under Integrated Pest Management programmes.

14. In order to train the farmers, trainers may be trained at different **training** centres in India and abroad in Integrated Pest Management programme. Several countries are now discouraging the chemical methods against these pests and chemical control may be made the last resort under Integrated Pest Management.

The planners and policy makers of Operational Research Project should consider the above items for helping the farmers in improving their agricultural production.

SUGGESTIONS FOR FUTURE RESEARCH

The results of the present study revealed the need for future research endeavour in several directions as suggested below:

1. Future studies be made to know the final impact of the programme in gain in knowledge, extent of adoption and increase in yield with wider and larger sample.
2. Future studies could be conducted by using valid reliable instrument for measuring the knowledge, adoption and attitude of the farmers towards research scientists and extension agency of Operational Research Project.
3. There is scope to initiate studies on the income generated out of the programme of Integrated Pest Management in rice and consequently the final impact of the Operational Research Project in the socio-economic status of the beneficiaries.
4. Future studies be made in detail in pertaining to opinion of the farmers about the Integrated Pest Management programme of Operational Research Project.

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* Original not seen

APPENDICES

APPENDIX

ANDHRA PRADESH AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE
EXTENSION EDUCATION INSTITUTE

POST-GRADUATE RESEARCH PROGRAMME

AN EVALUATIVE STUDY ON INTEGRATED PEST MANAGEMENT IN RICE, OPERATIONAL RESEARCH PROJECT, MEDCHAL IN RANGA REDDY DISTRICT

Interview Schedule

Respondent No:
Date of interview:

Mandal: _____ District: Ranga Reddy Village: _____

1.	Name of the farmer with fathers name	:
2.	caste	:
3.	Age (at the time of interview)	:
a)	Young age (1-35 years)	(1)
b)	Middle aged (36-58 years)	(2)
c)	Old age (above 58 years)	(3)
4.	**Education**	
a)	Illiterate	(0)
b)	Primary school	(1)
c)	Middle school	(2)
d)	High school	(3)
e)	Intermediate	(4)
f)	Graduate	(5)

5. **Farm size**	ha				
a) Dry	____	i)	Marginal	- Les than 1 ha	(1)
b) Irrigated dry	___	ii)	Small	- 1-2 ha	(2)
c) Wet land	___	iii)	Semi-medium	2-4 ha.	(3)
d) Garden land	___	iv)	Medium	- 4-10 ha.	(4)
Total:	___	v)	Large	- More than 10 ha	(5)

6. Source of irrigation

a) Well (1)
b) Tank (2)
c) Borewell (3)

7. Farm power

a) Country plough/iron plough (1)
b) Harrow (2)
c) Cultivator/puddler (3)
d) Sprayer/duster (4)
e) Electrical motor/oil engine (5)
f) Tractor with accessories (6)

8. Material possession

a) Cycle (1)
b) Moped/scooter/motor cycle (2)
c) Jeep/car (3)
d) Radio (4)
e) Television (5)
f) VCP/VCR (6) Score ( )

9. Social participation **Score**

Items:

a) No membership in any organisation (0)
b) Membership in one organisation (1)
c) Membership in more than one organization (2)
d) Office bearer (3)

Score ( )

10. Mass media exposure

How do you participate in the following mass media sources:

Mass media source		Extent of participation		
		Daily (2)	Occassionally (1)	Never (0)
a)	Read Newspaper	--	--	--
b)	Read farm magazines	--	--	--
c)	Read books on agriculture	--	--	--
d)	Listen to rural radio programmes	--	--	--
e)	Attend to rural programme on TV	--	--	--

Score ( )

11 Contact with research scientists and extension agency of Operational Research Project

S.No.	Research and Extension agency personnel	Frequency of contact			
		Once in a week (3)	Once in fortnight (2)	Once in a month (1)	Never (0)
A.	**RESEARCH PERSONNEL**				
1.	Scientists	--	--	--	--
B.	**EXTENSION PERSONNEL**				
1.	Dy. Director or Asst. Director of Agriculture.	--	--	--	--
2.	Agril. Officer	--	--	--	--
3.	Field Technicians	--	--	--	--
4.	Other fertilizer and pesticide agencies etc.	--	--	--	--

Score ( )

12. Trainings

Have you undergone any kind of trainings conducted by the Extension personnel or staff of Operational Research Project? Furnish the following.

To which category you belong?

a) Trained (1)

b) Untrained (0)

Score ( )

13. Cosmopoliteness

a) Please indicate the no. of times you visit the nearest town/city?

i) Very often (3)
ii) Often (2)
iii) Rare (1)
iv) Never (0)

b) Generally what could be main purpose of your visit?

i) All relating to agriculture (5)
ii) Some relating to agriculture (4)
iii) Personal/domestic (3)
iv) Entertainment (2)
v) Other purpose (1)
vi) No response (0)

Score ( )

PART - II

A. Knowledge of the farmers towards the Integrated Pest Management Programme in Rice Crop of Operational Research Project.

Following are the mixture of some correct and incorrect statements. Please check and put a tick (/) appropriate against each statement which you feel as either correct or incorrect.

		Correct (1)	Incorrect (0)
1.	Black soils are the most suitable soils for paddy cultivation.	--	--
2.	Improved paddy seed gives higher yields.	--	--
3.	Seed treatment protects the seed from seed borne diseases.	--	--
4.	Late planting promotes pest problem in the paddy fields.	--	--
5.	Intercultivtion spoils the soil structure.	--	--
6.	Irrigation and drainage are provided simultaneously.	--	--
7.	The yields are reduced if the timely and adequate plant protection measures are not taken up.	--	--
8.	The yields are reduced if the timely and adequate use of fertilisers are not followed.	--	--
9.	Timely harvesting is necessary to enhance the keeping quality of seed/grain.	--	--
10.	Zinc sulphate can be applied into the field once in every year for rectifying zinc deficiency.	--	--

		Correct (1)	Incorrect (0)
11.	Bavistin is used for seed treatment of paddy.	--	--
12.	Hopper burn damage is causedby Brown plant hopper.	--	--
13.	Blast disease is not found on the neck portion of paddy plant.	--	--
14.	Sambar Mahsuri paddy variety is moderately tolerant to stem borer and blast, with a higher yield and better grain quality than Tella Hamsa.	--	--
15.	Tulsi short duration paddy variety can be transplanted directly with sprouted seedlings and also out yields local variety.	--	--
16.	30 hills during kharif and 45 hills during rabi are recommended in one square meter for paddy crop.	--	--
17.	Ghundi bug attack can be controlled in sulphur chemical.	--	--
18.	Trimming of field bunds is necessary for neat appearacne of paddy fields.	--	--
19.	Stem borer pest attack can be controlled by carbofuran.	--	--
20.	Blast disease can be controlled by Nuvacron chemical.	--	--
21.	"Vikas' is one of the recommended high yielding variety of paddy.	--	--
22.	Butachlore is one of the recommended weedicide for control of weeds of paddy crop.	--	--
23.	100 kgs of treated seeds are required for raising one hectare of paddy crop.	--	--

		Correct (1)	Incorrect (0)
24.	Thin film or water is kept in nursery beds of paddy.	--	--
25.	20-25 days old paddy seedlings are used for transplantation in main field.	--	--
26.	Seed borne diseases can be controlled by seed treatment of paddy.	--	--
27.	2-3 seedlings are planted per hill while transplanting in main field.	--	--
28.	Recommended doses of fertilizers are necessary for obtaining higher yield of paddy crop.	--	--
29.	Nitrogenous fertilizer is applied in 3 split doses for paddy crop.	--	--
30.	0.2% solution zinc sulphate can be used as foliar spray for control of zinc deficiency in main field of paddy crop.	--	--
31.	Sheath rot disease can be controlled by spraying Bavistin chemical.	--	--
32.	Zinc phosphoid bait is used for control of rats.	--	--

PART - III

ADOPTION OF THE RECOMMENDED FARMING PRACTICES

Following are the recommended practices. Please indicate with your strength of opinion by putting tick mark (/) in the column that you feel appropriate.

S.No.	Practice of rice production	Adopted (1)	No adopted (0)
1.	Use of improved seeds of high yielding varieties of paddy.	--	--
2.	Recommended seed rate.	--	--
3.	Seed treatment	--	--
4.	Transplanting in time.	--	--
5.	Intercultivation	--	--
6.	Recommended spacing	--	--
7.	Timely and adequate plant protection measures:		
	a) Disease management	--	--
	b) Pest management	--	--
8.	Growing resistant varieties	--	--
9.	Keeping the nursery fields free from pests/diseases.	--	--
10.	Removal of left over nurseries and bund clearance.	--	--
11.	Major portion of stubbles in situ.	--	--
12.	Use of light traps for pest monitoring	--	--
13.	Formation of alley ways.	--	--

S.No.	Practice of rice production	Adopted (1)	Not adopte (0)
14.	Pest surveillane for every 3-4 days.	--	--
15.	Spraying selective pesticides on need basis and observing economic threshold level.	--	--
16.	Control of field rats on whole village approach.	--	--
17.	Conducting varietal minikits/adaptive trials.	--	--
18.	Correction of zinc deficiency.	--	--
19.	Conservation of natural enemies of rice insects.	--	--

PART IV

INCREASE IN YIELD

S.No.	Item	Season	yield kg/ha
a)	Yield of rice during pre-project period.	Kharif	....
		Rabi	....
b)	Yield of rice during post-project period.	Kharif	....
		Rabi	....

PART - V

Problems of farmers

Please indicate what the problems in cultivation of rice while implementation of practices of Integrated Pest Management of Operational Research Project. Please put a tick mark (✓) in the bracket shown against the item.

S.No.	Item	
1.	Non-availability of recommended high yielding varieties of paddy seed in time.	( )
2.	Non-availability of pesticides and fungicides.	( )
3.	Lack of credit facilities.	( )
4.	Non-availability of timely advice on recommended practices.	( )
5.	indifference of farmers in receiving the knowledge.	( )
6.	Frequent break down of electricity	( )
7.	Non-availability of labour in crop season.	( )
8.	Any other problem.	( )

PART - VI

Suggestions from the respondents to overcome the problems and any other suggestions.

1.

2.

3.

4.

5.