FARMING SYSTEMS AMONGST VARIOUS CATEGORIES OF FARMERS IN DAUSA DISTRICT OF RAJASTHAN

THESIS

Submitted to the
Rajasthan Agricultural University, Bikaner
in partial fulfilment of the requirements for
the degree of

DOCTOR OF PHILOSOPHY

IN

FACULTY OF AGRICULTURE

(EXTENSION EDUCATION)

BY

YOGENDRA KUMAR SHARMA

2006

RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER
S.K.N. College of Agriculture, Jobner

CERTIFICATE - I

Date: _____

This is to certify that **Mr. Yogendra Kumar Sharma** had successfully completed the Prellminary examination held on _____as required under the regulation for Ph.D. degree**.**

(K.D. Sharma)
Head
Deptt. of Extension Education,
S.K N. College of Agriculture,
Jobner

RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER
S.K.N. College of Agriculture, Jobner

CERTIFICATE – II

Date : _____

This is to certify that this thesis entitled **"Farming systems amongst various categories of farmers in Dausa district of Rajasthan"** submitted for the degree of **Doctor of Philosophy** in the subject of **Extension Education** embodies bonafide research work carried out by **Mr. Yogendra Kumar Sharma** under my guidance and supervision and that no part of this thesis has been submitted for any other degree. The assistance and help received during the course of investigation have been fully acknowledged. The draft of the thesis was also approved by the advisory committee on _____.

(K.D. Sharma)
Head
Deptt. of Extension Education,
S.K N. College of Agriculture,
Jobner

(G.S. Bangarva)
Major Advisor

(R.A. Singhania)
Dean
S.K.N. College of Agriculture
Jobner

RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER
S.K.N. College of Agriculture, Jobner

CERTIFICATE – III

Date :_____

This is to certify that this thesis entitled **"Farming systems amongst various categories of farmers in Dausa district of Rajasthan"** submitted by **Mr. Yogendra Kumar Sharma** to Rajasthan Agricultural University, Bikaner in partial fulfillment of the requirements for the degree of **Doctor of Philosophy** in the subject of **Extension Education**, after recommendation by the external examiner was defended by the candidate before the following members of the examination committee. The performance of the candidate in the oral examination on his thesis has been found satisfactory, we therefore, recommend that the thesis be approved.

(G.S. Bangarva)
Major Advisor

(I.M. Khan)
Advisor

(A.K Gupta)
Advisor

(K.N. Gupta)
Advisor

(M.C. Bhargava)
Dean, PGS, Nominee

(K.D. Sharma)
Head
Deptt. of Extension Education,
S.K N. College of Agriculture,
Jobner

External Examiner

Approved

DEAN
POST GRADUATE STUDIES

RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER
S.K.N. College of Agriculture, Jobner

CERTIFICATE – IV

Date :_____

This is to certify that **Mr. Yogendra Kumar Sharma** of the **Department of Extension Education, S.K.N. College of Agriculture, Jobner** has made all corrections/ modifications in the thesis entitled **"Farming systems amongst various categories of farmers in Dausa district of Rajasthan",** which were suggested by the external examiner and the advisory committee in the oral examination held on _____. The final copies of the thesis duly bound and corrected were submitted on _____ are enclosed herewith for approval.

(G.S. Bangarva)
Major Advisor

(K.D. Sharma)
Head
Deptt. of Extension Education,
S.K N. College of Agriculture,
Jobner

(R.A. Singhania)
Dean
S.K. N. College of Agriculture
Jobner

Approved

DEAN PGS
RAU, BIKANER

CONTENTS

LIST OF TABLES

TABLE NO.	PARTICULARS	PAGE NO.
	farming systems	

Contd…..

LIST OF FIGURES

Contd…..

INTRODUCTION

In India agriculture is the primary source of employment for both man and woman because this sector employs the majority of rural man power. Agriculture accounts for about 30 per cent of the Gross Domestic Product (GDP) and employs about two third of the labour force. Agriculture exports contribute 16 per cent of the country's total export. Thus agriculture development forms an integral part of the general economic development of our country.

Agriculture is the backbone of national economy. Although the country has become self sufficient in production of food grains by virtue of green revolution, the small and marginal farmers have not been able to reap the real benefits of the productivity. Most of the areas in our country suffer almost every year from one or other forms of natural calamities like flood, unseasonal heavy rains or drought. Further, the pressure on the available agriculture land is increasing due to growing urbanization, population explosion and subsequent fragmentation of land. Our country has achieved breakthrough in food grain, milk, egg and vegetable production since advent of planning in 1951, India has achieved all time high food grain production of 204.6 million tonnes, milk production of 90.7 million tonnes and vegetable production of 91.6 million tonnes in 2004-05. However, there still exists yawning gap between actual production and the potential in at above mentioned fields.[1]

According to the Ruthenberg (1976) a farming system is a collection of distinct functional units, such as crop, livestock, processing, investment and marketing activities which interact because of the joint use of inputs, they receive from the environment, which have the common objective of satisfying the farmers (decision maker's) aims. The definition of the borders of the systems depends on the circumstances often it includes not only the farm (economic enterprises) but also they have the households (farm household system).

In view of the above facts there is a strong need felt to commercialize agriculture. Agriculture should evolve from just 'a way of life' to dynamic entity that is 'agri business. Diversification of agriculture is required by placing an emphasis on cultivation of fruits, vegetables, spices, commercial crops like cotton, soybean medicinal and aromatic plants as well as enterprises like piggery, fishery, bee

[1] Economic Survey, 2005-06 : 157-159.

keeping and rural handicrafts. So far the agriculture research in our country has been heavily crop based and no attempt has been made to consider the farm as one enterprise in which both crop and other enterprises are raised together. However an interesting feature of our ancient farming is the combination of crop and livestock in a mutually beneficial manner. From a predominantly pastoral country, emphasis was shifted to mixed farming involving a blend of 'agriculture and animal husbandry' and 'agriculture and aquaculture'. Therefore, farming system research aiming at optimizing the income and employment potential of the small farms, through concurrent attention to crop, animal husbandry and post harvest technologies, need to be more widely fostered.

In order to ensure an all round development of farming families, farming should be considered as a 'system' in which crop and other enterprises that are compatible and complementary are combined together. It includes all components of land such as soil, water, crops, livestock, labour and other resources. Pal *et al.* (1985) specially defined the farming system as 'an appropriate combination of farm enterprises *viz*. cropping system, livestock, fisheries, forestry and poultry etc. and the means available to a farmer's family to raise them for profitability. Thus, only the resource based planning can improve the conditions of the rural families. Ghodake and Hardekar (1981) have further classified that a farming system or a whole farm system is not simply a collection of crops and animals, to which one can apply some inputs and expect immediate results, rather it is a complicated interwoven mesh of soils, plants, animal's, implements workers other inputs and environmental influences. Paroda (1999) has also advocated the need for shifting emphasis from commodity research to production system research from project mode to programme approach and sustainability of production system by adopting a wholistic and systematic approach towards farming system.

The advantage of this whole farm approach (farming system) is manifold. Firstly the crop failure due to disease, uneven rains or other hazards affect the family to a lesser extent, as the other enterprises practiced simultaneously can be relied upon. Secondly, farming system being labour intensive, family labour is utilized throughout the year and is also provide employment opportunities as well as additional income. Thirdly, inclusion of horticulture, dairy, poultry, fishery and goat enterprises provides nutritional food for family consumption and extra income from sale of the product. The whole farm approach can evaluate a technology or its package in the context of

the farmers or economic activities, agriculture enterprises and household as well as off farm operations.

It has been observed that the farmer's socio-personal, cultural, economic, psychological and communication attributes play an important role in his development and progress, but all these attributes concerning different enterprises in different farming systems have not been studied together in the past.

Moreover systematic studies on farming systems have not been reported in Dausa district of Rajasthan. It was therefore, thought necessary to study the status of different farming systems and examine the important role played by various attributes. To derive maximum benefits from different farming systems like increase in resource utilization, maximization of yield, better income, employment generation and enhancing self sufficiency etc., entire farming system and several dynamic aspects (like gross and net income) are needed to be critically examined with reference to Dausa district of Rajasthan. To mark various farming systems economically viable, one requires sound research in backup. Scientific and efficient farming system require a comprehensive study of different enterprises like dairy, crop, vegetable, goat and poultry etc. The present study with holistic approach will generate useful information on various aspect of farming system in Dausa district of Rajasthan. This study therefore is of great significance in creating database, not only to know the existing situation but also to pave the way for future researchers to probe in different farming systems.

To study farming system and application of farming systems approach can bring a ray hope for the betterment for farmers. Keeping all these factors in mind the present study is conducted to suggest which particular mixture of crop, dairy, vegetable etc. can provide maximum benefit and job opportunity for their development. In view of the above background the present study is designed with the following objectives,

1. To assess the present status of farming systems in various categories of farmers.

2. To study the inter-dependence of various sub-sectors in the farming systems and their role.

3. To study the relationship between annual gross and net income of different farming systems with selected independent variables.

4. To identify and analyze the constraints being faced by farmers in various farming systems.

5. To provide the blue print of the resource oriented farming systems for the overall development of farmers.

Implication of the study

To ensure overall economic development of the farming community the farming system approach is essential. For this purpose, a comprehensive study of various farming systems that are scientific, efficient, economically viable and practically feasible is required. The present study is a wholistic approach towards assessing different farming systems in Dausa district and their economic contribution towards family economy. It is expected that the results of the study will be of great significance in creating a useful database for the farming systems practiced in Dausa district. It will further pave the way for the change agents to replace traditional farming system by introducing new enterprises and will also motivate the farm families to adopt them.

Providing an insight to the various problems faced by the farming families of different categories will suggest some remedial measures to solve these problems and ensure further improvement. It is believed that this effort will have far reaching implications for the policy makers, administrators, extension workers and the farming community in recognizing farming system. The study will provide blue print of the resource oriented farming system for the overall development of farmers.

Limitation of the study:

The research studies in social sciences have face some limitations and the present study was no exception of this rule. The study has the following limitations.

1. The study will be limited to Dausa district of Rajasthan.
2. The findings are based on verbal expression and responses of the respondents. The personal bias of the respondent at any point of time might have prevailed much less taken to check such occurrence.
3. The study will further be confined only three tehsils, fifteen villages and 360 farmers.
4. Though, utmost efforts were made to make best use of standardized tools and techniques of data collection, yet their accuracy can not be guaranteed.
5. Only three categories of farmers i.e. marginal, small and big were included in the study.
6. The study were to suffer from all the limitations normally faced by an inservice researcher.

Organisation of the thesis

The thesis have been divided into five chapters, each dealing with separate aspects and presented in a logical sequence. The first chapter deals with the introduction having information about objectives, scope, implications and limitations of the study. The second chapter pertains to review of literature, while materials and methods has been drawn in third chapter giving details of measurement of dependent and independent variables, tool used, scoring procedure and the statistical techniques followed. The fourth chapter highlights the findings of the investigation with a simultaneous discussion. A brief summary and conclusion of the dissertation has been presented in fifth chapter which is followed by a literature cited. A few appendices appear at the end.

Abbreviations used

A.P.	:	Andhra Pradesh
AAO	:	Assistant Agriculture Officer
B	:	Big
BDO	:	Block Development Officer
BLADD	:	Blantyrc Agricultural Developmental Division
CD	:	Critical Difference

CIRG	:	Central Institute for Research on Goat
CV	:	Coefficient of Variance
DDO	:	Dairy Development Officer
df	:	Degree of Freedom
EO	:	Extension Officer
FS	:	Farming System
FYM	:	Farm Yard Manure
HYV	:	High Yielding Variety
I.T.D.	:	Intermediate Technology Project
IARI	:	Indian Agricultural Research Institute
ICRISAT	:	International Crop Research Institute for Semi Arid and Tropics
IJAE	:	Indian Journal of Agricultural Economics
IJDS	:	Indian Journal of Dairy Science
IJEE	:	Indian Journal of Extension Education
IJPS	:	Indian Journal of Poultry Science
IJSR	:	Indian Journal of Small Ruminants
IRJEE	:	Indian Research Journal of Extension Education
KVK	:	Krishi Vigyan Kendra
LDO	:	Livestock Development Organisation
LP Technique	:	Linear Programming Technique
M	:	Marginal
N	:	Number of Respondents
NGO	:	Non-Government Officials
OBC	:	Other Backward Class
RJEE	:	Rajasthan Journal of Extension Education
S	:	Small
SAU	:	State Agricultural University
SC	:	Schedule Caste
SE	:	Standard Error
ST	:	Schedule Tribe

VAS	:	Veterinary Assistant Surgeon
VLW	:	Village Level Worker

CHAPTER-II

REVIEW OF LITERATURE

A comprehensive review of literature forms an integral part of any scientific inquiry. It is necessary for the researcher to acquaint himself with the work done in the past to delineate the important problem mean. According to Singh (1967) the main functions of review of literature are to determining what work both theoretical and empirical has been done previously, assist in the delineation of the problem area provide basis for theoretical frameworks, provides an insight into methods and procedures, suggests operational definitions of major concepts and provide a basis for interpretation of the findings.

With this understanding in mind the literature pertinent to the problem has been reviewed in light of the objective of the study. It has been presented under the following sub-heads:

2.1 Farming systems in India and abroad

2.2 Crop as an enterprise

2.3 Dairy as an enter prise

2.4 Poultry as an enter prise

2.5 Goat as an enter prise

2.6 Vegetable as an enterprise

2.7 Inter-dependence of various sub-sectors in the farming systems

2.8 Relationship between annual gross and net income of different farming systems with selected independent variables.

2.9 Constraints in adoption of different enterprises in different farming systems

2.10 Blue print of the resource oriented farming systems for the over all development of farmers

2.1 Farming systems in India and abroad

A farming system is not simply a collection of crops, and animals to which one can apply this input or that and except immediate result. Rather, it is a complicated interwoven mesh of soils, plants, animals, implements, workers, other inputs and environmental influences with the strands held and manipulated by a person called farmer who given his preference and aspirations, attempts to produce out put from the input and technology available to him. It is the farmer's unique understanding of his immediate, environment, both natural and socio-economic that results in a farming systems (Tac, Cgiar, 1978).

Zandstra *et al.* (1981) defined farming system "As the farm system, or whole farm system is the production and consumption activities used by a person called a farmer to drive benefits from land, and other inputs through crop growth and the use of technologies available to him under specific

environmental conditions". Farming system "Involves the entire complex of development, management and allocation of resources as well as decisions and activities which within the operational farm unit or a combination of such units, result in agricultural production. The processing and marketing of the products is also directly related to the system that produces them" (ICRISAT, 1981; Krantz *et al.*, 1975 and adopted by Palaniappan, 1985).

Pal *et al.* (1985) defined, the system that "The farming system represents an appropriate combination of farm enterprises viz. cropping systems, livestock, fisheries, forestry, poultry and the means available to the farmers to raise them for profitability." It interacts adequately with environment without dislocating the ecological and socio-economic balance on one hand and attempts to meet the national goals on the other.

"Agricultural systems vary enormously through out the world, ranging from subsistence and peasant systems to commercial and redistribute (communist) system (Hurst, 1974; Morgan, 1978). Contrasts between these systems can and do occur within relatively short distances, often separated by natural or political barriers. There are several sub systems within agricultural system".

Satheesh (1982) in his study in Pithapuram block of Kaveri district (Andhra Pradesh) stated that "The need of credit was more in mixed farming system than in crop farming system. Under each farming system more capital was borrowed at recommended level of technology than at existing level of technology. Capital borrowing increased the net returns under all the farming systems".

Singh and Singh (1982) conducted a study in two villages of Gujarat state and found that "In the area of farming system soil and moisture conservation is of paramount importance. They further said that these villages offer good scope for studying integrated development of improved crop and

livestock based farming system. They also stated that the difference in the socio-economic structures of these two villages and it's consequence offer a unique opportunity for indepth studies of social dynamics and its role in rural transformation."

Mixed farming in Indian sub-continent is mostly subsistence farming. Similar, observation was made by Ballantyne (1985) while studying mixed farming in Sri Lanka. "He emphasized subsistence farm as a system of cultivation which provides maximum security of production related to climatic variation at minimum direct cost, production of crop which can be stored either, under ground or on the farm from one harvest to the next and area of production of each crop governed by the land preparation, weeding and harvesting capacity of its cultivators." He further, revealed that the cultivated land adequately feeds the family plus a small surplus in a normal year and ensures its arrival in a bad year. In a good year, there can be sizeable surplus for sale.

Reddy *et al.* (1986) while studying the effect of various system of farming reported that "Profits from milks, manure, calves, grain and seed were maximum for specialized dairying and decreased as the proportion of arable land increased, profits were greater for crossbreed cows than for buffaloes, crossbreed cows gave more milk at lower cost than buffaloes under all systems except arable".

Nair (1987) classified the agro-forestry systems based on the nature of components (with example of common sub-systems/practices under each system) in to four major systems as below:

(a) Agri-silvi- cultural systems

(b) Agri-silvi-pastoral systems

(c) Silvi-pastoral systems

(d) Other systems

Mary and Michon (1987) carried a survey in penengahan (Sumatra) and show the existence of two farming systems corresponding to two different types of farms. “They stated that the first farming system; features a productive damar agro-forest and irrigated rice fields, with the farmers living in the village permanently. The second farming system features a productive agro-forest and landing cultivation. The second system requires two houses, one temporary on the farm, the other farms in the village. 49 per cent of farms have adopted farming system one, 42 per cent of farms farming system second and 9 per cent practice both the systems simultaneously.

Kalla (1988) stated that “The flexibility in agro-forestry system has generated many variant systems. Some of these included silvi-pastoral, horti-pastoral and agri-horticultural combinations”.

Alteirl and Farrell (1989) studied the farming systems of campesinos of Mediterranean Chile and found the “These systems are diversified systems in these systems, the critical factor is the efficient use of scarce resources is diversity. Thus, campesinos assemble crops, animals and other farm resources to optimize production efficiency, nutrient cycling crop protection etc. farming systems can be divided into two major groups.”

1. Small scale intensive systems

These systems really exceed 1 ha. in size, this limited land area generally does not provide for all the food requirement of the family. On these farms, campesinos typically produce a great variety of crops and animals, and it is not unusual to find as many as 5 or 10 tree crops, 10-15 annual crops and 3 or 4 animal species on a single farm. These systems are somewhat similar, to the home gardens (pekarangan) found in Java reported by Christanly *et al.* (1982). Pekarangan systems are much more complex; it is not uncommon to

find home gardens with 120 plant species assembled in a multistoried vertical structure, very similar to a natural forest.

II. Extensive semi-commercial systems

These farmers range from 5-20 ha in size. These systems are also diversified, but the crop and animal combinations are designed to increase production, producing a marketable surplus. The campesinos devotes much of land to more extensive activities such as pasture for livestock and grain cultivation.

Toky *et al.* (1989) reported different farming systems in western Himalays as:

(I) Agri-Silvicultural systems

Wheat, peas, potato, cauliflower, mustard etc. during the winter season, maize, tomato, pepper etc in summer, grown in mono-culture or poly culture on the permanent terraces prepared across the hill slops

(ii) Agri-Horticultural systems

Leafy and rhizome type are grown in the inter space of horticultural trees such as apple, plum, apricot, peach, almond, pear etc.

(iii) Agri-Horti-Silvicultural systems

Production of fruits and grains and also the much needed fodder and fuel of wood for packing material.

Singh (1992) studied farming systems amongst Mewat area of India. the most prevalent farming systems are crop, dairy, goat, poultry farming systems, crop, dairy, goat, poultry and vegetable farming systems, crop and dairy farming systems, crop, dairy and poultry farming systems, crop and goat farming systems and crop farming system.

Fratkin and Smith (1994) studied problems of pastoral production shared cross culturally by many African pastoralist groups but focuses on variations of household production on experienced with in one particular community of pastoralists, the Arial of northern Kanya and concluded that livestock pastoralism remains a viable food production system in Africa's arid lands.

Mazoyer (1995) summarizes the theory of the evolution and differentiation of farming systems, the structure and operation of these systems and the methodology for examining their socio-economic dynamics. This insight into theory and technique will not open the door to a new technology. However, pertinent the analyses. However, appropriate the projects (or polices), the question of the legitimacy of development interventions still has to be resolved. Aside from emergency relief, intervention is legitimate only of it is requested by the people of their (legitimate) representatives. It is essential that there is a popular suppor for it. A preliminary study should therefore not only deal with technical issues, but also focus on legitimacy. Further added that the people and institutions concerned should be infermed on the aims and modalities of the study and project and the conclusions and recommendations should be submitted to all interested parties for discussion otherwise there will be no support for project participation in its implementation or project impact.

Meertens *et al.* (1996) studied about the significant factors of change in farming systems and concluded that increasing population densities and therefore decreasing availability of agricultural land per capita has occurred generally. In addition, there exist important agro-ecological differences, between the three differently located districts that have also been responsible for the present diversity in farming system. Among these, differences in rainfall and the relative availability quality and type of land resources as related to top sequential land units, are of major significance. Together these factors determined the potential and subsequently the changes that have occurred

during the past 50 years in the major land use systems and crops. In anticipating the direction of agricultural developments and consequently the sustainability of actual and future agricultural systems, differences in the principal agro-ecological factors of soils in relation to the topography (land scape units) should be considered more closely. Such information should be used to complement the broad socio-economic considerations on which most policy decisions, including development aid, are curently based.

Gairola and Todaria (1997) concluded that standard of living of the subsistence farmers of Tehri Garhural Himalyas can be improved by introducing "Small holder production system" introduction of agroforestry with emphasis the production of crops, together with trees to supply fire wood and fodder on the small land are needed. Further unproductive animals should be replaced by productive cattle's.

Diagana *et al.* (1998) concluded the constraints hampering the development of the agricultural system, including degradation of natural resources, lack of water for irrigation purposes, animal health and reproduction problems and lack of crop production skills, were identified using the "Problem tree concept" and were checked with local farmers during 'farmers assessment meetings' in each district. A diagnosis of the agricultural knowledge and information system was carried out. It was found that relationship between most of the actors are weak. Based on confrontation of the different strategies and visions of the stakeholders (research, development workers and farmers), recommendations were formulated. Forest and pasture resurrects can only be used fruit fully if farmers are implicated in the management of these resources, educated and made aware of their importance for the agro-pedological balance of the mountainous ecosystems. A well-developed extension organization is necessary to improve crop growing skills and tackle animals health and reproduction problems. Feasibility studies and actions aimed at mobilization

and management of available water resources are recommended regarding the lack of water for irrigation purposes.

Udo and Cornelissent (1998) stated that livestock research and development have to be reconsidered to understand the possibilities for a more sustainable animal production in resource poor farming systems. Animal production systems are complex and dynamic and they provide more than just food through their versatile roles in supporting human welfare. The objective of research, education and extension should be set in relation to this broad perceptive on livestock keeping. Changes in land use and economic conditions are the driving fores for change in animal production systems. A system approach is needed to assess disciplinary research focused on production levels of individual animals and sustainability prospects of new technologies with in context of farming system.

Singh (1998) found in his research that a farming system approach to controlling desertification and sustaining dry land farming in the desert ecosystem of India. Further resulted initial efforts to develop prototype farming systems for sustainable desert agriculture. The strategy involves synergistic integration of dry land farming with animal husbandry and amelioration of degraded land. Field experience of more than two years had revealed that farmers are willing to join in participatory technology development. The on farm research programme aims to produce prototype of sustainable desert agriculture.

Marfo and Wigging (1999) studied cropping system and pattern and returns to cropping system in Ghanais 'transition zone' were forest starts to give ways to guine savannah and found that villages with good market access have been a change in their farming over the past decade, evident in two dimensions. One is the greater frequency of cropping and indeed continuous cropping on some fields. The other is the introduction of some high value costs crops, tomato and garden egg, produced almost exclusively for the market.

Vegetable, production is however, limited due to the high inputs of labour and heavy cost spending on production inputs. Therefore, most farmer plant only very small area to vegetable. The new introduction have not replaced the older systems. Yam cultivation continuous and give good returns, but can only be practiced on land that had been will rested.

Choprakarn *et al.* (1999) studied farming systems and reported that many, changes occurred among families. Sub dividing their property into small plots for each family member. Each household wanted to grow rice both for home consumption. Farmers can be grouped according to the existing agricultural systems, namely. Group I does not produce enough rice for home consumption and the main source of cash is from off farm income; Groups II can produce enough for home consumption and have excess to sell and more than 50 per cent of their cash comes from off farm income; and Group III can produce enough for home consumption and the major source of income is from on farm production. It is recommended that farmers in the first 2 groups should be provided with skills to develop other activities such as handicrafts and animal production. Farmers in the third group should be encouraged to adopt, intensive and low risk farm activities, such as integrated farming.

Naved (2000) studied intrahousehold impact of modern agricultural technology and reported that for most women, income gains from implementation of vegetable technology are not substantial. The scope for implementing the technology is limited to the household plots resulting in small size of production and income. In addition whatever the income women do not automatically have controlled over it, as sale of produce in mostly mediated by man. Fish production by women's groups appears to premise better results in challenging the gender division of work space vegetable technology has marginally increased women's consumption of these particular vegetables, but mainly because the vegetables are not considered as tasty as traditional varieties. Fish cultivation clearly failed to improve the traditional

pattern of intere household food distribution, which favoures males, it still seems to be an effective strategy in the long run as it strengthen than women's position and may provide them with greater access to food in the future.

Nasr *et al*. (2000) studied on livestock production system and rangeland use in the EI-ouara de tataouine region with in the farm work preliminary assessment for agro-postoral project and reported that even in EI-ourea the traditional pastoral system has evolved and given rise to agro-pastoral farming system.

Sheokend *et al*. (2000) studied 300 landless (no land), marginal (0.1-1.0 ha), small (1.1-2.0 ha), medium (2.1-3.0 ha) and large (> 3.0 ha) farmers in Haryana, India to compare the economics of different farming systems in a rice-wheat cropping sequences and the results showed that higher gross and net returns per Rs 1000 invested, as well as higher per cent return over gross investment in mixed farming compared with other farming systems. Mixed farming also generated more income and human labour employment than arable and dairy farming.

Lotan Singh and Chattaraj (2000) surveyed livestock farming system in two villages of Haringhata block, West Bengal and found that a combination of cross-breed and deshi cattle and more than one animal type is considered to be more sustainable than having only a single bred or single animal farming system.

Phengsavanh *et al.* (2000) studied requirements to manage livestock and forage whilst stabilizing shifting cultivation in Northern Laos and concluded that farmers are strongly dependent on ruminant livestock for live hood security. Both groups of farmers, those who realize there are problems and are trying to do some things and those who do not have access to address problems they have recognized are prepared to work with development workers to explore ways in which local feeding technologies can be strengthened by

introducing new, robust forage species and evaluating new ways of incorporating then into existing farming systems.

Sharma *et al.* (2000) evaluated the input income and employment of the Parua Nala Rainfed Watershed Development Project in Madhya Pradesh India and resulted 100 per cent increase in employment over the base year. Per rupee return increased over the base year, being highest for small farming (Rs. 2.40 to 2.55) followed by medium (Rs. 1.95 to 2.08) and large farms (Rs. 1.79 to 1.92) and concluded that in the short run the small framers obtained greater advantage from the project as compared to medium and larger farmers. This is in line with the national objectives of fulfillment of the weaker sections of society and bridging the gap of income and employment of farmers.

Ndaeyo *et al.* (2001) studied the farming systems in South-eastern Nigeria and revealed that 72 per cent of the respondents engaged in both crop and livestock production. Intercropping was the dominant cropping system with cassava, yam and maize as the principal arable crops, while cocoa, kola nut, oil plam, rubber, cashew, banana and citrus were the main permanent crops. The dominant fallow period was found to be 3 to 4 years and most farm size were less than 2 hectares. The study also showed that 88 per cent of the respondents know of fertilizer, 61 per cent know of other agrochemicals, while 56 per cent and 16 per cent utilized them, respectively. Findings generally point to inefficiencies in some of the existing farming practices.

Neupane and Thapa (2001) studied the impact of an agroforestry intervention project on soil fertility and farm income and the benefit cost analysis showed that the agricultural system with agroforestry was more profitable than the conventional system. Result also showed that the introduction of multipurpose trees. Such as mulberry (*Morus alba*) for sericulture could further enhance the profitability of agroforestry based system. Thus in the hills, agroforestry has potential for enhancing food production and

farmers economic conditions in a sustainable manner through its positive contribution to soil fertility and household income.

2.2 Crop as an enterprise

The crop cultivation in India is subjected to a high degree of risk and uncertainty and provides only seasonal, irregular and uncertain income to the farmers.

Paudiyal (1983) while evaluating the four innovations, namely, rice, wheat, maize and upgrading of buffalo in a whole-farm context in Nepal, observed "The combination of crop technologies with upgrading buffalo herd as profitableable, although the supply of livestock feed and cash resources were important constraints on the expansion of their cropping pattern."

Sharma and Moorti (1984) in his study stated that "The marginal value productivity of land increased when labour was hired in and capital was borrowed in the optimal plans using modern technology. It was also indicated that under modern technology with existing resources, the marginal value productivity of capital was higher in both the categories of farm."

Singh and Saini (1986) found that "Diversification of crop farming with high-yielding milch animals helped in increasing the income and employment of small land holders in Patiala district."

Swaminathan (1986) suggested that "In the area of economic sustainability the urgent tasks facing us are:-

(a) Reduction in the cost of producing without sacrificing the yield and:

(b) Optimizing the economic benefits from the available resources of land, water and labour, to farming family through a multiple cropping, mixed cropping, and mixed farming including livestock and agriculture-cum-aquaculture system."

Deoghare (1987) conducted a research in Karnal district of Haryana and concluded that "More optimization of resources at existing level of technology without capital borrowing considerably increased the net returns of tractor operated while there was slight increase in case of bullock operated and bullock plus tractor operated farms. The per capita income of farmers on tractor operated farms was above the poverty line, while in other two situations it remained below he poverty line. The net returns of tractor-operated farms further increased with the availability of credit facilities. In case of bullock operated and bullock plus tractor operated farms also the net returns increased with the availability of adequate credit but the per capital income still remained below the poverty line. Optimal allocation of resources with adequate credit facilities along with recommended level of technology increased the incomes by about 57.72, 56.14 and 45.25 per cent in case of bullock operated, tractor operated and bullock plus tractor operated farms, respectively." The total human labour employment increased in all the optimal plans of crop farming system under different farm situations at both the levels of capital availability and technology. It was also observed that the higher increase in employment was under bullock-operated farms as compared to tractor operated and bullock plus tractor operated farms.

Bouis and Haddad (1994) investigated on the nutrition effects of the commercialization of agriculture and reported that maize productivity in the study area is low and generally maize tenants would realize higher income by working as agricultural labours. Sugarcane production is more profitable than maize production. Raising household incomes appears to be necessary but not sufficient condition for improving pre-schooler nutrition. There are a substantial number of households that are 'looser' in the process of agricultural commercialization in Mindanao. Households that access to land have suffered severe declines in income with the children of these households exhibiting significant growth defects. Winners are the landowners who switched to sugarcane. A major mistake in the development of export cropping in

Mindanao was the relative exclusion and small holders in the development process.

Kweyuh (1994) carried out study about the ecological and social impact of tobacco production and reported that in some cases, farmer with smaller holdings have planted all their land with tobacco, relying on tobacco income to buy food. While many food crops were still cultivated, their quality has suffered due to neglect as efforts are largely concentrated on tobacco. Such a massive expansion in tobacco growing needs proper management if socio-economic and environmental consequences are not to worsen. Farmers need to be educated about tobacco growing and its effects on the environment. The farmers need to be moved from riaverine nurseries, but this will be difficult without the proper development of pipe water. Farmers must also begin to grow more indigenous trees.

Seyoum *et al.* (1998) investigated the technical efficiency of maize producers and found that stochastic frontier production functions in which the tehnical inefficiency effects are assumed to be functions of the age and education of the farmers, together with the time spent by extension advisor in assisting farmers in their agricultural production operations. For the cross-sectional data obtained for the 1995-96 agricultural year, Cobb-Donglas stochastic frontiers are fund to be adequate representation of the data, given the specifications of the tranaslog stochastic frontiers for the farmers with in and outside the project. The empirical results indicate that farmers within the SG-2000 project are more technically efficient than farmers outside the project, relative to their respective technologies. The mean frontier out put of maize for farmers with in the SG 2000 project is significantly greater than that for the farmers out side the project.

Zeller *et al.* (1998) reported in his findings that maize is the major share crop in crop enteriprises and for food staple. Given limited off farm employment opportunities, much needed increases in household income for

improving food security must come from gains in agricultural productivity through better technology and more profitable crops. In the past, hybrid maize and more recently tobacco were promoted by policies for increasing small holder income. An analysis and determinants of adoption of these two crops and related income effects is presented. Apart from factor endowment and exposure to agroecological risks, differences in the household's access to financial and commodity markets significantly influence its cropping shares and farm income.

Kumari and Singh (1999) studied farmers participatory assessment of late sown wheat production technologies with the objective of refinement of farmers needs and prospective. Four criteria, namely profitability, compatibility, agroclimatic suitability and operational feasibility were decided through a farmers participatory approach (FPA) and found that small and low cost interventions like use of improved seeds, adequate seed rate and immediate balanced dose of fertilizers could considerably boost the productivity and profitability of late sown wheat in rainfed ecosystems of the Chhota Nagpur Plateau.

Gautam *et al.* (1999) studied cultivation of soyabean-wheat in three triabal villages and three economical backward community of district Chhindwara (M.P.) and observed that on tribal farms. The per hectare cost of imputed own and hired human labour was Rs 1734 (25.77 per cent of cost). The rental value of land was Rs 1138 (16.91 per cent), bullock labour Rs 776 (11.33 per cent), and compost and chemical fertilizer Rs 1023 (15.22 per cent). For the community farmers, the average cost of respective inputs came to Rs 2876, Rs 1724, Rs 1175, Rs 2017 per hactare which was 28 per cent, 16.66 per cent, 11.35 per cent and 19.49 per cent of cost. The additional yield and income from soybean-wheat production was higher on community farms.

Jawahar and Chaudhary (1999) studied cropping pattern and the proportion of area covered by different crops in Muzaffarpur district of Bihar

state India and found that food crop dominated the cropping pattern in both categories of farms though the dominance was higher on large farms. The small and marginal groups of farms followed 12 different rotations compared to only 5 in the large groups. Expenditure on human labour dominated costs in both categories of farms followed by that for chemical fertilizers. Marginal and small farms were more efficient and obtained more income per unit of land. However, with their small holding size, they were operating their farms at almost subsistence level and had a low level of marketable surplus. The shift from food to non food crops has been observed more on small and marginal farms as compared to large farms

Abduali and Huffman (2000) surveyed 256 farmers in four district of Northern Ghana for household's profit efficiency and the relationship between farm and household attributes and profit efficiency. The main hypothesis are that, household rice production decisions are consistent with profit maximization, and to the extent that profit inefficiency differs across household, it is related to farmers schooling, specialization in rice production, and access to credit and greater specialization, and being located in districts where extension services and better infrastructure are significant variables for increasing profit efficiency. Increasing participation in non-farm activities by farmers, however, tends to lower profit efficiency.

Gaytancioglu and Surek (2000) investigated the use of inputs and determines production costs at farmer level in three rice growing regions in Turkey and found that there are great differences among the regions in terms of fertilizer use. In general, farmers apply nitrogen in exclusive dosages, far in excess of the recommended rate. They also use high rates of herbicides. Rice production is more costly than for many other crops, so the majority of rice farmers need credit. Machinery is not used as widely in rice cultivation as for other crops. South Marmara region has the cheapest rice production cost ($.30/kg) followed by Thrace and the black sea regions at $.33/kg. Because, of

low grain yield per ha; the most expensive production cost was found in South-eastern Anatolia.

Soni *et al.* (2000) studied the impact of improved wheat production technology, including high yielding varieties with cultural practices, in Sagar district, Madhya Pradesh, India reported that demonstration fields produced significantly higher yields than the farmers practice. Farmers harvested 29.81 q/ha and 14.17 q/ha under irrigated and unirrigated condition, respectively, with the traditional system. However, farmers adopting advanced technology had 61.92 per cent, 76.07 per cent higher yields as compared to the traditional system. The study concludes that the investment in modern technologies proportionately enhanced out put and net income.

Lanjewar *et al.* (2000) studied on socio-economic consequences of change in cropping pattern in district Wardha (Maharashtra) and revealed that the large scale change is due to introduction of soybean in place of cotton and sorghum. This significantly increased the annual income of farmers and consequently resulted in improvement of farms, loan repayment and domestic expenditure.

Adesina and Quattara (2000) studied simple risk programming model to assess the effect of price and yield risk on the income of small holder farmers in 'Savanna Zone' and evaluated that significant reduction in income risk (and increased income gains) can be made by reallocating the existing crop mix. It is important to consider not only the yield of alternative crops. but also the yield risk, price risk and income risk that farmers face in adjusting their cropping patterns. Second to reduce production risks faced by farmers, emphasis should be placed on yield-stability of technology interventions intended for farmers in this zone

2.3 Dairy as an enterprise

"The efficiency of crop-animal interactions is most pronounced where production resources are scarce. They are, therefore, crucial to the improvement and success of small farms, where production potential is otherwise limited, and where the possibility of capturing and exploiting additional crop and labour energy by raising animals is of relatively large importance. In the most productive crop-animal interactions, the animal is used as a source of power to farm operations as a source of milk for domestic consumption as well as for sale and as a consumer of various crop by-products and also as a means of recycling nutrients into crop land. This near total interaction in the most common animal-crop relationship on small farms in Asia and its productivity accounts for increasing popularity of this type of system in that region. The draft animals tend to be more common on small farms. They require little capital investment from the small farmers as they are mostly obtained from own cows or buffaloes on farms or can be bought cheaply when they are young. The operating cost of a work animal is also relatively small, making it admirably practical for a farming system in which cash flow is extremely limited. The better draft animals. However, are usually not sold until they outgrown their slue as workers, when they bring reduced prices at market", stated Harwood (1979).

Gangwar and Bhatia (1980) studied the economics of milk production and optimum live-stock-cum-crop combination for less than 2.2 hectares farms in Haryana and concluded that "Local cow could not compete at all even with existing level of technology. When improved technology was recommended. Buffaloes could also not compete with the crop even though capital constraint was relaxed. They emphasized the importance to popularize crossbreed animals. The study revealed that dairy provided additional employment for human labour on small farms with additional availability of capital."

Balakrishnan (1980) stated that "The gross income from crop and dairying was found to be Rs. 3995.63 per acre in mixed farming on small

farms, Rs.3947.48 on medium farms, and Rs. 4192.94 on large farms. The income contribution on small holdings through dairying was 26.70 per cent to total gross income, much higher than that of medium and large holding (10.30 and 11.05 per cent respectively)."

Saini and Singh (1980) stated that "Integrated crop and milk production provides remarkable scope for generating employment on small farms. The authors emphasized the importance of availability of both short and medium term credit to the farmers for adoption of new technology."

Talathi and Borudae (1980) studied the economics of mixed farming in Kulaba district of Maharshtra and indicated that "Mixed farms (crop and dairy) were superior to the arable farms in respect of providing more gainful employment to family labour."

Pawar and Sutar (1982) indicated that "Gross returns in respect of crop and livestock production increased since obtaining bank finance. The increase in gross returns from these activities was, however, greater than the operating cost. As a result, there was an increase in net returns from these activities."

On a mixed farming system of South-east Asia, Guzman (1983) found that "Integration of crop and livestock and in particular dairy beef farming, could have a profound effect in Asian agriculture and rural development. It would raise soil fertility, production and income per hectare and his standard of living, but this would require better roads to facilitate marketing of farm products, use of available farm and industrial by products and of available farm labour."

Weber (1984) while analysing the interaction between economic, social and natural factors in the development of livestock farming in India since independence to the present day observed "Less numbers of livestock in more densely populated area, while it was more in less densely populated area. Competition for food was the main factor in the relation between populations

and livestock distribution. Industrialization enhanced the production of cereals and also increased the volume of production for markets, which in turn-increased capital use of farms machinery and productivity of cattle. Farmers were increasingly specializing in milk production near town, industrial development influence agriculture production and livestock farming. Farming is becoming more efficient and more specialized, adapting to the different external environments."

Saini and Singh (1985) used mixed integer programming to develop the optimal plan for small farm in Punjab. The results showed that "The diversification of arable farming with livestock activities resulted in an increase in income ranging from 12.21 per cent to 54.15 per cent. They concluded that the dairy enterprise can easily justify its role to diversify the crop farming for higher income on the small farms."

Gupta and Patel (1985) in their study indicated that "Employment generation was higher in dairy enterprise. Rearing herd of 30 cross-breed cows was, on an average, of the order of 3.058 man-days per-year. If 273 man-days of employment in a year was taken as one standard person-year as per the norm followed by the planning commission, the average employment generation by 10 cows dairy unit would be of the order of more than 11 standard per year.

Thorve and Galgalikar (1985) observed that "The average returns to investment ranged between 35 to 64 per cent on different size groups of farms without milch cattle but the same was more that 80 per cent on farms with milch cattle. The dairy enterprise increased the efficiency of capital by 36 per cent. The investment of Rs.100 yield a return of Rs. 184 on the farm with milch cattle as against Rs. 148 on farm without milch cattle."

Devadoss *et al.* (1985) explored the possibilities of increasing income and employment through crop and dairy farming on irrigated and unirrigated small farm. Results indicated that "Inclusion of dairy in crop plans increased

the farm income and labour employment on both irrigated and unirrigated small farms. On the unirrigated small farm the dairy enterprise played a vital role in augmenting farm returns. And labour employment. There was considerable scope for diversification by including dairy enterprise and there by increasing the farm returns. When liberal credit facilities were made available, the net returns from crop and dairy enterprises increased on both types of farms. The net returns of unirrigated small farms were more than that of irrigated small farms."

Deoghare (1987) reported that "On bullock operated farms, at availability of capital, crop and dairy farming system showed little increase in net returns when compared to crop farming system at existing level of technology with the relaxation of capital, however, the net returns increased up to Rs. 6847.85, Rs.11079.30 and Rs. 6238.35 in case of bullock operated, tractor operated and bullock plus tractor operated farms at existing level of technology, respectively. He further stated that the total human labour employment was higher in all the capital plans in crop and dairy farming systems than that of crop farming system under different farm situations. Owing to the liberalization of credit facilities at recommended level of technology increased the total human labour employment by 97.82, 90.03 and 86.31 per cent on bullock operated, tractor operated and bullock plus tractor operated farms than that of existing plan, respectively".

Thamas and Bhatt (1994) studied the transformation of the rural livehood system and reported that buffalo keeping and milk sales have increased the well-being of many households while at the same time creating in equalities in roles and responsibilities greater inequalities between *Brahmin* and Tamang residents, and put pressure on the ecosystems for increased supplies of fodder and fuel wood. Evidences suggested that there is a critical need for attention to be given to the social and particularly gender based,

implication of maintaining livestock for milk sales and to the ecological underpinnings of this livehood system.

Sangu, (1995) he reported that investment was found to be higher in towns than in village for all type of milch animals. With in the animals investiamt was maximum on buffaloes followed by cross-breed cows and deshi cows. He also reported that cost incurred on maintaining the cross-breed cows found to be higher than buffaloes and cows in village and towns.

Malhotra (1997) found the role of livestock in the rural economy of India and indicated that livestock resource figures show that, next to agriculture, it is the major source of income and employment for the rural population. The overall average income generated in rural area as in 1992-1993 was 73.6 per cent from agriculture and 26.4 per cent from livestock and the income from livestock accounted for 100, 48.15 and 25.32 per cent of the total income of landless, marginal and small land holding household, respectively. Among various agricultural products, milk was the single largest contributor to the output from agriculture in 1993-94 and had an estimated gross value of Rs 437 billion. More time was spent on cow and buffalo rearing than any other agricultural activity on the farm. The importance of cows and buffaloes as a source of draught power as well as milk and meat in rural areas. The conversion efficiency of feeds into milk and other food products by animals, further explained and the economic importance of declining to the rural economic of India.

Nicholson *et al.* (1999) studied the factors influencing adoption of three related dairy technologies in costal Kenya and found that adoption of a grade or cross-breed dairying animal may results in substantial increase in household income, can generate paid employment and may improve the nutritional status of pre-school age children in the household, economic analyses, which controlled for numerous confounding factors produced consistent support for the impact of adoption on household income and paid employment.

Ranjeet and Sharma (1999) Evaluated the impact of dairy co-operatives on resource use structure, milk production, marketed surplus, income and employment of rural household in Nalanda district, Bihar, India and found that the dairy co-operative society has been successful in improving the socio-economic condition of milk producer household, especially that of the landless household and marginal and small farmers. It has also resulted in introduction and dissemination of improved technologies in the area of operation. By increasing income and employment of the weaker section of household, the dairy co-operative tend to meet the social objective of equity.

Koshta and Chandrakar (1999) studied the diffeence between members and non-members of milk co-operative societies with regard to distribution pattern of dairy animals, productivity cost and returns of milk production, disposal pattern of fluid milk in Raipur district, Chhaittisgarh region, Maharashtra and observed the non members have higher operational costs per cow per day and lower cow productivity than member of milk co-operative societies. Returns are higher for non-member as they obtain higher prices than members. Cost benefit ratio is higher for buffaloes than cow due to the low operational cost of milk production.

2.4 Poultry as an enterprise:

Kumat (1975) in his study "Economics of Egg Production," A case study in Udaipur conducted in Udapur city, twelve out of 44 poultry units were selected for the purpose. The size of those 44 units ranged from 200 layers to 1100 layers. They were grouped into three sizes viz 200-500, 500-800, 800-1100 layers. From each group, four units were taken, the data were collected by survey method for the year 1972-73. The data for all units in the respective groups pooled and average out to arrive at synthetic situations and the conclusion draw were that total loss per 100 egg ranged from 20.72 to Rs. 45/- with an average of Rs 25.70/-. Total cost per layer was ranged from Rs. 52.20/- to Rs. 71.49/- with an average of Rs. 57.67/-. Feed cost was 76.54 per cent of

the total cost. Gross return as well as net return showed increasing trend with increased from size. Further more, it was witnessed that feed cost per 100 eggs and labour cost per 100 egg declined as the size of the flock increased. Return from egg accounted for the major part of the total return.

Sethuraman *et al.* (1978) conducted a study "Cost and return analysis of egg production in and around Madras city" This study was directed towards the identification of various economic factors contributing to costs and returns. A purposive sample of 65 layers farm were drawn and enquired with a pre-tested questionnaire. The average gross cost of production of 100 eggs was Rs. 34.34 layers farm had the least cost of production and no difference was observed between the strains of birds studied. Of the component of cost, feed cost formed 71.66 per cent followed by bird depreciation, interest on capital, miscellaneous costs, labour cost and depreciation on house and equipment. The bulk line cost was found to be Rs. 31.53 per cent per 100 eggs. Total receipts and profitability per bird worked out to Rs. 95.95 and Rs. 18.09, respectively. The study also revealed that gross cost of production decreases as farm size increased.

Rajpal *et al.* (1978) in their study entitled "Cost and return analysis of egg production in and around Madras city". Evaluated the performance of four commonly available commercial egg laying stocks and compared up to 52 weeks of age. The net profit per bird up to 52 weeks was Rs. 2.90, 6.06, 8.45 and 7.16 for stock category A, B, C and D, respectively. The basis for classification of the stock in to four groups was management difference and isolation of male birds from female birds at the age of eight weeks.

Nugabhushana *et al*. (1979) took a study "Economics of poultry farming at Bapatala in Guru district of Andhra Pradesh, five poultry units in and around Bapatala town were selected for to study and data were collection by survey method and were reduced to a unit of 1000 birds. Cost of production and various items of income were calculated to arrive at the profitability of poultry

units. As per the result to analysis, 1000 birds poultry unit was getting a net profit of Rs. 5740 and cost of production of an egg was calculated to be Rs. 0.34 as compared to its sale price of Rs. 0.36, there by giving a net profit of Rs. 0.02 per egg.

Charyulu (1980) in his study "A study of production and marketing of eggs in Hyderabad city, the poultry farms in and around Hyderabad city were classified into small with 1000-2000 layers medium with 2001-5000 layers and large with 5001 and above layers and ten farms under each category were selected at random for collection of primary data. The share of profit by the large farm was found to be as highest as 72 per cent followed by 20.50 and 7.50 per cent by medium and small farms, respectively.

Raja (1980) took a study " Economics of poultry farming in Namakkal Taluk- An inter- group comparison" farm size of 350, 750, 1500 and 3500 birds were taken by survey method. The result of the study showed that different size of poultry units were getting a net profit of Rs. 1157, 5617.50, 7270, 24980 and 29943 per farm size, respectively. The cost of production of an egg was calculated to be Rs. 0.35, 0.29, 0.32, 0.27, and 0.29, respectively as compared to the sale price of Rs. 0.33 thereby giving a net profit of Rs. 0.02, 0.04, 0.01, 0.06 and 0.04 per rupee invested, respectively.

Sirohi *et al.* (1980) in their study in the union territory Delhi stated that "In the existing plan, there was no poultry enterprise on the sampled farms. The optimal plan suggested a poultry enterprise with 489 birds on marginal farms and 269 birds on small farms for maximization of farm returns. This was the reason of the large increase in the income of small and marginal farmers. The introduction of poultry enterprise on marginal and small farms was possible if liberal credit facilities were made available to these farmers for this enterprise. The largest need for borrowing capital was noticed marginal farms (Rs.23,925/-) followed by small farms (Rs. 14355/-) and medium farms (Rs.11,784/-) the study also indicated that the marginal farmers required a credit of Rs. 1500/-

for dairy enterprise and Rs.9000/- for poultry enterprise. Besides this, the optimal plan suggested a cross-breed cow in place of buffalo on small and marginal farms and two cross-breed cows in addition to a buffalo in medium farm for increasing the farm returns."

Singh *et al.* (1981) in their study in Karnal district of Haryana indicated that labour can be employed on the small poultry units with around 1000 birds. If the existing stock of birds increased to about 250 birds, it can provide gainful employment to a worker in the households. It also concluded that rationalization of the use of various resources in crop, dairy and poultry farming may lead to increased labour absorption."

Sharma *et al.* (1981) conducted a study in Delhi territory and concluded that "Farm returns could be increased by 10,72,37 and 21 per cent due to resources optimization marginal, small, medium and large farms, respectively, Over the existing plan with one dairy cattle, by the introduction of poultry enterprise alone, the marginal and small farms, could increase their income by 18.68 per cent and 4.87 per cent, respectively. Thus, the introduction of poultry enterprise along with resource optimization could increase the income by 31 per cent and 80 per cent on marginal farms and small farms respectively. Due to optimization of resourced and human labour employment increased by 231 man-days and 329 man-days on medium and large farm, respectively".

Lalet *et al.* (1984) concluded that "On an average, the poultry enterprise increased the total employment by 19.38 per cent and income by 5.62 per cent. Incase of dairying, the total employment increased by 14.32 per cent and income by 4.15 per cent. It also stated that share of poultry and dairy in the total income increased with the size of farm."

Krishnamohan (1984) in his study stated that "A unit of 100 poultry birds give an income of Rs. .200/- per month after deducting all the expenses like feed and bank installment."

Singh (1994) conducted a study " Economics of poultry farming in Haryana, categorizing poultry farms into; small, medium and large". To analysis the profitability aspect, a number of measures of commercial efficiency were employed. As far as net return per bird is concerned it was found to be Rs. 0.42, 0.99 and 1.47 on small medium and large size farms, respectively.

Safalaoh *et al.* (1998) noted that broiler production is one of the fast growing income generating enterprises among poultry farmers. Further, they concluded that the lack of proper knowledge and technology in poultry husbandry and nutrition, of locally available ingredients for formulating low cost balance rations of adequate and reliable veterinary pharmaceutical facilities and services, and of accessible credit as well as an ineffective extension net work and a poor processing and marketing infrastructure are the important constraint for made poultry enterprise as highly income generating sector among the farmers. According, them adequate resources, appropriate research and favourable government policies, solution to these problems can be found to help advance the broiler industry as income generating enterprises.

Ashiha Sisay (1999) studied the economic performance of poultry farms in Ajmer (Raj.) and concluded that cost of raising 100 pullets, cost per 100 layers and per 100 eggs and cost per layer and per egg in general followed decreasing pattern with increased farm size, the net return from overall 21 sample farms, net return per 100 layers and per 100 eggs and net return per layer and per egg were found to increase as the farm size extended.

Rai *et al.* (2000) conducted a study in 8 villages in rural South Andaman India to evaluate the egg production performance of fowl under open range system. They concluded that with suitable breed back yard poultry farming is highly feasible in these Island, in which management and transportation problem are negligible

2.5 Goat as an enterprises:

The goat is a versatile animal. It is known as the 'poor man's cow' in India and as 'wet nurse' of infants in Europe. Goats can be kept with little expense marginal and undulating land. Unsuitable for other types of livestock, may be used and any inexpensive shelter will suffice.

Goat milk is cheap, wholesome, easily digestible and nutrition's. It is recommended for use in dyspepsia, peptic-ulcer and pyloric stenosis. About 75 per cent of the total world production of goat meat is produced in tropical and sub-tropical countries India contributed about 50 per cent of the total production in this region. Goats are also the important source of fresh skin mainly used in lather trade and handicraft and of pashmina and mohair, the most valuable textile fibre. Goat keeping has now assumed a key position in the rural development programmes in the developing countries. To the poor, rearing of goats, serves an insurance during economic crisis, goat provides, horns, hooves, blood and bone meal, all of which can be sold. In mountain regions of Nepal and Bhutan, they are used for transport.

"The controversy over goats is on the damage it causes to the environment. On one hand goat is accused as the major cause of deforestation and soil erosion and on the other hand it is claimed as a useful animal for poor people and is responsible for cleaning the bushes and making land worth cultivation (Sahni, 1990).

Prabhakaran and Thirunavakkarasu (1995) studied the participation of women in goat rearing in Tamilnadu and reported that on an average 184. 30g and 437 labour days were required per year in small medium and large size herds, respectively of which 88-91 per cent were contributed by women and children. The results by agro climatic region did not differ greatly indicating that goat keeping is adaptable to varying environment

Singh and Riyazuddin (1996) studied the participation of women in semi-arid regions of Rajasthan in sheep rearing and concluded that, women performed 60 per cent of the task in sheep farming and provided 50 per cent of the labour associated with crop farming. Sheep rearing was characterized as only a subsidiary activity based on castes.

Deoghare (1997) concluded a survey of the availability of resources and the income and employment potential of a sample of 451 goat raising households in Mathura district Uttar Pradesh, India. The main occupation of households was : agriculture (68.51 per cent), dairy (10.20 per cent), goat keeping (20.40 per cent) and sheep farming (0.89 per cent) or through wholesalers and retailers (13%). The number of family members and farm workers increased land holding size increased. Average net income per household per year from livestock farming was 26.69 per cent and from crop farming 73.31 per cent. Average labour employment per household per year from goat, sheep, buffalo and crop farming was 23.34 per cent, 1.96 per cent, 33.17 per cent, and 41.53 per cent, respectively.

Alvarez and Pazmotola (1997) resulted in their research that the principal economic stages in establishment of goat milk production were identified and characterized, and then principal component and cluster analysis were used to identify different types of producer. Proposals are discussed for goat milk production each of the 6 farming situations identified.

Adeymo (1998) found in his study that small ruminants were either reared in an extensive management system or a semi-intensive management system, with the majority of farmers selling animals direct to consumers (64 per cent), through middle men (23 per cent) or through wholesalers and retailers. It is concluded that extension agents would encourage a better production system along with the use of credit.

Killanga and Traore (1999) studied causes responsible of productivity differences between sheep and goat flocks in a central Malian villages

belonging to an agro pastoral sub system associated to a rainfed millet culture. Management factors, socio-economic characteristics of agro pasters and sheep and goat productivity parameters were simultaneously followed up and analysed. The results have shown that both sheep and goats were not managed in the same manner and that the observed causes of productivity differences between flocks are related to the agro-pastor's personal production means, to his methods of management of animals, to his apprentice-ship of the stock breeder profession and to detention of other species.

Sirohi and Rawat (2000) studied resource use efficiency on small and large farmers and reported that human labour was found to be the most significant factor influencing the value of sheep products on both small and large farms. Use of labour was sub-optimal on small farms and near optimal on large ones. Increasing expenditure on miscellaneous items could inhance the income of large breeders. It is concluded that scope exists for sheep farmers to increase their income through better coordination and utilization of available resources.

2.6 Vegetables as an enterprise

After achieving self-sufficiency in food grain production, supply of nutritious and balanced diet is the highest priority. The availability of 120 gms of vegetables and 40 gms of fruit against the recommendation of 280 gms and 120 gms, respectively per capita per day, is far below the desired level. Nonetheless, India is the third largest producer of fruit in the world after Brazil and the U.S. and the second largest producer of vegetables after China.

Pandey (1990) made the following recommendations for future plans for horticultural development.

a. Horticultural development needs a storing research backup in all four major constituents.

b. Effective steps for implementation of the nursery registration/ certification regulations, supply of genuine planting material and genotype and popularizing high density concept need to be taken.

c. Emphasis should be laid on increasing production by using modern technology and inputs,

d. Strengthening post-harvest management by setting up horticulture grower's co-operative marketing societies needs priority.

e. Credit facilities at concenssional rates to extend the area under horticultural corps and utilizing waste lands to some extent, should be made available be made available.

f. It is necessary to carry out the production programmes in concert with the other National Rural Development Programmes.

Seshadri (1990) stated that "Nearly 60 kinds of leafy, fruit and other varieties of vegetables and starchy tubers are cultivated. The status of vegetables production in India has been unique, consisting of diverse kinds such as home or kitchen gardens of urban areas, market gardens such as those near the metropolitan cities and truck farming involving long distance haulage and catering to distant terminal wholesale markets as in Chhota Nagpur plateau (Ranchi), the lower hills of Himachal Pradesh (Solan) or the Poona-Nasik belt of Western India. He further stated that there is a specialized and expensive vegetable growing system like the river bed growing of cucurbits along the Ganga, the Jamuna, the Narmanda, the Tapthi, the Krishna and the Pennar riverain regions. Rainfed cultivation of vegetables is practiced in Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu.

Khandelwal (1991) studied the participation of women in vegetable production and found that all the respondents had medium level of participation. All the respondents were found to be participating in seed

sowing, transplanting, whereas, 71.42 per cent of them were involved in watering activities. Nursery raising and inter cultural operations were the areas where the participation was higher, 71.42 per cent and 61.42 per cent, respectively. Women were not involved at all in land preparation, procurement of inputs, plant protection and disposal of produce.

Jefremovas (1993) studied the seasonal glut of vegetable 'green tide' in the market in Baguio and found that non-market relations based on kin, community. Friendship, neighborhood and nuclear family relations provide access to land, labour, tools, capital and knowledge, as well as access to common property such as clean lands and communal forests. These resources allow integration of market production with subsistence, production market based strategies centre around risk broadening through the use of multiple sources of income, such as wage labour, multiple enterprises or diversified investment.

Braun and Immink (1994) reported that production of export vegetables increased on farm employment, reducing the need to rely on uncertain off-farm employment in local and distant labour markets for additional income. New employment opportunities were also created for non-member household in the study communities. There was substantial increase in total household income particularly for the smallest farms. Disparities in income levels were also reduced.

Singh, (1997) highlighted economics of production and marketing of vegetables and concluded that the vegetable growers all produced tomato, brinjal and okra, the various components arising from market forces analysed. The costs and returns in vegetable production were estimated along with marketing efficiency. The problems faced by the vegetable growers are analysed and suitable remedial measures were suggested.

Spaner *et al.* (1997) studied common problems encountered during large-scale development projects for the mechanized production of grain maize in Trinidad and Tobago. They reported that farmers on small land holding produce maize as a fast, easy and relatively profitable side line vegetable. It is un likely that small-scale farmers will adopt grain maize production, as the production of green maize is, more profitable.

Behera and Mohanty (2000) studied on use of unutilised riverbed land resources for potato cultivation and observed that river beds are ideal but under utilised areas for potato production in Orissa. In some trials the riverbed tuber yields were three times higher than the state average irrigated upland yield. Number of growing days is an important factor for potato cultivation in Orissa, due to a shorter potato-growing period than in other parts of India. The use of unutilised river beds will bring more area under potatoes which will help in increased food production and alleviating the poverty of resource-poor families. The net profit per unit area earned by the farmers was much higher from river bed than irrigated upland potato cultivation. The cost of potato cultivation, however is higher than in uplands, particularly due to the cost of leveling the seed beds. For small farmers who do not have enough money to buy seed tubers and fertilizers it is difficult to cultivate potatoes in the river beds as individuals, and there of potato production in these sites is often done in groups. It suggested that river bed area under potato cultivation is likely to increase rapidly in Orissa.

Constant *et al.* (2000) studied the farming system covering as cropping & livestock system, land tenure and access to market and reported that activities are centered on vegetables, short cycle food crops and perennial fruit crops. The most important factors in farmers choice of production type is the level of plots in relation to the main water sources. Which determines their susceptibility to flooding and drought. The size of land holding is also

important in that it determines whether farmers can raise cattle which is a source of animal traction of manure and of income.

2.7 Inter-dependence of various sub-sectors in the farming systems

Ruf (1986) revealed that "Crop and livestock farming in Egypt were carried out independent of each other up to the beginning of nineteenth century. Since then, state policy has encouraged small farmers to set up mixed crop livestock enterprises with a view to promoting cotton production. Livestock provided draft power needed to expand the cultivated area. Over the years, livestock farming has acquired additional roles including, the restoration of soil fertility and provision of farm income." The scientists, with most commonly followed method of liner programming, found that optimal organization of crop and livestock enterprises increase the net returns and helped in increasing stability and regularity in farm income. Their further observations were mostly based on resource allocation, risk aversion, labour utilization, herd size, capital investment, and technology use etc. (Devados, 1980; Pandy *et al.,* 1982: Sardana and Panghal, 1983 and 1984; Singh *et al.,* 1985; Kushwah *et al.*, 1986; Acharaya, 1986; Rao, 1986; Reddy *et. al.*, 1986 and Sharma *et al.* 1984).

Mandepe (1989) reported that "The difference in crop, livestock and land productivity among marginal, small and medium farmers in the study area of Maharashtra, U.P. and Haryana is mainly due to difference in resource use and resource endowments. Marginal farmers have low fixed as well as variable resources than small and medium farmers. Moreover difference in land productivity has amply been demonstrated by the differences in crop internsity and crop yields. Small and marginal farmers practicing mixed farming in all the three states have utilized land to maximum possible extent. Small and marginal farmers enjoy the higher land productivity than medium farmers. Their cropping patterns have been such that could provide than with main and by-products for family consumption and also for utilizing it fully in livestock enterprise."

He further concluded that "Farmers practicing mixed farming have definite inclination towards use of resources either in crop or livestock enterprises. This has resulted into achieving higher productivity on their farms. Investment of marginal and small farmers per hectare on seed, fertilizer and pesticide is more than medium farmers. Even on livestock, their investment is more or less equal to that of medium farmers. Transactional use of by-products from crop enterprise to livestock enterprise and from livestock to crop has been ensured more in mixed farming. It also indicated that both the enterprises highly depending on each other, livestock enterprise being a supplementary and complementary in nature. Some of the resources like manual labour in livestock enterprise are not efficiently or effectively utilized. This has been indicated by negative net income from livestock enterprise in Haryana and U.P there is great scope for improving the present status of farming through proper reallocation and reorganization of available resources."

Singh (1992) revealed that inter-dependence of various sub-sectors in the farming system in Mewat area of India, while the different farming system viz., crop, dairy, goat and poultry farming systems, crop, dairy, goat, poultry and vegetable farming systems, crop and dairy farming systems, crop, dairy and poultry farming systems, crop dairy and goat farming systems and crop farming systems are interdependent on each other in the study area.

Singh (1992) reported in his study in Mewat region in India that net income from crop enterprises is higher in farming systems crop, dairy, goat and poultry and vegetable farming systems (Rs. 17977.62) followed by farmig system crop, dairy, goat and poultry farming systems (Rs. 14594.72), Crop, dairy and poultry farming systems (Rs. 11729.36), crop, dairy and goat farming systems (Rs. 8957.29) and crop farming systems (Rs. 5980.13).

Haque (1996) studied the farming system of 900 farm households selected from relatively advanced and relatively backward districts of Andhra Pradesh, Bihar, Rajasthan and Haryana and reported that there are large inter

state variations in cropping pattern, yield factors and productivity of crops. A declining trend in net profitability of various crops overtime has been observed. Horticulture and sericulture yield large returns. Small framers in irrigated technologically developed areas are viable in terms of both efficiency and income levels.

Singh (1997) reported that 73 farmers were found to be practicing 'crop and dairy farming system' and only 4 were practicing 'crop and goat farming system'. The maximum net income from crop enterprises earned by small farmers was Rs. 6670 per year, whereas, it was Rs. 18410.21 for medium farmers. The maximum average annual net return from dairy was Rs. 30510. Further it was suggested that Crop + Dairy+ Poultry +Sheep/Goat+ Agro forestry farming system was most acceptable and had maximum income potential.

Singh *et al.* (1999) studied expenditure and income average from a lactating buffalo and crops for one year on 240 farmers in the Rohtak, Hisar and Bhiwani districts in Haryana and reported that maximum returns of Rs 12593, Rs 6746 and Rs 2317 were obtained from one hectare with a buffalo in Rohtak, Hisar and Bhiwani, respectively. The highest net return from Rohtak was attributed to the existence of a better soil fertility type and of irrigation facilites, coupled with better management of feeding, breeding, housing practices and disease contorl measures compared to that of Hisar and Bhiwani zones. In terms of total man days. Rohtak also had the highest employment potential, followed by Hisar and Bhiwani, the employment potential, under conditions of mixed farming was predominantly from livestock rather than crop production.

2.8 Relationship between annual gross income of different farming systems with selected independent variables

Tyagi and Sohal (1984) found that herd size had non significant relationship with adoption of dairy innovation.

Ghosh (1986) revealed that "Human and bullock labour per unit of land was inversely related to the size of land holding-similarly, the cropping intensity and the percentage of irrigated land were negatively associated with farm size both in mid fifties and early seventies."

Murthy (1990) reported that education, economic motivation, extension contact and mass media exposure were found to be significantly correlate with knowledge level of cotton growers.

Kher (1992) revealed that extension contact and participation in extension programme were significantly associated with knowledge of farmer.

Singh (1992) observed that the annual gross and net income from farming system crop, dairy, goat, poultry and vegetable, is positively and significantly correlated with family size, family education, operational land holding, social participation and extension contact variables of Mewat village and other village farmers.

Singh (1992) revealed that the annual gross income and net income from crop and dairy farming system i.e. positively and significantly correlated with extension contact, size of land holding and herd size variables in case of Mewat village and other village farmers.

Singh (1992) concluded that the annual gross and net income from crop farming system are not found significantly correlated with age, family size, family education, farm machinery, equipment possession, means of transport and operational land holding are positively and significantly correlated in Mewat area of India.

Chauhan and Moorti (1993) investigated regarding the income, expenditure, saving and investment behavior of sample of 150 migratory sheep

herds in tribal area of Himachal Pradesh and found that sheep rearing was the major source of income and investment. Income was found to be more unevenly distributed among small farmers but income in equality was not very high over all due to the development programme launched for tribal people. Income from sheep and saving increased with herd size. Food grains were the most important item of household expenditure for all farm size groups.

Singh (1995) reported that land holding, socio-economic status, farm power, family type and family size were having positive and significant correlation with wheat production technology.

Jirli and Gangadharappa (1997) studied the knowledge of vegetable growers with respect to integrated pest management practices. The result indicated that 31 per cent of farmers had high knowledge of integrated pest management, while 45 per cent had medium and 24 per cent had little knowledge. Land holding, extension participation and innovativeness were significantly related to the over all knowledge level of farmers.

Singh *et al.* (1998) reported that there was a highly significant positive relationship between the caste, education, family size, size of land holding, farm power, social participation and socio-economic status with the adoption of over all seed technology of wheat.

Arunachalam and Thiagaranjan (1999) evaluated the status of livestock farming in Tamil Nadu, India and reported that size of land holding had a significant ($P \leq 0.01$) and positive relationship with livestock numbers. Cow and buffalo, work bullock, sheep, goat, pig and poultry were the seven species, classes of animals mentioned and they were found either as single species or in various combinations, totaling 5 and farming structures. The association of size of land holding with species of livestock maintained was also significant ($P \leq 0.05$).

Choudhary (1999) found that four independent variables *viz*., education, social participation, size of land holding and farm information sources were positively and significantly related with adoption level of farmers about improved practices of mothbean cultivation whereas, independent variables viz. age, family type and size of family were non-significantly related with adoption level of farmers.

Sagar and Dohare (2000) studied 36 land less, 34 marginal, 20 small and 15 medium-large (Total 105) randomly selected goat farmers from 8 purposively selected village in the goat production technology transfer area of the Central Institute for Research on Goats in the Farah block of Mathura district, Utter Pradesh. Adoption of health care in goats was measured. Barberi and non-descript goats were taken into accountant and reported that flock size, availability of critical inputs, education, occupation, annual income from goat and goat products, total annual income, housing of goat, milk yield index, extension participation of good farmers and awareness of a goat co-operative society were positively and significantly correlated with the adoption of health care in goats among all four categories of farmers.

Asiwal (2004) found that independent variables viz., education, social participation, size of land holding, farm power, family type, family size and socio-economic status were found to be positive and significant correlation with independent variables. Income source and caste were found to be associated negatively and significantly with income from groundnut-wheat cropping system.

Asiwal (2004) observed that management aspects such as land, labour, capital, irrigation, seed, farm power and equipments and manure and fertilizers were found to be positively and significantly with income and prospects. The aspects of transportation, plant protection and marketing were non-significant relationship with prospects of groundnut-wheat cropping system.

2.9 Constraints in adoption of different enterprises in different farming systems

2.9.1 Crop enterprises

Khan (1985) reported that "Big, small and marginal farmers had perceived the different sets of problems in the adoption and confined used of innovation. Lack of knowledge, lack of conviction and situational factors such as uncertain rains non-availability of inputs were felt by big farmers as most important constraints, while high cost of inputs, lack of finance, low risk bearing capacity and lack of awareness were felt by small and marginal farmers as the most important reasons for low adoption of new technology".

Wasnik (1988) conducted a study and concluded that "Inadequacy of capital (90 per cent), lack of improved implements (44 per cent) non-availability of inputs (Seeds, fertilizers, pesticides etc. 32 per cent), uneconomic holdings (78 per cent), inadequacy of rains (44 per cent), lack of irrigation facilities (44 per cent), lack of extension contact (80 per cent), do not want to take risk (52 per cent), and existing expenses more important than modern technology (26.25 per cent) were the constraints faced by the farmers in adoption of dry farming technology".

Ingle *et al.* (1988) concluded that "Farmers faced constraints as they perceived the new technology as costly (84.78 per cent), inadequate irrigation facilities (65.22 per cent), inadequate implement (47.82 per cent), inadequate inputs (43.47 per cent) and inadequate information (23.91 per cent) in adoption of new farm technology by tribal of Melghat".

Rathore (1988) reported that the main reasons for non-adoption of improved technology of mustard cultivation were high cost of inputs, lack of irrigation facilities, lack of knowledge about improved practices.

Pant (1988) analysed that the low adoption of improved varieties on large scale was mainly because of non-availability of seeds in adequate quantities and the seed distribution programme for moth crop did not attract the attention of seed distribution agencies.

Patil *et al.* (1990) conducted a study in Malmatha area of Malegaon tehsil. They reported that "Among the several constraints, the major ones faced by the farmers in adoption of dry land agricultural technology recommended for *bajra* and groundnut area.

(i) Inadequate and very scanty rains.

(ii) Non-availability of inputs like fertilizers, pesticides etc.

(iii) Lack of improved implements

(iv) Inadequate capital availability

(v) Lack of technical guidance regarding dry farming techniques

(vi) Small and uneconomic holdings.

Srivastava *et al.* (1989) reported that insect, pest and disease attack was the major constraints reported by majority of farmers in all the size groups. The other constraints were timely non-availability of improved seed varieties. The supply when available was inadequate in quantity thus causing serious impediments to the overall growth.

Nekela (1989) found that lack of knowledge and technical guidance, high cost of inputs, poor economic conditions of farmers and non-availability of pure seed in time were three main constraints perceived by the pulse growers of Udaipur district.

Jaiswal and Sharma (1990) concluded that unavailability of seed at proper time, lack of knowledge and awareness of seed treatment, higher cost of

inputs lack of technical guidance and non-availability of labour were the main constraints faced by the farmers in adoption of improved rice technology.

Nikhada *et al.* (1990) reported that "The paddy growers come across number of difficulties while adopting recommended technology of paddy. These were (i) situational: not owing the thresher, difficulty in first ploughing after harvest due to less moisture in the soil, non-availability of sufficient FYM, non-availability of seeds of disease resistant variety, non-availability of improved seed in time, insufficient irrigation water, non-availability of blue-green algae, non-availability of neem cake, (i) Skilled labour and inadequate rains (ii) Economic expensiveness of preparation of raised beds, line planting, stubble collection and burning: high cost of insecticides and lack of finance (iii) Technical: low germination wastage of by products act and (iv) Informational:

Kumar and Singh (1990) reported that "The unavailability of fertilizer with in easy reach, high cost of fertilizers and non-availability of crop loan in time. Unavailability of fertilizer in time, lack of knowledge about which fertilizer to use in a particular crop and in wheat quantity, when and how inadequate subsidy on fertilizer. Low price of farm produce, uncertainty of subsequent rains and risk of crop failure, burning effect of fertilizer on crop were the major constraints faced by the farmers in use of fertilizer in dry farming".

Rade *et al.* (1990) reported that "Among the various constraints studied in adoption of improved package of practices for groundnut, the major constraints reported by the majority of the farmers were lack of knowledge of the respective practices *viz.,* use of recommended seed rate, application of proper doses of chemical fertilizer, use of drum roller and plant protection measures. Besides, inadequate finance for purchase of required inputs, non-availability of required inputs shortage of labour, non-availability of irrigation sources and inadequate rainfall were the other constraints reported by the farmers".

Chaudhary (1991) reported that the important constraints expressed by the farmers in adoption of recommended production technology of gram were high cost of inputs and chemicals, less guidance provided by extension personnel and lack of knowledge about the recommended practice.

Rajbala (1991) concluded that major constraints faced by women in *bajra* cultivation are lack of knowledge and skill in procurement of seeds, fertilizers insecticides etc; banking and credit facilities, detection of pests or diseases; names of seeds and chemical fertilizers.

Singh (1991) observed major "Constraints responsible for low adoption of the new farm technology as untimely availability of seeds, inadequate irrigation facilities, lack of knowledge, costly chemicals, timely non-availability of fertilizers, lack of technical help and non-availability of plant protection equipments, water, salinity, small size of land holding and high cost of improved farm implements". These findings are also supported by Singh (1981), Tripathi (1986) and Saraswat (1991).

Singh (1992) observed major constraints responsible for low adoption of new technology that lacks of links roads to the nearest market, unavailability and higher cost of labour for loading and unloading (Transport), lack of educational facilities, lack of training institute for training the farmers and farm women and lack of technical know how available to farmers (Institutional), non-availability of good quality seed, seedling (Supply), non-availability of adequate amount of money. Untimely loaning by different banks and higher interest rate charged by private financing agencies (Credit), non-availability of market facilities in the village, cheating by the middleman and delayed payment of commodity sold in the market (Market), lack of communication of technical know how from agricultural universities/agricultural department to the farmer and lack of technology according to farmers need (technical), low prices of commodities, fluctuations of prices in the market (Economic), poverty and lack of farmers participation in social activities (Social cultural) inadequate

and untimely rainfall (Situational), lack of housing facilities for human beings and inadequate water facilities for drinking as well as for irrigation (physical) are major problems faced by the farmers in Mewat area of India.

Chandra (1995) concluded that the major problems faced by the mung bean growers were lack of knowledge about improved seeds, inadequate availability of improved seeds, lack of knowledge about plant protection measures, delayed occurance of mansoon and high cost of fertilizers.

Sharma *et al.* (1997) concluded constraints and the extent of adoption of high yielding cotton varieties and improved cultivation practices. They revealed that the majority of cotton growers in the district belonged to the medium adoption category knowledge status seemed to play significant and decisive role in adoption of improved varieties and plant protection measures. Similarly, the education level of cotton growers and the size of land holding also influenced the adoption rate of improved practices. Adoptability was hampered by the untimely supply of seeds and chemical fertilizers for high adopters, inadequate credit facilities and non-availability of reliable seeds for medium adopters and non-availability of reliable seeds and high cost of chemical fertilizer for low adopters.

Intodia (1999) identified major constraints of pulse, cereal and oilseed growers as non-availability of plant protection measures (45 per cent), seed treatment (43 per cent) and ecological conditions (39.91 per cent).

Choudhary (1999) reported that the important constraints expressed by the farmers in adoption of improved mothbean cultivation practices were high cost of inputs and chemical, less guidance provided by extension personal and lack of knowledge about the recommended practices.

2.9.2 Dairy enterprise

Srivastava and Kharde (1983) reported that farmers of Tribal Mundas were associated with cattle husbandry and faced constraints such as Singh Bongo (Sun. God) created cows and buffaloes-I, Goroya Bango, the deity presiding over cattle must be worshipped for the welfare of the cattle wealth-II, Colestrum feeding to calves is harmful-III, artificial insemination is injurious to cattle health-IV, when Mundas sell their cattle they pull put few hairs from the waist of the animals considering it auspicious-V, Nason Bongo and some other evil spirits causes diseases to the cattle-VI, the ox whose tail colour differs from the colour of the body is inauspicious-VII, in the month of *magh* if buffaloes give birth than the owner is destroyed-VIII, the coughing of cows and oxen predicts rain-IX, and milking cows makes them weak-X..

Kokate and Tyagi (1988) observed "Problems encountered by most of the respondents were lack of irrigation facilities for fodder production-I, unsatisfactory price for milk-II, no proper veterinary aid-III, developed milk marketing net work-IV, difficulties in obtaining loans-V, other constraints faced by farmers were dairy farming is unnecessary, unawareness of different sources of credit and dairy enterprises is unprofitable, cattle feed is costly, unavailability of bank facilities, artificial insemination is not possible because animals are let loose, dairy enterprise requires more investment and regularity in collection of milk".

Dube *et al.* (1989) concluded that "Problems faced by the dairy farmers in adoption of animal husbandry practices were, rate of milk and milk products are comparatively low (100 per cent), lack of veterinary hospital in villages (72.5 per cent), no provision of animal insurance (24.16 per cent), green fodder, feeding, concentrate are available on high cost (66.66 per cent), treatment fee of animal is high (62.50 per cent), lack of irrigation facilities for fodder cultivation (29.16 per cent), seeds of green fodder are not available in time and free of cost (50.00 per cent), lack of land for growing green fodder (66.66 per cent), lack of proper transportation facility for marketing of milk and

its production (15.00 per cent), lack of proper training by veterinary department and other agencies (37.50 per cent), lack of improved bulls for breeding in villages (29.16 per cent) and veterinary doctors do not visit villages frequently (54.16 per cent)".

Kulkarni *et al.* (1990) found that "Cent per cent dairy farmers complained about non-availability of loan facilities for purchase of milch animals, fodder for animals and construction of animal byre. More than 80 per cent of the respondents reported that they perceived he construction cost of animal byre high, lack of capital for purchase of improved animals and fodder are prominent constrains (economic constraints).

They further reveals that as regards inputs supply constraints, all dairy farmers complained that there is no supply of improved cow breeds, buffaloes, breeding bulls and fodder from the society. More than two third (67.57 per cent) expressed that there is no pasture land for their animals in the village as well as no artificial insemination facilities, when milk marketing constraints were considered, it is observed that all the dairy farmers demanded milk preservation facility in the village and more than three fourth (76.35%) complained regarding the inadequate rate to their milk produce, while considering the personal constraints of the dairy farmers. It is clearly indicated that these constraints are prevailing due to lack of training facilities and lack of veterinary and A.I. centres in the village. Almost all the respondents did not possess knowledge about scientific feeding milk preservation practices and animal management. About 95 per cent respondents were found lacking in the knowledge of improved fodder, improved byre first aid etc."

Singh and Khan (1996) observed the constraints in rearing cross-breed cattle and found out that because of the religious sentiments male calves could not be sold for slaughter, which become a major problem. Further high cost of cross-breed cattle, lack of medical and A.I. facilities in the village, lack of

awareness about profitability in rearing cross-breed cattle, and the social prejudices were the other important constraints faced by women.

Smita and Sirohi (1997) concluded in his study that shortage of water, lack of feed and fodder, poor veterinary and infrastrucural facilities were the main constraints faced in adoption by the dairy farmers.

Yedukondalu et al. (2000) conducted the study in Medak district of Andhra Pradesh with 100 dairy farmers, majority of the farmers strongly felt that non-remunerative price for milk, lack of co-operative societies and transport facilities were the main constraints in dairying.

Yadav asnd Sharma (2000) conducted the research in Govindgarh panchayat samiti of Jaipur district on the constraints as perceived by the respondents in rearing cross-breed cows with a sample size of 100 farmers at random. They revealed that the most important technical, infra-structural, financial, socio-cultural and educational constraints were male calves of cross-breed cows are not found suitable for drought purpose work, lack of technical guidance is a problem, cost of cross-breed cows is very high that is why average farmer cannot afford to purchase it, because of religious sentiments male calves or cross-breed cows could not be sold for slaughter purpose and respondents are not aware about the profitability of cross-breed cows, respectively.

Panicker and Choudhary (2000) found that majority of the respondents (80.66 per cent) reported lack of time and poor economic condition and unawareness about the procedures of taking loan (33.0 per cent) were the main constraints in receiving training by the rural women.

Nisha and Subramanian (2000) examined the level of participation of women in dairy co-operatives and the constraints in participation. Data were collected by personal interview with 100 women members from 4 women societies from Erode and Modakurichi block of Poriyar district in Tamil Nadu,

India. It is indicated that there is low level of participation in dairy co-operatives. Social mores and taboos, excessive burden of household works responsibilities and distant location of the society were felt as major constraints.

Pandey *et al.* (2001) conducted study on constraints in training programme perceived by trainees in Haryana State. The KVK's from three organizations *i.e.*, NGO, SAU and IARI were taken for study. All the trainers working in these organizations were taken purposively for response. The result of study showed that major constraints in organizing training as perceived by trainers in KVK (NGOs) were mainly due to inability to lack of facilities for professional growth, job insecurity in the organization, lack of promotional opportunities and lot of external interferences in the organization. The major constraints experienced by the trainers engaged in the KVK (IARI) were, irregular supply of input, insufficient fund available to the training programme timely, lack of transport facilities and no incentives for extra work. The trainers under KVK (SAU) feels the insufficient funds available for training programme, external inter farmers, irregular supply of inputs and poor infra-structural facilities were the major constraints in KVK organizing training programme smoothly.

Podikunju *et al.* (2001) conducted study in Girwa panchayat samiti of Udaipur district of Southern Rajasthan with 100 respondents (50 tribal and 50 non-tribal). They found that lack of improved sire was most important constraints faced by tribals in breeding while in case of non-tribals results of A.I. was the most important constraint faced by them. Further, it was noticed that high prices of concentrates, lack of money for scientific housing, illiteracy being hindrance in record keeping and lack of knowledge about cause and control of disease were the constraints faced by both the categories of respondents in feeding, housing, milking and health care and hygene, respectively.

Vyas and Patel (2001) study was conducted in each of five tribal and non-triabl talukas of Panchmahals district of Gujarat with 300 randomly selected respondents from 20 villages. The findings of their study revealed that non-availability of loan facilities for purchase of milk animals and fodder, non-availability of A.I. centers and milk marketing facilities, lack of knowledge of scientific animals feeding as well as preservation practices no pasture land and non-availability of veterinary aid centre were the main constrains expressed by milk producers.

Waman and Girase (2001) conducted the research in Dhule district of Maharashtra in 1999-2000 on the constraints faced by the extension personnel working in single window system of agricultural development with 10 circle agriculture officers, 30 agricultural supervisors and 20 agriculture assistants. They reported that lack of relevant literature (73.33 per cent), lack of training on administrative procedures of working (76.67 per cent) and untimely available of government grants (81.67 per cent) were technical, administrative and financial constraints, respectively.

Ulmek and Patil (2001) conducted the study to findout the constraints faced by buffalo owners in breeding tract of Pandharpuri buffaloes of Maharashtra with a sample size of 17838 farmers. They revealed that amongst the different groups of constraints, intensity of financial constraints was very high, followed by shortage of resources, technical problems and the lower price offered for per kg of milk produced.

Dwivedi *et al.* (2002) conducted study in Jhansi district of Bundelkhand region on 84 dairy farmers. They articulated that shortage of green fodder, lack of veterinary hospitals, high cost of drugs, lack of knowledge about diseases, shortage of grazing land, shortage of water in summer, poor market facilities and lack of loan facilities were the main constraints in cattle and buffalo rearing and product. It may be concluded that majority of the respondents expressed impediments like high cost of A.I., vaccines, concentrate mixture

and also shown unavailability of dairy inputs like training, credit etc and inadequate infrastructural facilities.

Choudhary and Lalwani (2004) observed that the economics of milk production in the Arang block of the Raipur district in Chhattishgarh. It was shown that the performance of the dairy unit was positive with significant growth in investments on buildings, machinery and dairy equipment and increased value of milking price and quantity of milk. The net income was higher for cattle compared to buffaloes. The major constraints to milk production and marketing were higher prices of improved dairy cattle, high cost of inputs and high transportation costs.

2.9.3 Poultry enterprises

Mahapatra (1990) reported that "Out apathy towards improvement was primarily due to poor productivity, low prices for egg and meat, and inadequate knowledge of control and prevention of contagious poultry disease. Inadequate knowledge about scientific methods of feeding and management, lack of appreciation for nutritive value of egg and meat and above all the prejudices of a large section of Indian society against rearing of chicken and consumption of eggs and meat were the other factors".

Richards (1990) reported "That although India has made a break through in the poultry industry, it has still to bridge the gap between production and demand. It is poised for a showdown with the middle man and the poultry farmers are struggling for subsistence. The escalating cost of inputs and poor marketing facilities have made the situation worse. The scientists and the government agencies involved in poultry research have a challenging task providing suitable technology measures to readress the grievances of the poultry farming community and sustain their interest. He further reported that poultry breeding and genetics poultry management feed technology, health care and disease prevention and poultry marketing technology, were the some major

aspects of poultry farming, need improvement to raise the production level used to enhance the profit margin".

Roy and Choudhary (1996) found out that lack of money (86 per cent), lack of knowledge in Home Science (72 per cent), small land holdings (59 per cent), illiteracy (56 per cent), taboo for rearing chicken, and pigs (47 per cent) were the main constraints faced by the Assamese women in performing their roles in crop husbandry and poultry keeping in Hazo development block in Assam.

Safalaoh *et al.* (1998) surveyed that broiler production enterprises in Malawi by interviewing 103 broiler farmers from the Blantyrey Agriculture Development Division (BLADD) and concluded that broiler industry is plagued by a lack of proper knowledge and technology in poultry husbandry and nutrition, of locally available ingredients for formulating low cost balanced rations, of adequate and reliable veterinary pharmaceutical facilites and services and of assessable credit, as well as an effective extension net work and a poor processing and marketing infrastructure. With adequate resources, appropriate research and favourable government policies, solutions to these problems can be found to help advance the broiler industry.

2.9.4 Goat enterprises

Sahni (1990) observed "The constraints in goat production in as:

(i) Non-availability of high yielding breeding stock.

(ii) Low level of nutrition and managerial efficiency.

(iii) Lack of definition of the production objectives.

(iv) Limited attention to application of modern techniques for improving the reproductive efficiency e.g. artificial insemination, synchronization of estrus and deep freezing of semen.

(v) Limited use of outstanding and improved breeds, both native and exotic, for defined production objectives such as use of Alpine and Saanam for increasing milk production.

(vi) Inadequate control of diseases and parasites due to non-availability of pro-phylactic vaccines against important contagious disease such as goat pox and contagious caprine pleuro-pneumonia.

(vii) Lack of knowledge on clinical aspects of goat diseases such as mastitis, brucellosis. Pneumonia, enteritis and lumbar paralysis, leading to loss in production.

(viii) Lack of knowledge of successful rearing of kids. Kid mortality is generally high where weaning is practiced at very young age.

(ix) Lack of knowledge of silvi-postoral system, especially in case of goats-fodder trees, shrubs etc.

(x) Housing for goat in different eco-zones require a very collaborate systematic study.

(xi) Organised marketing is very limited. This has resulted in unscrupulous exploitation by middle man who are often seen moving with goats along the migratory routes.

(xii) The non-availability of know-how on goats resulting in lack of expert knowledge of various facts of goat industry, particularly with reference to economics and feasibility studies.

Sharma and Riyazuddin (1993) revealed that the constraints other than technological in nature expressed by the respondents, which hindered the transfer of technology programme poor infra-structural facilities i.e. non-availability of reliable medicine, poor veterinary aid non-remunerative price of wool, difficult procedure and non-cooperative attitude of bank authorities, very

poor grazing fields and poor socio-economic status of the sheep farming community in the society were some of the factors which restrain the sheep farmers from the adoption of sheep production technologies.

Khatik (1998) reported that amongst the constraints in rearing cross-breed goat majority of the respondents perceived that cross-breed goat are comparatively more susceptible to disease" cost of cross-breed goat is very high so the average farmer can not tolerate high temperature during summer. The problem of "Lack of individual contact for effective adoption of cross-breed goat" was the least perceived by constraint the farmers rearing cross-breed goat.

Sagar and Ojha (1998) reported that higher adoption of goat production technology is dependent upon the time of organization of health camps for treatments of sick goats, vaccination against contagious diseases and timely availability of veterinary care, supply of fodder tree, sapling, training in goat rearing, health and other aspects, provision of remunerative prices of goats, easy availability of credit and arrangement of breeding bucks from CIRG at low price.

Maharajan and Cronje (2000) while studying the factors affecting the goat production in communal farming system in South Africa revealed that the major constraint in this system was of labour as only 44 per cent of the goat owners herded their flocks themselves only 19 per cent kept hired labour for their flocks. Low ranking for goat meat was also found to be another constraint.

Kumar and Deoghare (2003) observed that the goat production system adopted by landless households in South-western semi arid region of U. P. The linkages among various components of the production system and how goat rearing acts as a livelihood security system for rural poor was economics. The goat rearing provided an opportunity for efficient utilization of family labour, 57 per cent of income from goat rearing was spend in procuring food for the

family. The share of income from goat raring/total income was estimated to be 33.3, 71.53 and 81.47 per cent for small, medium and large categories, respectively.

2.9.5 Vegetables enterprise

Pandey (1990) observed that "Unorganized orchards and vegetable growing, poor efficiency old heterogeneous population of trees, poor or low yielding varieties, multiplication of plants grown on unknown pedigree and poor quality seeds are among the factors contributing to low productivity. He further reported that area expansion with an out standing performance, quality planting material supply, supply of inputs such as fertilizer and pesticides and educating the farmers in new technologies will help in increasing production".

Seshadri (1990) observed that "The major constraints in vegetable production are low priority in planning and non-availability of reliable production statistics, inadequate supply of inputs such as good quality of seeds and plant protection chemicals, lack of awareness of new varieties and inadequate plant protection measures".

Parewa (1992) reported that the non-suitability of vegetable crops to highly saline soil and the difficulty in control of insect pest and diseases were the technical constraints in the adoption of vegetable cultivation. The major economical constraints were the high cost of seeds of vegetables as well as the high cost of irrigation. The major infrastructural constraints were the unavailability of the agricultural inputs and the lack of proper technical guidance by the agriculture department.

Halkatti and Swamy (1994) reported that decaying in storage (60.00 per cent) and lack of technical guidance (20.6 per cent) were perceived as the important technical constraints faced by potato growers. Costly input and low price of produce were important economical constraints.

Ogna (1995) reported that the decline in the production and knowledge of indigenous vegetables in Kenya. He revealed that traditionally, the cultuvation and marketing of indigenous food plants had been carried out mostly by women on a nationwide basis, until the colonial administration insisted that local farmers grow cash crops of mostly exotic species, rather than subsistence crops. He studied that the currently low status of indigenous food plants is considered and the work of NGOs and the indigenous food plant programme to reverse this trend. He also described that women are playing a major role in combining indigenous and modern practices and some of these are briefly considered.

Shekhawat, (1997) reported that majority of the farmers perceived that the "Non-availability of improved hybrid seeds at reasonable cost."(86.25 per cent) "Cost of irrigation was is very high" (56.25 per cent) and "Cost of fertilizers is also very high" (48.75 per cent) as the major economical constraints responsible for the technological gap in the package of practices of vegetable cultivation. The "High cost of weedicide" and "High cost of insecticides" were the least important economic constraints responsible for the technological gap in the package of practices of vegetable crops.

Yadav (1997) reported that the majority of the farmers perceived that the "Cost of HYV seeds of vegetables is very high" (79 per cent) "Cost of plant protection measures is very high" (64 per cent) and "Cost of fertilizer is high" (41 per cent) as the major economical constraints in the adoption of recommended package of practices of vegetable cultivation.

Agarwal (2000) reported that the constraints which were most perceived by the farmers were " Risk due to lack of assured irrigation" " More risk in investing on fertilizer" "Inadequate availability of improved seed" and " High cost of chemical" in the adoption improved pea cultivation practices.

2.10 Blue print of the resource oriented farming systems for the over all development of farmers

Mruthyunjaya and Sirohi (1979) in their study stated that "The net returns were higher and more stable in the final optimal plans with dairy than the optimal plans without dairy. On small farms, the net returns were Rs.4559/- with level of risk at Rs. 592/- and on large farm. It was Rs.17722/- and the level of risk was Rs.2966/- only. The results showed that mixed farming with dairy activities could not only increase net returns but also added stability to farm income. Human labour and capital became the major constraints when sufficient dairy activities were suggested in the plans along with crop activities."

Singh (1981) observed "A marked increase in income in optimum plan at current production technology with currently available capital or farmers own funds (without borrowing) and optimum plans with improved technology and with currently available capital or farm own funds (without borrowings) suggests the scope for increasing income by reorganization of resources and further increase in income could be realised by effectively switching over to new technology, even without using borrowed capital. Optimal plan at current production technology with capital constraints relaxed (borrowing adequate capital) and optimum plan with improved technology and with currently available capital or farmer's own funds (without borrowing) suggested the possibilities of further increasing income and employment on all the types of farms with the use of adequate capital at both existing and improved technology levels."

Bhati (1983) used linear programming technique to develop optimum crop plan for the three agro-climatic zones i.e. low hills, mid hills and high hills in Himachal Pradesh. The results showed that "The net farm income in the low hills could be increased to Rs.3490/- from the current income of Rs.3183/- under existing cropping pattern. On the mid hills, income could increased from

existing Rs. 3089/- to Rs. 3383/- and in the high hills from Rs.2704/- to Rs.3052/-, if the farmers use their land optimally even under to current resources availability situations. It was also indicated that without bringing additional land under cultivation, farm income could be increased by 9.7 to 12.8 per cent by optimizing land use pattern with the existing resources base and technology on the farms."

Bogahawatte (1984) while evaluating crop-livestock based farming system in Sri Lanka found that "Livestock in the optimal plan was mainly confined to milch animals. The optimal plan also suggested the use of crop residues as a substitute for compost. Increase in supplementary irrigation resulted in the expansion of farms income which includes re-placing the hired labour with non-utilized family labour and also emphasize the need for strengthening agricultural research and extension activity for promoting the use of modern inputs on farms."

Satheesh *et al.* (1985) used liner programming technique to determine the potential increase in income and employment of non-viable farm in Pithapuram block of east Godavari district. They revealed that "Total net farm returns for group I and –II were Rs.3043/- and Rs.4551/-, respectively and the respective non-farm income was Rs.126/- and Rs.107/- . The crop farming system, for group I farmers, the effect of optimization of farm resources on net returns was not very significant indicating thereby that farmers were utilizing the resources optimally. The net returns increased only by 5 per cent. In case of group-II the optimal allocation of existing resources in creased net returns by 54 per cent, reflecting a misallocation of scare resources. The recommended technology with adequate capital, yields the maximum net returns for both the group of farmers. The returns were Rs.9014/- and Rs. 11584/-. respectively. This implied that the recommended technology had greater potential for increasing net returns if adequate capital was made available".

Singh and Subbarayan (1986) used liner programming technique for maximizing the net returns on different size-groups of farms in Meerut district of Uttar Pradesh. The results showed that "On the small farms, the net returns per hectare in the existing plan were Rs.7503.75 and net returns per hectare in the optimal plans increased by 14.98 per cent. On medium and large farms, the net returns per hectare increased by 17.52 and 16.34 per cent, respectively. The net returns per rupee on small, medium and large farms increased to Rs. 1.59, Rs. 1.72 and Rs. 1.63, respectively."

Sinha and Sharma (1986) used liner programming technique to develop different optimal plans for each of the three synthetic farm situation in Nalanda district of Bihar and the result showed that "There was ample scope for augmenting the farm income on all sizes of farms through optimal allocation of available farm resources. The over all average increase in farm income due to resource optimization was 21 per cent. The credit facilities increased the farm income even at existing level of technology by about 18.02 per cent. Adoption of new technology with the existing availability of capital increased the farm income by 35 per cent. But the increase in income was substantial i.e. 52 per cent when new technology was accompanied by adequate credit facilities."

Deoghare (1987) concluded that "Inadequate availability of capital at existing level of technology showed a very little increase in net returns on bullock operated farms under crop and poultry farming system as compared to crop farming system. The tractor operated and bullock plus tractor operated farms brought exactly the same changes in the existing plan. Liberalization of facilities increased the net returns substantially the net returns were Rs. 6551.06, Rs. 12382.20 and Rs. 6088.67 on bullock operated, tractor operated, and bullock plus tractor operated farms at existing level of technology, respectively. Potential of this farming system was fully exploited when adequate credit and recommended technology were provided together. The net returns increased to as high as Rs. 8311.73, Rs. 13805.10 and Rs. 7803.65 in

case of bullock operated, tractor operated and bullock plus tractor operated farms, respectively. If further concluded that more optimal allocation of resources this farming system without adequate credit and recommended technology did not prove to be of much help to total employment. Liberalization of credit facilities increased total employment by 82.25, 72.31 and 60.30 per cent in case of bullock operated, tractor operated and bullock plus tractor operated farms, respectively. The recommended level of technology with adequate credit facilities increased the total employment by 84.69,75.31 land 66.89 per cent on bullock operated, tractor, operated bullock plus tractor operated farms, respectively increase in total employment in crop and poultry farming system was higher than that of crop farming system in all the optimal plans under different farm situations."

Singh (1992) concluded by using linear programming techniques that the farming system of crop dairy, goat, poultry and vegetable provides on an average annual net income of Rs. 30077.56 and Rs. 36728.34 at both the levels of existing and recommended technology, respectively. The farming system crop and dairy, the net returns increased to Rs. 18190.11 and Rs. 21701.86 at both levels of existing and recommended technology and in crop farming system net returns increased to Rs. 6723.21 and Rs. 6933.21 at both the levels of existing and recommended technology.

CHAPTER-III

MATERIALS AND METHODS

This chapter is depicting the selection of locale and respondents, tools used to collect the data and their quantification, mode of data collection etc. for the purpose of clarity. This chapter has been presented under the following heads.

1. Locale and sample of study
    i. Selection of location.
    ii. Selection of tehsils
    iii. Selection of villages
    iv. Selection of respondents
2. Operationalisation and measurement of variables
    i. Dependent variables
    ii. Independent variables
3. Tools and method of investigation
4. Theoretical model of study
5. Operationalisation of the term used.
6. Hypotheses
7. Statistical analysis

1. Locale and sample of study

(i) Selection of location

The present investigation was carried out at Dausa district in Rajasthan which was selected purposely because of the following important considerations.

1. The district falls in zone IIIa (semi-arid eastern plain) and IIIb (flood prone eastern plain) being representative of the other part of the state which make generalisation meaningful.

2. Active participation of different categories of farmers in agricultural and allied enterprises.

3. Familiarity of the researcher with the terrain of Dausa as the researcher belongs to the same district and worked in K.V.K., Dausa (August, 2000 to January, 2005) for five years, hence due to the experience of field extension programme of K.V.K., knowledge of local dialect and acquaintance with farmers and other field extension personnel or workers were make the data collection work easier, more reliable and trustworthy.

(ii) Selection of tehsils

Dausa district comprises of five tehsils. Out of which three tehsils were selected randomly for the study purpose. These were Dausa, Mahwa and Lalsot.

(iii) Selection of villages

A list of all revenue villages from each selected tehsil was prepared. Out of the lists five revenue villages from each tehsil was selected using simple random sampling technique. In this way a total number of 15 revenue villages were selected for the study (Table -1).

Table-1 : List of selected villages and farmers from Dausa district

N=360

Tehsils	S.No.	Villages	Category of farmers			Total
			Marginal	Small	Big	
Dausa	1.	Kandoli	8	8	8	24
	2.	Baniyana	8	8	8	24
	3.	Jopada	8	8	8	24
	4.	Badagaon	8	8	8	24
	5.	Prempura	8	8	8	24
Lalsot	6.	Salempura	8	8	8	24
	7.	Tutiawas	8	8	8	24
	8.	Bechha	8	8	8	24
	9.	Didwana	8	8	8	24
	10.	Indava	8	8	8	24
Mahwa	11.	Ramgarh	8	8	8	24
	12.	Rashidpur	8	8	8	24
	13.	Garhhimmat Singh	8	8	8	24
	14.	Palanhera	8	8	8	24

	15.	Balin	8	8	8	24
		Grand Total	**120**	**120**	**120**	**360**

(iv) Selection of respondents

From each selected village a separate list of farmers belonging to different land holding categories was prepared with the help of records available with *Patwari*. The land holding indicates the actual area of land under cultivation by the respondents family. Since the large farmers were rarely found so the random selection of farmers was not possible, hence it was decided to keep only three categories (medium and large farmers were clumped together) of farmers as mentioned below.

1. **Marginal farm category** : Stands below 1 hectare of land.
2. **Small farm category**: Ranges between 1-2 hectares of land.
3. **Big farm category** : Stands more than 2 hectares of land.

From each village, eight farmers from each category were randomly selected by making a total of 24 farmers. In this way 120 farmers from each of the farm category i.e. marginal, small and big were selected to make a total sample of 360 farmers (Fig.- 2).

2. Oprationalisation and measurement of variables

(A) Dependent variables

(i) Annual gross income from different farming systems

(ii) Annual net income from different farming systems

(i) Annual gross income from different farming systems

It refers to total annual gross income earned from different enterprises such as crop, dairy and vegetables in a particular farming system. It is an absolute figure of income expressed in rupees. It was calculated by adding the income from various sources of crop, dairy and vegetable enterprises.

(ii) Annual net income from different farming systems

It refers to the total amount earned in a year from farm and non-farm sources, minus the amount spent on earning that income. The farm source pertaining to the cultivation of land owned dairy and vegetable grown. The non-farm sources include

labour, self employment in the shape of hiring out of tractor, thresher, bullocks, plough or bullocks cart etc.

It was determined by computing the annual gross income from different enterprises in a particular farming system and than subtraction the total amount spent on different enterprises in a particular farming system. When subtracted gave the aggregate value of net income for different enterprises and was expressed in rupees per year. Annual gross and net income from different farming systems was considered as dependent variables in this study, whereas, other variables were used as independent ones.

B. Independent variables

For measuring socio-economic variables scale developed by G. Trivedi (1963) was used with some modification.

(i) Age : It is one of the basic characteristics of an individual linked with his maturity, physical well being, productivity level and work efficiency. It refers to the chronological age of the respondent in years at the time of investigation.

(ii) Caste : Caste is a class gained by birth. For measuring caste, the following scores were given as below :

Caste		**Score**
Scheduled Tribe	:	1
Scheduled Caste	:	2
Other Backward Class	:	3
General	:	4

(iii) Family type : Respondents were classified according to their type of family and the scores of family type were given as below :

Single	:	1
Joint	:	2

(iv) Family size : It was measured in terms of total number of members residing together in one household at the time of investigation.

(v) Family education : It refers to the academic qualifications of all the family members, acquired through formal schooling and training. The years of schooling of different family members were quantified by providing scores of zero to illiterate, one to those who can read, two to those who can read and write, three to primary level, four to middle school level, five to high school level and six to graduation level and above. First, each eligible members of the family was given educational score and than over all educational level of the family was computed by using the following formula.

$$\text{Family Education Scores (FES)} = \frac{\text{Total education score of the family}}{\text{Total number of eligible members of the family}}$$

(vi) Type of house : Respondents were classified according to their type of houses and the scores were given as below.

i. Hut	:	1
ii. *Katcha* house	:	2
iii. Mixed house	:	3
iv. *Pucca* house	:	4
v. Mansion	:	5

(vii) Source of energy : Energy is the basic ingredient of all societies and it is the ability to do work and sometimes it is referred as wood, coal and petroleum. In present study the source of energy referred as firewood, dung cake, agro-waste, kerosene and electricity. The scores of source of energy given as below:

i. Fire wood	:	1
ii. Agro-waste	:	2
iii. Dung cake	:	3
iv. Kerosene	:	4
v. Electricity	:	5

vi. Others : 6

(viii) Operational land holding : It refers the actual area of land in hectares under cultivation possessed by the respondents at the time of investigation. It was expressed in hectares.

(ix) Farm machinery and equipment possession: The possession of farm machinery and equipments including dairy and horticulture equipments was measured in terms of quantity of items they possess. Weightage was assigned to each item. Sum of the assigned weightage provide the total score for the farm machinery and equipment possession. Weightage assigned was done after judiciously considering the weightage assigned by Singh (1969), Sohoni (1967) and Ambastha (1974). Slight modifications were also made while assigning the weightage.

The weightage assigned were as under :

I. Hand tool

S.No.	Name	Weight
1.	Khurpa	1
2.	Spade	1
3.	Rake	2
4.	Sickle	2
5.	Kasola	2
6.	Wheel hoe	2

II. Bullock drawn implements

S.No.	Name	Weight
1.	Desi plough	1
2.	M B plough	2
3.	Bullock/Camel/He buffalo cart	2
4.	Yok	1
5.	Kera/pora	1
6.	Leveler	1
7.	Seed cum fertilizer drill	1

III. Tractor drawn implements

S.No.	Name	Weight
1.	Plough	3
2.	Cultivator	3
3.	Leveler	3

4.	Seed cum fertilizer drill	3
5.	Trolley	3

IV. Farm power

S.No.	Name	Weight
1.	Tractor	6
2.	Power tiller	2
3.	Thresher	2
4.	Diesel pump set	3
5.	Electric pump set	3
6.	Power sprayer	2
7.	Manual sprayer	2
8.	Duster	2
9.	Potato planter	1
10.	Potato digger	2

V. Animal power

S.No.	Name	Number	Score
1.	Bullock and He buffalo	1-2	2
		3-4	4
		5-6	6
2.	Camel	1-2	5
		3-4	10

VI. Dairy equipments

S.No.	Name	Weight
1.	Milk cane	1
2.	Bucket and milk pan	1
3.	Measuring set	1
4.	Chaff cutter	2
5.	Wooden feed menger	2
6.	Brush/broom	1

VII. Horticultural equipments

S.No.	Name	Weight
1.	Majara	1
2.	Budding/grafting knife	1
3.	Scatier	2
4.	Hand-hoe	2
5.	Bund former	2
6.	Bucket	1
7.	Crowbar	1
8.	Duck hoe	1

9.	Khurpee	1

VIII. Poultry equipments

S.No.	Name	Weight
1.	Chick feeder	1
2.	Layer feeder	1
3.	Basket	1
4.	Egg collector	2
5.	Water Pan	2

IX. Goat equipments

S.No.	Name	Weight
1.	Bucket	1
2.	Milking pot	1

(x) Means of transport : It was analyzed the possession of transport means, used by the farmers. To obtain the total score of transport means, the score of items possessed by the respondents were added. If the item was more than one, the score was multiplied by the number of a particular item. All the means of transport were quantified as follows.

S.No.	Means of transport	Score
1.	Bicycle	2
2.	Scooter	3
3.	Moter Cycle	3
4.	Car/ Jeep	5
5.	Bullock cart	3
6.	Moped	2

(xi) Information and recreation facilities : It was analysed the possession of information and recreation facilities used by the farmers. The score of item possessed were added. If the item was more than one the score was multiplied by the number of particular item. All the information and recreation facilities were quantified as under.

S.No.	Information and recreation facilities	Weight
1.	Radio	3
2.	Television	3
3.	Newspaper	1
4.	Farm magazine	1
5.	Film	1
6.	Puppet	1
7.	Drama	1

(xii) Herd size : It refers to the total number of animal including dairy and draft animal possessed by the respondents on the date of investigation. It also included all the young stock possess by actual enumeration.

(xiii) Social participation

It has been conceptualized as the respondents participation and involvement in informal and formal organization as a member or office bearer. It was quantified on the basis of scoring system followed by Trivedi (1963).

Social participation score was computed by assigning a single score to each of the respondents having membership in one organisation. Additional one score was assigned to those who were office bearer in the organisation. The weights assigned were as under

Membership of one organisation : 1

Office holders in the organisation : 2

In this way the total score of each respondent was computed.

(xiv) Extension contact

It refers to the frequency of contact with personnel *viz*. Village Level Worker (VLW), Extension Officer (EO), Block Development Officer (BDO), Stockman, Veterinary Assistant Surgeon (VAS), Dairy or Livestock Development Officer (DDO or LDO), Registrar (Co-operatives), Scientists of Research Institutes, Krishi Vigyan Kendra and Agricultural Research Station of Agricultural University. The frequency of contact with extension personnel was measured initially after verifying actual contacts made by them in a year and then it was categorised in five point continuum

viz. most frequently (more than 15 times), frequently (11 to 15 times) quite often (7 to 10 times), often (4 to 6 times) and seldom (1 to 3 times) with respective weightage 5, 4, 3, 2, 1. Thus, the total score for each respondent was computed.

3. Tools and method of investigation

Keeping in view the purpose and sample of the study required information was collected from the respondents by personally interviewing them. The investigator used the interview schedule developed by Singh (1992) with slight modification, modifications were made in the schedule in consultation with experts and on the basis of pre-testing covering various aspects to define objectives.

The text of the schedule in given in Appendix – I. Before starting actual data collection rapport was established with the field extension personnel and farmers in the selected villages. The respondents were personal interviewed by the researcher with the help of the schedule.

4. Theoretical model of the study

Based on the conceptual framework a theoretical model of the study has been developed during the course of investigation (Fig. 3).

The entire investigation is based on this model. The final form of this model has been presented in the chapter "Summary" based on the findings of the study. As shown in the model it was presumed that the fourteen independent variables might affect the annual gross and net income of different farming systems. There are (Fig. 3).

(i) Age
(ii) Caste
(iii) Family type
(iv) Education
(v) Size of land holding
(vi) House and farm building
(vii) Farm machinery and power
(viii) Transport facility
(ix) Information and recreation on facilities
(x) Herd size
(xi) Family size
(xii) Source of energy

(xiii) Social participation

(xiv) Extension contact

5. Operationalisation of the term used.

Farming system

According to Ruthenberg (1976) farming systems is a collection of distinct functional unit, such as a crop, livestock, processing investment and marketing activities which interact because of the joint use of inputs, they receive from the environment, which have the common objectives satisfying the farmers (decision maker's) aims. The definition of the borders of the systems depends on the circumstances often it include not only the farm (economic enterprises) but also they have the households (farm household system).

Pal *et al.* (1985) specially defined the farming system as "an appropriate combination of farm enterprise *viz*. cropping system, livestock, fisheries, forestry, poultry and the mean available to a farmers family to raise them for profitability. The same view has been considered as the farming system in the present study.

In the present investigation 26 farming systems have been identified. Out of that only five most popular farming systems have been analysed critically which are as follows:

Table-2 : Farming systems followed by the respondents

N=297

S.No.	Farming systems	No. of respondents
1.	Crop farming system	107
2.	Crop + Labour farming system	97
3.	Crop + Dairy farming system	52
4.	Crop + Vegetable farming system	27
5.	Crop + Vegetable+ Labour farming system	14
	Total	**297**

As per synopsis 360 respondents were to be included in the study but because of very few number of respondents were falling in the remaining 21 farmers systems resulting difficulty in calculation. Hence, 63 respondents dropped from the calculation as per advise of statisticians.

In order to calculate the annual gross income and annual net income of the respondents the following definitions were considered for different enterprises.

1. Crop enterprises

(i) Annual gross income from crop enterprises

It refers to the total annual income earned from crop enterprises. It is absolute figure of income expressed in rupees per year. The price of various farm outputs was determined according to their market price in that area and after computation of the total earnings from various by-products the total annual income determined for the crop enterprise. It was calculated in per hectare in all the categories of farmers.

(ii) Annual net income from crop enterprises

It refers to the actual net income earned by a farmer in a year from crop enterprises and it indicates the gross income minus the amount spent on the crop enterprises, it was expressed in rupees per year. It was computed per hectare in all the categories of farmers.

2. Dairy enterprises

(i) Annual gross income from dairy enterprises

It refers to the actual total income of the respondent from various sources in dairy enterprises. It was determined after knowing the market value of major and other product and the income obtained from sale of animals and cow dung. The aggregate of all the products in a year, gave the total annual gross income from dairy enterprises. It was expressed in rupees per year.

(ii) Annual actual net income from dairy enterprises

It refers to the actual net income earned by a farmer in a year from dairy enterprises and it indicates the gross income less the amount spent on the dairy enterprises. It was expressed in rupees per year.

3. Vegetables enterprises

(i) Annual gross income from vegetable enterprise

It refers to the total annual income earned from vegetable enterprises. It is an absolute figure of income expressed in rupees per year. The cost of various vegetables out put was determined according to the present market value in that area and after proper appointment of the total cost of the various by-products. The annual gross income was determined for the vegetable enterprises.

(ii) Annual net income from vegetable enterprise

It refers to the actual net income earned by farmer in a year from vegetable enterprises and it indicated the gross income minus the amount spent on the vegetable enterprises. It was expressed in rupees per year.

4. Annual net income from labour enterprise

It refers to hired out family labour available (mandays) with the farmer to work after finishing all farming work and there by earn some income in terms of rupees in a year.

5. Goat enterprises

(i) Annual gross income from goat enterprise

It refers to the actual total income of the respondent from various sources in goat enterprise. It was expressed in rupees per year. It was obtained only from sell of kids or goats if any litter of goat. The aggregate of these products in a year gave the total income from goat enterprise.

(ii) Annual net income from goat enterprise

It refers to the actual net income earned by the farmers in a year from goat enterprise. It indicate the gross income minus the amount spent on the goat enterprises in a year. It was expressed in rupees per year.

6. Poultry enterprises

(i) Annual gross income from poultry enterprise

It refers to the actual total income of the respondent from various sources in poultry enterprise. It was expressed in rupees per year. It was determined after

knowing the market value of major and other products including the income obtained from sale of birds and their beat. The aggregate of all the products in a year gave the total annual gross income from poultry enterprise.

(ii) Annual net income from poultry enterprise

It refers to the actual net income earned by the farmers in a year from poultry enterprise. It indicates the gross income minus the amount spent on the poultry enterprises in terms of rupees per year.

Although goat and poultry enterprises were also taken at the time of problem formation but after data collection they were found in very small number that's why they were deleted from the study because their number was not sufficient for calculation.

5. Hypotheses stated in null form

H_0 1.1 There is no relationship between annual gross income of different farming systems and age of the farmers.

H_0 1.2 There is no relationship between annual net income of different farming systems and age of the farmers.

H_0 1.3 There is no relationship between annual gross income of different farming systems and caste of the farmers.

H_0 1.4 There is no relationship between annual net income of different farming systems and caste of the farmers.

H_0 1.5 There is no relationship between annual gross income of different farming systems and family type of the farmers.

H_0 1.6 There is no relationship between annual net income of different farming systems and family type of the farmers.

H_0 1.7 There is no relationship between annual gross income of different farming systems and family size of the farmers.

H_0 1.8 There is no relationship between annual net income of different farming systems and family size of the farmers.

H_0 1.9 There is no relationship between annual gross income of different farming systems and family education of the farmers.

H_0 1.10 There is no relationship between annual net income of different farming systems and family education of the farmers.

H_0 1.11 There is no relationship between annual gross income of different farming systems and source of energy of the farmers.

H_0 1.12 There is no relationship between annual net income of different farming systems and source of energy of the farmers.

H_0 1.13 There is no relationship between annual gross income of different farming systems and size of land holding of farmers.

H_0 1.14 There is no relationship between annual net income of different farming systems and size of land holding of farmers.

H_0 1.15 There is no relationship between annual gross income of different farming systems and farm machinery and equipment possession with farmers.

H_0 1.16 There is no relationship between annual net income of different farming systems and farm machinery and equipment possession with farmers.

H_0 1.17 There is no relationship between annual gross income of different farming systems and information and recreational facilities with farmers.

H_0 1.18 There is no relationship between annual net income of different farming systems and information and recreational facilities with farmers.

H_0 1.19 There is no relationship between annual gross income of different farming systems and herd size of farmers.

H_0 1.20 There is no relationship between annual net income of different farming systems and herd size of farmers.

H_0 1.21 There is no relationship between annual gross income of different farming systems and type of house with farmers.

H_0 1.22 There is no relationship between annual net income of different farming systems and type of house with farmers.

H_0 1.23 There is no relationship between annual gross income of different farming systems and means of transport with farmers.

H_0 1.24 There is no relationship between annual net income of different farming systems and means of transport with farmers.

H_0 1.25 There is no relationship between annual gross income of different farming systems and social participation of farmers.

H_0 1.26 There is no relationship between annual net income of different farming

systems and social participation of farmers.

H_0 1.27 There is no relationship between annual gross income of different farming systems and extension contact with farmers.

H_0 1.28 There is no relationship between annual net income of different farming systems and extension contact with farmers.

7. Statistical analysis of data

After collecting the data, work table and talley sheets were prepared and they were tabulated classified and analysed. The cross tables were prepared and statistical treatment were given accordingly. The data were interpreted in the light of the objectives of the study.

The following statistical measures were used for interpreting the data and testing the hypothesis.

1. Percentage

Simple comparison were made on the basis of percentage.

2. Correlation

In order to know the inter-dependence/relationship between any two variables correlation test is frequently applied. In this study correlation between net income of Crop + Labour, Crop+Dairy, Crop + Vegetable and Crop + Vegetable + Labour Farming systems i.e. correlation between crop and vegetable, vegetable and labour and crop and labour was estimated using following formula.

$$r = \frac{\sum x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n}}{\sqrt{\sum x_i^2 - \frac{(\sum x_i)^2}{n}} \sqrt{\sum y_i^2 - \frac{(\sum y_i)^2}{n}}}$$

Here,

r = correlation coefficient

x and y = Two variables for which test is applied

n = number of paired observation

The value of ‘r’ always lies between -1 to +1. positive value of ‘r’ indicates a tendency of ‘x’ and ‘y’ to increase together. Where ‘r’ is negative, the large value of ‘x’ are associated with small value of y.

Test of significance was also estimated to test reliability of the coefficient.

3. Completely randomized design (CRD)

The standard procedures as suggested by Fisher (1949) were employed by applying the technique of analysis of variance for completely randomized design. Where ever "F" test was found significant at 5 per cent level of probability. The critical differences were calculated to assess the significance differences between the net income of different farming systems.

4. Regression analysis

Regression is a measure of average relationship between variables. It involves comparison of series with its help, we can know the average probable change in one series given a certain amount of change in the other.

The purpose of applying regression is to learn if 'Y' does depend on 'X' or predictin of 'Y' from 'X' may be goal. For the purpose of the study, the relationship between dependent variable 'X' and the selected independent (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13} and X_{14}) variables was obtained by fitting the multiple regression equation as follows :

$$\hat{Y} = A + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + b_{11}x_{11} + b_{12}x_{12} + b_{13}x_{13} + b_{14}x_{14}$$

Where,

$\hat{Y}$ = Predicated value of dependent variable.

b = Partial regression coefficient which represent the amount of change in 'Y' that can be associated with a unit change in any of the 'x' with the remaining independent variables held fixed. Any partial coefficient can be tested by 't' test as :

$$t = \frac{b_i}{S.E.\ (b_i)}$$

$$df = n - k$$

Where,

b_i = Partial regression coefficient

k = Total number of variables

S_Eb_i = Standard error of partial regression coefficient.

5. Multiple correlation coefficient

Beside the multiple regression equation R^2 (multiple correlation coefficient) was also calculated in the following manner.

$$R^2 = \frac{\text{S.S. Regression}}{\text{S.S. (y)}}$$

Where,

S.S. Regression = $b_1Sp(x_1y) + b_2Sp(x_2y) + b_3Sp(x_3y) + b_4Sp(x_4y) + b_5Sp(x_5y) + b_6Sp(x_6y) + b_7Sp(x_7y) + b_8Sp(x_8y) + b_9Sp(x_9y) + b_{10}Sp(x_{10}y) + b_{11}Sp(x_{11}y) + b_{12}Sp(x_{12}y) + b_{13}Sp(x_{13}y) + b_{14}Sp(x_{14}y)$

$$\text{S.S. (y)} = \sum y_i^2 - \frac{\sum y^2}{N}$$

$$\text{S.S. } (x_iy) = \sum x_{iy}^2 - \frac{\sum x_i \sum y}{N}$$

$$F(K, n\text{-}k\text{-}1) = \frac{R^2}{1 - R^2} \frac{N - K - 1}{K}$$

Where,

R^2 = Multiple correlation coefficient

K = Number of independent variable

N = Number of respondents in the sample

The correlation value were compared against the table value of 'F' for N_2 = N-K-1 and N_1 = k degree of freedom.

6. Blue print analysis

Blue print of the farming system was obtained using L.P. technique. To obtain optimal plan (Blue print) maximization of net return was done subject to existing resources, namely, land, labour and capital. All the constraints that could be made available were taken as level of resource available with the farmer. Different plans were developed for marginal, small and big farmers.

Model :

The model used for the study was as follows :

Objective function

(1) Optimised crop plan with existing resources

$$\text{Max. } Z = \sum_{J_a=1}^{n} a_{ja} X_{ja} \quad \text{.....(1)}$$

Subject to

Land constraints

$$\sum_{i=1}^{3} a_{ij} X_J \leq b^a_i \text{ (i = } \textit{Kharif, Rabi \& Zaid} \text{ season) ..... (2)}$$

Capital constraints

$$\sum_{J=4}^{6} a_{ij} X_j \leq b^b_i \text{ (i = } \textit{Kharif, Rabi \& Zaid} \text{ capital available)..... (3)}$$

Labour constraints

$$a_{ij} X_J \leq b^c_i \text{ .....(4)}$$

Maximum

Area constraint

$$\sum_{J=1}^{n} a_{ij} X_i \leq b^d_i \text{ .....(5)}$$

50% and 10% of net area was considered as maximum area allowed under crop and vegetable, to avoid crop specialization. .

Dairy constraint

$$\sum_{i=1}^{n} a_{ij} X_i \leq b^d_i \text{ ..... (6)}$$

Dairy activity was included with maximum units of dairy, considering feasibility of the sample farmers i.e. 2 marginal, 4 small and 6 big. One dairy unit includes 2 buffaloes and one cow for marginal farmers, 3 buffaloes and one cow for small farmers and 4 buffaloes and one cow for big farmers.

Non negativity constraints

$$Xj \geq o \; \forall_{js}$$

Where,

Z = Annual aggregate net return from the plan

Xja = Existing crop, vegetable, dairy and labour, activities.

a_{ij} = Amount of the i^{th} resource required to produce one unit of j^{th}.

b_{ij} = Amount of the i^{th} resource required to produce one unit of j^{th}.

b^a_i = Land availability *Kharif*, *Rabi* and *Zaid* season.

b^b_i = Capital availability *Kharif*, *Zaid* and *Rabi* season.

b^c_i = Labour availability for *Kharif* and *Rabi* season (i = 8, 9).

b^d_i = Dairy availability (units)

Description of the model

Objective function

The objective was to maximize net returns of the farmers for agriculture as a whole, definition of net return was as follows :

Net return = Gross income (Main + By-product) - operating expenses

Operating expenses = Cost of seed + FYM + Fertilizer + Hired human labour + Machine labour + Expenditure on plant protection measures + Irrigation charges etc.

Crop & Dairy Activities for Farmer

Existing crop have been included in the model. List of all the existing crop is presented in the Table No. 3

S. No	Abbr ev-iations	Name of crop		
		Marginal farmer	**Small farmer**	**Big farmer**
1	X_1	Guar *Kharif* crop	Guar *Kharif* crop	Guar *Kharif* crop
2	X_2	Maize *Kharif* cereal	Maize *Kharif* cereal	Maize *Kharif* cereal
3	X_3	Bajra *Kharif* cereal	Bajra *Kharif* cereal	Bajra *Kharif* cereal
4	X_4	Groundnut *Kharif* oilseed	Groundnut *Kharif* oilseed	Groundnut *Kharif* oilseed
5	X_5	Wheat *Rabi*	Wheat *Rabi*	Wheat *Rabi*

		cereal	cereal	cereal
6	X_6	Mustard *Rabi* oilseed	Mustard *Rabi* oilseed	Mustard *Rabi* oilseed
7	X_7	Barley *Rabi* cereal	Barley *Rabi* cereal	Barley *Rabi* cereal
8	X_8	Gram *Rabi* pulse	Gram *Rabi* pulse	Gram *Rabi* Pulse
9	X_9	Lucerne *Rabi* fodder	Lucerne *Rabi* fodder	Lucerne *Rabi* fodder
10	X_{10}	Jowar *Kharif* cereal	M.P. Chari, *Kharif* fodder	M.P. Chari *Kharif* fodder
11	X_{11}	Tomato *Rabi* vegetable	Jowar *Kharif* cereal	Jowar *Kharif* cereal
12	X_{12}	Loki *Zaid* vegetable	Onion *Rabi* vegetable	Chilli *Rabi* vegetable
13	X_{13}	Pea *Rabi* vegetable	Tomato *Rabi* vegetable	Tomato *Rabi* vegetable
14	X_{14}	*Bhindi Zaid* Vegetable	*Bhindi Kharif* vegetable	*Tinda Kharif* vegetable
15	X_{15}	*Rabi* vegetable Garlic	Pea *Rabi* vegetable	Cabbage *Rabi* vegetable
16	X_{16}	*Tinda Kharif* vegetable	Garlic *Rabi* vegetable	*Bhindi Zaid* vegetable
17	X_{17}	Brinjal *Zaid* vegetable	*Tinda Kharif* vegetable	Dairy Unit
18	X_{18}	Onion *Rabi* vegetable	Dairy unit	Labour
19	X_{19}	Dairy Unit	Labour	
20	X_{20}	Labour		

3. Constraints

(i) Land constraint

Net operational area at farmers disposal was considered as land availability for the farmers of respective classified groups. Equation 2 guarantees that total area allocated to different crops will not exceed the net operational area ($b^a i$)

(ii) Capital constraints

Actual expenditure made by the farmers in the past year for raising crop was taken as a proxy of capital available with farmers, scarcity of capital restricts use of the resources such as labour, seed, irrigation, manure and plant protection and therefore this constraint was included to take care of all these resources that otherwise are available in abundance in the area. Capital constraint (equation 3) was introduced for *zaid*, *kharif* and *rabi* season separately.

(iii) Labour constraint

Labour required to grow different crops was calculated on the basis of sample date collected. The same input-output coefficient was used under different activities.

(iv) Labour hired out activities

After engaging labour for Crop/Vegetable/Dairy activity remaining man days assumed as the period available for labour work. Remaining period available for labour work also calculated as per convenience of the sample farmer.

RESULTS AND DISCUSSION

This chapter has been divided into two parts. In the first part, the results about various aspects of the study have been described. In the second part an attempt has been made to discuss the research findings. The results of the study have been presented under suitable sub-heads as given below :

Section I	Present status of farming systems in various categories of farmers.
Section II	The inter-dependence of various sub-sectors in the farming systems and their role.
Section III	Relationship between annual gross and net income of different farming systems with selected independent variables
Section IV	Constraints being faced by farmers in various farming systems.
Section V	Blue print of the resource oriented farming systems for the overall development of farmers.

Section I

Scientists working in different fields have realized that researches conducted in isolation either on crop or live stock or in any other enterprise did not substantially provide any support to the farmer, either for developing appropriate technical production alternatives or for maximization of yield so that the farmers can make profits. Much of the researches in agriculture conducted in developing countries concentrate on economic analysis of an existing system. Practice, technology or as the development or improvement of a particular facet of a given system. There is a need not only to improve what exists but to find out alternatives which may be more productive and useful in achieving food security.

A cursory look at Table no. 4 brings to the fore that in all 26 farming systems have been identified under the present investigation. Farming system wise analysis indicated that there are 107 respondents having ‘crop farming’ system which

was the highest number of respondents under a particular farming system. Similarly, 97 respondents having Crop + Labour followed by 52 respondents who were having Crop + Dairy farming system.

In many farming systems there were only one or two respondents like Crop + Astrologer, Crop + Business + Labour, Crop + Artizen, Crop + Business + Tractor + Dairy, Crop + Poultry, Crop + *Chakki*, Crop + Dairy+ Business, Crop + Dairy + Labour etc.

Farmer's category wise analysis indicated that the maximum number of big farmers (40) were having crop as the farming system. Whereas, in case of marginal farmers the maximum number of respondents (57) were having Crop + Labour farming system. In the same way maximum number of small farmer that is (36) were having Crop + Labour as the farming system. It was interesting to note that many of the farming systems were not at all adopted by either big or marginal or small farmers.

On the basis of above narration it may be concluded that the farming systems like Crop, Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop + Vegetable + Labour were adopted by the majority of farmers and the rest were adopted by very less number of respondents.

As per synopsis 360 respondents were to be included in the study but because of very few number of respondents were falling in the remaining 21 farming systems resulted difficulties in calculation. Hence, 63 respondents were dropped from the calculation as per advice of statisticians.

Section- II

To examine inter-dependence of various sub-sectors in the farming system, correlation between net income through various sub-sectors was calculated.

Inter-dependence of crop and labour sub-sectors under different categories of farmers

The data presented in the Table no. 5 shows the inter-dependence of Crop + Labour farming system. The correlation coefficient of crop and labour sub-sector for marginal and small farmers was obtained as 0.323 and 0.340 respectively and combined correlation coefficient was obtained 0.297 as significant correlation

were observed between crop and labour sub-sectors for different categories of the farmers at 5 per cent and 1 per cent level of significance.

Table 4 : Present status of farming systems in Dausa district of Rajasthan
N = 360

S. No.	Farming systems	CATEGORY OF FARMERS			
		Total	**Marginal**	**Small**	**Big**
1.	Crop	107	32	35	40
2.	Crop + Vegetable + Tractor	4	1	0	3
3.	Crop + Vegetable	27	5	13	9
4.	Crop + Business + Labour	2	0	0	2
5.	Crop + Business + Service	3	0	2	1
6.	Crop + Business + Tractor + Dairy	1	0	0	1
7.	Crop + Camelcart	6	0	4	2
8.	Crop + *Chakki*	1	1	0	0
9.	Crop + Dairy	52	2	19	31
10.	Crop + Dairy + Business	2	0	0	2
11.	Crop + Dairy + Labour	2	0	1	1
12.	Crop + Dairy + Service	6	1	1	4
13.	Crop + Dairy + Tractor	5	0	1	4
14.	Crop +Dairy +Vegetable + Labour	2	1	0	1
15.	Crop + Goat	5	3	2	0
16.	Crop + Labour	97	57	36	4
17.	Crop + Poultry	1	1	0	0
18.	Crop + Service + Labour	1	0	0	1
19.	Crop + Service + Tractor	2	0	0	2
20.	Crop + Tractor	6	1	1	4
21.	Crop + Astrologer	1	0	1	0
22.	Crop + Vegetable + Business	2	1	1	0
23.	Crop + Vegetable + Dairy	8	0	1	7
24.	Crop+Vegetable + Dairy + Tractor	1	0	0	1
25.	Crop + Vegetable + Labour	14	12	2	0
26.	Crop + Artizan	2	2	0	0

Total	**360**	**120**	**120**	**120**

The correlation coefficients of big farmers could not be calculated due to insufficient data. Small value of correlation was obtained might be due to excess family labour, engaged themselves in labour work without hampering the work of crop.

Table 5 : Inter-dependence of crop and labour sub-sectors under different categories of farmers

N=97

S.No.	Farmers category	Correlation coefficient (r)
1.	Marginal farmers (N = 57)	0.323*
2.	Small farmers (N = 36)	0.340*
3.	Big farmers (N = 4)	-
4.	Combined (N = 97)	0.297**

* Significant at 5% level of significance
** Significant at 1% level of significance

Inter-dependence of crop and dairy sub-sector under different categories of farmers

The inter-dependence of Crop + Dairy farming system presented in Table no.-6. The correlation coefficients of crop and dairy for small and big farmers was obtained as 0.459 and 0.478, respectively. The combined correlation coefficient was 0.433. The correlation in big and small both reflects significant association between the crop and dairy at 5 per cent and 1 per cent level of significance and combined category 1 per cent level of significance.

Due to insufficient data, correlation coefficient of marginal farmer could not be obtained. The correlation between these both sub-sectors in big and small farmers might be due to the complimentary nature of crop and dairy.

Table-6 : Inter-dependence of crop and dairy sub-sector under different categories of farmers

N=52

S.No.	Farmers category	Correlation coefficient (r)
1.	Marginal farmers (N = 2)	-
2.	Small farmers (N = 19)	0.459*
3.	Big farmers (N = 31)	0.478**
4.	Combined (N = 52)	0.433**

* Significant at 5% level of significance
** Significant at 1% level of significance

Inter-dependence of crop and vegetable sub-sectors under different categories of farmers

The inter-dependence of Crop + Vegetable farming system is presented in Table no-7. The correlation coefficient of crop and vegetable sub-sector for marginal, small and big farmer were obtained as 0.975, 0.563 and 0.684, respectively with correlation coefficient 0.631 for combined category. The correlation in marginal, small and big farmer reflect significant association between the crop and vegetable sub-sectors at 1 per cent and 5 per cent level of significance and combined 1 per cent levels of significance.

The correlation between both these sub-sectors in marginal, small and big farmers might be due to complimentary nature of crop and vegetable sub-sectors.

Table-7 : Inter-dependence of crop and vegetable sub-sectors under different categories of farmers

N=27

S.No.	Farmers category	Correlation coefficient (r)
1.	Marginal farmers (N = 5)	0.975**
2.	Small farmers (N = 13)	0.563*
3.	Big farmers (N = 9)	0.684*
4.	Combined (N = 27)	0.631**

* Significant at 5% level of significance
** Significant at 1% level of significance

Inter-dependence between crop, vegetable and labour sub-sectors under different categories of farmers

The data presented in the Table no. -8 shows the inter-dependence of Crop + Vegetable + Labour farming system. The correlation coefficients of crop and vegetable, vegetable and labour and crop and labour sub-sectors for marginal farmers was obtained as 0.594, 0.712 and 0.573, respectively and for combined category these values were 0.644, 0.560 and 0.556, respectively. All correlation coefficients were found significant at 5 per cent level of significance.

The extent of correlation between marginal category of farmers might be due to complimentary level of crop and vegetable, vegetable and labour and crop and labour sub-sectors. Due to insufficient data for small category of farmer and none of the farmer under big category correlation coefficients was not calculated.

Table-8 : Inter-dependence between crop, vegetable and labour sub-sector under different categories of farmers

N=14

S.No	Farmers category	Correlation coefficients (r)		
		Crop and Vegetable	Vegetable and Labour	Crop and Labour
1.	Marginal farmers (N = 12)	0.594**	0.712**	0.573*
2.	Small farmers (N = 2)	-	-	-
3.	Big farmers (N = 0)	-	-	-
4.	Combined (N = 14)	0.644*	0.560*	0.556*

* Significant at 5% level of significance
** Significant at 1% level of significance

Hence, it may be concluded that all the sub-sectors are inter-dependent on each other.

Comparison of net returns between the farming systems

Five farming systems were studied for their net returns presented in Table no. 9 and significant differences were observed among farming systems. The maximum net returns was recorded in Crop + Vegetable + Labour farming system followed by Crop + Labour, Crop, Crop + Dairy and Crop + Vegetable farming systems and these systems were significantly superior or higher to other farming systems. The net returns ranges between Rs. 24603.36 to Rs. 50430.52.

The minimum net return was recorded in Crop + Vegetable farming system and it was statistically at par with Crop + Dairy farming system. The farming system Crop + Labour was also at par with crop but significantly higher to Crop + Dairy and Crop + Vegetable farming system.

Hence, it may be concluded that the farming system Crop + Vegetables + Labour has emerged out as the best amongst the farming systems under investigation (Fig. 4).

Table-9 : Comparison of net returns between the farming systems

N=297

S.No.	Farming systems	Number of farmers	Average net return in Rupees per annum

1.	Crop	107	38216.77
2.	Crop + Dairy	52	27320.57
3.	Crop + Labour	97	42008.16
4.	Crop + Vegetable	27	24603.36
5.	Crop + Vegetable + Labour	14	50430.52
	S.Em ±		1586.68
	C.D. at 5%		4416.27
	C.V. (%)		74.13

Section-III

Relationship between annual gross income of Crop farming system with selected independent variables

The individual and combined influence of the selected independent variables over annual gross income was assessed by applying multiple regression technique. The following symbols have been used to denote the dependent variables

Y = Annual gross income from Crop farming system

Independent variables

X_1 = *Age*
X_2 = *Caste*
X_3 = *Family type*
X_4 = *Education*
X_5 = *Size of land holding*
X_6 = *House and farm building*
X_7 = *Farm machinery and power*
X_8 = *Transport facility*
X_9 = *Information and recreation facility*
X_{10} = *Herd size*
X_{11} = *Family size*
X_{12} = *Source of energy*
X_{13} = *Social participation*
X_{14} = *Extension contact*

A close study of the data in the Table no.10 explained that all the 14 independent variables taken together explained to the extent of 20.75 percent of variation for crop farming system. The respective 'F' value was 1.7393 at 14 and 93 degree of freedom which was non-significant. Thus the result implied that all the 14 variables would not account for a significant variation for annual gross income of crop farming system.

Further it was also observed that 't' test of significance expresses that coefficient of regression 'b' value for annual gross income was significantly correlated with "Education (X_4) at 5 per cent level of significance and the "Extension contact" (X_{14}) at 1 per cent level of significance.

It could be inferred that these two independent variables have exerted influence on annual gross income in crop farming system.

Coefficient of regression 'b' value were non-significant for rest of the twelve independent variable in gross income namely Age (X_1), Caste (X_2), Family type (X_3), Size of land holding (X_5), House and farm building (X_6), Farm machinery and power (X_7), Transport facility (X_8), Information and recreation facility (X_9), Herd size (X_{10}), Family size (X_{11}), Source of energy (X_{12}) and Social participation (X_{13}) (Fig. 5).

Relationship between annual net income of Crop farming system with selected independent variables

The individual and combined influence of the selected independent variables over annual net income was assessed by applying multiple regression technique

The following symbols have been used to denote the variables

Dependent variable

Y = *Annual net income from crop farming system*

Independent variables

X_1 = *Age*
X_2 = *Caste*
X_3 = *Family type*
X_4 = *Education*
X_5 = *Size of land holding*
X_6 = *House and farm building*
X_7 = *Farm machinery and power*
X_8 = *Transport facility*
X_9 = *Information and recreation facility*
X_{10} = *Herd size*
X_{11} = *Family size*
X_{12} = *Source of energy*
X_{13} = *Social participation*
X_{14} = *Extension contact*

A close study of the data in the Table no. 10 explained that all the 14 independent variable taken together explained to the extent of 36.93 percent of variation for crop farming system. The respective 'F' value was 3.8906 at 14 and 93 degree of freedom which was significant at 1 per cent level of significance. Thus, the

result implied that all the 14 variables would account for significant variation for annual net income of crop farming system.

Further examination of the data in Table no. 10 shows that the multiple regression b value of the independent variables. Caste (X_2), family type (X_3) were found significant at 5 per cent level of significance and transport facility (X_8) was found significant at 1 per cent level of significance. This means only three variables X_2, X_3 and X_8 were more important for predicting the annual net income of farming system Crop.

Coefficient of regression b value were non-significant for 11 independent variables namely Age (X_1), Education (X_4), Size of land holding (X_5), House and farm building (X_6), Farm machinery and power (X_7), Information and recreation facility (X_9), Herd size (X_{10}), Family size (X_{11}), Source of energy (X_{12}), Social participation (X_{13}), and Extension contact (X_{14}) (Fig. 5).

Relationship between annual gross income of Crop + Labour farming system with selected independent variables

The individual and combined influence of the selected independent variables over annual gross income was assessed by applying multiple regression technique

The following symbols have been used to denote the variables.

Dependent variable

Y = *Annual gross income from Crop + Labour farming system*

Independent variables

X_1 = *Age*
X_2 = *Caste*
X_3 = *Family type*
X_4 = *Education*
X_5 = *Size of land holding*
X_6 = *House and farm building*
X_7 = *Farm machinery and power*
X_8 = *Transport facility*
X_9 = *Information and recreation facility*
X_{10} = *Herd size*
X_{11} = *Family size*
X_{12} = *Source of energy*
X_{13} = *Social participation*
X_{14} = *Extension contact*

A close study of the data in the Table no. 11 explained that all the independent variables taken together explained to the extent of 24.74 % variation in the annual gross income obtained from Crop + Labour farming system. The respective 'F' value was 1.9493 at 14 and 83 degree of freedom which was significant at 5 per cent level of significance. Thus, the result implied that all the 14 variables would account for significant variation in annual gross income of Crop + Labour farming system.

Further, it was also observed that 't' test of significance expresses that coefficient of regression (b value) for annual gross income was significantly correlate with three variables Age (X_1), Caste (X_2) and size of land holding (X_5) at 1 per cent level of significance.

It could be inferred that these three independent variable have exerted significant influence on annual gross income in farming system Crop + Labour.

Coefficient of regression 'b' value were non significant for rest of the 11 independent variables namely Family type (X_3), Education (X_4), House and farm Building (X_6), Farm machinery and power (X_7), Transport facility (X_8), Information and recreation facility (X_9), Herd size (X_{10}), Family size (X_{11}), Source of energy (X_{12}), Social participation (X_{13}), and Extension contact (X_{14}) (Fig. 6).

Relationship between annual net income of Crop + Labour farming system with selected independent variables

The individual and combined influence of the selected independent variables over annual net income was assessed by applying multiple regression technique

The following symbols have been used to denote the variables.

Dependent variable

Y = *Annual net income from Crop + Labour farming system*

Independent variables

X_1 = *Age*
X_2 = *Caste*
X_3 = *Family type*
X_4 = *Education*
X_5 = *Size of land holding*
X_6 = *House and farm building*
X_7 = *Farm machinery and power*
X_8 = *Transport facility*
X_9 = *Information and recreation facility*
X_{10} = *Herd size*
X_{11} = *Family size*
X_{12} = *Source of energy*
X_{13} = *Social participation*
X_{14} = *Extension contact*

Table no. 11 depicts that all the fourteen independent variables taken together explained to the extent of 32.65 percent variation in the annual net income obtained

from Crop + Labour farming system. The calculated value of 'F' was 2.870 which was found significant at 1 per cent level of significance at 14, 83 degree of freedom.

Thus the result implied that all the fourteen independent variables would account for significant variation in the annual net income from Crop + Labour farming system.

A further examination of the data in Table no. 11 shows that the multiple regression coefficient b value of the independent variable namely Size of land holding (X_5), Family size (X_{11}) found significant at 1 per cent level of significance.

This means that only the variable X_5 and X_{11} were more important for predicting the annual net income in farming system Crop + Labour. Coefficient of regression 'b' value were non-significant for 12 independent variables namely Age (X_1), Caste (X_2), Family type (X_3), Education (X_4), House and farm building (X_6), Farm machinery and power (X_7), Transport facility (X_8), Information and recreation facility (X_9), Herd size (X_{10}), Source of energy (X_{12}), Social participation (X_{13}), and Extension contact (X_{14}) (Fig. 4).

Relationship between annual gross income of Crop + Dairy farming system with selected independent variable

The individual and combined influence of the selected independent variables over annual gross income was assessed by applying multiple regression technique

The following symbols have been used to denote the variables.

Dependent variables

Y = *Annual gross income from Crop + Dairy farming system*

Independent variables

X_1 = *Age*

X_2 = *Caste*

X_3 = *Family type*

X_4 = *Education*

X_5 = *Size of land holding*

X_6 = *House and farm building*

X_7 = *Farm machinery and power*

X_8 = *Transport facility*

X_9 = *Information and recreation facility*

X_{10} = *Herd size*

X_{11} = *Family size*

X_{12} = *Source of energy*

X_{13} = *Social participation*

X_{14} = *Extension contact*

A close study of the data in the Table no. 12 explained that all the fourteen selected independent variables taken together explained to the extent of 40% variation in the annual gross income obtained from Crop + Dairy farming system. The respective 'F' value was 1.8098 at 14 and 38 degree of freedom which was non-significant at 5 per cent level of significance. Thus, the result implied that all the fourteen variables would not account significant variation in annual gross income of Crop + Dairy farming system.

Further, it was also observed that 't' test of significance expresses that coefficient of regression 'b' value for annual gross income was significantly correlated with one independent variable i.e. herd size at 1 per cent level of significance.

It could be inferred that this one independent variable have exerted significant influence on annual gross income in farming system Crop + Dairy.

Coefficient of regression 'b' value were non-significant for rest of the 13 independent variable namely Age (X_1), Caste (X_2), Family type (X_3), Family education (X_4), Size of land holding (X_5), House and farm building (X_6), Farm machinery and power (X_7), Transport facility (X_8), Information and recreation facility (X_9), Family size (X_{11}), Source of energy (X_{12}), Social participation (X_{13}) and Extension contact (X_{14}) (Fig. 7).

Relationship between annual net income of Crop + Dairy farming system with selected independent variables

The individual and combined influence of the selected independent variables over annual net income was assessed by applying multiple regression technique

The following symbols have been used to denote the variables.

Dependent variable

Y = *Annual net income from Crop + Dairy farming system*

Independent variables

X_1 = *Age*
X_2 = *Caste*
X_3 = *Family type*
X_4 = *Education*
X_5 = *Size of land holding*
X_6 = *House and farm building*
X_7 = *Farm machinery and power*
X_8 = *Transport facility*
X_9 = *Information and recreation facility*
X_{10} = *Herd size*
X_{11} = *Family size*
X_{12} = *Source of energy*

X_{13} = *Social participation*
X_{14} = *Extension contact*

A close study of the data in the Table no. 12 explained that all the fourteen selected independent variable taken together explained to the extent of 28.21 % variation in the annual net income obtained from Crop + Dairy farming system. The respective 'F' value was 1.0667 at 14 and 38 degree of freedom which was non-significant at 5 per cent level of significance. Thus, the result implied that all the fourteen variables would not account significant variation in annual net income of Crop+ Dairy farming system.

Further, it was also observed that 't' test of significant expresses that coefficient of regression 'b' value for annual net income was non-significant for all the fourteen independent variables namely Age (X_1), Caste (X_2), Family type (X_3), Family education (X_4), Size of land holding (X_5), House and farm building (X_6), Farm machinery and power (X_7), Transport facility (X_8), Information and recreation facility (X_9), Herd size (X_{10}), Family size (X_{11}), Source of energy (X_{12}), Social participation (X_{13}) and Extension contact (X_{14}) (Fig. 7).

Relationship between annual gross income of Crop + Vegetable farming system with selected independent variables

The individual and combined influence of the selected independent variables over annual gross income was assessed by applying multiple regression technique

The following symbols have been used to denote the variables.
Dependent variable
Y = *Annual gross income from Crop + Vegetable farming system*

Independent variables

X_1 = *Age*
X_2 = *Caste*
X_3 = *Family type*
X_4 = *Education*
X_5 = *Size of land holding*
X_6 = *House and farm building*
X_7 = *Farm machinery and power*
X_8 = *Transport facility*
X_9 = *Information and recreation facility*
X_{10} = *Herd size*
X_{11} = *Family size*
X_{12} = *Source of energy*

X_{13} = *Social participation*
X_{14} = *Extension contact*

Table no. 13 depicts that all the fourteen independent variables taken together explained to the extent of 47.5% variation for annual gross income from Crop + Vegetable farming system. The calculated value of 'F' was 0.8422 at 14 and 13 degree of freedom which was found non-significant. Thus the result implied that all the fourteen independent variables would not account for significant variation in the annual gross income from Crop + Vegetable farming system.

A further examination of the data in the Table no. 13 shows that the multiple regression coefficient b value of the independent variable namely family type found significant at 1 per cent level of significance and size of land holding found significant at 5% level of probability.

This means that only the variable X_3 and X_5 were more important for predicting the annual gross income in farming system Crop + Vegetable.

Coefficient of regression 'b' value were non-significant for rest of the 12 independent variables namely Age (X_1), Caste (X_2), Family education (X_4), House farm building (X_6), Farm machinery and power (X_7), Transport facility (X_8), Information and recreation facility (X_9), Herd size (X_{10}), Family size (X_{11}), Source of energy (X_{12}), Social participation (X_{13}), and Extension contact (X_{14}) (Fig. 8).

Relationship between annual net income of Crop + Vegetable farming system with selected independent variables

The individual and combined influence of the selected independent variable over annual net income was assessed by applying multiple regression technique

The following symbols have been used to denote the variables.

Dependent variable

Y = *Annual net income from Crop + Vegetable farming system*

Independent variables

X_1 = *Age*
X_2 = *Caste*
X_3 = *Family type*
X_4 = *Education*
X_5 = *Size of land holding*
X_6 = *House and farm building*
X_7 = *Farm machinery and power*
X_8 = *Transport facility*
X_9 = *Information and recreation facility*
X_{10} = *Herd size*
X_{11} = *Family size*
X_{12} = *Source of energy*
X_{13} = *Social participation*
X_{14} = *Extension contact*

A close study of the data in the Table no. 13 explained that all the fourteen selected independent variable taken together explained to the extent of 65.63 percent variation in the annual net income obtained from Crop + Vegetable farming system.

The respective 'F' value was 1.7731at 14 and 13 degree of freedom which was non-significant at 5% level of probability. Thus, the result implied that all the 14 variables would not account significant variation in annual net income of Crop + Vegetable farming system.

Further, it was also observed that 't' test of probability express that coefficient of regression 'b' value for annual net income was significantly correlated with Extension contact (X_{14}) at 5 per cent level of significance. It could be inferred that one independent variable have exerted significance influence on annual net income of Crop + Vegetable farming system.

Coefficient of regression 'b' value were non-significant for rest of the 13 independent variable namely Age (X_1), Caste (X_2), Family type (X_3), Family education (X_4), Size of land holding (X_5), House farm building (X_6), Farm machinery and power (X_7), Transport facility (X_8), Information and recreation facility (X_9), Herd size (X_{10}), Family size (X_{11}), Source of energy (X_{12}) and Social participation (X_{13}) (Fig. 8).

Relationship between annual gross and net income of Crop + Vegetable + Labour farming system with selected independent variables

As per objective of the present investigation, the relationship between the dependent and independent variables were required to be calculated. Apropos to it was thought out to apply multiple regression techniques which would yield the combined effect of independent variables as well as individual effect of these variables over dependent variables.

In case of Crop + Vegetable + Labour farming system there were 14 independent variables and 14 number of respondents. Under this condition the multiple regression technique can not be applied because of equal number of respondents and independent variables.

Hence, the data under this section could not be presented.

Section–IV

To identify and analyze the constraints being faced by farmers in various farming systems

The productivity in different farming systems is largely affected by a number of constraints faced by the farmer in different enterprises. Major constraints in different enterprises retard to their growth and at time paralyse the systems. In the present study the constraints being faced by the farmers were grouped in major heads like transport, institutional, supply, credit, marketing, technical, economic, socio-cultural, situational and physical constraints faced by the farmers in different farming systems. Constraints group wise description is given below.

Major "Transport constraints" faced by farmers practising different farming systems

Major "Transport constraints" faced by the farmers among various categories and different farming systems under study were present in Table no. 14, as it appears from the table that transport constraints faced by the farmers in different

farming systems were not the same. The constraints varied greatly from farming system to farming system. For instance lack of link road to the nearest market was the first major constraint faced by the farmers. It was found III in farming system Crop, Crop + Labour, and Crop + Vegetable. None of the farmer faced this constraints in farming systems Crop + Dairy and Crop + Vegetable + Labour.

Categorywise analysis indicated that 9 marginal, 8 small and 6 big farmers faced this type of constraint among five farming systems.

Similarly, "Quality of road is poor to the nearest market" was the second major constraint faced by the farmers. It was found first in farming system Crop + Vegetable + Labour and second in farming system Crop, Crop + Labour, Crop + Dairy and Crop + Vegetable.

Categorywise analysis showed that 22 marginal, 17 small and 20 big farmers were facing such constraints in five farming systems. Similarly "Non availability of communication means was the III major constraints faced by farmers. It was rated first in farming system Crop, Crop+Labour, Crop+Dairy, Crop+Vegetable and Crop+Vegetable+Labour.

Categorywise data indicated that 33 marginal, 37 small and 30 big farmers were facing this constraint.

In the same way "Non-availability of labour for loading and unloading" was fourth major constraint under transport. It was found IV in farming system Crop and Crop+Labour and none of the farmer faced this constraint in farming system Crop+Dairy, Crop+Vegetable and Crop+Vegetable+ Labour.

To sum up, there was a clear cut difference between the transport constraint faced by farmers in different farming systems and categories of farmers.

Major constraint identified was "Non-availability of communication mean" in five farming system and "Non-availability of labour for loading and unloading" was the least important constraint (Fig. 9).

Major "Institutional constraints" faced by farmers practising different farming systems

Major "Institutional constraints" faced by the various categories of farmers in different farming systems under study were presented in Table no.15.

As it appears from the table that institutional constraints faced by the farmers in different farming systems were not the same. The constraints varied greatly from farming system to farming system. For instance, lack of educational facilities was the first major constraint. It ranked V in farming system Crop + Vegetable whereas, it was found VII in farming system Crop + Labour and Crop + Dairy, VIII in farming system Crop and none of the farmer found in farming system Crop + Vegetable + Labour.

Categorywise analysis showed that 28 marginal, 32 small and 24 big farmers were facing such constraint among five farming systems.

Similarly, "Unavailability of training institute for training the farmers" was the II major constraints faced by the farmers under institutional constraints. Whereas, it was found first in farming system Crop+Labour, II in Crop+Dairy and Crop+Vegetable, III in farming system Crop and IV in farming system Crop+Vegetable+Labour.

Categorywise analysis indicted that 84 marginal, 87 small and 61 big farmers were facing this constraint among five farming system.

In the same way "Scarcity of technical know how" was the III major constraints faced by farmers. It was rated I in farming system Crop and Crop + Vegetable and II in Crop + Labour and Crop + Dairy and V in Crop+ Vegetable + Labour.

Categorywise analysis showed that 84 marginal, 85 small and 64 big farmers were facing this constraint among five farming systems.

In the same way "Scarcity of co-operative banks" was the IV (a) major constraints under institutional. It was rated of II in farming system Crop + Vegetable and Crop + Vegetable + Labour, III in Crop + Labour and Crop+ Dairy and IV in Crop farming system.

Caregorywise analysis showed that this kind of constraint was encountered by 76 marginal, 74 small and 64 big farmers.

Similarly "Scarcity of farmers club" was the IV (b) major constraint under Institutional. It was found III in farming system Crop+Vegetable and Crop + Vegetable + Labour, IV in farming system Crop and VI in farming system Crop + Labour and Crop + Dairy.

Categorywise analysis showed that 59 marginal, 52 small and 45 big farmers were facing this constraint in five farming systems.

Similarly "Scarcity of discussion groups" was the IV major constraints under institutional. It ranked III in farming system Crop + Vegetable + Labour, IV in farming system Crop+Vegetable, V in farming system Crop + Labour and Crop + Dairy and VII in farming system Crop.

Caregorywise analysis showed that this kind of constraint was encountered by 61 marginal, 51 small and 47 big farmers.

In the same way "Scarcity of caste panchayat" was the (IV) (c) major constraints under institutional. Whereas, it was found first in Crop + Vegetable + Labour II in Crop+ Vegetable, IV in Crop+ Labour and Crop +Dairy and VI in Crop farming system.

Categorywise analysis showed that 65 marginal, 68 small and 52 big farmers were facing this constraint among five farming systems.

Similarly, "Gram panchayat is not functioning in proper way" was the V major constraints under institutional. It was ranked V in farming system Crop + Vegetable + Labour, VI in farming system Crop + Vegetable and VIII in farming system Crop + Labour and Crop + Dairy. IX in Crop farming system.

Categorywise analysis showed that this kind of constraint was encountered by 32 marginal, 25 small and 22 big farmers.

In the same way "Non-availability of effective leader in the village was the VI major constraint under institutional. It was found first in farming system Crop + Labour and Crop + Dairy II in farming system Crop and Crop + Vegetable + Labour and IV in farming system Crop + Vegetable.

To sum up "Non-availability of effective leader in the village" was the most important constraint faced by different categories of farmers in different farming system and "Gram panchayat is not functioning in proper way" was the least important constraints (Fig. 10).

Major "Supply constraints" faced by farmers practising different farming systems

Timely, availability of essential inputs like good quality seed/seedlings of improved varieties. Fertilizers, chemical for plant protection, diesel, electricity etc serve as a boon to the farmers in maximizing the returns. Agricultural research has released large number of varieties of seeds, which can suit to the other resources available with farmers. But their availability at a given time is must. The major "Supply constraint" faced by the farmers among various categories and different farming systems under study were presented in Table no.16, as it appears from the table that supply constraint faced by the farmers in different farming systems were not the same the constraint varied greatly from farming system to farming system. For example, "unavailability of good quality seeds/seedlings of improved varieties" were the I (a) major constraints faced by the farmers. It was found III in farming system Crop + Dairy and Crop + Vegetable IV in farming system Crop + Labour and Crop + Vegetable + Labour and V in farming system Crop.

Categorywise analysis indicated that 61 marginal, 66 small and 54 big farmers were facing this type of constraint among five farming systems.

Similarly, "Unavailability of fertilizer" were the I (b) major constraints faced by the farmers whereas it was VII in farming system Crop + Vegetable + Labour, IX

in farming system Crop + Dairy, X in farming system Crop+Vegetable, XI in farming system Crop+Labour and XII in farming system Crop.

Categorywise analysis showed that 33 marginal, 43 small and 30 big farmers were facing such constraint in five farming systems.

In the same way "Unavailability of chemical for plant protection" were the I (c) major constraint faced by the farmers. Whereas, it was found VII in farming system Crop+Vegetable+Labour, X in farming system Crop+Vegetable, XI in farming system Crop+Dairy and XIII in farming system Crop and Crop+Labour.

Caregorywise analysis indicated that 31 marginal, 28 small and 31 big farmers facing such constraint among five farming systems.

Similarly, "Unavailability of implements" was the I (d) major constraint faced by farmers. It ranked V in farming system Crop+Dairy, VI in farming system Crop + Vegetable + Labour and IX in farming systems Crop, Crop + Labour and Crop + Vegetable.

Categorywise analysis showed that 45 marginal, 51 small and 44 big farmers were farming such constraint among five farming systems.

In the same way "Unavailability of feed and fodder were the I (e) major constraint faced by the farmers. It ranked V in farming system Crop + Vegetable +Labour, VIII in farming system Crop+Vegetable, X in farming system Crop + Dairy, XI in farming system Crop, XII in farming system Crop+Labour.

Categorywise analysis indicated that 38 marginal, 47 small and 37 big farmers were facing such constraint in five farming systems.

Similarly, "Untimely supply of seeds" were the 2nd (a) major constraints faced by the farmers. It was found III in farming system Crop+Vegetable+Labour, VII in farming system Crop+Vegetable, VIII in farming system Crop and Crop+Labour and IX in facing system Crop+Dairy.

Categorywise analysis showed that 51 marginal, 50 small and 43 big farmers were facing such constraint in five farming systems.

In the same way untimely supply of fertilizer were the 2nd (b) major constraints faced by the farmers. It ranked V in farming system Crop + Vegetable + Labour, VII in farming system Crop and Crop+Labour, VIII in farming system Crop + Dairy and Crop+Vegetable.

Categorywise analysis indicated that, 51 marginal 53 small and 48 big farmers were facing such constraint in five farming systems.

Similarly "Untimely supply of chemical for plant protection" were the 2nd (c) major constraints faced by the farmers in farming systems. It found III in farming system Crop+Vegetable+Labour, IV in farming system Crop, V in farming system Crop+Vegetable, VI in farming system Crop+Labour, and Crop+Dairy.

Categorywise analysis indicated that 59 marginal, 59 small and 51 big farmers were facing such constraint in five farming system.

In the same way "Untimely supply of diesel" was the 2nd (d) major constraints faced by the farmers. It ranked first in farming system Crop+Vegetable, II in farming system Crop+Dairy and Crop + Vegetable + Labour and III in farming system Crop, Crop + Labour.

Categorywise analysis indicated that 75 marginal, 73 small and 58 big farmers were facing such constraint in five farming systems.

Similarly, "Untimely supply of electricity" were the 2nd (e) major constraints faced by the farmers. It rated first in farming system Crop + Dairy and Crop + Vegetable + Labour and II in farming system Crop, Crop + Labour and Crop + Vegetable.

Categorywise analysis indicated that 89 marginal, 79 small and 64 big, farmers were facing such constraint in five farming systems.

In the same way "Non-descript breed of animal and poultry bird" were the III major constraints faced by farmers. It found first in farming system Crop, Crop+Labour, Crop + Dairy and Crop+Vegetable+Labour and ranked II in farming system Crop + Vegetable.

Categorywise analysis indicated that 96 marginal, 81 small and 63 big, farmers were facing such constraint in five farming systems.

Similarly, "Poor quality and non-availability of water for drinking" were the IV major constraints faced by farmers. It was found IV in farming system Crop + Dairy, V in farming system Crop + Labour, Crop + Vegetable + Labour and VI in farming system Crop and Crop + Vegetable.

Categorywise analysis indicates that 57 marginal, 58 small and 52 big farmers were facing such constraint in five farming systems.

In the same way "Poor quality of feed and fodder availability" were the V major constraints. It ranked III in farming system Crop + Vegetable + Labour, IV in farming system Crop+Vegetable, VIII in farming system Crop+Dairy and X in farming system Crop and Crop+Labour.

Categorywise analysis indicates that 50 marginal, 51 small and 45 big, farmers were facing such constraint in five farming systems.

To sum up there was a clear cut difference between supply constraint faced by the farmers in different farming systems.

Overall "Unavailability of chemical for plant protection" was first major constraints among five farming systems and "Untimely supply of fertilizer" was least important constraint (Fig. 11).

Major "Credit constraints" faced by farmers practising different farming system

The success of a farming system is greatly influenced by the economic condition of a farming family. In our country majority of the farmers are either a marginal or small category, possessing small land holding and faced the scarcity of other resources. Poor economic condition of the family may prevent the farmers from purchasing good quality inputs at the proper time which may affect the returns. For the purpose, credit facilities are provided to families by bank, co-operative societies and other agencies. However, the farming families face number of constraints in availing such facilities.

Major "Credit constraints" faced by the farmers among various categories and different farming systems under study were presented in Table no. 17, as it appears from the table that "Credit constraints" faced by the farmers in different farming systems were not the same. The constraints varied greatly from farming system to farming system. For instance, "Financial crisis in the family" is the first major constraints faced by the farmers. Whereas, it ranked first in farming system Crop, Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop+Vegetable+Labour.

Categorywise analysis indicated that 104 marginal, 92 small and 73 big farmers were facing such constraint among five farming systems.

Similarly, "Lack of banks and other authorised loaning agencies" was the second major credit constraints faced by the farmers. Whereas, it rated first in farming system Crop + Vegetable and Crop + Vegetable + Labour, II in farming system Crop + Dairy and IV in farming system Crop and Crop + Labour.

Categorywise analysis indicated that 88 marginal, 87 small and 70 big farmers were facing such constraint among five farming systems.

In the same way "Untimely and inadequate loaning by banks or other authorised loaning agencies" was the III major constraints under credit. It was found first in farming system Crop+Vegetable, Crop+Vegetable+labour V in farming system Crop and Crop+Dairy and VI in farming system Crop+Labour.

Categorywise analysis indicated that 87 marginal, 82 small and 67 big farmers were facing such type of constraint.

Similarly, "Lack of private finance agencies" was the IV major constraint under credit. It was ranked first in Crop+Vegetable and Crop+Vegetable+ Labour, III in Crop farming system and IV in Crop + Dairy farming system and V in Crop + Labour farming system.

Categorywise analysis indicated that 90 marginal, 83 small and 69 big farmers were facing such constraint among five farming systems.

In the same way "Higher interest rates of private finance agencies" was the V major constraint under credit. It was found first in farming system Crop+Vegetable and Crop+Vegetable+Labour, II in Crop and Crop+Labour farming system and VI in Crop+Dairy farming system.

Categorywise analysis indicated that 94 marginal, 87 small and 68 big farmers were facing this type of constraint.

Similarly, "Inefficient working of co-operative societies" was the 6th major constraints under credit. It was ranked III in Crop + Vegetable and Crop +Vegetable + Labour farming system, VII in Crop and Crop+Labour farming systems and VIII in Crop+Dairy farming system.

Categorywise analysis indicated that 70 marginal, 61 small and 56 big, farmers were facing such constraint among five farming systems.

In the same way "Only few influential persons getting loans from the banks/co-operative societies was the VII major constraint under credit. It was rated II in Crop+Vegetable and Crop+Vegetable+Labour farming system, VI in Crop farming system, VII in Crop+Dairy farming system and VIII in Crop+Labour farming system.

Categorywise analysis indicated that 71 marginal, 71 small and 65 big farmers were facing such constraint among five farming systems.

Similarly, "Long and complicated procedure is to be followed for taking loans" was the VIII major constraints under credit. It was ranked first in Crop+Vegetable and Crop + Vegetable+Labour farming system, II in farming system Crop, III in Crop+Labour and Crop+Dairy farming systems.

Categorywise analysis indicated that 91 marginal, 88 small and 73 big farmers were facing such constraint among five farming systems.

Overall "Financial crisis in the family" was the first major constraint faced by farmers in five farming systems and least important constraint was "In efficient working of co-operative societies" (Fig. 12).

Major "Marketing constraints" practising different farming systems

Economic condition of a farming family does not depend merely upon quantity of the yield but is also influenced by intelligent selling of the produce to get maximum profit. Knowledge of the prevailing price and market facilities with in their own village are the important prerequisites that help the farmer, specially marginal and small ones, to get maximum returns from their produce. In the absence of adequate marketing facilities, the farming families face a number of difficulties in selling their produce at appropriate rates, which affect the entire family economy.

Major "Marketing constraints" faced by the farmers among various categories and different farming system under study have been presented in Table no. 18.

As it appears from the table that "Marketing constraints" faced by the farmers in different farming systems were not the same. The constraints varied greatly from farming system to farming system. For instance, "No market facilities in the village" was the first major constraints faced by the farmer. It was found first in farming

system Crop+Vegetable and Crop+Vegetable+Labour. It was II in farming system Crop, Crop+Labour and Crop+Dairy.

Categorywise analysis showed that 87 marginal, 82 small and 64 big farmers were facing such constraint among five farming systems.

Similarly, "Market is far away" was the II major constraint under marketing facilities. It was IV in farming system Crop+Vegetable+Labour, V in farming system Crop+Vegetable, VI in farming system Crop, Crop + Labour and Crop + Dairy.

Categorywise analysis indicated that 30 marginal, 33 small and 28 big farmers were facing such constraint among five farming systems.

In the same way "Lack of knowledge about prevailing market price" was the III major constraint under marketing facilities. It was found III in farming system Crop, Crop + Vegetable and Crop + Vegetable + Labour, IV in farming system Crop + Labour and Crop + Dairy.

Categorywise analysis indicated that 57 marginal, 61 small and 44 big farmers were facing such constraint among five farming systems.

Similarly, "High marketing charges" was the IV major constraints under marketing. It was ranked V in Crop+Vegetable and Crop+Vegetable+Labour farming system, VI in Crop+Dairy farming system, VII in crop farming system and VIII in Crop+Labour farming system.

Categorywise analysis indicated that 22 marginal, 30 small and 26 big farmers were facing such constraint among five farming systems.

In the same way "Lack of water facilities for drinking to human being and animals" was the V major constraint. It was found II in Crop+Vegetable and Crop+Vegetable+Labour farming systems, III in Crop + Labour and Crop+Dairy farming system, IV in Crop farming system.

Categorywise analysis indicates that 62 marginal, 63 small and 44 big farmers were facing such constraint among five farming systems.

Similarly, "Very low support price fixed by Govt." was the sixth major constraint under marketing. It was found first in five farming systems i.e. Crop, Crop + Labour, Crop+Dairy, Crop+Vegetable and Crop+Vegetable+Labour.

Categorywise analysis indicates that 105 marginal, 100 small and 75 big farmers were facing such constraint among five farming systems.

In the same way "Untimely payment of commodities sold in the market" was the VII major constraint under marketing facilities. It was ranked III Crop + Vegetable + Labour farming system, IV in Crop+Vegetable farming system and V in Crop, Crop+Labour and Crop+Dairy farming system.

Categorywise analysis showed that 38 marginal, 34 small and 35 big, farmers were facing such constraint among five farming systems.

Similarly, "Cheating by middleman in the marketing" was the VIII major constraint. It was found V in Crop+Vegetable+Labour farming system, VI in Crop+Vegetable farming system, VIII in Crop+Dairy farming system and IX in Crop and Crop+Labour farming systems.

Categorywise analysis showed that 20 marginal, 18 small and 21 big farmers were facing such constraint among five farming systems.

In the same way "Constraints in disposal of produce" was the IX major constraint under marketing facilities. It was rated III in Crop+Vegetable farming system, V in Crop+Vegetable+Labour farming system, VII in Crop + Labour and Crop + Dairy farming systems and VIII in Crop farming system.

Categorywise analysis indicated that 27 marginal, 32 small and 25 big farmers were facing such constraint among five farming systems.

It may be concluded that the most important constraints found was "Very low support price fixed by government" in five farming systems. However, "The cheating by middleman" was least felt by the respondents (Fig. 13).

Major "Technical constraints" faced by farmers practicing different farming systems

In order to earn maximum returns from a farming system, the requirements are adequate physical resource and input, financial facilities and marketing opportunities. However, above every thing, a farming family requires the essential technical know how and latest technology for an effective use of inputs available, for maximum yield. Inspite of extension efforts for the transfer of latest technology, its adoption among the farming community of Dausa district was found to be set with various constraints.

Major "Technical constraints" faced by the farmers among various categories and different farming systems under study presented in Table no.-19. As it appears from the table that technical constraints faced by farmers in different farming systems were not the same. The constraints varied greatly from farming system to farming system. For instance, "Lack of communication of technical know how from Agril. Deptt. / Agril. University to the farm families" was the first major constraint faced by the farmers in farming system Crop+Vegetable whereas, it was II in farming systems Crop +Labour and Crop+Vegetable+Labour, III in farming systems Crop and Crop + Dairy.

Categorywise analysis indicated that 100 marginal, 99 small and 74 big farmers were facing this constraint among five farming systems.

Similarly, "Untimely diffusion of the latest technical know how" was the second major constraint under technical. It was rated first in farming systems Crop + Labour, Crop+Dairy and Crop+Vegetable, II in farming systems Crop and Crop + Vegetable +Labour.

Categorywise analysis indicated that 100 marginal, 96 small and 77 big farmers were facing such constraints among five farming systems.

In the same way "Lack of latest technology related to agriculture and allied fields" was the III major constraints under technical. It found first in farming systems Crop + Labour, Crop + Dairy, II in farming systems Crop, Crop + Vegetable and Crop + Vegetable + Labour.

Categorywise analysis indicated that 100 marginal, 98 small and 77 big farmers were facing this type of constraint among five farming systems.

Similarly "Lack of practical applicability of technical know how" was the fourth major constraints under technical. It was rated first in farming system Crop, II in farming systems Crop + Labour, Crop + Dairy and Crop + Vegetable + Labour and III in farming system Crop + Vegetable.

Categorywise analysis showed that 99 marginal, 96 small and 78 big farmers were facing this type of constraint among five farming systems.

In the same way "Only the big farmers are getting the benefits of improved technology through extension personnel" was the fifth major constraint under technical. It was found III in farming system Crop+Vegetable+Labour, IV in farming system Crop+Labour and V in farming systems Crop and Crop+Dairy and Crop + Vegetable.

Categorywise analysis indicated that 72 marginal, 66 small and 56 big farmers were facing this type of constraint among five farming systems.

Similarly, technology is not according to the need of farmer was the VI major constraints under technical. It was rated first in farming system Crop +Vegetable + Labour, III in farming system Crop+Labour, IV in farming systems Crop, Crop + Dairy and Crop + Vegetable.

Categorywise analysis showed that 90 marginal, 93 small and 70 big farmers were facing this type of constraint in five farming systems.

To sum up, there was a clear cut difference between the technical constraint faced by the farmers in different farming system and categories of farmers.

Overall the most important constraints identified was "Untimely diffusion of latest technical know how" and "Only the big farmers are getting the benefits of improved technology through extension personnel" was least important constraints (Fig. 14).

Major "Economical constraints" faced by farmers practising different farming systems

Major "Economical constraints" faced by the farmers among various categories and different farming systems under study were presented in Table no. 20.

Variations in economical constraint faced by the farmers has been observed in different farming systems. "Lack of credit facilities" was the first major constraint under economical constraints . It was found first in farming systems Crop, Crop + Dairy and Crop+Vegetable+Labour, whereas, it was II in farming systems Crop + Labour and Crop+Vegetable.

Categorywise analysis indicated that 106 marginal, 99 small and 79 big, farmers were facing this constraint among five farming systems.

In the same way "Non-availability of inputs including labour" was the second major constraint under economical. It was found V in farming systems Crop and Crop + Dairy and VI in farming systems Crop+Labour, Crop+Vegetable and Crop + Vegetable +Labour.

Categorywise analysis indicated that 42 marginal, 37 small and 34 big farmers were facing this constraint among five farming systems.

Similarly "Lack of knowledge about marketing" was the third major constraints under economical. It was rated IV in farming systems Crop, Crop+Dairy, Crop+Vegetable and Crop+ Vegetable+ Labour and V in farming system Crop + Labour.

Categorywise analysis showed that 61 marginal, 65 small and 51 big farmers were facing this type of constraint among five farming systems.

Similarly, "Market price fluctuation" was the fourth major constraints under economical. It was II in farming system Crop and Crop+Dairy, III in farming systems Crop + Labour and Crop + Dairy and V in farming systems Crop + Vegetable and Crop + Vegetable + Labour.

Categorywise analysis indicated that 77 marginal, 77 small and 61 big, farmers were facing this constraint among five farming systems.

In the same way "Low prices of commodity in the village" was the fifth major constraints. It was found III in farming system Crop, Crop+Dairy, Crop+Vegetable and Crop+Vegetable+Labour, IV in farming system Crop+Labour.

Categorywise analysis indicated that 72 marginal, 72 small and 55 big farmers were facing this type of constraint among five farming systems.

Similarly, "Input cost are higher" was the sixth major constraint under economical. It was found first in farming systems Crop, Crop+Labour, Crop+Dairy and Crop + Vegetable, II in farming systems Crop + Vegetable+ Labour.

Categorywise analysis indicated that 105 marginal, 102 small and 79 big farmers were facing this type of constraints among five farming systems.

Overall major constraint was found "Input cost are higher" in five farming system and "Non-availability of inputs including labour" was the least important constraints (Fig. 15).

Major "Socio-cultural constraints" faced by farmers practising different farming systems

Six major socio-cultural constraints have been identified in study area among various categories and different farming systems were presented in Table no. 21.

It is evident from the table that the major socio-cultural constraints faced by the farmers in different farming systems and categories were not the same. Their

seriousness or importance varies from system to system. For instance, "Non-adoption by the society" was the first major socio-cultural constraint faced by the farmer. Whereas, it was II in farming systems Crop+Vegetable+Labour, III in farming system Crop+Dairy, IV in farming systems Crop+Labour and Crop+Vegetable and V in farming system Crop.

Categorywise analysis indicated that 81 marginal, 82 small and 67 big farmers were facing this constraint among five farming systems.

"Lack of participation" in socio-cultural activities was the second major constraints. It rated III in farming systems Crop+Vegetable+Labour, IV in farming system Crop+Vegetable and V in farming systems Crop+Dairy and VI in farming system Crop and Crop+Labour.

Categorywise analysis indicated that 71 marginal, 77 small and 62 big farmers were facing such constraint among five farming systems.

Similarly, "Attachment to tradition" was the III major constraints under socio-cultural constraints. It was rated II in farming system Crop +Vegetable + Labour, III in farming system Crop+Vegetable, IV in farming systems Crop and V in farming system Crop+Labour and VI in farming system Crop+Dairy.

Categorywise analysis indicated that 83 marginal, 75 small and 68 big farmers were facing such constraint among five farming systems.

In the same way "More attachment to social norms and culture" was the IV major constraint under socio-cultural constraint. Whereas it was II in farming systems Crop, Crop + Labour, Crop + Dairy and Crop + Vegetable + Labour and III in farming system Crop + Vegetable.

Categorywise analysis indicated that 97 marginal, 95 small and 75 big farmers were facing this constraint among five farming systems.

Similarly, "Poverty" was the V major constraint under socio-cultural constraint. It was rated first in farming systems Crop, Crop+Labour, Crop+Dairy and Crop+Vegetable+Labour, II in farming system Crop+ Vegetable.

Categorywise analysis showed that 104 marginal, 100 small and 78 big farmers were facing this constraint among five farming systems.

In the same way "Resistance in adoption of new technology by neighboring farmers/relatives" was the VI major constraint under socio-cultural. It was found first in farming systems Crop+Vegetable and Crop+Vegetable+Labour, III in farming systems Crop, Crop+Labour and IV in farming system and IV in farming system Crop+Dairy.

Categorywise analysis indicated that 93 marginal, 90 small and 75 big farmers were facing this constraint among five farming systems.

Overall most important constraints identified was "Poverty" in five farming system and "Lack of participation in socio-cultural activities" was the least important constraints (Fig. 16).

Major "Situational constraints faced by farmers practising different farming systems

Five major situational constraints have been identified in study area among various categories and different farming systems were presented in Table no.22.

It appears from the table that the major situational constraints faced by the farmers in different farming systems and categories were not the same. They varies from system to system for example "Fragmented land holding" was the first major constraints under situational constraint. It was rated first in farming systems Crop + Labour, Crop + Vegetable and Crop+Vegetable+Labour, II in farming system Crop and Crop + Dairy.

Categorywise analysis indicated that 105 marginal, 97 small and 75 big, farmers were facing this constraint among five farming systems.

Similarly, "Inadequate and untimely rainfall" was the II major constraints under situational. It found first in farming systems Crop, Crop+Dairy and Crop + Vegetable +Labour, II in farming system Crop+ Labour and Crop+Vegetable.

Categorywise analysis indicated that 107 marginal, 98 small and 77 big farmers were facing this constraint among five farming systems.

In the same way "Sudden illness of farmers/animals during the peak season" was the third major constraints. It found III in farming systems Crop + Vegetable + Labour, V in farming systems Crop, Crop + Labour, Crop+ Dairy and Crop + Vegetable.

Categorywise analysis indicated that 21 marginal, 23 small and 25 big farmers were facing this constraint among five farming system.

"Inadequate health and artificial insemination facilities" was the IV major constraints. It found II in farming system Crop + Vegetable+ Labour, IV in farming systems Crop, Crop+ Labour, Crop + Dairy and Crop+Vegetable.

Categorywise analysis indicated that 68 marginal, 69 small and 59 big farmers were facing this constraint among five farming systems.

Similarly, "Lack of money" was the fifth major constraint under situational constraints. It found first in farming system Crop+Vegetable+Labour, III in farming system Crop, Crop+Labour, Crop+Dairy and Crop+Vegetable.

Categorywise analysis indicated that 94 marginal, 92 small and 71 big farmers were facing this constraint among five farming systems.

Overall most important constraint faced by farmers in five farming systems was "Inadequate and untimely rainfall" and least important constraints was "Sudden illness of farmers/animals during the peak season" (Fig. 17).

Major "Physical constraints" faced different farming system

Major "Physical constraints" faced by the farmers among various categories and different farming systems under study were presented in Table no. 23.

As it appears from the table that "Physical constraints" faced by the farmers in different farming systems were not the same. The constraint varied greatly from farming system to farming system. For instance "Lack of housing facilities for human beings and animals" was the first major constraint. It was II in farming systems Crop + Vegetable + Labour, III in farming systems Crop+Dairy, and Crop + Vegetable, IV in farming system Crop and V in farming system Crop+Labour.

Categorywise analysis indicated that 38 marginal 38 small and 34 big farmers were facing this constraint in five farming system.

Similarly "Poor physique of human beings and animals" was the II major constraints under physical constraint. It was rated first in farming system Crop + Vegetable + Labour. Whereas, it was II in farming system Crop+Dairy and Crop + Vegetable, III in farming system Crop, IV in farming system Crop+Labour.

Categorywise analysis indicated that 42 marginal, 44 small and 40 big farmers were facing this constraints among five farming system.

In the same way "Inadequate water facilities for drinking as well as for irrigation" was the third major constraints under physical constraints. It was found first in farming system Crop, Crop+Labour, Crop+Dairy, Crop + Vegetable, II in farming system Crop+Vegetable+Labour.

Categorywise analysis indicated that 69 marginal, 72 small and 50 big farmers were facing this constraint among five farming systems.

Similarly, "More distance between house and farmers field" was the fourth major constraints under physical. It was found first in farming systems Crop + Vegetable + Labour, whereas it was II in farming systems Crop, Crop + Labour, Crop + Dairy and Crop+Vegetable.

Categorywise analysis indicated that 56 marginal, 45 small and 44 big farmers were facing this type of constraint in five farming systems.

In the same way "Poor efficiency of labour used at farm" was the fifth major constraints under physical. It was rated as II in farming systems Crop + Vegetable,

Crop + Vegetable + Labour, III in farming systems Crop+Labour, IV in farming system Crop + Dairy and V in farming system Crop.

Categorywise analysis indicated that 41 marginal, 37 small and 34 big farmers were facing this type of constraint among five farming systems.

To sum up, there was a clear cut difference between physical constraints faced by different categories of farmers in different farming systems.

Overall "Inadequate water facilities for drinking as well as for irrigation" was most important constraint and "Lack of housing facilities for human being and animal" was least important constraint (Fig. 18).

SECTION-V

Blue print of the resource oriented farming systems for the overall development of farmer

Farmers would always like to bring positive change without disturbing their existing setup drastically, so we have to evolve optimum strategies which can bring desired change without disturbing much the existing set up. Hence, the optimum resource utilization strategy can be identified and different set-up using optimization techniques linear programming methods.

In present investigation, five farming systems, namely Crop, Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop + Vegetable + Labour have been identified and using linear programming techniques, net returns per farm in each farming system has been maximized. Details of L.P. model, which, includes coefficient of objective functions and input-output coefficient along with the supply level of different resources are presented in the Appendices - II, III and IV (marginal, small and big farmers). The results are sown in the Table from 24 to 27.

Blue print of suggestive farming systems for marginal farmers

The data presented in Table no. 24 showed the blue print of marginal farmers wherein maximisation of net returns was attempted through various activities of crop production, vegetable production, establishing dairy unit and labour.

The plan suggests two Kharif *crops i.e.* bajra *and groundnut in 0.2172 and 0.2715 ha area which was 19.05 per cent and 23.81 per cent of gross cropped area.*

In the same way, in Rabi *season two* Rabi *crops, namely wheat and gram were occupied on 0.2715 and 0.2172 ha area which was 23.81 and 19.05 per cent of gross cropped area. Three vegetables* loki *in* Zaid*, garlic in* Rabi *and* tinda *in* Kharif *season were taken each on 0.540 ha area which accounts 4.73 per cent of the gross cropped area.*

The dairy unit which includes 2 buffaloes and 1 cow were there in the plan with 2 dairy units. The plan also suggests to hire out family labour 342 mandays available with the farmer to work after finishing all farming work and thereby can earn Rs. 18810.00.

The total plan suggests 209.83 per cent cropping intensity to harvest Rs. 38113.44 as net return, by investing Rs. 62075.87 and employing 529.54 mandays (Fig. 19).

Blue print of suggestive farming systems for small farmers

The data presented in Table no. 25 showed the plan for small farmer obtained through linear programming where in maximum net return was attempted through various activities of crop production, vegetable production and establishing dairy unit.

As per the plan two kharif *crops namely maize and groundnut were taken on 0.5651 and 0.7063 ha area which was 20 per cent and 24.39 per cent of gross cropped area, respectively.*

Similarly, in Rabi *season two crops namely wheat and barley were taken on 0.5651 and 0.7063 ha area, which was 20.0 per cent and 24.99 per cent of gross cropped area. Two vegetables garlic in* Rabi *and* tinda *in* Kharif *were taken each on 0.1413 ha area which accounts 5 per cent of the gross cropped area.*

The dairy unit which includes 3 buffaloes and one cow were there in the plan with 4 dairy units. The plan also suggests to hired out family labour upto 210 mandays available with the farmer to work after finishing all farming work and thereby can earn Rs. 11550.00

The total plan suggests 200 per cent cropping intensity to harvest Rs. 61427.36 as this net return using Rs. 128793.00 capital and 1422.03 mandays (Fig. 19).

Blue print of suggestive farming systems for big farmers

The blue print of big farmers i.e. the plan obtained through Linear programming where in maximization of net return was attempted through various activities of crop, dairy and vegetable is as presented in Table no.26.

The plan suggests three Kharif *crops namely* guar*, groundnut and fodder M.P. chari in 1.88, 2.35 and 0.47 ha area, respectively, which was 19.04, 23.80 and 4.76 per cent of gross cropped area.*

In the Rabi *season three crops namely wheat (2.35) ha, barley (0.94 ha) and lucerne (0.47 ha) which was 23.80, 9.52 and 4.76 per cent of gross cropped area and*

two vegetables namely chilli (0.47 ha) and cabbage (0.47 ha) were in the plan in Zaid *season* bhindi *was taken in 0.47 ha, which was 4.76 per cent of gross cropped area.*

The 210 per cent cropping intensity may be realized to harvest Rs.156191.21 net return and by investing Rs. 258676.55 as capital and 2147.67 as mandays.

The dairy unit which includes 4 buffaloes and one cow are there in the plan with 6 units (Fig. 19).

Comparative advantage of blue print (optimum plan) crop and vegetable factor productivity

A comparative analysis of different farm sizes was done by estimating crop factor productivity and the data presented in Table no. 27 the factors included for comparison purpose were land, capital and labour.

*It was observed that land productivity (*i.e. *net returns per hectare) was Rs. 26345.19, 28021.06, 29614.00 in case of marginal, small and big farmers, respectively.*

Table 27: Comparative advantage of blue print (optimum plan) crop and vegetable factor productivity

(In Rupees)

S.No.	**Indicator**	Margina l	**Small**	**Big**
1	Land productivity (Rs./ha)	26345.19	28021.06	29614.30
2	Capital productivity (Rs/ rupee invested)	1.03	1.15	1.22
3	Labour productivity (Rs./labour)	159.76	158.32	168.16

Labour productivity was calculated as net return per labour employed in crop production and it was observed that in case of marginal farmer it was Rs.159.76 almost equal i.e. Rs.158.32 in case of small farmer and Rs. 168.16 in case of big farmer.

Net return per rupee invested for crop production was also estimated and it was observed that lowest in case of marginal (Rs 1.03) followed by small farmer (1.15) and big farmer (1.22).

In nut shell it can be concluded that the big farmers are best in terms of crop factor production.

Table 26 : Blue print of suggestive farming systems for big farmer

S. No.	Activity	Optimum Plan	Net Return (Rs)	Capital Required (Rs)	Labour Required
(A)	Crop activity				
	Kharif crops				
1	*Guar* (X_1)	1.88 ha (19.04)	14645.20	13103.60	107.16
2	Groundnut (X_4)	2.35 ha (23.80)	28785.15	21746.90	145.70
3	M.P. Chari (X_{10})	0.47 ha (4.76)	8091.05	2718.95	20.21
	Rabi crops				
1	Wheat (X_5)	2.35 ha (23.80)	38951.25	29875.55	185.65
2	Barley (X_7)	0.94 ha (9.52)	12937.22	9622.78	74.26
3	Lucerne (X_9)	0.47 ha (4.76)	12431.03	4523.75	16.45
	***Rabi* vegetable**				
1	**Chilli (X_{12})**	0.47 ha (4.76)	16822.71	11630.62	75.20
2	Cabbage (X_{15})	0.47 ha (4.76)	6429.60	10114.40	120.32
	Zaid Veg				
1	*Bhindi* (X_{16})	0.47 ha (4.76)	94.00	10434.00	82.72
(B)	**Dairy unit (X_{17})**	6 Unit	17004.00	124368.00	1320.00
(C)	Cropping intensity	210 per cent			
	Total		**156191.21**	**258676.55**	**2147.67**

Figures in parentheses are percentage of gross cropped area.

Table 24 : Blue print of suggestive farming systems for marginal farmer

S. No.	Activity	Optimum Plan	Net Return (Rs)	Capital Required (Rs)	Labour Required
(A)	**Crop activity**				
	Kharif crops				
1	Bajra (X_3)	0.2172 ha (19.05)	1109.67	1139.64	10.64
2	Groundnut (X_4)	0.2715 ha (23.81)	2310.19	3103.24	16.56
	Rabi crops				
1	Wheat (X_5)	0.2715 ha (23.81)	4513.41	3882.72	21.44
2	Gram (X_8)	0.2172 ha (19.05)	3385.27	2842.06	13.90
	***Zaid* vegetable**				
1	***Loki* (X_{12})**	0.0540 ha (4.73)	1150.90	901.09	6.48
	Rabi vegetable				
1	Garlic (X_{15})	0.0540 ha (4.73)	928.80	928.80	7.56
	***Kharif* vegetable**				
1	*Tinda* (X_{16})	0.0540 ha (4.73)	907.20	976.32	12.96
(B)	**Dairy unit (X_{19})**	2 Unit	4998.00	48302.00	440.00
(C)	**Labour**	342 Mandays	18810.00	--	--
(D)	**Cropping intensity**	209.83 per cent			
	Total		**38113.44**	**62075.87**	**529.54**

Figures in parenthesis are percentage of gross cropped area.

Table 25 : Blue print of suggestive farming systems for small farmer

S. No.	Activity	Optimum Plan	Net Return (Rs)	Capital Required (Rs)	Labour Required
(A)	**Crop activity**				
	Kharif crops				
1	Maize (X_2)	0.5651ha (20.00)	4703.32	5197.22	42.38
2	Groundnut (X_4)	0.7063 ha (24.99)	6996.60	6997.32	45.90
	Rabi crops				
1	Wheat (X_5)	0.5651 ha (20.00)	9707.28	7644.67	46.90
2	Barley (X_7)	0.7063 ha (24.99)	12723.99	8705.85	57.21
	Rabi vegetable				
1	Garlic (X_{16})	0.1413 ha (5.00)	3018.16	4329.43	35.04
	***Kharif* vegetable**				
1	*Tinda* (X_{17})	0.1413 ha (5.00)	2436.01	1407.34	22.60
B	**Dairy unit (X_{18})**	4 Unit	10292.00	9452.00	1172.00
C	**Labour**	210 Mandays	11550.00	--	--
D.	**Cropping intensity**	200 per cent			
	Total		**61427.36**	**128793.82**	**1422.03**

Figure in parenthesis are percentage of gross cropped area.

discussion

The analysis, interpretation and findings of the study have been presented in the preceding section of this chapter. The discussion of the research findings in terms of their practical meaning supported with the related past studies have been presented in this section. The discussion of the findings may be of immense value in driving the implications of the result which would in turn be helpful in augmenting the farming systems amongst various categories of farmers in Dausa district of Rajasthan.

The discussion on the results so obtained have been presented under different major components.

SECTION - I

Present status of farming systems in Dausa district of Rajasthan

Results under this section has indicated that in all, there were 26 farming systems operating under area of investigation. The most popular farming systems were Crop, Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop + Vegetable + Labour. This might be due to fact that mostly the farmers were having crops and animals and those who were not having sufficient land they used to earn their live hood by labour during the leisure time. It is an established fact that crop and animal husbandry are complimentary to each other. It resulted to compel the farmers to have animals on their farms.

The findings of the study was in conformity with the findings of Nair (1987), Kalla (1988), Alteri and Farrel (1989), Singh (1992) and Garilla and Todaria (1997).

SECTION - II

Inter-dependence of various sub-sectors in the farming systems and their role

It has already been indicated that most of the families selected under study were practicising, Crop, Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop +

Vegetable + Labour *i.e.* crop and vegetable, vegetable and labour and crop and labour farming system. The observations showed that all the sub-sectors were interdependent on each other.

Results seemed to be quite natural due to the fact that all the farming system were interdependent in the sense that cultivation of crops provide fodder to the animal and animals provide manure for farming. Similarly, crop residues could be used in the soil for addition of organic matter and the leisure time of farmer can be utilized for additional earning in the form of labour.

Similar, results were also reported by Ruf (1986), Mandape (1989) and Singh (1992).

Comparison of net returns between the farming systems

From the findings mentioned in preceding sections, it was disclosed that the maximum net return was recorded in Crop + Vegetable + Labour farming systems followed by Crop + Labour, Crop, Crop + Dairy and Crop + Vegetable farming system and these systems were significantly superior to other farming systems.

The net returns received from different farming systems were compared and it was found that the net returns was maximum from Crop + Vegetable + Labour farming system. This might be due to fact that vegetable gives higher returns to the farmer and simultaneously farmer could get additional income from doing labour on the farm.

The findings of the study was in conformity with the findings of Singh (1992), Haqua (1996), Singh (1997) and Singh *et al.* (1999).

SECTION - III

Relationship between annual gross and net income of different farming systems with selected independent variables

One of the objective was to find out the relationship between the dependent and independent variables. In the present investigation there were two dependent

variables namely, annual gross income and annual net income obtained from various farming systems under study. Similarly, there were 14 independent variables namely age, caste, family type, education, size of land holding, house and farm building, farm machinery and power, transport facility, information and recreation facility, herd size, family size, source of energy, social participation and extension contact.

To find out the relationship between dependent and independent variables multiple regression technique was applied and results presented in the preceding section of the chapter. The discussion of the most important variables which have affected the annual gross income as well as the net income has been given in the preceding paragraphs.

Relationship between annual gross income of crop farming system

1. Education

As against the assumption, the education was positively and significantly related with annual gross income of crop farming system. It means that farmers having higher education were subjected to adopt improved practices of crop farming system. The results so arrived may be due to the fact that literate farmers can read literature pertinent to agriculture and have better understanding than illiterate farmers.

Findings are contradictory with the findings of Singh (1992) and similar with the findings of Murthy (1990), Choudhary (1999) and Asiwal (2004).

2. Extent contact

As against the assumption, the extension contact was positively and significantly correlated with annual gross income of crop farming system. It means those farmer who have higher extension contacts got more opportunities to interact with extension workers working in various capacities and with various organizations.

The result so arrived may be due to the fact that those farmer who have more extension contact have better understanding than farmers who have less extension contact.

The findings are in line with the findings of Murthy (1990) and contradictory with the findings of Singh (1992).

Relationship between annual gross income of Crop + Labour farming system

1. Age

As against the assumption, the age was positively and significantly related with annual gross income of Crop + Labour farming system.

The result so arrived may be due to the fact that as the farmer become older he gains experience and experienced farmer can manage his farm and other enterprises in a better way.

Findings are contradictory with the findings of Singh (1992) and Choudhary (1999).

2. Caste

As against the assumption, the caste was positively and significantly correlated with annual gross income of Crop + Labour farming system.

It means that farmer belonging to higher cast were subjected to adopt improved practice of Crop + Labour farming system.

The result so arrived may be due to the fact that general caste people facing the problem of unemployment that's why they were moving to adopt Crop + Labour farming system.

Findings are in line with findings of Singh *et al.* (1998) and findings are contradictory with findings of Asiwal (2004).

3. Size of land holding

As against the assumption, the size of land holding was negatively and significantly related with annual gross income of Crop + Labour farming system.

It means that size of land holding was an a important negative factor for annual gross income of Crop + Labour farming system.

The result seemed to be quite natural that as the size of land holding decreased the farmers had adopted Crop + Labour farming system.

These findings are in line with the findings of Singh (1992) and Choudhary (1999).

Relationship between annual gross income of Crop + Dairy farming system

1. Herd size

Result shows the positive and significant relation between herd size and annual gross income of Crop + Dairy farming system.

It could be inferred that the herd size had positive and significant relationship with annual gross income of Crop + Dairy farming system. It means that annual gross income of Crop + Dairy farming system increase with increase in herd size. This might be due to fact that more number of animals, increase the gross income of Crop + Dairy farming system.

The findings are supported by the findings of Singh (1992), Sagar and Dohare (2000) and Chauhan and Moorti (1993) and contradictory with Tyagi and Sohal (1984).

Relationship between annual gross income of Crop + Vegetable farming system

1. Family type

As against the assumption, the family type was positively and significantly correlated with annual gross income of Crop + Vegetable farming system. The result so arrived may be due to the fact that the farmers who live in joint family have more man power and can plan better and manage their farm and other enterprises in better way.

Similar, findings have also been reported by Singh (1995), Asiwal (2004) and contradictory with Choudhary (1999).

2. Size of land holding

As against the assumption, the size of land holding was positively and significantly correlated with annual gross income of Crop + Vegetable farming system.

It means the size of land holding was an important factor for annual gross income of Crop + Vegetable farming system.

The result seemed to be quite natural that as size of land holding increases the farmer move towards from Crop + Vegetable farming system.

This findings are in line with findings of Singh (1992) and Choudhary (1999).

Relationship between annual net income of crop farming system

1. Caste

As against the assumption, the caste was negatively and significantly related with annual net income of crop farming system.

It means caste exert negative significant influence on the annual net income of crop farming system.

The results, so appeared might be due to fact the SC, ST, OBC caste members who were dominating in the sample might have adequate men power and can manage their farm and other enterprises in better way from crop farming system than members from upper caste.

This finding are in line with the findings of Asiwal (2004).

2. Family type

As against the assumption, the family type was positively and significantly related with annual net income of crop farming system.

The results, so arrived may be due to the fact the farmers who live in joint family have more man power and better planning and can manage his farm and other enterprises in better way.

Similar findings have also been reported by Singh (1995), Asiwal (2004) and contradictory with Choudhary (1999).

3. Transport facility

As against the assumption, the transport facility was positively and significantly correlated with annual net income of crop farming system.

It means that the farmers having own transport facility can earn more profit than those farmers who do not have own transport facility.

The results, so arrived may be due to the fact that rich farmers have their own transport facility to earn more profit than poor farmers.

Findings are in contradictory with the findings of Singh (1992) and Asiwal (2004).

Relationship between annual net income of Crop+Labour farming system

1. Size of land holding

As against the assumption, the size of land holding was negatively and significantly related with annual net income of Crop + Labour farming system.

It means size of land holding was an important negative factor for annual net income of Crop + Labour farming system.

The results seems to be quite natural that as the size of land holding decreases the farmer move towards to adopt Crop + Labour farming system.

These finding are similar with findings of Singh (1992) and Choudhary (1999).

2. Family size

As against the assumption, the family size was positively and significantly related with annual net income of Crop + Labour farming system.

It means that farmers have more members in family which were subject to adopt Crop + Labour farming system.

The results so arrived may be due to the fact that as the family size increases the farmer can earn more money from Crop + Labour farming system.

The findings are in line with findings of Singh (1995) and contradictory with the findings of Singh (1992) and Choudhary (1999).

Relationship between annual net income of Crop + Vegetable farming system

Extension contact

As against the assumption, the extension contact was positively and significantly correlated with annual net income of Crop + Vegetable farming system.

It means that farmer having higher extension contact got more opportunities to interact with extension workers working in various capacities and with various organization.

The results so arrived may be due to the fact that those farmers who have higher extension contact have better understanding than farmer who have less extension contact.

Findings are in line with the findings of Murthy (1990) and Singh (1992).

SECTION - IV

To identify and analyze constraints being faced by farmers in different farming systems

The productivity in different farming systems is largely affected by a number of constraints faced by the farmers in different farming systems. Major constraints in different enterprises retard to their growth and at time paralyse the system and the discussion about these constraints have been given below.

1. Transport constraints

Results high lighted that among the transport constraints "Non availability of communication mean" as the most important constraint perceived by the respondents. This might be due to the fact that farmers were not getting informations about the marketability of produce. Although there were a number of communication means available in the social system but these means were not easily approachable to the farmers that's why this constraint has been rated at the top.

Another constraint highlighted was the "Quality of road is poor to the nearest market" which is true that most of the villages are not well connected with road to nearest market.

Findings are in ling with findings of Choudhary (1991), Singh (1992) and Pandey *et al.* (2001).

2. Institutional constraints

Results showed that among the institutional constraints "Non-availability of effective leader in the villages" was perceived as the most important constraint by the respondents. This might be due to the fact that mostly the leaders in villages are political leaders. They use to discuss the political matters rather than agricultural issues. Hence, they were not the potential and functional leaders.

Another constraint highlighted was "Scarcity of technical know how" which may be true due to the reason that most of the technological advances are not reaching to the farmers through extension agency.

Findings are in line with Rade *et al.* (1990) and Singh (1992).

3. Supply constraints

Results showed that among the institutional constraints "Non-availability of chemicals timely" for plant protection were found as major constraint. The reason may be that the most of the sample villages were not having co-operative societies. Hence, the respondents might be bound to purchase plant protection chemicals form local market even at high rates. Thus the monopoly of shopkeepers in local or nearby markets may have caused this constraints.

Another constraint highlighted was "Non-descript breed of animal and poultry birds". This might be due to the fact that farmers do not have knowledge about descript breeds of animals and poultry birds.

Findings are in line with findings of Patil *et al.* (1990) and findings are contradictory with Singh (1992).

4. Credit constraints

The results suggests that the respondents have accorded top priority to the constraints of "Financial crisis in the family". The reasons for financial crisis seems very obvious as most of the families were from low socio-economic status and were having marginal farms and dependent on rains for farming.

Another important constraint was "Long and complicated procedure is to be followed for taking loans". The reasons may be that in most of the villages their were neither banks nor cooperative societies. The procedure of getting loans was very complicated.

Findings are in line with the findings of Jaiswal and Sharma (1990) and Singh (1992).

5. Marketing constraints

Results highlighted that among the marketing constraints "Very low support price is fixed by the government". The reason of this constraint was that input cost was very high as comparison to the farm produce.

Another constraint highlighted was "No market facilities in the villages". Adequate market facilities is quite essential to get appropriate value of the produce. The farmers had to take the produce to city market which adds the cost of transportation and reduces the net profit.

Findings are in line with the findings of Jaiswal and Sharma (1990), Kumar and Singh (1990) and Singh (1992).

6. Technical constraints

Results showed that among the technical constraints "Untimely diffusion of the latest technical know how" as the most important constraints perceived by the respondents. This might be due to fact that farmers are not getting informations about latest technical know how timely. So they are not getting maximum out put from the farming systems. That's why the constraints has been rated at top.

Findings are in line with the findings of Patil *et al.* (1990), Singh (1992) and Choudhary (1999).

7. Economical constraints

Data of present study reveals that the major economical constraints was "Lack of credit facilities" and "Inputs cost are higher" as the most important constraints perceived by the farmers. The reasons for this constraint is that co-operative societies and banks are not in most of the sample villages. So farmers are forced to purchase input from local markets and take credit from local moneylenders.

Another important constraint was market price fluctuation. The reason was that due to lack of communication facilities in the villages farmers was not getting information about current market price so the middle man could cheat to the farmers.

Findings are in line with findings of Kumar and Singh (1990) and Kulkarni *et al.* (1990) and Singh (1992).

8. Socio-cultural constraints

Results showed that 'poverty' was the major socio-cultural constraints. The reasons for this constraint is that due to fragmentation of land holdings farmers have very less land so they were not getting employment throughout the year.

Another important constraint was "More attachment to social norms and culture". This might be due to the fact that still there was strong belief of the farmers in cultural values of society.

Findings are in line with findings of Nekela (1989), Singh (1992), Singh and Khan (1996) and Panickar and Choudhary (2000).

9. Situational constraints

Results showed that "Inadequate and untimely rainfall" was the most important constraint. This might be due to the fact that in most of years the rainfall has been quite erratic and unevenly distributed.

Fragmentation of land holdings was another most important constraint due to increase in population this constraints is increasing day by day.

Findings are in line with findings of Khan (1985), Rade (1990) and Singh (1992).

10. Physical constraints

Results highlighted that among physical constraints "Inadequate water facilities for drinking as well as for irrigation" was perceived by the farmers. The reason for this constraint is that inadequate and untimely rainfall. The water table goes down year after year. Hence, this constraint has been given top priority.

Findings are in line with findings of Nikhada *et al.* (1990) and contradictory with findings of Singh (1992).

SECTION - V

Blue print for the resource oriented farming systems for the overall development of farmers

The blue print of suggestive farming systems for different categories of farmers highlighted that farmers should grow crops, vegetables as in all the three seasons as well as they should have a small dairy unit and excess labour can be utilized for earning additional money. This blue print has been prepared taking into consideration the resource available with the farmers and their economic condition. The gross irrigated areas of Dausa district is 147449 ha and the main source of irrigation is tubewells. The farmers can take crops vegetables and can rear the animal also. This blue print for optimum utilization of the resources of the farmers.

The results are similar to findings of Mruthyunjaya and Siorhi (1979), Satheesh *et al.* (1985), Singh and Subbarayan (1986), Deoghare (1987), Bhati (1983) and Singh (1992)

SUMMARY

In our situation, having an advantage of better natural resource and endowments, maximization of returns from land is best ensured by integrating of crop, dairy, labour and vegetable enterprise in particular system. Different farming systems, if practiced on scientific and commercial lines have a decisive advantage, particularly for small and marginal farmers. Due to certain inherent weaknesses and constraints the poor farmers have not been able to derive proportionately the same degree of benefits from modern scientific agriculture as had been the case with bigger farmers. This is partially attributed to relatively less applicability of non-traditional modern agricultural practices to the conditions of the poor farmers.

In most of the developing countries however extension system still revolve around top down supply driven extension approaches which do not adequately addresses the socio-economic situation of resource poor small holder producers of their requirement. The major challenge in this context, is therefore, to develop appropriate technology transfer systems in developing agricultural economics (Keseba, 1989).

It is necessary for every farmer to keep abreast of the correct cultural and manual practices in order to make full use of scarce resource. Profit in farming depends more on rational decisions rather than on merely hard physical work. Crop cultivation in India provides only seasonal, irregular and uncertain income to the farmers. On the other hand, the cultivators lack risk absorbing capacity because of the inadequacy of resources with them. Highly variable income from the crop enterprises thus put them entirely on the mercy of the nature. The resources of the farmers are meager, and it is difficult for them to achiever higher income and to sustain themselves and the family at a reasonable standard of living and also it is very difficult to meet the day to day expenses through only crop production processes. It is therefore, essential that farmers incorporate such enterprises in their production programme which yield regular flow of income throughout the year and are not subjected so badly to the vagaries of nature, dairy, labour and vegetable are such

enterprises which provides more certain and regular flow of income from month to month and even day to day if so desired. The combination of crop production with dairy, hiring out labour after finishing all and vegetable farming enables fuller utilisation of farm by-products, increasing income, conservation of soil fertility and fuller employment of family labour all the year round and raising the standard of living. Keeping above facts in view, the present study is an attempt to study the "Farming systems amongst various categories of farmers in Dausa district of Rajasthan".

The specific objectives of the study are :

6. To assess the present status of farming systems in various categories of farmers.
7. To study the inter-dependence of various sub-sectors in the farming systems and their role.
8. To study the relationship between annual gross and net income of different farming systems with selected independent variables.
9. To identify and analyze the constraints being faced by farmers in various farming systems.
10. To provide the blue print of the resource oriented farming systems for the overall development of farmers.

The present investigation was carried out in Dausa district of Rajasthan purposively. Dausa district comprises five tehsils, out of which three tehsils were selected randomly for the study purpose.

Separate list of all revenue villages, under each selected tehsil was prepared out of these five revenue villages from each tehsil were selected using simple random sampling technique. In this way a total of 15 revenue villages were selected for the study.

From every selected villages separate list of farmers belonging to different land holdings categories were prepared with the help of record available with *patwari*. The land holding indicates the actual area of land under cultivation by the respondents family either at one place or fragmented at the time of investigation. Since the big farmers are rarely found in every village so the random selection of farmer is not

possible hence it has been decided to keep only three categories (medium and big farmer clumped together) of farmers as mentioned below.

Marginal farm category	:	Below 1 hectare of land
Small farm category	:	Between 1-2 hectares of land
Big farm category	:	more than two hectares of land

From every village 8 farmers were selected from each category randomly making a total of 24 farmers. In this way 120 farmers from each of three farm category *i.e.* marginal, small and big were selected to make a total sample of 360 farmers. But because of very few number of respondents were falling in the remaining 21 farming systems resulting difficulty in calculation. Hence, 63 respondents were dropped from the calculation as per advice of statisticians.

The data have been collected by the personal contact method for the year 2002-03 with the help of specially designed schedule.

Information regarding recommended technology of various enterprises activities have been obtained from K.V.K., Dausa (Rajasthan Agricultural University, Bikaner).

Major findings

Section-I

Present status of farming systems in Dausa district.

1. In all, 26 farming systems have been identified in the Dausa district of Rajasthan. The most prevailing farming system have been observed as Crop, Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop + Vegetable + Labour were adopted by majority of farmers.
2. In many farming systems there were only one or two respondents like Crop + Astrolger, Crop + Business+ Labour, Crop + Artizen, Crop + Business + Tractor + Dairy, Crop + *Chakki* etc.
3. Farmers category wise analysis indicated that the maximum number of big farmers (40) were having crop as the farming system. Whereas, in case of marginal farmers the maximum number of respondents were (57) having Crop + Labour farming system. In the same way maximum small farmers that were (36) having Crop + Labour as farming system.

Section-II

Inter-dependence of various sub-sectors in the farming systems and their role

Four sub-sectors Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop + Vegetable + Labour were identified in this study and out of that the interdependence (correlation) between net income of Crop and Labour, Crop and Dairy, Crop and Vegetable, Crop+Vegetable +Labour farming systems i.e. correlation between Crop and Vegetable, Vegetable and Labour and Crop and Labour.

It was found that all the sub-sectors are interdependent on each other.

Comparison of net returns between the farming systems

Five farming system were studies for their net returns and significant differences were observed among farming systems. The maximum net return was recorded in Crop + Vegetable + Labour farming systems followed by Crop + Labour, Crop, Crop + Dairy, Crop + Vegetable farming system and these systems were significantly superior or higher to other farming system. The net returns ranges between Rs. 24603.36 to Rs. 50430.52.

Hence it may be concluded that the farming system "Crop + Vegetable + Labour" has emerged out as the best amongst the following systems under investigation with the net income of Rs. 50430.42 per annum.

SECTION-III

Relationship between annual gross and net income of different farming systems with selected independent variables

Relationship between annual gross income from farming system Crop with independent variables

Education and extension contact were found positively and significantly correlated with annual gross income of farming system Crop. It indicates that education and extension contact variables play significant role in enhancing the gross income (Fig. 20).

Relationship between annual net income from farming system Crop with independent variables

There independent variables namely caste was negatively correlated, family type and transport facility were positively and significantly correlated with annual net income of farming system crop (Fig. 20).

Relationship between annual gross incomes from farming system Crop + Labour with independent variables

The annual gross income from farming system Crop + Labour was positively and significantly correlated with age, caste and negatively correlated with size of land holding (Fig. 20).

Relationship between annual net income from farming system Crop + Labour with independent variables

The annual net income from farming system Crop + Labour was negatively correlated with size of land holding and positively and significantly correlated with family size (Fig. 20).

Relationship between annual gross income from farming system Crop + Dairy with independent variables

The annual gross income from farming system Crop + Dairy was significantly and positively correlated with one independent variable i.e. herd size (Fig. 20).

Relationship between annual net income from farming system Crop + Dairy with independent variables

The annual net income from Crop + Dairy farming system with independent variables was non-significant for all the fourteen independent variables *i.e.* age, caste, family type etc. (Fig. 20).

Relationship between annual gross income from farming system Crop + Vegetable with independent variables

The annual gross income from Crop + Vegetable farming system was positively and significantly correlated with family type and size of land holding independent variables (Fig. 20).

Relationship between annual net income from farming system Crop + Vegetable with independent variables

The annual net income from farming system Crop+ Vegetable was found significantly and positively correlated with extension contacts (Fig. 20).

Relationship between annual gross and net income of farming system Crop + Vegetable + Labour with independent variables

As per the objective of the present investigation, the relationship between the dependent and independent variables were required to be calculated. Apropos to it was though out to apply multiple regression technique which would yield the combined effect of independent variables as well as individual effect of these variables over dependent variables.

In case of Crop + Vegetable + Labour farming system there were 14 independent variables and 14 number of respondents. Under this condition the multiple regression technique can not be applied because of equal number of respondents and independent variables.

Hence, the relationship under this section could not be calculated.

Section - IV

Constraints being faced by farmers in various farming systems

Constraints and difficulties faced by farmers were grouped in major head like transport, institutional supply, credit, market, technical, economical, socio-cultural, situational and physical. Constraints being faced by three categories of farmers were in different farming systems were studied. The first overall constraints are given below.

Transport constraints

"Transport constraints" found by the farmers in different farming systems were not the same in all the systems. The constraints identified vary greatly from system to system. For instance, non-availability of communication means was the first major constraints faced by the farmers of farming systems, Crop, Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop + Vegetable + Labour.

Institutional constraints

The major "Institutional constraints" faced by the farmers in order of their importance or seriousness in different farming systems were not same. From instance, scarcity of technical know how was the first major constraints of farming systems Crop and Crop + Vegetable. Similarly, "Unavailability of training institutes for

training the farmers" was the first major constraints of farming system Crop + Labour and "Non-availability of effective leader in the village" was the first major constraints of farming system Crop + Dairy. In the same way "Scarcity of caste panchayat" was the first major constraints of farming system Crop + Vegetable + Labour.

Supply constraints

The major "Supply constraints" faced by the farmers in order of their importance or seriousness in different farming systems were not the same. For instance "Non-descript breed of animal and poultry bird was the first major supply constraints reported by the farmers of farming systems Crop, Crop + Labour, Crop + Dairy and Crop + Vegetable + Labour, while "Unavailability of diesel" was the first major constraints in farming system Crop + Vegetable.

Credit constraints

The intensity and severity of credit constraints varies from system to system. "Financial crisis in the family" was the first major constraints reported by the farmers of farming systems Crop, Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop + Vegetable + Labour.

Marketing constraints

The major market constraints faced by the farmers in different farming systems were different from one another. For instance, "Very low support price fixed by the government" was the first major constraints in farming systems Crop, Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop + Vegetable + Labour.

Technical constraints

Six technical constraints have been identified. The intensity and seriousness of these constraints varies from system to system. "Lack of communication of technical know how from Agricultural Department/Agricultural University" to the farm families and "Untimely diffusion of the latest technical know how" was the first major constraints of farming system Crop + Vegetable. Similarly, "Untimely diffusion of latest technical know how" and "Lack of latest technology related to agriculture and allied fields" was the first major constraints of farming systems Crop + Labour and Crop + Dairy. Similarly, "Lack of practical applicability of technical know how" was the first major constraints of farming system Crop. In the same way technology is

not according to need of farmer was first major constraints of farming system Crop + Vegetable + Labour.

Economical constraints

The major "Economical constraints" faced by the farmers were also not the same but these differ from system to system. "Lack of credit facilities" and "Input costs are higher" was the first major constraints of farming systems Crop and Crop + Labour, Crop + Dairy, Crop + Vegetable. Similarly, "Lack of credit facilities" was the first major economical constraints of farming system Crop + Vegetable + Labour.

Socio-cultural constraints

The major "Socio-cultural constraints" faced by farmers are almost same "Poverty" was the first major socio-cultural constraints faced by the most of the farmers in farming systems Crop, Crop + Labour, Crop + Vegetable and Crop + Vegetable + Labour.

Situational constraints

The major "Situational constraints" faced by the farmers in different farming systems vary from system to system. "Fragmentation of land holding" was the first major constraint of farming systems Crop + Labour, Crop + Vegetable and Crop + Vegetable + Labour. Similarly, "Inadequate and untimely rainfall" and "Lack of money" was the first major constraints of farming system Crop + Vegetable + Labour. In the same way "Inadequate and untimely rainfall" was the first major constraint of farming systems Crop and Crop + Dairy.

Physical constraints

The major physical constraints faced by farmers are almost same. "In adequate water facilities for drinking as well as for irrigation" was the major constraints of farming systems Crop, Crop + Labour, Crop + Dairy and Crop + Vegetable. Similarly, "Poor physique of human beings and animals" was first major constraints of farming system Crop + Vegetable + Labour.

Section – V

Blue print of the resource oriented farming systems for the overall development of farmers

Blue print of suggestive farming systems for marginal farmers

The plan suggests two *Kharif* crops i.e. *bajra* and groundnut. In the same way in *Rabi* season two *Rabi* crops namely wheat and gram. Three vegetables *loki* in *Zaid,* garlic in *Rabi* and *tinda* in *Kharif* season.

The dairy unit which including 2 buffaloes and 1 cow are there in the plan with 2 dairy units.

The total plan suggests 209.83 per cent cropping intensity to harvest Rs. 38113.43 as net return by investing Rs. 62075.87 and employing 529.54 mandays.

Blue print of suggestive farming system for small farmers

As per the plan two *Kharif* crops namely maize and groundnut were taken. Similarly, in *Rabi* season two crops namely wheat and barley and two vegetables garlic in *Rabi* and *tinda* in *Kharif* season were taken. The dairy unit which includes 3 buffaloes and one cow are there in the plan with 4 dairy units.

The total plan suggests 200 per cent cropping intensity to harvest Rs. 61427.36 as this net return using Rs. 128793.00 capital and 1422.03 mandays.

Blue print of suggestive farming system for big farmers

The plan suggests three *Kharif* crops namely *guar*, groundnut and fodder M.P. *Chari* and in the *Rabi* season three crops namely wheat, barley and fodder crop lucerne and two *Rabi* vegetables chilli and cabbage and *Zaid* vegetable *bhindi*. The dairy unit 4 buffaloes and one cow are there in the plan with 6 units.

The total plan suggests 210.00 per cent cropping intensity may be realized Rs. 156191.21 net return by investing Rs. 258676.55 as capital and 2147.67 as mandays.

Comparative advantage of blue print (optimum plan) crop and vegetable factor productivity

It was observed that per ha land productivity (*i.e.* net return ha) was 26345.19, 28021.06 and 29614.00 in case of marginal, small and big farmers, respectively.

Labour productivity was calculated as net returns labour employed in crop production and it was observed that in case of marginal farmer it was Rs. 159.79 and almost equal i.e. Rs. 158.32 in case of small farmers and Rs. 168.16 in case of big farmers.

Net return per rupee invested for crop production was also estimated and it was observed that lowest in case of marginal (Rs. 1.03) followed by small farmers (1.15) and big farmer (1.22).

In nut shell it can be concluded that the big farmers are best in terms of crops factor productivity.

Recommendation

1. The present investigation reveals that all the sub-sectors i.e. Crop + Labour, Crop+ Dairy, Crop + Vegetable and Crop + Vegetable + Labour inter-dependent on each other. Hence, farmers should be encouraged to take these enterprises simultaneously so that they can improve their socio-economic condition.

2. In the present investigation, five farming systems were studied for their net returns. The maximum net returns was recorded in Crop + Vegetable + Labour farming system followed by Crop + Labour, Crop, Crop+ Dairy and Crop + Vegetable. Hence these farming systems should be advocated so that farmers can increase their income.

3. Since the education and extension contact were positively and significantly correlated with annual gross income of crop farming system. Therefore, literacy programme needed to strengthen and extension agencies should conduct more trainings and demonstrations to equip the farmers about improved practice of crop farming system and primary education should made compulsory for children.

4. The present investigation showed that three independent variable namely caste negatively correlated while family type and transport facilities were positively and significantly correlated with the annual net income of Crop farming system. Hence, transport facility should be provided to farmers at cheaper rate so that they can easily sell their produce and earn more profit.

5. Relationship between annual gross income from Crop + Dairy farming system was positively significantly correlated with herd size. Hence, good quality breed of cattle and buffalo should be made available to farmers at subsidized rate.

6. Relationship between annual net income from Crop + Dairy farming system was non-significant for all the fourteen independent variables, it means some more variables influencing net income are still to identified.

7. The annual net income from Crop + Vegetable farming system significantly correlated with extension contact independent variable. Hence, extension agencies should be strengthen and good demonstration of crop and vegetable should be conducted at village level. So that farmers can learn improved packages of practices.

8. The productivity in different farming systems was largely affected by number of constraints faced by the farmers in different enterprises. Major constraints in different enterprises retarded to their growth and at time paralyse the systems.

Following are the major recommendations in this direction based on findings of study and the personal experience during course of investigation :

(a) The major transport constraint faced by the farmers among various categories and different farming systems under study were "Non-availability of communication means". Hence, it is suggested that communication facilities should be made available to farmers.

(b) The major institutional constraint is "Non-availability of effective leader in the village". Hence, it is suggested that extension agencies should conduct training on leadership development at village level.

(c) Major supply constraint is "Unavailability of chemical for plant protection". Hence, it is suggested that co-operative societies should be made effective so that original chemical for plant protection should be provided to the farmers.

(d) Major credit constraint is "Financial crisis in the family". So it is recommended that long and complicated procedure for taking loans should be made simple.

(e) The major marketing constraint is "Very low support price fixed by government" Therefore suggested that support price should be increased.

(f) The major technical constraint is "Untimely diffusion of latest technical know how". Hence, it is suggested that latest technology should be diffused among the farmers timely.

(g) The major economic constraint is “Higher input costs”. Hence, it is suggested that inputs costs should be minimized by providing subsidies by the government.

(h) The major socio-cultural constraint is “Poverty”. Hence, it is suggested that for marginal and small farmers, poverty elevation programmes for these categories should be reviewed by increasing budget provision.

(i) The major situational constraint is “Inadequate and untimely rainfall”. Hence, it is suggested that irrigation canals or *boaring* well facilities should be provided in villages along with drought resistant varieties of crops.

(j) The major physical constraint is “Inadequate water facilities for drinking as well as for irrigation”. Hence, therefore, it is suggested that adequate quantity of hand pump should be installed in village to solve problem of drinking and irrigation canals or *Patal Tod boring* facilities should be provided in villages so that irrigation problem may solve.

9.The blue print for marginal, small and big farmers have been suggested in the present investigation. Hence, necessary facilities should be provided to farmers so that he they can improve his socio-economic condition.

Future scope of study

1. Similar, study can be undertaken in other parts of Rajasthan state.
2. Farming systems other than 5 selected for this study area also important but as the number of sampled respondents were less, they were left out, hence in future study in other areas, these other farming systems may be included.
3. A comparative study on various farming systems can be undertaken between Dausa district and other districts of Rajasthan.
4. Anthropological aspect may be included in future study along with farming systems.
5. An action research can be taken up provided some development plan, in Dausa district of Rajasthan.

6. LITERTATURE CITED

8. Abdulai, A. and Huffman, W. (2000). Structural adjustment and economic efficiency of Rice farmers in Northern Ghana. *Economic Development and Cultural Change*. 48 (3) : 503-520.

9. Acharya, R.M. (1986). Research need in dairy production. *Indian Dairyman*. 38 (7) : 319-326.

10. Adesina, A.A. and Quattara, A.D. (2000). Risk and agricultural systems in Northern Cote d' Ivoire. *Agricultural systems.* 66 (1) :17-32.

11. Adeymo, R. (1998). An analysis study of the traditional production and marketing system of small ruminants in South-West Nigeria. *Journal of Rural Development and Administration* 30 (1):18-24.

12. Agarwal, J.K. (2000). "Knowledge and adoption of improved pea cultivation practices in Jaipur district of Rajasthan". M.Sc. (Ag.) Thesis, R.A.U., Bikaner, Campus : S.K.N. COA, Jobner.

13. Altieirl, N.A. and Farrell, J. (1989). Traditional farming systems of South-central Chile, with special emphasis on agro-forestry. *Agroforestry Systems.* 2 (3-18), 6-8.

14. Alvarez, F.R. and Pazmotola, R. (1997). Methodology for the desigen of proposals for the development of goat milk production. Metodologia asociada al diseno de propuestas para el desarrollo de la production lechera Caprina. *Archivos de zootecnia* 46 (175):211-224.

15. Ambastha, C.K. (1974). Communication patterns in farm innovation development, extension and client system in Bihar: A system approach. Ph. D. Thesis, IARI, New Delhi.

16. Anonymous (2003-04). Vital Statistics, Govt. of Raj., Pant Krishi Bhawan, Jaipur: 6.

17. *Anonymous (2005-06). Economic Survey, Govt. of India, New Delhi : 157-159.*

18. Arunachalam, S. and Thiagarajan, M. (1999). Livestock farming structure in Tamil Nadu. Cheiron 28 (4) : 96-101.

19. Ashiha, Sisay (1999). Economic performance and poultry farmers in Ajmer, Rajasthan. M.Sc. (Ag.) Thesis, R.A.U., Bikaner, Campus : S.K.N. COA, Jobner.

20. Asiwal, K.C. (2004). Problems, prospects and management of groundnut-wheat cropping system in Jaipur region of Rajasthan. Ph.D. Thesis, R.A.U., Bikaner, Campus : SKN COA, Jobner.

21. Balakrishnan, V. (1980). Economics of mixed farming. *Madras Agricultural Journal,* 67 (3 : 161.

22. Ballantyne, A.O. (1985). Subsistence production: Wheat comes next. *Agriculture Administration*, 20 (3) : 139-152.

23. Behera, S.N. and Mohanty, S.K. (2000). Studies on use of unutilized riverbed land resources for potato cultivation. *Orissa Journal of Horticulture*. 28 (1) : 94-103.

24. Bhati, J.P. (1983). Population pressure on land resources and ecological balance, problems of agricultural development in Himachal Pradesh. *Agricultural situation in India*. 23 : 641-650.

25. Bogahawatte, C. (1984). Evaluating crop livestock based farming system: A village level study in the dry zone rainfed district of Sri Lanka. *Agricultural System*. 14 (4) :199-212.

26. Bouis, H. and Haddad, L.J. (1994). The nutrition effects of sugarcane cropping in a southern Philippine province. In agricultural commercialization, economic development, and nutrition Blatimore, Maryland, USA: Johns Hopking University Press : 204-217.

27. Braun, J. Von. and Immink, M.D.C. (1994). Non-traditional vegetable crops and food security among small holders farmers in Guatemala. In agricultural commercialization economic development and nutrition Baltimere, Maryaland, USA: Jhons Hopkins University Press. : 189-203.

28. Chandra, S. (1995). "Knowledge and adoption of improved cultivation practices of mungbean by farmers of Chirawa panchayat samiti in Jhunjhunu district of Rajasthan". M.Sc. (Ag.) Thesis, R.A.U., Bikaner, Campus : S.K.N. COA, Jobner.

29. Charyulu, V.S. (1980). A study on production and marketing of eggs in Hyderabad city. *Indian J. Poul. Sci.,* 15 (4) : 211-216.

30. Chaudhary, M.R. (1991). "A study of factors affecting adoption of recommended production technology of gram in panchayat samiti Sambhar Lake of district Jaipur (Raj.)". M.Sc. (Ag.) Thesis, R.A.U., Bikaner, Campus : S.K.N. COA, Jobner.

31. Chauhan, S.K. and Moorti, T.V. (1993). Income expenditure, savings and investment behaviour on tribal hill sheep farm in Himachal Pradesh. *Indian Journal of Hill Farming* 6 (2) :159-165.

32. Choprakarn, K.; Wanikoran, V.; Smart, N.; Singtongla, P.; Sanorasert, R. and Kacwmani, C. (1999). A feasibility study on agriculture produciton system in the community for appropriate technology development. In the Kasgetsari University Annual Conference, 3-5 Feb., 1999.

33. Choudhary, M. (1999). "A study on knowledge and adoption of improved cultivation practies of mothbean in Bikaner district of Rajasthan" M.Sc. (Ag.) Thesis, R.A.U., Bikaner, Campus : S.K.N. COA, Jobner.

34. Choudhary, V.K. and Lalwani, N.R. (2004). An inter temporal performance analysis of progressive dairy unit of Chhattisgarh state in India. *Egyptian Journal of Dairy Science.* 32(1) : 153-162.

35. Christantly, L.; Abdoellah, O. and Iskander, J. (1982). Traditional agroforestry in west Java. The Pakarangen (Home garden) and talun-kebun (shifting cultivation) cropping systems. *Rural Development*, *Abstract* : 69-71.

36. Constant, P.; Diedhiou, I.; Layaida, N.; Mapongmentsem and Wereme, P.M. (2000). Constraints and opportunities for periurbean agriculture at Phonom penhi in Cambodia :case of the province of kanda (Saang district) contraintes et oppertunites de agriculture peri-urbaine de phhom pehh, uu combodge case de la province de kandel (district de sang). Montnellier, France Agropolis international No. 89 :130.

37. Deoghare, P.R. (1987). Impact of mixed farming on income and employment on farms in Karnal district of Haryana. Ph. D. Thesis, IARI, New Delhi

38. Deoghare, P.R. (1997). Sustainability of on farm income and employment through livestock production in Mathura district of Uttar Pradesh. *Indian Journal of Animal Sciences* 67 (10) : 916-919.

39. Devadoss, S. (1980). A study on maxization of income and employment on small farms of Theni block, district Madhurai (Tamil Nadu). M.Sc. Thesis, IARI, New Delhi.

40. Devadoss, S.; Sharma, B.M. and Singh, C. (1985). Impact of farming systems on economic and employment of small farmers in Theni Block of Tamil Nadu. *Journal of Farming Systems,* 1 (1): 48-57.

41. Diagana, C.; Fadlaoui, A.; Neira, J.; Padonau, E. and Randrianampy, J. (1998). Agricultural research for the development of mountain farming system; study of rural development support in the ifrane province, Morocco, Serie de Doucments de Travail Agropolis International No. 74 : 113.

42. Dube, S.K.; Swarnkar, V.K. and Nair, K.M. (1989). Constraints in adoption of improved animal husbandry practices. *Mah. J. Ext. Edu.* VIII (10) : 140-141.

43. Dwivedi, R.P.; Meena, B.S. and Ramana, D.B.V. (2002). Analysis of small scale dairy farming in Bundelkhand. *IRJEE.* 2 : 83-86.

44. Fisher, R.A. (1949). Statistical methods for research workers. Oliver and Boyal. Edinberg, London.

45. *Fratkin and Smith (1994). Labour, livestock and land: The organisation of pastural production. In African Pastoralist systems an integrated approach : 91-112.*

46. Gairola, J. and Todaria, N.P. (1997). The status of women in subsistence agriculture in the Garhwal Himalyas India. *Mountain Research and Development*. 17 (2) :169-170.

47. Gangwar, A.C. and Bhatia, H.C. (1980). Prospects of increasing income and emplyment through dairying on small farms. *IJAE,* XXXV (4) : 165.

48. Gautam, D.S.; Tomar, L.S. and Thakur, P. (1999). Study on cost benefit structure of soyabean-wheat crop sequence on tribal and other backward community farmers of Satpura Region. *Bhartiya Krishi Anusandhan Patrika.*14 (3&4) : 70-77.

49. Gaytancioglu, O. and Surek, H. (2000). Input use and production cost in rice cultivation Turkey. *International Rice Commission Newsletter*. 49 : 43-59.

50. Ghodake, R.D. and Hardkar, J.B. (1981). Whole farm modeling for assessment of dry land technology. ICRISAT, Ratancheru, (A.P.) :17.

51. Ghosh, M. (1986). Farm size productivity nexus under alternative technology, *IJAE,* 41 (1) : 17-28.

52. Gupta, J.N. and Patel, R.K. (1985). Economic appraisal of investment in cross-bred cattle. *IJAE,* XI (1): 36-42.

53. Guzman, M.R.D. (1983). Integration of backyard dairy beef farming with the cropping system of South-East Asia. *NSTA Technology Journal, B*. (2) 27 (I) : 1471.

54. Halkatti, S.V. and Swamy, S.B.(1994). "Knowledge adoption and constraints in the improved cultivation of Potato". *Rural India*. Vol. 11 & 12 (1 & 2) : 14-17.

55. Haque, T. (1996). Sustainability of small holder agriculture in India. New Delhi, India; Concept of Publishing Company. : 156.

56. Harwood, R.R. (1979). Small farm development, understanding and improving farming system in the humid tropics. Bouldar, Colorado, Westview Press.

57. Hurst, M.E. (1974). A geography of economic behaviour London: Prantice Hall.

58. Ingle, P.O.; Supe, S.V. and Sagane, M.A. (1988). Adoption of farm technology by tribals of Melghat. *Mah. J. Ext. Edu.* VII : 259-261.

59. Intodia, S.L. (1999). Identification of technological constraints and action there of in crop production in different agro-climatic zones of Rajasthan. Directorate of Ext. Edu., R.A.U., Bikaner.

60. Jaiswal, R.K. and Sharma, P.N. (1990). Constraints in adoption of improved technology of rice. *Mah. J. Ext. Edu.* IX (10):342-343.

61. Jawahar, T. and Chaudhary, J.N. (1999). An empirical investigation of crop diversification : a study of North Bihar. *Artha Vikas*. 35 (2) : 28-34.

62. Jefremovas, V. (1993). Riding the green tide: Strategies among the Sagada vegetable gardeners of North Luzon. Working papers-Cordillera studies centre, University of Philippines College Baguio No. 22 : 16.

63. Jirli, B.V. and Gangadharappa, N.R. (1997). Cognitive domain of vegetables growers with respect to integrated pest management. *Mysore Journal of Agricultural Sciences,* 31 (1) :98-102.

64. Kalla, J.C. (1988). Forestry and economic development. *IJAE.* 43 (3): 43-44.

65. Kesseba, A.M. (1989). Technology systems for small farmers: Issues and options. Westivew Press, London.

66. Khan, P.M. (1985). Analysis of factors influencing adoption and discontinuance of modern agricultural technology among various categories of farmers. Ph. D. Thesis, R.A.U., Bikaner, Campus : S.K.N. COA, Jobner.

67. Khandelwal, M. (1991). Role of women in commercial vegetable production in Girwa panchyat samiti district Udaipur. M.Sc. Thesis, R.A.U. Bikaner, Campus : Home Sc., Udaipur.

68. Khatik, K.C (1998)."Knoweldge and attitude of farmers towards rearing cross breed goat in panchayat samiti Sambhar Lake district Jaipur (Rajasthan). M.Sc. Thesis, R.A.U., Bikaner. Campus : S.K.N. COA, Jobner.

69. Kher, S.K. (1992). Adoption of improved wheat cultivation practices. *IJEE.* 28 (1&2) : 97-101.

70. Killanga, S. and Traore, A. (1999). The influence of the management and the socio-economic status of the agropaster on the productivity of sheep and goats in central Mali. Influence delagestion et du statut socio-economic de agro-pasteur sur la producitivty desovines et descaprins au mali control Tropicultura. 16& 17 (4) : 180-183.

71. Kokate, K.D. and Tyagi, K.C. (1988). Dairy development in a tribal scenario: Diagnosing the needs and problems. *Mah. J. Ext. Edu.* : 143-147.

72. Koshta, A.K. and Chandrakar, M.R. (1999). Indian Co-operative Review. 36 (4) : 300-309.

73. Krishna, M. (1984). Success of poultry programme: A case study. *Kurukshetra*, XXXII (7) : 11-15.

74. Kulkarni, V.V.; Bhopale, R.S. and Chede, P.N. (1990). Constraints in adoption of dairy technologies by dairy farmers *Mah. J. Ext. Edu.* IX.:137-140.

75. Kumar, N. and Singh, R.P. (1990). Constraint of fertilizer use in dry land farming. *Mah. J. Ext. Edu.,* IX (2) : 312-313.

76. Kumar, S. and Deoghare, P.R. (2003). Goat production system and livelihood security of rural landless households. *IJSR,* 9 (1) : 19-24.

77. Kumari, K. and Singh, R.P. (1999). Farmers participatory assessment of latesown wheat production technologies. *Journal of Research, Birsa agricultural University.* 11 (2) :167-172.

78. Kumat, V.S. (1975). "Economics of egg production a case study in Udaipur". *Poultry Guide*, XII (11) : 13-14.

79. Kushwah, R.K.; Singh, G.N. and Singh, C.P. (1986). Economics of milk production by small and marginal farmers in district Ghazipur. *Indian Farming,* 36 (5) : 14-15.

80. Kweyuh, P.H.M. (1994). Tobacco expansion in Kenya the socio-ecological losses. *Tobacco Control*. 3(3) : 248-251.

81. Lal, S.K.; Bhalerao, M.M. and Gupta, S.B.L. (1984). Income and employment among tribals. *Kurukshetra*, XXXII (8) : 22-24.

82. Lanjewar, D.M.; Gade, S.S.; Longewar, A.D.and Pusankar, V.D. (2000). Socio-economic consequences of change in cropping pattern. *Journal of Soils and Crops* 10 (12) : 272-274.

83. Lotan Singh and Chattaraj, J. (2000). Sustainable livestock farming system in eastern India. In dairy development in eastern India, Kalyani, India National Dairy Research Institute, Eastern Regional Station. : 82-87.

84. Mahanjan, A.M. and Cronje, P.B. (2000). Factors affecting goat production in a communal farming system in the eastern cape region of South Africa. *South African Journal of Animal Science*. 30 (2) :149-154.

85. Mahapatra, S.C. (1990). Poultry breeding. Hand Book of Animal Husbandry, Publication and information division, ICAR, New Delhi.

86. Malhotra, R. (1997). Significance of dairy in Indian Economy. *Indian Dairyman*. 49 (8) : 33-38.

87. Mandepe, M.M. (1989). "A multidimensional study of mixed farming amongst small and marginal farmers. Ph. D. Thesis, IARI, New Delhi.

88. Marfo, K. and Wigging, S. (1999). Changing farming practices in the forest Guinea Savannah zone of Ghana. In natural resource management in Ghana and its socio-economic context Landon, U.K; Overseas Development Institute : 60-69.

89. Mary, F. and Michon, M.G. (1987). When agroforestry drive back natural forests: A socio-economic analysis of a rice agro-forest system in Sumatra. *Agroforestry Systems*, 5 : 27-55.

90. Mazoyer, M (1995). How to achieve legitimate and effective agricultural projects : Theory and critical analysis of farming systems. Land reform, land settlement and co-operative. No. 1992/93 (22) : 4-17.

91. Meertens, H.C.; Fresco, L.O. and Stoop, W.A. (1996). Farming system dynamics; impact of increasing population density and the availability of land resources on changes in agricultural systems. The case of Sukumaland, Tanzania, Agriculture, Ecosystems and Environment. 56 (3) : 203-215.

92. Morgan, W.B. (1978). Agriculture in the third world : A Capital analysis. London: Bell and Hyman.

93. Mruthyunjaya and Sirohi, A.S. (1979). Enterprise system for stability and growth on drought prone farms: An application of parametric linear programming. *IJAE.* 34 (1):27-42.

94. Murthy, R. (1990). Factors associated with the knowledge of cotton growers of Gunter district (A.P.). *Mah. J. Ext. Edu.,* 9 : 181-184.

95. Nair, P.K.R. (1987). Agroforestry systems inventory: *Agroforestry Systems*, 5 : 301-307.

96. Nasr, N.; Salem, M.B.; Rachidi, Y.L.; Benissad, J. and Medouni, Y. (2000). Change in livestock farming and management system throughout the arid zones; EI-ouarade Tataounine (Tunisic). Mutation des systems elevage et de gestiondes parcours collectivos en zones arides: Et-ouarade Tataoueni (Tunisie). Secheresse 11 (2) : 93-100.

97. Naved, R.T. (2000). Intrahosehold impact of the transfer of modern agricultural technology: A gender perspective Washington, D.C. USA, Discussion Paper-Food Consumption and Nutrition Division, International Food Policy Research Institute No. 85: 92

98. Ndaeyo, N.V., Umoh, G.S. and Ekpe, E.O. (2001). Farming systems in Southern- Eastern Nigeria: implications for sustainable agricultural production. *Journal of Sustainable Agriculture.* 17 (4) : 75-89.

99. Nekela, N.S. (1989). "*Kharif* pulse technology accessibility to farmers in tribal and non-tribal areas of Udaipur district (Raj.)". M.Sc. (Ag.) Thesis, R.A.U., Bikaner, Campus : R.C.A., Udaipur.

100. Neupane, R.P. and Thapa, G.B. (2001). Impact of agroforestry intervention on soil fertility and farm income under the substance farming system of middle hills of Nepal. Agriculture, Ecosystems and Environment, 84 (2): 157-167.

101. Nicholson, C.F.; Thornton, P.K.; Mohammed, L.; Muinga, R.W. ; Mwamachi, D.M.; Elbasha, E.H.; Stall, S.J. and Thrope, W. (1999). Small holder dairy technology in coastal Kenya: An adoption and impact study. Nairobi, Kenya: International Livestock Research Institutes. : 59.

102. Nikhada, D.M., Bhopale, R.S. and Sagane, M.A. (1990). Constraints analysis in adoption of recommended technologies of paddy. *Rural India*, 53 (2): 318-320.

103. Nisha, P.R. and Subramanian, R. (2000). Participation of farm women in dairy co-operatives and their problems. *J. Res. Punjab Agril. Univ.,* 28 : 32-36.

104. Nugabushana R.B.; Naidu, M.R. and Mohammad H. (1979). "Economics of poultry farming." *Poultry guide*. XVI (9) : 43-47.

105. Ogna, W. (1995). Indigenous vegetables in Kenya. In do it herself : women and technicla innovation (edited by Appleton, H.) London, U.K.; Intermediate Technology Publications Ltd. (ITP). : 167-172.

106. Pal, M.; Singh, K.A. and Ahlawat, I.P.S. (1985). Cropping system research concept, needs and directions; proceedings of the national symposium on cropping systems. *The Indian society of Agronomy*, New Delhi. : 3.

107. Palaniappan, S.P. (1985). Cropping systems in the tropics-principles and management. Willey Eastern Limited. New Delhi. : 6-9.

108. Pandey, R.M. (1990). New Vistas for growth : Horticultural crops. The Hindu Survey of Indian Agriculture, Parasarathy Garden, Madras. 7: 178-179.

109. Pandey, S.N.; Dalal, R.S. and Pandey, S. (2001). Constraints perceived by trainers in krishi vigyan kendras. *Journal of Dairying Foods and Home Science,* 20 : 238-240.

110. Pandey, U.K.; Suhagi, K.S. and Chhikara, O.P. (1982). An economic analysis of dairy enterprise vis-à-vis crop cultivation in Haryana. *IJDS,* 35 (2): 150-155.

111. Panicker, B.C. and Choudhary, M.R. (2000). Constraints faced by rural women in receiving training in the modern practices of agriculture. *Agril. Extn. Rev.* 12 : 20-21.

112. Pant, D.C. (1988). "An economic analysis of production and marketing of moth". Ph. D. Thesis, R.A.U., Bikaner, Campus : R.C.A., Udaipur.

113. Parewa, B.L. (1992). "Analysis of constraints in the adoption of vegetable crops by the farmers of panchayat samit Sambhar Lake district Jaipur (Raj.)" M.Sc., (Ag.) Thesis, R.A.U., Bikaner. Campus : S.K.N. COA, Jobner.

114. Paroda, R.S. (1999). The Challenges, opportunities and strategies before national agricultural research system during the next millennium. changing scenario in farming practices polices and management. Kurukshetra Farm Book Series. ; 219-275.

115. Patil, R.P.; Desai, B.R. and Girase, K.A. (1990). Constraints faced by *jowar* seed producers. *Mah. J. Ext. Edu.*, IX (10): 241-242.

116. Paudiyal, D. (1983). Evaluating cropping pattern innovation in whole farm context; a case study in Nepal. Agricultural Projects Service Centre, Bulletin. No. 17 (R.D.A., 1984/ 17-2).

117. Pawar, J.R. and Sutar, S.R. (1982). Impact of lower interest rate finance on economic condition of rural weaker section. *IJAE,* XXXVII (2): 265-272.

118. Phengsavanh; Phimphachanhvongsod and Horne, P. (2000). Livestock and forage management in stablishing shifting cultivation. 16 (3) : 26-27.

119. Podikunju, B.; Sharma, F.L. and Panwar, J.S. (2001). Constraints encountered by farm women in management of dairy animals in Southern Rajasthan. *Indian Dairy man.* 53 53-57.

120. Prabhakaran, R. and Thirunavakkarasu, M. (1995). Income and employment dynamics of goat farm in different agroclimatic zones of Tamil Nadu. *Ind. Jour. Animal Produ. and Mgt., Vol.* 11 (1):14-26.

121. Rade, V.M.; Desai, B.R. and Girase, K.A. (1990). Constraints in adoption of recommended kharif groundnut production. *Mah. J. Ext. Edu.,* Vol. IX : 152.

122. Rai, R.B.; Balakrishnan, P.; Tripathi, P.K. and Ummer, K.P. (2000). Performance of back yard poultry in bay Island. *Indian Veterinary Journal*. 77 (8) : 709-710.

123. Raja, A. (1980). "Economics of poultry farming in Namakkal Taluk - an inter group comparison". *Poultry Guide*, 18 (6) : 73-76.

124. Rajbala, (1991). "Participatory role and constraints of women in *Bajra* cultivation. M.Sc. Thesis, H.A.U., Hisar.

125. Rajpal, S.K.; Kumar J. and Singh, B. (1978). "Cost and return analysis of egg production in and around Madras City". *IJPS.* XIII (12) : 12-16.

126. Ranjeet K. and Sharma, A.K. (1999). Impact of dairy co-operatives on the rural economy in National district a case study. *Indian Co-operative Review,* 36 (3) : 201-208.

127. Rao, V.M. (1986). Some problems of milk producers in a Delta village of Andhra Pradesh. *Asian Journal of Dairy Research*. 5 (2):71-77.

128. Rathore, S.S. (1988). "Factor affecting the adoption of improved agriculture practices of mustard cultivation in panchayat samiti Bhinmal district Jalore". M.Sc. (Ag.) Thesis, RAU, Bikaner, Campus : R.C.A., Udaipur.

129. Reddy, C.R.; Reddy, G.V.N. and Reddy, E.V.R. (1986). Effect of various systems of farming on the cost of milk production in Hyderabad. *Asian Journal of Dairy Research,* 5 (1) : 57-60.

130. Richard, M.P. (1990). Genetic tool for high yielded-poultry. *The Hindu Survey of Indian Agriculture*, 7, Parasarathy Garden, Madras. 7: 194-195.

131. Roy, M.N. and Choudhary, R.K. (1996). Constraints of the scheduled caste women in their role in crop husbandry. Animal husbandry and poultry keeping in Hajo development block, Assam. *IJSR.* 372 : 155-168.

132. Ruf, T. (1986). Integration of livestock farming on small farms of the Nile Delta. Historical approach to the analysis of the role of cattle; draft animals, soil fertility and savings, Cahiers de le Recherche Development, 9 (10): 100-106.

133. Ruthenberg, H. (1976). Farming system in the tropics. Clrerdon press Oxford, II edition.

134. Safalaoh, A.; Jesemuni, K. and Phoya, R.A. (1998). Survey of Broiler production in the Blantyre Agriculture and Development Division, Malawi Development Southern Africa 15 (2) : 235-250.

135. Sagar, R.L. and Dohare, R.S. (2000). Adoption of health care in goat as related to some situational, socio-economic and extension characteristics of goat farmers. *IJSR,* 6 (1) : 36-41.

136. Sagar, R.L. and Ojha, S.N. (1998). Constraints and factors helping in adoption of goat production technology : Farmers per ception. *IJSR,* 4 (1) : 28-30.

137. Sahni, K.L. (1990). Goat production, HandBook of Animal Husbandry, Publication and Information division, ICAR, New Delhi : 118-162.

138. Saini, A.S. and Singh, R.V. (1980). "Generating farm income and employment through integrated crop and milk production. *IJAE,* XXXV (4) :166.

139. Saini, A.S. and Singh, R.V. (1985). "Impact of diversification on income and employment and credit needs of small farmers in Punjab. *IJAE,*. XI (3) : 310-316.

140. Sangu, K.P.S. (1995). Comparative economics of milk production for buffalo deshi cow and cross bred cow in village and town condition. *IJDS.* 48 (4): 266-270.

141. Saraswat (1991). A critical study in technological gap of pulses and oil seeds crops with special reference to small, medium and large farmers of C.D. Block Bichpuri, Agra. Ph. D. Thesis , Agra University, Agra.

142. Sardana, P.K. and Panghal, B.S. (1983). Feasibility of dairy finance on small farms. *Asian Journal of Dairy Research*. 2 (3) : 147-152.

143. Sardana, P.K. and Panghal, B.S. (1984). Prospects of increasing the income and employment on small farm through dairying. *IJDS*. 37 (3): 187-192.

144. Satheesh, A.V. (1982). Income potential of non-viable farms in Pithapuram block, east Godavari district (Andhra Pradesh). M.Sc. Thesis, IARI, New Delhi.

145. Satheesh, A.V.; Sharma, B.M. and Sharma, V.K. (1985). "Impact of diversification and liberal credit policy on income and employment of non-viable farms in Pithapuram block of east Godavari, district (A.P.). *IJAE,* X (3): 323-329.

146. Seshadri, V.S. (1990). Need for a secure seed policy. Boosting vegetable productivity. *The Hindu Survey of Indian Agriculture*, Parathasarathy Garden, Madras, 182-184.

147. Sethuraman, B.; Subranian, M. and Kothandaraman, P. (1978). "Cost and return analysis of egg production in and around Madras City*", IJPS. 1*3 (4):12-16.

148. Seyoum, E.T.; Battese, G.E. and Flamening, E.M. (1998). Technical efficiency and productivity of maize producers in eastern Ethopia: A study of farmers with in and out side the Sasakawa Global 2000 Project. *Agricultural Economics.* 19 (3) : 341-348.

149. Sharma, B.M.; Singh, I.; Singh, D. and Kumar, V. (1981). Role of livestock and poultry enterprise in rural development in Alipur block, Delhi (a case study). Paper presented in the national seminar on changes for rural development held at HAU, Hisar, March 2-3, 1981.

150. Sharma, H.O.; Soni, S.N. and Nahatkar, S.B. (2000). Impact of watershed development programme on income and employment. *Crop Research Hisar*. 19 (3) : 447-451.

151. Sharma, N.K. and Riyazuddin (1993). Adoption of improved sheep production technologies, IJEE, XXX (1&2): 102-107.

152. Sharma, R.K. and Moorti, T.V. (1984). Optimising sheep herd size on tribal farms of Himachal Pradesh: A study of Bharmaur tehsil of district Chamba". *Agricultural Situation of India*. (13): 83-86.

153. Sharma, R.K.; Moorti, T.V. and Mehta, P. (1984). Economics of mixed farming in tribal areas of Himachal Pradesh. Agricultural Economics Publication, Hpkvv, 21 & 27 (11).

154. Sharma, V.B.; Sharma, T.N.and Singh, R.I. (1997). Adoption behaviour of cotton growers with species reference to knowledge status and constraints. *Crop Research* (Hisar).13 (1) : 189-203.

155. Shekhawat, S.S. (1997). "Technological gap in the recommended production technology and constraints in vegetable cultivation in Kotputli panchayat samiti of Jaipur district" M.Sc. (Ag.) Thesis, RAU, Bikaner, S.K.N. COA, Jobner.

156. Sheokend, R.S.; Singh, N. and Sheoran, O.P. (2000). Comparative economics of different farming system under paddy-wheat farming sequence in rice belt of Haryana. *Haryana Agricultural University Journal of Research* 30 (1/2) : 49-53.

157. Singh, B.S.P. (1967). "A comparative study of the adoption behaviour of farmers of package and non-package block of Shahabad. *Review Ext. Res.* 7, Agriculture College of Sabour, Bihar.

158. Singh, C.B.; Dhaka, J.P. and Sharma, S.P. (1981). "Labour absorption and factors influencing levels of employment in crop, dairy and poultry enterprise". *IJAE,* 36 (4) :14-20.

159. Singh, G.N.; Sagar, S.D.S.; Gupta, B.K. and Mishra, P.D. (1985). Economics of milk production on farms of different size in district Farrukhabad in U.P. *Asian Journal of Dairy Research*. 4 (1): 29-35.

160. Singh, H. (1992). A study of farming systems amongst farmers in Mewat Area of India. Ph.D. Thesis, R.A.U., Bikaner, Campus : R.C.A., Udaipur.

161. Singh, H.P. (1998). Sustainable development of the Indian desert: The relevance of the farming systems approach. *Journals of Arid Environment.* 39 (2) : 279-284.

162. Singh, I. and Subbarayan, M. (1986). "Optimal use of energy inputs on different size groups of farms in Meerut district of U.P.". *IJAE,* 41 (1) : 86-92.

163. Singh, J.P. (1981). "The role of credit and technology on increasing income and employment on small and large farms in western region of Hyderabad district, Andhra Pradesh". *IJAE,* XXXVI (3): 50-61.

164. Singh, J.P. (1981). A study of small farmers with respect to their farming condition, communication pattern, and adoption of new technology in Agra district of Uttar Pradesh, Ph. D. Thesis, Agra Univesity, Agra.

165. Singh, K. (1991). A study of adoption and communication behaviour of small farmers in Bharatpur district of Rajasthan. Ph.D. Thesis, University of Agra, Campus : R.B.S. College. Bichpuri (Agra).

166. Singh, K., Singh, J.P. and Singh, P. (1998). Adoption behaviour of small farmers in Bharathpur district of Rajasthan. *Raj. J. Ext. Edu.,* 7: 6-93.

167. Singh, L. (1995). Resource management for rice-wheat management in Haryana. Ph.D. Thesis, HAU, Hisar.

168. Singh, M.K. (1997). Economics of production and marketing of vegetables a case study in Patna block of Jabalpur district. *Agricultural marketing*. 40 (2) : 18-20.

169. Singh, N.P. and Riyazuddin (1996). Social status and role in agriculture of sheep farmer women in semi-arid region of Rajasthan. *Wool and Woolens of India*. 33(1) : 21-23.

170. Singh, R. (1997). Farming system of dry land Haryana Village; What is and what should be. Thesis Abs. Vol. XXIII (4).

171. Singh, R., Singh, N. Phogat, S.B. and Sharma, U.K. (1999). Income and employment potential of different farming systems. *Haryana Agricultural University Journal of Research.* 29 (3/4) : 143-145.

172. Singh, R.P. and Singh, S.B. (1982). Features of traditional farming systems in two villages of Gujarat, ICRISAT, Patancheru, (A.P.). India. : 26.

173. Singh, R.V. and Saini, A.S. (1986). Dairy enterprise for increasing income and employmenet on small farms. *Indian Dairyman,* 38 (8): 97-399.

174. Singh, S. (1994). Economics of layer poultry farming in Haryana. *Poultry Guide*, XXXI (4) : 73-77.

175. Singh, S. and Khan, I.M. (1996). Identification of the major constraints in rearing cross bred cattle as perceived by farm women. *Rural India*. 59 (4) :112-113.

176. Singh, S.N. (1969). An study of adoption of high yielding varieties and investment pattern of additional income by the farmers of Delhi Territory, Ph. D. Thesis, IARI, New Delhi.

177. Sinha, R.P. and Sharma, B.M. (1986). "Prospects of increasing farm income on tube-well irrigated bullock operated farm through new technology and credit. *Agricultural situation in India*. XII (3): 139-142.

178. Sirohi, A.S.; Sharma, B.M.; Singh, U.T. and Dayal, R. (1980). Role of dairy and poultry enterprise for increasing income and employment on farms in the union Territory of Delhi". *IJAE,* 35 (4): 112-119.

179. Sirohi, Smita and Rawat, P.S. (2000). Resource use efficiency in sheep farming: A case study of district Tonk, Rajasthan. *IJSR,* 6 (1) : 42-47.

180. Smita, S. and Sirohi, S.K. (1997). Knowledge level and constraints to adoption of scientific dairy farming practices among farmers of Chinndwara district (M.P.). *Journal of Dairying, Foods and Home Sciences.* 16 (1):28-36.

181. Sohoni, A.W. (1967). Impact of farm machine mechanisation on some aspect of farming in Kanjhawala block (Delhi territory). Ph.D. Thesis, IARI, New Delhi.

182. Soni, S.N.; Mishra, P.C. and Kurmvanshi, S.M. (2000). Economics of technical change of wheat production in Sagar district, M.P. *Crop Research* (Hisar). 19 (3) : 452-456.

183. Spaner, D.; Brathwaite, R. and Mathur, D.E. (1997). Prospectives in development for maize production in the Caribbean: A case study of Trinidad and Tobago. *Canadian Journal of Development Studies*. 18 : 613-627.

184. Srivastava, R.B.; Singh, D.P. and Rizvi, A.H. (1989). "Pulses production technology, adoption and cultivation in Bihar." *Agricultural Situation India*, No. 1989 : 641-652.

185. Srivastava, R.M. and Kharde, R.L. (1983). Traditional bellefs of tribal mundas associated with cattle husbandry. *IJAE,* XIX (3 & 4) : 77-81.

186. Swaminathan, M.S. (1986). Agricultural research and the challenge of conservation, 18th Lal Bhadur Shastri memorial culture, 5th Feb., 1986. ISTT, New Delhi.

187. Tac, Cgiar (1978). Farming system research at the International Agricultural Research Centre, Rome, Italy, Agril, Dept, FAO. : 8-12.

188. Talathi, J.M. and Borude, (1980). "Economics of mixed farming in Kulaba district (Maharashtra)". *IJAE,* XXXV (4) : 317-323.

189. Thomas, S.B.P. and Bhatt, N. (1994). Land, livestock and livehood: changing dynamics of gender, caste and ethricity in a Nepalese village. *Human Ecology* (New York). 22 (4) : 467-494.

190. Thorve, P.V. and Galgalikar, V.D. (1985). Economics of diversification of farming with dairy enterprise. *IJAE,* XI (3) : 317-323.

191. Toky, O.; Kumar, P. and Khosia, P.K. (1989). Structure and function of traditional agroforestry systems in the western Himalaya. *Agroforestry systems*. : 47-70.

192. Tripathi, (1986). "Diffusion and adoption of agricultural innovations with special reference to the problems of small and marginal farmers of district Manipur (U.P.). Ph. D. Thesis, R.B.S. College, Bichpuri, Agra.

193. Trivedi, G. (1963). Measurement and analysis of socio-economic status of rural families, Ph. D. Thesis, IARI, New Delhi.

194. Tyagi, K.C. and Sohal, T.S. (1984). Factors associated with adoption of dairy innovation : *IJEE*, 20 : 1-6.

195. Udo, H. and Cornelissent, T. (1998). Livestock in resource poor is farming system. Out look on Agriculture. 27 (4) : 237-242.

196. Ulmek, B.R. and Patil, V.P. (2001). Constraints faced by the buffalo owners in breeding tract of Pandharpur buffaloes of Maharashtra. *IJDS.* 54 : 286-287.

197. Vyas, H.V. and Patel, K.F. (2001). Constraints faced by milk producers in adoption of dairy technology. *Rural India.* 64 : 117-118.

198. Waman, G.K. and Girase, S.T. (2001). Problems of rural women engaged in *Bidi* making occupation. *Rural India.* 64 : 187-189.

199. Wasnik, S.M. (1988). Adoption of dry farming technology in progressive and non-progressive villages. *Mah. J. . Ext. Edu.*. VII : 203.

200. Weber, C. (1984). Livestock farming in India. forms of organisation differentiation and regional development trends. *Bonner studien zur landlichen, Entwicklung in der Dritten Welt*, No. 9 : 372.

201. Yadav, A.K. (1997). "A study on constraints in the adoption of recommended package of practices of vegetable crops by the farmers of panchayat samiti Pisangan district Ajmer (Raj.)". M.Sc. (Ag.) Thesis, R.A.U., Bikaner, Campus : S.K.N. COA, Jobner,.

202. Yadav, J.P. and Sharma, S.K. (2000). Constraints in rearing crossbred cows as perceived by the farmers. *IJSR.* 41: 113-21.

203. Yedukondalu, R.; Rao, B.V.; Raghavendra and Rao, K. Saryan (2000). Problems and Prospects of Dairying in Medak district of Andhra Pradesh. *Ind. J. Dairy Sci.,* 53 : 434-440.

204. Zandstra, H.G.; Price, E.C.; Litsinger, J.A. and Morris, R.A. (1981). A method for on farm cropping system research IARI. Los Banos, Laguna, Philippines.

205. Zeller, M.; Diagne, A. and Mataya, C. (1998). Market access by small holder farmers in Malawi; implications for technology adoption, agricultural productivity and crop income. *Agricultural Economics,* 19 (1&2) : 219-229.

Farming Systems Amongst Various Categories of Farmers in Dausa District of Rajasthan

Y.K. Sharma[*]
Investigator

Dr. G.S. Bangarva[**]
Major Advisor

ABSTRACT

In India agriculture is the primary source of employment for both man and women, as this sector employs the majority of rural man power. Agriculture accounts for about 30 per cent of gross domestic product and employs about two third of the labour force. Most of the areas in our country suffers almost every year from one or other form of natural calamities like flood, unseasonal heavy rains or drought. Further the pressure on the available agriculture land is increasing due to growing urbanization, population explosion and subsequent fragmentation of land.

In view of the above facts there is strong need felt to commercialize agriculture and in order to ensure an all round development of farming families farming should be considered as a system in which crop and other enterprises that are compatible and complimentary are combined together. It should include all components of land such as soil, water, crop livestock, labour and other resources.

The study of farming systems and application of farming systems approaches can bring a ray hope for the betterment of farmers. Keeping all these factors in mind the present study was conducted to suggest which particular mixture of Crop, Dairy, Vegetable and Labour can provide maximum benefit and job opportunity for their development. In view of the above background the present study is designed with following objectives:

1. To assess the present status of farming systems in various categories of farmers.
2. To study the inter-dependence of various sub-sectors in the farming systems and their role.
3. To study the relationship between annual gross and net income of different farming systems with selected independent variables.
4. To identify and analyze the constraints being faced by farmers in various categories of farmers.

[*] Ph.D. Scholar, Deptt. of Extn. Edu., S.K.N. College of Agriculture, Jobner (Jaipur), Rajasthan

5. To provide blue print for resource oriented farming systems for the overall development of farmers.

The present investigation was carried out in Dausa district of Rajasthan purposively. Dausa district comprises of five tehsils out of which three tehsils were selected randomly for the study purpose.

Separate list of all revenue villages, under each selected tehsil was prepared. Out of these, five revenue villages from each tehsil were selected using simple random sampling technique. In this way a total of 15 revenue villages were selected for the study.

From every village 8 farmers were selected randomly for each category making a total of 24 farmers. In this way 120 farmers from each of three farm categories i.e. marginal, small and big was selected to make a total sample of 360 farmers.

An interview schedule was prepared consisting of devices for measuring dependent and independent variables. The data were collected by personally interview method. The data so collected were classified, tabulated and analyzed statistically which led to the following findings.

1. In all 26 farming systems have been identified in the Dausa district of Rajasthan. The most prevailing farming system have been observed as Crop, Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop + Vegetable + Labour which were adopted by majority of farmers.
2. Farmers category wise analysis indicated that the maximum number of big farmers (40) were having crop as the farming system, where as in case of marginal farmer the maximum number of respondents (57) were having Crop + Labour farming system. In the same way maximum small farmers that is (36) were having Crop + Labour as farming system.
3. Four sub-sectors *viz.,* Crop + Labour, Crop + Dairy, Crop + Vegetable and Crop + Vegetable + Labour were identified in this study and it was found out that all the sub sectors are interdependent on each other.

** Associate Professor, Deptt. of Extn. Edu., S.K.N. College of Agriculture, Jobner (Jaipur), Rajasthan

4. Five farming systems were studied for their net return and significant difference were observed among farming systems. The maximum net returns was recorded in Crop + Vegetable + Labour farming systems followed by Crop + Labour, Crop, Crop + Dairy and Crop + Vegetable farming systems and these systems were significantly superior or higher to other farming systems.

5. To study the relationship between annual gross income of crop farming system. Education and extension contact were positively and significantly correlate with annual gross income of crop farming system.

6. To study the relationship between annual net income of crop farming system with independent variable. Two independent variables namely, family type and transport facilities were positively and significantly correlate with annual net income of crop farming system and caste was negatively correlated with annual net income from crop farming system.

7. The annual gross income from farming system Crop + Labour was positively and significantly correlated with age, caste and negatively correlated with size of land holding.

8. The annual net income from farming system Crop + Labour was positively and significantly correlated with family size and negatively correlated with size of land holding.

9. Relationship between annual gross income from farming systems Crop + Dairy with independent variables was significantly and positively correlate with one independent variable i.e. herd size.

10. Relationship between annual net income from farming system Crop + Dairy with independent variable was non-significant for all the fourteen independent variables.

11. The annual gross income from farming system Crop + Vegetable was positively and significantly correlated with family type, size of land holding independent variables.

12. The annual net income from farming system Crop + Vegetable was found significantly and positively correlate with extension contact independent variable.

13. Constraints being faced by farmers in various farming systems were not found same. The constraints identified varied greatly from system to system.

14. Blue print of suggestive farming systems for marginal farmers : The study suggests cultivation of two *kharif* crops i.e *bajra* and groundnut, two *Rabi* crops namely wheat and gram and three vegetables *loki* in *Zaid*, garlic in *Rabi* and *tinda* in *Kharif* season. This plans also suggest keeping two dairy unit having two buffaloes and one cow in each unit.

15. Blue print of suggestive farming systems for small farmers : As per the study farmer should cultivate two *kharif* crops namely maize and groundnut, wheat in barley in *Rabi* and two vegetables i.e. garlic in *Rabi* and *tinda* in *Kharif* season. Four dairy units are recommended with each unit comprising 3 buffaloes and one cow

16. Blue print of suggestive farming systems for big farmer : It is cultivation of guar, groundnut and fodder M.P. *Chari* in *Kharif*, wheat, barley and fodder crop lucerne in *Rabi and two Rabi* vegetables chilli and cabbage and *Zaid* vegetable *bhindi*. The dairy unit have 6 each unit having four buffaloes and one cow.

Recommendations

1. It is recommended that Crop + Vegetable + Labour, Crop + Labour, Crop, Crop + Dairy and Crop + Vegetable farming systems should be adopted in the sequence of their decreasing effectively.

2. Literacy programme should be strengthened and extension agencies should conduct training and demonstrations to equip the farmers about improved practices of crop farming system and primary education should made compulsory for children.

3. The annual gross income from Crop + Vegetable farming system was positively and significantly correlated with size of land holding. It is suggested that farmers should be motivated for co-operative farming.

Table 10 : Relationship between annual gross and net income from Crop farming system and selected independent variables

N=107

S. No.	Independent variables	Annual gross income			Annual net income		
		b value (R.Cof.)	S. Error of b	't' value	b value (R. Cof.)	S. Error of b	't' value
1	Age	299.9444	267.4307	1.1215	293.1450	274.3956	1.0683
2	Caste	-756.2301	2591.0846	-0.2918	-6299.2098	2658.5658	-2.3694*
3	Family type	4477.3497	7422.6401	0.6032	6934.8303	7615.9524	0.9105*
4	Education	7873.6110	3402.6711	2.3139*	8745.7818	3491.2889	2.5050
5	Size of land holding	-649.5757	433.9154	-1.4970	-573.0349	445.2161	-1.2870
6	House & farm building	624.7157	1736.8108	0.3596	1224.3210	1782.0436	0.6870
7	Farm machinery & power	-6.4139	250.3214	-0.0256	149.6780	256.8470	0.5827
8	Transport facility	1096.3474	1447.5964	0.7573	5845.6457	1485.2971	3.9356**
9	Information & recreation facilities	-261.6109	816.1969	-0.3205	-451.8720	837.4536	-0.5395
10	Herd size	-1767.2374	2107.5935	-0.838	-3066.6472	2162.4818	-1.4181
11	Family size	935.7827	766.4223	1.2209	863.4478	786.3827	1.0979
12	Source of energy	1414.4144	1249.0031	1.1324	329.5968	1281.5316	0.2571
13	Social participation	-4706.9597	4893.1545	-0.9619	-6400.5882	5020.5899	-1.2748
14	Extension contact	3084.2186	1055.5968	2.9217**	-1844.5188	1083.0884	-1.7030
		R^2 =	0.2075		R^2 =	0.3693	
		F =	1.7393		F =	3.8906	
		df =	14,93		df =	14, 93	

*Significant at 5% level of significance

**Significant at 1% level of significance

Table-11 : Relationship between annual gross and net income from Crop + Labour farming system and selected independent variables

N=97

S. No.	Independent variables	Annual gross income			Annual net income		
		b value (R.Cof.)	S. Error of b	't' value	b value (R. Cof.)	S. Error of b	't' value
1	Age	406.5223	176.3644	2.3050**	234.2659	168.8193	1.4043
2	Caste	9062.2672	2901.0591	3.1237**	5185.9048	2744.0508	1.8898
3	Family type	-1107.8259	6442.0946	-0.171967	-9679.2641	-6093.44	-1.5884
4	Education	-2862.6475	3241.6746	-0.8830	-5433.3954	3066.2318	-1.7720
5	Size of land holding	-9618.0618	4000.5546	-2.4041**	-3046.6023	3784.0405	-8.8051**
6	House & farm building	-716.0724	1462.1301	-0.4897	1387.1983	1382.9982	1.0030
7	Farm machinery & power	311.2061	264.9214	1.1747	417.9805	250.5836	1.6680
8	Transport facility	-210.7317	1691.7951	-0.1245	-972.1929	1600.2334	-0.6075
9	Information & recreation facilities	-510.5504	1117.1811	-0.4337	-648.2596	11113.4709	-0.5821
10	Herd size	2297.7539	1798.3236	1.2777	-1008.4769	1700.9964	-0.5928
11	Family size	834.5868	629.4276	1.3259	2160.1160	595.3624	3.6282**
12	Source of energy	182.3544	1093.9950	0.1666	1549.0902	1034.7869	1.4970
13	Social participation	-579.9948	3335.0996	-0.1739	-953.0476	3154.6005	-0.3021
14	Extension contact	204.6494	930.1319	0.2200	47.9209	879.7922	0.0544
		R^2 =	0.2474		R^2 =	0.3265	
		F =	1.9493		F =	2.8750	
		df =	14, 83		df =	14, 83	

*Significant at 5% level of significance

**Significant at 1% level of significance

Table-12 : Relationship between annual gross and net income from Crop+Dairy farming system and selected independent variables

N=52

S. No.	Independent variables	Annual gross income			Annual net income		
		b value (R.Cof.)	S. Error of b	't' value	b value (R. Cof.)	S. Error of b	't' value
1	Age	508.1250	414.9012	1.2246	62.0744	251.1802	0.2471
2	Caste	7343.8178	4465.8957	1.6444	992.7283	2703.6426	0.3671
3	Family type	-3231.3400	14411.8907	-0.2242	-7577.1253	8724.9241	-0.8684
4	Education	7168.1678	5858.7920	1.3258	4955.3996	3546.8986	1.3971
5	Size of land holding	-672.8990	2094.9660	-0.3211	-2415.4902	1268.2874	-1.9045
6	House & farm building	-3356.2139	3059.3362	-1.0970	928.9573	1852.1148	0.5015
7	Farm machinery & power	319.2185	404.2348	0.7896	460.3350	244.7228	1.8810
8	Transport facility	-5910.1709	2907.9022	-2.0324	-459.6912	1760.4370	-0.2611
9	Information & recreation facilities	-3766.5961	2437.9648	-1.5449	-1980.8967	1475.9380	-1.3421
10	Herd size	11208.5605	2731.1278	4.1040**	3129.7493	1653.4182	1.8928
11	Family size	120.2265	1454.9359	0.0826	-255.3897	880.8147	-0.2899
12	Source of energy	-83.0358	2394.0124	-0.0346	-1898.0684	1449.3293	-1.3096
13	Social participation	13846.8930	9805.5989	1.4121	11221.0961	5936.2861	1.8902
14	Extension contact	-90.0589	2366.1985	-0.0380	109.7170	1432.4909	0.0765
		R^2 =	0.4000		R^2 =	0.2821	
		F =	1.8098		F =	1.066752	
		df =	14, 38		df =	14, 38	

*Significant at 5% level of significance

**Significant at 1% level of significance

Table-13 : Relationship between annual gross and net income from Crop+Vegetable farming system and selected independent variables

N=27

S. No.	Independent variables	Annual gross income			Annual net income		
		b value (R.Cof.)	S. Error of b	't' value	b value (R. Cof.)	S. Error of b	't' value
1	Age	-236.9584	303.7390	-0.7801	-320.9895	162.9107	-1.9703
2	Caste	6233.4803	5390.5753	1.1563	3545.3656	2891.2411	1.2262
3	Family type	39786.8935	12524.9715	3.1766**	9665.7729	6717.7826	1.4388
4	Education	998.5518	5944.1457	0.1679	790.1446	3188.1493	0.2478
5	Size of land holding	4861.9582	1899.6122	2.5594*	1936.8396	1018.8591	1.9009
6	House & farm building	-2897.0022	3799.3091	-0.7625	-15.3559	2037.7637	-0.0075
7	Farm machinery & power	-390.2015	492.7079	-0.7919	-426.15457	264.2644	-1.6126
8	Transport facility	-407.5870	3635.1029	-0.1121	315.7083	1949.6915	0.1619
9	Information & recreation facilities	-1849.8046	2433.9865	-0.7599	513.4924	1305.4714	0.3933
10	Herd size	-2124.0577	4101.3262	-0.5178	1279.5201	2199.7509	0.58186
11	Family size	-2314.2431	1999.9680	-1.15714	408.0197	1072.6851	0.3803
12	Source of energy	3149.1575	1637.1847	1.9235	982.9425629	878.1058	1.1193
13	Social participation	3340.0746	11232.8870	0.2973	-2208.4673	6024.7716	0.3665
14	Extension contact	2609.5477	2122.4272	1.2295	2566.1341	1138.3662	2.2542*
		R^2 =	0.4756		R^2 =	0.6563	
		F =	0.84226		F =	1.773167	
		df =	14,13		df =	14,13	

*Significant at 5% level of significance

**Significant at 1% level of significance

Table 14 : Major transport constraints faced by of farmers practising different farming systems

Constraints faced by farmers	Crop F.S. N=107					Crop+Labour F.S. N=97					Crop+Dairy F.S. N=52				
	M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
1 Lack of linked road to the nearest market	3	3	5	**10.28**	III	6	4	1	**11.34**	III	0	0	0	**0**	
2 Quality of road is poor to the nearest market	7	10	12	**27.10**	II	6	5	3	**14.43**	II	0	1	5	**11.54**	II
3 Non-availability of communication means	10	12	14	**33.64**	I	17	13	0	**30.93**	I	0	6	9	**28.85**	I
4 Non-availability of labour for loading & unloading	0	0	2	**1.86**	IV	1	0	0	**1.03**	IV	0	0	0	**0**	

Crop+Vegetable F.S. N=27					Crop+Vegetable+Labour F.S. N=14					Overall N=297				
M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
0	1	0	**3.70**	III	0	0	0	**0**		9	8	6	**7.74**	III
4	1	0	**18.52**	II	5	0	0	**35.71**	I	22	17	20	**19.86**	II
2	5	7	**51.85**	I	4	1	0	**35.71**	I	33	37	30	**33.67**	I
0	0	0	**0**	0	0	0	0	**0**		1	0	2	**1.01**	IV

M = Marginal S = Small B = Big FS = Farming system % = Percentage

Table 15 : Institutional constraints faced by farmers practising different farming systems

Constraints faced by farmers		Crop F.S. N=107					Crop+Labour F.S. N=97					Crop+Dairy F.S. N=52				
		M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
1	Lack of educational facilities	9	12	12	**30.84**	VIII	19	12	1	**32.99**	VII	0	6	9	**28.85**	VII
2	Unavailability of training institutes for training the farmers	24	25	27	**71.02**	III	50	31	1	**84.54**	I	2	18	24	**84.62**	II
3	Scarcity of technical know how	28	28	27	**77.57**	I	45	27	3	**77.32**	II	2	17	25	**84.62**	II
4	Scarcity of															
(a)	Co-operative banks	20	24	30	**69.15**	IV	40	23	3	**68.04**	III	1	17	23	**78.85**	III
(b)	Farmers club	19	18	22	**55.14**	V	26	16	3	**46.39**	VI	1	9	12	**42.31**	VI
(c)	Discussion groups	14	16	24	**50.46**	VII	33	19	1	**54.64**	V	2	11	15	**53.85**	V
(d)	Caste panchayat	17	18	23	**54.20**	VI	34	26	2	**63.92**	IV	1	11	19	**59.62**	IV
5	Gram panchayat is not functioning in proper way	11	8	13	**29.90**	IX	13	14	1	**28.86**	VIII	0	2	8	**19.23**	VIII
6	Non-availability of effective leader in village	22	26	34	**76.63**	II	50	30	2	**84.54**	I	1	18	27	**88.46**	I

Crop+Vegetable F.S. N=27					Crop+Vegetable+Labour F.S. N=14					Overall N=297				
M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
0	2	2	**14.81**	V	0	0	0	**0**	-	28	32	24	**28.28**	VIII
1	11	9	**77.78**	II	7	2	0	**64.29**	IV	84	87	61	**78.11**	III
3	12	9	**88.89**	I	6	1	0	**50.00**	V	84	85	64	**78.45**	II
5	8	8	**77.78**	II	10	2	0	**85.71**	II	76	74	64	**72.05**	IV
4	8	8	**74.07**	III	9	1	0	**71.43**	III	59	52	45	**52.52**	VII
3	9	7	**70.37**	IV	9	1	0	**71.43**	III	61	56	47	**55.21**	VI
2	11	8	**77.78**	II	11	2	0	**92.86**	I	65	68	52	**62.28**	V
2	0	0	**7.40**	VI	6	1	0	**50.00**	V	32	25	22	**26.59**	IX
3	9	7	**70.37**	IV	10	2	0	**85.71**	II	86	85	70	**81.14**	I

M = Marginal S = Small B = Big FS = Farming system % = Percentage

Table 16 : Supply constraints faced by farmers practising different farming systems

Constraints faced by farmers		Crop F.S.					Crop+Labour F.S.					Crop+Dairy F.S.				
		N=107					N=97					N=52				
		M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
1	Unavailability of															
(a)	Good quality of seed/seedling of improved varieties	17	22	26	**60.75**	V	35	23	3	**62.89**	IV	0	13	17	**57.69**	III
(b)	Fertilizer	8	18	17	**40.18**	XII	20	15	1	**37.11**	XI	0	7	11	**34.62**	IX
(c)	Chemical for plant protection	7	14	18	**36.44**	XIII	19	10	1	**30.93**	XIII	0	2	10	**23.08**	XI
(d)	Implements	12	21	24	**53.27**	IX	27	17	1	**46.39**	IX	0	10	17	**51.92**	V
(e)	Feed & fodder	12	22	21	**51.40**	XI	17	14	4	**36.08**	XII	0	6	11	**32.69**	X
2	Untimely supply of															
(a)	Seeds	15	20	25	**56.07**	VIII	24	19	4	**48.45**	VIII	1	5	12	**34.62**	IX
(b)	Fertilizers	14	22	27	**58.87**	VII	28	20	4	**53.61**	VII	0	6	16	**42.31**	VIII
(c)	Chemical for plant protection	18	23	26	**62.61**	IV	29	21	4	**55.67**	VI	1	7	18	**50.00**	VI
(d)	Diesel	26	22	25	**68.22**	III	36	27	4	**69.07**	III	1	12	21	**65.38**	II
(e)	Electricity	25	27	30	**76.63**	II	45	26	3	**76.29**	II	2	14	24	**76.92**	I
3	Non descript breed of animal & poultry bird	29	25	32	**80.37**	I	48	27	3	**80.41**	I	2	18	20	**76.92**	I
4	Poor quality and non-availability of water for drinking	16	20	28	**59.81**	VI	30	21	4	**56.70**	V	1	10	18	**55.77**	IV
5	Poor quality of feed & fodder availability	16	22	18	**52.33**	X	24	15	3	**43.30**	X	0	6	17	**44.23**	VII

Crop+Vegetable F.S.					Crop+Vegetable+Labour F.S.					Overall				
N=27					N=14					N=297				
M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
4	7	8	**70.37**	III	5	1	0	**42.86**	IV	61	66	54	**60.94**	V
2	3	1	**22.22**	X	3	0	0	**21.43**	VII	33	43	30	**35.69**	XIII
2	2	2	**22.22**	X	3	0	0	**21.43**	VII	31	28	31	**84.11**	I
2	3	2	**25.93**	IX	4	0	0	**28.57**	VI	45	51	44	**47.13**	XI
4	5	1	**37.04**	VIII	5	0	0	**35.71**	V	38	47	37	**41.07**	XII
4	6	2	**44.44**	VII	7	0	0	**50.00**	III	51	50	43	**48.48**	X
4	5	1	**37.04**	VIII	5	0	0	**35.71**	V	51	53	48	**51.17**	VIII
4	8	3	**55.56**	V	7	0	0	**50.00**	III	59	59	51	**56.90**	VI
4	11	8	**85.19**	I	8	1	0	**64.29**	II	75	73	58	**69.36**	IV
5	10	7	**81.48**	II	12	2	0	**100.0**	I	89	79	64	**78.11**	III
5	9	8	**81.48**	II	12	2	0	**100.0**	I	96	81	63	**80.80**	II
5	7	2	**51.85**	VI	5	0	0	**35.71**	V	57	58	52	**56.22**	VII
4	7	7	**66.67**	IV	6	1	0	**50.00**	III	50	51	45	**49.15**	IX

M = Marginal S = Small B = Big FS = Farming system % = Percentage

Table 17 : Credit constraints faced by farmers practising different farming systems

Constraints faced by farmers		Crop F.S. N=107					Crop+Labour F.S. N=97					Crop+Dairy F.S. N=52				
		M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
1	Financial crisis in the family	31	30	36	**90.65**	I	54	32	4	**92.78**	I	2	18	24	**84.62**	I
2	Lack of banks and other authorised loaning agencies	26	32	33	**85.04**	IV	43	27	3	**75.26**	IV	2	15	26	**82.69**	II
3	Untimely and inadequate loaning by banks or other authorised loaning agencies	27	29	33	**83.17**	V	41	26	3	**72.16**	VI	2	14	23	**75.00**	V
4	Lack of private finance agencies	29	30	34	**86.91**	III	42	26	3	**73.20**	V	2	14	24	**76.92**	IV
5	Higher interest rates of private finance agencies	29	31	34	**87.85**	II	46	29	4	**81.44**	II	2	14	22	**73.08**	VI
6	Inefficient working of cooperative societies	22	17	28	**62.61**	VII	41	22	3	**68.04**	VII	1	11	17	**55.77**	VIII
7	Only few influential persons getting loans from the banks/ cooperative societies	19	23	34	**71.02**	VI	37	25	3	**67.01**	VIII	1	11	20	**61.54**	VII
8	Long & complicated procedure is to be followed for taking loans	27	31	36	**87.85**	II	45	29	4	**80.41**	III	2	15	25	**80.77**	III

Crop+Vegetable F.S. N=27					Crop+Vegetable+Labour F.S. N=14					Overall N=297				
M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
5	10	9	**88.89**	I	12	2	0	**100.0**	I	104	92	73	**90.57**	I
5	11	8	**88.89**	I	12	2	0	**100.0**	I	88	87	70	**82.49**	IV
5	11	8	**88.89**	I	12	2	0	**100.0**	I	87	82	67	**79.46**	VI
5	11	8	**88.89**	I	12	2	0	**100.0**	I	90	83	69	**81.48**	V
5	11	8	**88.89**	I	12	2	0	**100.0**	I	94	87	68	**83.83**	III
2	10	8	**74.07**	III	4	1	0	**35.71**	III	70	61	56	**62.96**	VIII
4	10	8	**81.48**	II	10	2	0	**85.71**	II	71	71	65	**69.69**	VII
5	11	8	**88.89**	I	12	2	0	**100.0**	I	91	88	73	**84.84**	II

M = Marginal S = Small B = Big FS = Farming system % = Percentage

Table 18 : Marketing constraints faced by farmers practising different farming systems

Constraints faced by farmers	Crop F.S.					Crop+Labour F.S.					Crop+Dairy F.S.				
	N=107					N=97					N=52				
	M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
1 No market facilities in the village	24	28	34	**80.37**	II	44	27	3	**76.29**	II	2	13	19	**65.38**	II
2 Market is far away	8	17	17	**39.25**	VI	17	8	4	**29.90**	VI	0	5	6	**21.15**	VI
3 Lack of knowledge about prevailing market price	18	25	27	**65.42**	III	28	20	3	**52.58**	IV	1	9	12	**42.31**	IV
4 High marketing charges	6	15	14	**32.71**	VII	13	9	2	**24.74**	VIII	0	2	9	**21.15**	VI
5 Lack of water facilities for drinking to human being and animals	19	22	23	**59.81**	IV	29	21	3	**54.64**	III	2	11	14	**51.92**	III
6 Very low support price fixed by Govt	32	34	35	**94.39**	I	54	34	4	**94.85**	I	2	18	28	**92.31**	I
7 Untimely payment of commodities sold in the market	11	14	22	**43.92**	V	17	12	3	**32.99**	V	1	2	9	**23.08**	V
8 Cheating by middle man in the marketing	8	9	12	**27.10**	IX	8	7	4	**19.59**	IX	0	0	4	**7.69**	VIII
9 Constraints in disposal of produce	9	10	12	**28.97**	VIII	15	11	2	**28.87**	VII	0	5	4	**17.31**	VII

Crop+Vegetable F.S.					Crop+Vegetable+Labour F.S.					Overall				
N=27					N=14					N=297				
M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
5	12	8	**92.59**	I	12	2	0	**100.0**	I	87	82	64	**78.45**	II
2	3	1	**22.22**	V	3	0	0	**21.43**	IV	30	33	28	**30.63**	VI
5	7	2	**51.85**	III	5	0	0	**35.71**	III	57	61	44	**54.54**	IV
1	4	1	**22.22**	V	2	0	0	**14.29**	V	22	30	26	**26.26**	VIII
5	9	4	**66.67**	II	7	0	0	**50.00**	II	62	63	44	**56.90**	III
5	12	8	**92.59**	I	12	2	0	**100.0**	I	105	100	75	**94.27**	I
4	6	1	**40.74**	IV	5	0	0	**35.71**	III	38	34	35	**36.02**	V
2	2	1	**18.52**	VI	2	0	0	**14.29**	V	20	18	21	**19.86**	IX
2	5	7	**51.85**	III	1	1	0	**14.29**	V	27	32	25	**28.28**	VII

M = Marginal S = Small B = Big FS = Farming system % = Percentage

Table 19 : Technical Constraints faced by farmers practising different farming systems

Constraints faced by farmers	Crop F.S. N=107					Crop+Labour F.S. N=97					Crop+Dairy F.S. N=52				
	M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
1 Lack of communication of technical know how from Agril. Deptt./ Agril.University to the farm families	32	33	37	**95.32**	III	52	32	4	**90.72**	II	2	17	24	**82.69**	III
2 Untimely diffusion of the latest technical know how	32	34	37	**96.26**	II	52	33	4	**91.75**	I	2	18	27	**90.38**	I
3 Lack of latest technology related to agril. and allied fields	32	34	37	**96.26**	II	52	33	4	**91.75**	I	2	18	27	**90.38**	I
4 Lack of practical applicability of technical know how	32	34	38	**97.19**	I	51	33	4	**90.72**	II	2	17	27	**88.46**	II
5 Only the big farmers are getting the benefits of improved technology through extension personnel	23	21	29	**68.22**	V	37	23	3	**64.95**	IV	1	11	17	**55.77**	V
6 Technology is not according to the need of farmer	28	32	33	**86.91**	IV	50	32	4	**88.66**	III	1	16	24	**78.85**	IV

Crop+Vegetable F.S. N=27					Crop+Vegetable+Labour F.S. N=14					Overall N=297				
M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
5	13	9	**100.0**	I	9	1	0	**71.42**	II	100	96	74	**90.90**	IV
5	13	9	**100.0**	I	9	1	0	**71.42**	II	100	99	77	**92.92**	I
5	12	9	**96.3**	II	9	1	0	**71.42**	II	100	98	77	**92.59**	II
5	11	9	**92.59**	III	9	1	0	**71.42**	II	99	96	78	**91.91**	III
4	10	7	**77.78**	V	7	1	0	**57.14**	III	72	66	56	**65.31**	VI
2	11	9	**81.48**	IV	9	2	0	**78.57**	I	90	93	70	**85.18**	V

M = Marginal S = Small B = Big FS = Farming system % = Percentage

Table 20 : Economical constraints faced by farmers practising different farming systems

Constraints faced by farmers	Crop F.S. N=107					Crop+Labour F.S. N=97					Crop+Dairy F.S. N=52				
	M	**S**	**B**	**Total %**	**Rank**	**M**	**S**	**B**	**Total %**	**Rank**	**M**	**S**	**B**	**Total %**	**Rank**
1 Lack of credit facilities	32	35	37	**97.19**	I	55	33	4	**94.85**	II	2	17	29	**92.31**	I
2 Non availability of inputs including labour	14	17	22	**49.53**	V	21	13	3	**38.14**	VI	0	3	8	**21.15**	V
3 Lack of knowledge about marketing	21	23	25	**64.48**	IV	29	22	2	**54.64**	V	1	8	16	**48.08**	IV
4 Market price fluctuation	26	25	27	**72.89**	II	43	28	2	**75.26**	III	2	13	23	**73.08**	II
5 Low prices of commodity in the village	22	24	26	**67.28**	III	35	23	2	**61.86**	IV	1	13	19	**63.46**	III
6 Inputs costs are higher	31	34	39	**97.19**	I	56	34	4	**96.91**	I	2	19	27	**92.31**	I

Crop+Vegetable F.S. N=27					Crop+Vegetable+Labour F.S. N=14					Overall N=297				
M	**S**	**B**	**Total %**	**Rank**	**M**	**S**	**B**	**Total %**	**Rank**	**M**	**S**	**B**	**Total %**	**Rank**
5	12	9	**96.30**	II	12	2	0	**100.0**	I	106	99	79	**95.62**	II
4	4	1	**33.33**	VI	3	0	0	**21.43**	VI	42	37	34	**38.04**	VI
2	11	8	**77.78**	IV	8	1	0	**64.29**	IV	61	65	51	**59.59**	V
1	10	9	**74.07**	V	5	1	0	**42.86**	V	77	77	61	**72.39**	III
4	10	8	**81.48**	III	10	2	0	**85.71**	III	72	72	55	**67.00**	IV
5	13	9	**100.0**	I	11	2	0	**92.86**	II	105	102	79	**96.29**	I

M = Marginal S = Small B = Big FS = Farming system % = Percentage

Table 21 : Socio-cultural constraints faced by farmers practising different farming systems

Constraints faced by farmers	Crop F.S. N=107					Crop+Labour F.S. N=97					Crop+Dairy F.S. N=52				
	M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
1 Non-adoption by the society	21	29	31	**75.70**	V	46	29	1	**78.35**	IV	1	15	27	**82.69**	III
2 Lack of participation in socio cultural activities	19	27	31	**71.96**	VI	39	27	2	**70.10**	VI	1	13	22	**69.23**	V
3 Attachment to tradition	27	25	36	**82.24**	IV	40	27	4	**73.20**	V	1	11	21	**63.46**	VI
4 More attachment to social norms & culture	30	32	37	**92.52**	II	51	34	4	**91.75**	II	1	17	27	**86.54**	II
5 Poverty	31	34	37	**95.32**	I	54	34	4	**94.85**	I	2	18	29	**94.23**	I
6 Resistance in adoption of new technology by neighbouring farmers/ relatives	29	30	36	**88.78**	III	45	31	4	**82.47**	III	2	14	26	**80.77**	IV

Crop+Vegetable F.S. N=27					Crop+Vegetable+Labour F.S. N=14					Overall N=297				
M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
3	7	8	**66.67**	IV	10	2	0	**85.71**	II	81	82	67	**77.44**	IV
3	8	7	**66.67**	IV	9	2	0	**78.57**	III	71	77	62	**70.70**	VI
5	10	7	**81.48**	III	10	2	0	**85.71**	II	83	75	68	**76.09**	V
5	10	7	**81.48**	III	10	2	0	**85.71**	II	97	95	75	**89.89**	II
5	12	8	**92.59**	II	12	2	0	**100.0**	I	104	100	78	**94.94**	I
5	13	9	**100.0**	I	12	2	0	**100.0**	I	93	90	75	**86.86**	III

M = Marginal S = Small B = Big FS = Farming system % = Percentage

Table 22 : Situational constraints faced by farmers practising different farming systems

Constraints faced by farmers	Crop F.S. N=107					Crop+Labour F.S. N=97					Crop+Dairy F.S. N=52				
	M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
1 Fragmented land holding.	31	28	36	**88.78**	II	55	36	4	**97.94**	I	2	18	27	**90.38**	II
2 Inadequate and untimely rainfall.	32	33	37	**95.32**	I	56	33	4	**95.88**	II	2	18	28	**92.31**	I
3 Sudden illness of farmers/animal during the peak season.	7	10	12	**27.10**	V	7	6	2	**15.46**	V	0	3	8	**21.15**	V
4 Inadequate health and artificial insemination facilities.	19	25	32	**71.02**	IV	38	23	3	**65.98**	IV	0	13	17	**57.69**	IV
5 Lack of money.	24	34	34	**85.98**	III	53	30	4	**89.69**	III	1	15	24	**76.92**	III

Crop+Vegetable F.S. N=27					Crop+Vegetable+Labour F.S. N=14					Overall N=297				
M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
5	13	8	**96.30**	I	12	2	0	**100.0**	I	105	97	75	**93.26**	II
5	12	8	**92.59**	II	12	2	0	**100.0**	I	107	98	77	**94.94**	I
4	4	3	**40.74**	V	3	0	0	**21.43**	III	21	23	25	**23.23**	V
4	7	7	**66.67**	IV	7	1	0	**57.14**	II	68	69	59	**65.99**	IV
4	11	9	**88.89**	III	12	2	0	**100.0**	I	94	92	71	**86.53**	III

M = Marginal S = Small B = Big FS = Farming system % = Percentage

Table 23 : Physical constraints faced by farmers practising different farming systems

Constraints faced by farmers	Crop F.S.					Crop+Labour F.S.					Crop+Dairy F.S.				
	N=107					N=97					N=52				
	M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
1 Lack of housing facilities for human beings and animals	12	14	15	**38.31**	IV	18	13	2	**34.02**	V	0	5	10	**28.85**	III
2 Poor physique of human beings and animals	15	17	19	**47.66**	III	17	14	3	**35.05**	IV	0	6	11	**32.69**	II
3 Inadequate water facilities for drinking as well as for irrigation	23	26	26	**70.09**	I	38	25	4	**69.07**	I	1	12	12	**48.08**	I
4 More distance between house and farm fields	17	15	22	**50.46**	II	29	17	4	**51.55**	II	0	5	12	**32.69**	II
5 Poor efficiency of labour used at farm	14	9	17	**37.38**	V	19	16	3	**39.18**	III	0	4	8	**23.08**	IV

Crop+Vegetable F.S.					Crop+Vegetable+Labour F.S.					Overall				
N=27					N=14					N=297				
M	S	B	Total %	Rank	M	S	B	Total %	Rank	M	S	B	Total %	Rank
4	5	7	**59.26**	III	4	1	0	**35.71**	II	38	38	34	**37.03**	V
4	6	7	**62.96**	II	6	1	0	**50.00**	I	42	44	40	**42.42**	III
3	8	8	**70.37**	I	4	1	0	**35.71**	II	69	72	50	**64.30**	I
4	7	6	**62.96**	II	6	1	0	**50.00**	I	56	45	44	**48.82**	II
4	7	6	**62.96**	II	4	1	0	**35.71**	II	41	37	34	**37.71**	IV

M = Marginal S = Small B = Big FS = Farming system % = Percentage