CHANGING SCENARIO OF AGRICULTURE IN MOUNTAINS: A CASE STUDY OF MALANA VILLAGE OF HIMACHAL PRADESH

THESIS

By

ATUL DOGRA

Submitted to



CHAUDHARY SARWAN KUMAR
HIMACHAL PRADESH KRISHI VISHVAVIDYALAYA
PALAMPUR-176 062 (H.P.) INDIA

IN

Partial fulfilment of the requirements for the degree

OF

MASTER OF SCIENCE IN AGRICULTURE
(AGRICULTURAL ECONOMICS)
(2004)

UNIVERSITY LIBRARY
C.S.K.H.P. KRISHI VISHVAVIDYALAYA
PALAMPUR

Acc. No. 13449
Class No. 338.1095452 Book No. Dogra. C
Author Dogra, Alu
Title Changing scenario of agriculture in hill villages of H.P.

Borrower's No.	Due Date	Borrower's No	Due Da

CSK H P KRISHIVISHVAVIDYALAYA
LIBRARY, PALAMPUR
Accession No. 13449
Date 19.02.05 Price
Source C/o The Dean, PGS, CSKHPKV, Palampur
Bill No. Date
Recommended by Checked by

351.10:52
D51C
Rs 415/105

Dedicated

to my Revered

Parents

Dr. Ashok Kumar
Associate Professor

Department of Agricultural Economics,
CSK HP Krishi Vishvavidyalaya,
Palampur-1760 062 (H.P.) India

CERTIFICATE I

This is to certify that the thesis entitled "**Changing scenario of agriculture in mountains: a case study of Malana village of Himachal Pradesh**" submitted in partial fulfilment of the requirements for the award of the degree of **Master of Science (Agriculture)** in the subject of **Agricultural Economics** of Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur is a bonafide research work carried out by **Mr. Atul Dogra** (A-2002-30-10) son of **Shri Shyam Kumar Dogra** under my supervision and that no part of this thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of this investigation have been fully acknowledged.

(Dr. Ashok Kumar)
Chairman
Advisory Committee

Place: Palampur
Dated: the 14th December, 2004

CERTIFICATE II

This is to certify that the thesis entitled "**Changing scenario of agriculture in mountains: a case study of Malana village of Himachal Pradesh**" submitted by **Mr. Atul Dogra** (A-2002-30-10) son of **Shri Shyam Kumar Dogra** to the Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur in partial fulfilment of the requirements for the award of degree of **Master of Science (Agriculture)** in the subject of **Agricultural Economics**, has been approved by the Advisory Committee after an oral examination of the student in collaboration with an External Examiner.

13/01/05

(Dr. Ashok Kumar)
Chairman
Advisory Committee

13/01/05

External Examiner

13/1/05

(Dr. S.K. Sharma)
Member

13/01/20

(Dr. S.K. Chauhan)
Member

13.1.05

(Dr. Kamlesh Singh)
Member

13.1.05

(Dr. N. K. Pathania)
Dean's Nominee

13/1

(Dr. R. K. Sharma)
Head of the Department

13/1/05

(Dr. B. Prasad)
Dean
Postgraduate Studies

Acknowledgement

My foremost thanks, with limitless humility, to God who blessed us and has been adorning the nature of the humanity with excellence of teaching and learning.

My profound gratitude is expressed to the chairman of my advisory committee, Dr. Ashok Kumar, for his valuable suggestions, constructive criticism, constant encouragement and bringing the manuscript to its original form.

It is also a matter of pleasure for me to express my sincere regards to the erudite members of my advisory committee, Dr. S.K.Sharma, professor, Dr. S.K.Chauhan, Associate Professor, Dr.Kamlesh Singh, professor and Dr. N.K.Pathania (Professor and Head, Vegetable Science) for their counsel and cordial co-operation extended towards the completion of this study. Help rendered by Dr. G.D.Vashisht (Former Head, Deptt. of Ag. Economics), Dr. K.D.Sharma and Dr. Harbans Lal is also acknowledged.

My thanks also are due to Dr. R.K.Sharma, Head, Department of Agricultural Economics and Dr. B. Prasad, Dean Postgraduate Studies for providing necessary research facilities and support for conducting the study.

I feel indebted to my seniors, Vinod, Girish, Sapan and my friends, Billu, Rakesh, Amit, Sony, Gaurav, Sudhir, Ramesh, Romil, Susheel, Madhu, Rajeev, Sandeep, Naleeni-Vijay, Shalu-Nishu and Ravi bhaiya for their infatigued assistance and joyous company. Exultant and enviable company provided by my friend Sheetal, who kept me in exalted state even during moments of despondence is greatly acknowledged.

I wish there could have been a more befitting way than words to express deep sense of gratitude to the malanese for their infatigued assistance and co-operation provided to me during the course of this investigation.

Words in lexicon would be a few exiguous to express deep sense of gratitude towards my father, Shri Shyam Kumar Dogra, mother, Asha, sister, Golu and cousins Kittu, Ishu, Shishu, Pooja and Rishu for their constant and everlasting encouragement for higher studies and incessant help.

Needless to say, all omissions and errors are mine.

Place: Palampur
Dated: the 1st December, 2004

(Atul Dogra)

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
I	INTRODUCTION	1-6
II	REVIEW OF LITERATURE	7-22
III	MATERIALS AND METHODS	23-29
IV	RESULTS	30-72
V	DISCUSSION	73-81
VI	SUMMARY	82-85
	LITERATURE CITED	86-92
	APPENDIX	93

List of Tables

Table No.	Title	Page No.
3.1	Distribution of selected sample	24
4.1	Malana village vis-a-vis district Kullu at a glance	31
4.2	Infrastructural facilities in Malana village	32
4.3	Age-wise distribution of family members on different categories of farm	33
4.4	Sex-wise family composition on different categories of farm	35
4.5	Distribution of households according to caste	35
4.6	Sex-wise educational status of family members on different categories of farm	36
4.7	Occupational distribution of sample farms	37
4.8	Cropping pattern on different categories of farm	38
4.9	Average yield of crops on different categories of farm	39
4.10	Inventory and investment on farm implements on different categories of farm	40
4.11	Input-use pattern for different crops on sample farms	42
4.12	Technological gap in crop yields	43
4.13	Per hectare returns and cost of cultivation in maize	44
4.14	Different costs of cultivation for maize production	45
4.15	Net returns over different costs in maize	46
4.16	Per hectare returns and cost of cultivation in rajmash	46
4.17	Different costs of cultivation for rajmash production	47
4.18	Net returns over different costs in rajmash	47
4.19	Per hectare returns and cost of cultivation in potato	48
4.20	Different costs of cultivation for potato production	49
4.21	Net returns over different costs in potato	49
4.22	Per hectare returns and cost of cultivation in amaranthus	50
4.23	Different costs of cultivation for amaranthus production	51
4.24	Net returns over different costs in amaranthus	51
4.25	Per hectare returns and cost of cultivation in buckwheat	52

Table No.	Title	Page No.
4.26	Different costs of cultivation for buckwheat production	53
4.27	Net returns over different costs in buckwheat	53
4.28	Per hectare returns and cost of cultivation in wheat	54
4.29	Different costs of cultivation for wheat production	55
4.30	Net returns over different costs in wheat	55
4.31	Per hectare returns and costs in barley cultivation	56
4.32	Different costs of cultivation for barley production	57
4.33	Net returns over different costs in barley	57
4.34	Cobb-Douglas production function for maize on all farms	58
4.35	Cobb-Douglas production function for rajmash on all farms	59
4.36	Cobb-Douglas production function for potato on all farms	60
4.37	Cobb-Douglas production function for amaranthus on all farms	60
4.38	Cobb-Douglas production function for buckwheat on all farms	61
4.39	Cobb-Douglas production function for wheat on all farms	62
4.40	Cobb-Douglas production function for barley on all farms	63
4.41	Livestock inventory on sample farms	64
4.42	Livestock production and input use on marginal farms	65
4.43	Livestock production and input use on small farms	65
4.44	Livestock production and input use on medium farms	66
4.45	Livestock production and input use on overall farms	66
4.46	Change in cropping pattern	68
4.47	Change in productivity of field crops	69
4.48	Change in livestock composition/wealth	70
4.49	Problems and constraints on sample farms	71

List of Figures

Figure No.	Title	Between Pages
3.1	Map of Kullu district (Himachal Pradesh) showing study area	23-24
4.1	Cropping pattern on marginal farms in Malana village	39-40
4.2	Cropping pattern on small farms in Malana village	39-40
4.3	Cropping pattern on medium farms in Malana village	39-40
4.4	Cropping pattern on overall farms in Malana village	39-40
4.5	Technological gap (%) in yield of crops of the study area	43-44

List of Plates

Plate No.	Title	Between Pages
5.1	An overview of the study area	31-32
5.2	A farmer shearing wool by an indigenous method	64-65

INTRODUCTION

Chapter- I

INTRODUCTION

India-the very name evoke images of vast landscape with mountain perennial snow peaks on the one hand and a never ending coast line on the other. Ever green forests remind of the Western Ghats and one is not unruffled in surprise when he is reminded that the Great Indian Desert is only at stone's throw. It is the rich geographical, botanical and cultural diversity, which has been the subject of interest and amazement of many Western and Indian scholars. At the very head of India are the great Himalayas which always add to its beauty with 80 out of 100 peaks in them. They are highest and youngest mountain eco-system on this planet. The Himalayan region occupies 5 lakh square kilometers of the total sub continental area of around 32 lakh square kilometers (Mamoria, 1978). The eco-system's diversity, fragility, marginality and cultural heterogeneity known as the mountain specificities are the major features of the Himalayan region. At the same time, Himalayas have immense strategic, climatic, environmental and hydrological significance for the entire India affecting the lives, prosperity and overall economic development of people not only in mountains but also for the large chunk of population living in the down plains.

At the end of the Zaskar range one gets a glimpse of the panoramic Kullu valley. This transverse valley is indeed a true representation of such region, which harbours rich biological diversity. Any account of the mesmerizing valley would be incomplete without making a reference to secluded village called Malana, which is the *raison d' etre* for this study. What distinguishes this village in the interior of the Himalayas are the striking characteristics as persistent and adamant efforts by inhabitants to retain their unique age-old heritage and makes it a greater attraction for adventure and scholar alike. However, its

unique geographical location also preserves its biodiversity and makes it an ecological heaven.

A civilized society in a country like India originates in the village where people of different identities interact for mutual benefit, self-sufficiency and autonomy. All villages outwardly appear to be similar but each has its core, a soul which is distinct as one finger print from the other. There are what is called artist villages, epic villages, shrine villages, fringe villages and forsaken villages distinguished by their inhabitants and their traditions (Bangroo and Stronski, 2004). Of these, in Himachal Pradesh, the most distinctive are the shrine villages. In every such village there is presiding Deity recognized by people on the basis of faith only. Malana is one such village in the district Kullu that has preserved its age-old tradition and customs.

Although there is no literary meaning for word Malana, but in *Kulluvi*, a dialect spoken by people of Kullu district, Malana means "to join". Yet the village does not seem to imbibe the meaning of its name. The Malana people neither know when their village was first inhabited nor does where they themselves came from. However, the people of Malana believed to be descendant of Alexander The Great during 326 B.C. and because no anthropological or archaeological surveys are there to disapprove this, the belief seems to be true.

The village is situated on the right bank of Malana torrent that confluence Parvati river at *Jari* in North –East of Kullu District of Himachal Pradesh. The village is located at an elevation of 2650 m above mean sea level (Anonymous, 2002). The village is surrounded on all sides by sharp vertical rocks. On the East it is surrounded by *Manikaran*, *Kasol* and *Rasol*, while on the South by *Jari*. On the West it is surrounded by *Chanderkhani* pass and *Naggar* valley while to the North the glittering white peak of the Deotibba Mountain in the Spiti hills dominates the view.

Malana village falls in the high hills temperate wet region of Hindukush Himalayas. The climate of the region remains cool almost all the year round. The cold winter season extends from mid September-April and receives a snowfall ranging from 5 to 10 feet a year. Out of the total rainfall more than fifty per cent rains are received during mid June to mid September. As per the conservative estimates, the village experiences an annual rainfall of 1250 mm during a year. During summer season, which is of short duration, that is, mid April to mid June, temperature rises to about 28 ^{0} C. During this period, *Rabi* crops ripen and vegetative growth takes place in *Kharif* crops (Singh and Sikka, 1992).

The *Malanese* are beautiful and attractive in appearance and have sharp features with prominent nose. However, people of near by areas as Lahaul and Spiti, which are at similar altitude, have flat nose, rounded face and deep set of eyes. They look more like Europeans rather than Indians. They are very much conservative in nature and do not mingle with outsiders. High castism can be seen in the village, as majority of families are *Rajputs*. Untouchability phenomenon is very strong among *Malanese*. The Malana has a unique type of judiciary system, which is unmatched form of participatory court. The village is said to be Oldest Democracy of world and peculiar social structure rests on villagers unshaken faith in their powerful Deity, the *Jamdagani* or *Jamlu devta* (Chauhan, 1998). In Kullu valley, Malana is also called as "The Republic of Malana". Although property and social disputes are very rare among the *Malanese*, if at all, there is any, it is taken to judicial council-the Malana Supreme Court for the final judgment and not to any government agency or courts of laws.

The civilized modern world has a lot to learn from the *Malanese*. The way they settle their issues is a lesson to the urban elite. No law books, no clause, no constitution, no lawyers, no policemen or police stations and yet the villagers live in mutual harmony,

sharing their burden with each other. With basic minimum requirements, the *Malanese* over the centuries have learned to live in tune with nature. They may not have access to the luxuries of the modern world, still one can see the glow of contentment on their innocent faces. In fact, outsiders in Malana or any other village is an intruder. The village of Malana is like a well knit family and it is but natural that no body should interfere in their private affairs. They are happy to be part of benevolent nature. Malana with its unique lifestyle, language and traditions has remained curiosity for the outsiders for the last four decades. Much have been written about it, but not in a proper manner. But how long can the unique identity of this land be maintained when the *Malanese* themselves are more or less succumbing to the evil of modernization. The dwellings too are changing and in fact, the village is going through slow process of socio- cultural transformation and if this continues the day may not be far off when it will loose its unique identity.

The twenty- first century though boasts of technological innovations and wizardry through computers, genetic engineering, stem cell research and satellite phones; but there are regions in the subcontinent, which dwell on stash-and-burn agriculture too. Though Malana is not one of them but it is peculiar and erratic enough to draw contrasts on the contour of development and sustainability. Therefore, there is an urgent need to develop farming techniques which are sustainable from the point of view of environment and socio-ecological considerations and socio-economic conditions of the people leading to the sustainable development. Where sustainable development means development that meets the need of the present generation without compromising the ability of future generation to meet their needs. Agriculture assumes special significance for this backward and remote area as almost entire population is dependent on this sector due to lack of other non-farm avenues of employment. To venture into the unknown agriculture of this region and to point a finger to the lacunae and chinks in the development of village

economy which should not be understood only as a flash in the pan but should get deeper and stern consideration, this study has been undertaken with the following objectives:

1.1 Objectives of the study:

1) to study the existing socio-economic characteristics of the households
2) to analyse the extent of change in production, productivity and resource use pattern in different farm enterprises
3) to study the problems and constraints of the village and suggest suitable strategy for boosting agricultural production.

1.2 Usefulness of the study:

Village studies have relevance to understand the farming system in the rural areas, what are the conditions under which they are surviving and also help in identifying the socio-economic and institutional constraints faced by the dwellers and the development in agriculture with passage of time. It is thus, for the policy planners to make an advance with such a deft handling of village that it does not harm them anyway and in way that the unique cultural heritage is tampered to the least with future strategy for their well being.

1.3 Organization of Study

The entire study has been systematically planned in six chapters. Chapter 1 (Introduction) elaborates brief history of Malana village, rationale and objectives of the study. Chapter II contemplates the critical review of work done in India and abroad which is relevant to the present topic of investigation. The systematic methodology adopted for collection and analysis of data has been described in chapter III. The results of the study have been presented in chapter IV. Chapter V is devoted to elaborate discussion with logical conclusions and inferences drawn based on the results. Finally, findings of this study along with suggestions and policy options for the development of agriculture in Malana village have been summarized in chapter VI. The illustrations, tables and figures

have been extensively used to elucidate the results. The references quoted and used in this study have been duly enlisted under literature cited. Additional information has also been given in the appendix for further use of interested researchers in the field of agriculture and societies alike.

1.4 Limitation of the study

1. Due to limited time and other constraints, the study is based upon a random sample of 101 households drawn from the village. Due to extreme climatic conditions, the area remained cut-off from rest of the world for 4-5 months during winter season. However, an attempt was made to obtain a random sample from different categories of household to have a true representative sample.
2. The data were collected by survey method and the information collected was based on the memory and past experience of the respondents. Though, due care was taken to extract accurate information, the possibility of few slips from the memory of the respondent could not, however, be ruled out.
3. The study is based on one year data. However, this year may have a little deviation in agro-climatic parameters from the normal year.
4. The area was very remote with higher illiteracy. Besides, the dialect spoken by the *Malanese* was also difficult to understand. To overcome these difficulties, help of village youths was taken to clarify the very purpose of study among the ruralites at one hand and enhancing precision of retrieved data on the other.

REVIEW OF LITERATURE

Chapter-II

REVIEW OF LITERATURE

The scientific research is based upon systematic thinking developed on the past accumulated knowledge and experience. A thorough insight into the studies already conducted relating to the research area under consideration, therefore, becomes imperative for conceptual clarity, development of sound methodology and for identifying the critical gaps for further improvement in the research work. In this back drop the brief resume of the research work especially relating to mountain agriculture has been prepared and documented under the following four broad sections:

3.1 Socio-economic characteristics: importance and scope

3.2 Extent of changes in farm enterprises

3.3 Problems and constraints of agricultural development

3.4 Suitable strategy and policy implication

3.1 Socio- Economic Characteristics: Importance and Scope

Pope and Prescott (1980) from their study in California emphasised the importance of farm size in affecting the extent of diversification positively. They also found that younger or less experienced farmers were the most specialized one which might also imply shortage of capital with these farmers. The result of study also suggested that there might not be sufficient economies of scale in any activity to warrant specialization.

Chand (1983) examined the socio- economic and demographic characteristics of the Bhotia villages in Kumaun. He revealed the highest concentrations of population in the age group of below 10 years and lowest in the age group of above 60 years. The household size was found to be 4.97 persons with the standard deviations of 2.63 persons and an average dependent population per household was only 0.29 person with a variation

of 0.23 person. Nuclear families seemed to dominate the village (83.53 per cent). Profession wise, agriculture dominated the occupational structure (36.80 per cent) followed by households industry (30.20 per cent). It was also reported that household size, cattle, education, occupation and income appear to be related to each other in socio-economic structure.

Saraswat *et al.* (1995) studied change in socio-economic features of Kot village of Himachal Pradesh using survey and census method for a period from 1959-60 to 1990-91. They reported that number of households increased sharply by 78 per cent because of population growth and the break- up of the joint family system. The average family size has increased from 5.31 to 6.60 persons but the sex-ratio has gone down from 924 to 863 over the period. The average holdings size has been reduced drastically from 2.90 ha to 1.40 ha registering a decline of 52.0 per cent. The literacy rate for males and females was found to be 78.50 and 43.70 per cent, respectively, showing the availability of more skilled manpower for different occupations. Over the years, the average number of livestock per household however, has decreased from 3.20 to 2.50 due to decreasing pasture lands, since more land appears to have been brought under the plough.

Janalah *et al.* (2000) conducted village studies in six rice growing villages of Chhattisgarh region by personal visit method. They found 90 per cent of the households in the study villages as farm households and the rest were being functionally landless. Average farm size was much higher in the rainfed ecosystem than in irrigated ecosystem and 90 per cent of the operated land was owned by farmers. Household size was, however, higher in the irrigated ecosystem. Though education level of working male member was higher in the irrigated ecosystem than in the rainfed ecosystem but the level of education of children was same in all villages. Rice was the predominant crop in the village, occupying 96 per cent of the cropped area in irrigated area and 67 per cent in

rainfed area. As about one-third of the total poor in Madhya Pradesh live in this region implies, therefore, that improving rice production and productivity could directly led to substantial reduction in rural poverty in the region.

Sharma *et al.* (2001) examined the farm size productivity relationship at the village level in an agriculturally developed region of Himachal Pradesh through personal interview method. They revealed that the inverse farm size productivity relationship did not hold true in all the villages and in some villages it was even positive *albeit* statistically insignificant. In case of paddy, the positive relationship was more universal and robust. However, in other crops farm size did not affect level of gross value productivity significantly. In different crops, small farmers used significantly higher amount of human labour and fertilizers. Moreover, the relationship between farm size and bullock and tractor use in different crops in most of the villages was not so pronounced.

Topal and Samal (2001) studied the variation in social and economic conditions among three mountain tribes viz., *Jaunsaries*, the *Bhotias* and the *Rajas* inhabiting the Indian Central Himalayan region, which constituted about 35.62 per cent of total tribal population of the region. They found that common socio- economic problems of three tribes were high rate of infant and child mortality , acute sex-ratio, winding economy and food insecurity, lack of cultivated land, lack of will power in government machinery to allot land to the families of the tribe, lack of avenues for occupational diversification and employment, disappearance of art and craft and disintegration of culture, lack of basic social and physical infrastructure viz., medical facility, drinking water, educational infrastructure, housing, transportation, communication etc. The findings, however, established that all the three tribes living in similar geo-climatic conditions and experiencing more or less similar development interventions have variant social and economic conditions. These variations are due to factors like ecology, economy and

culture in addition to factors like nature of interventions, constitutional safe gaurds and specific special privileges and Sino- Indian conflict. The major bottlenecks in the programme implementation were lack of political will among the decision makers, leakage at the level of functionary, lack of inter departmental co-ordination and lack of committed personnel and apathy of development agents with target oriented efforts that lack focus.

Roy (2002) studied the successive development and changes of the Garo Hill people down the ages, from the ancient times to the present decade. He revealed that Garos are ancient tribes who have remained isolated from the mainstream population till the recent time. He also described the traditional lifestyle, culture, language, social and economic aspects of the life in order to assert the uniqueness of this hill tribe and as how Garos on one hand have adjusted themselves to the challenges of the modern life and managed to preserve the basic and valuable aspects of their culture on the other.

3.2 Extent of changes in farm enterprises

Gill and Thakur (1984) studied the growth and instability in Himalayan agriculture from 1954-55 to 1980-81 in Jammu and Kashmir and Himachal Pradesh using secondary data. They concluded that post green revolution period is characterized by marked increase in production and yield fluctuations due to the effect of new technologies. Further, they revealed variable relationship between growth and instability in yield.

The extent of diversification in various agro climatic zones of Himachal Pradesh was studied by Chand *et al.* (1986). They found high level of diversification in mid and high altitude areas comprising districts of Shimla, Kullu, Kinnaur, Solan, Mandi and Lahaul-Spiti. They were found to grow both commercial and subsistence crops. The low

level of diversification in low hills districts was partly attributed to adverse land-man ratio.

Saini *et al.* (1995) studied the impact of consolidation on technology adoption and inequalities in Himachal Pradesh using primary data. With the consolidations of holdings, the number of fragments decreased which accelerated the rate of adoption of modern technology and thus consolidation has shown positive and significant impact on agricultural development. Moreover, the disparities/ inequalities in the distribution of land, income, expenditure on health and education has decreased showing desirable impact on consolidation in Himachal Pradesh.

Gauraha (1996) studied the impact of technological change on the cropping pattern, farm investment and farm income distribution in village agriculture. There was an increase in the percentage of net and gross cropped area of marginal farms but in case of medium and large farmers it had declined. The cropped area in the *Kharif* season has declined, while area under *Rabi* and summer crops has increased as a result of development of assured irrigation and higher yield and income from *Rabi* and summer crop. However, in the *Kharif* season the high yielding varieties of paddy occupied the whole paddy area due to higher yield and income which showed that the new technology is apparently influencing the crop enterprises at farm level towards more specialization. The reason for disappearance of the local and improved varieties of paddy was low yield, low net income, low market price, frequent attack of insects and pests etc.

Raman and Sharda (1996) while studying the pace and direction of diversification of agriculture in Himachal Pradesh revealed it a shift in favour of fruits and vegetables in the state, but to varied extent in all the districts. The districts lying in the mid and high hill zones have registered much greater agrarian diversification on account of agro-climatic conditions favourable for fruit and off-seasonal vegetable production. The most important

factor responsible for diversification was state government policy which enhanced production of horticultural crops.

Similarly, the increasing pace of commercialization and diversification in Indian agriculture was also reported by Nadkarni (1996). The diversification was evident from high growth rate of area under non-food grains as compared to food-grains over the long period form 1949-50 to 1993-94. Among food-grains, a decline was witnessed in coarse cereals and pulses while among the non-food grains, the area under fruits, vegetables and oilseeds was increased.

Saraswat (1996) studied the diversification of cropping pattern and farming system in a village in Hamirpur district of Himachal Pradesh using census method from 1959-60 to 1989-90. The change in cropping pattern was marginal because of lack of irrigation facilities. However, some new crops were introduced and the diversification in agriculture took place mainly due to increase in agricultural productivity because of use of high yielding variety seeds, fertilizers, pesticides and improved methods of cultivation in agriculture, which were not used earlier.

Satyasai and Viswanathan (1996) also confirmed the growing share of non-food crops like oilseeds, fruit and vegetable in the total gross cropped area. Among cereals, superior cereals replaced the inferior cereals like millets. Significant increases in the share of livestock and fishery in the total agricultural income was also there.

Sharma *et al.* (1996) further examined the change in proportion of different groups of crops during 1980-81 to 1991-92 in major states of India by using Herfindahl Index. They reported that percentage of area under cereals has been decreasing and diversification has a positive relation with size of holding but percentage of leased-in area, Gini index and fertilizer consumption had no effect. They further revealed that the correlation between percentage of area under non-food crops and cash crops and

Herfindahl Index with expenditure on foods and non food items were not found significant. So there is substantial scope for increasing degree of diversification without adversely affecting food security for the nation.

Bhalla and Singh (1997) studied the recent developments in Indian agriculture from 1962-65 to 1992-95. They revealed that the introduction of yield raising new seed-fertilizers technology in agriculture during the mid 1960 led to a marked increase in the growth rate of agricultural output and has been instrumental in the transformation of traditional household agriculture to modern commercial agriculture. The period 1980-83 to 1992-95 was also characterized by improvement in cropping pattern changes away from coarse cereals to rice and wheat cultivation on one side and oilseeds on the other. Moreover, 1980 also witnessed a wide spread acceleration in per male agricultural worker productivity which is likely to result in higher wages and also trigger growth wages and also trigger growth in the non-agriculture sector through input-output and consumption linkage.

Das (1997) studied the performance of agriculture from 1976-77 to 1995-96 in Eastern India and its component states with the help of agricultural efficiency index. The analysis revealed that agriculture suffers from low productivity, stagnation, backwardness and instability. The diffusion of new agricultural technology and consequently the rate of agricultural growth are slow because of the absence of institutional and infrastructural facilities of credit, irrigation, marketing etc. and also due to unproductive agrarian structure characterized by the existence of exploitative tenancy, fragmentation of holdings and under utilization of land, water and other resources of the larger farmers. So development of infrastructure consistent with the socio-economic aspirations and environment should get priority. Similarly, agrarian reforms and institutional changes must precede any effort to bring technological innovations for rapid development.

Gangwar and Sen (1997) studied comparative analysis of technology adoption in Nanital district using secondary information and pointed out that introduction of short duration high-yielding variety and seeds of cereals encouraged the farmers for intensive farming. Use of chemical fertilizers and pesticides has increased many folds. However, productivity did not increase in same proportion probably due to the mono cropping of cereals and sugarcane being adopted by farmers due to remunerative price policy which subsequently resulted in nutrient imbalance and deficiency of micro-nutrients. In addition they observed that the number of tractors and tractor driven implements increased rapidly since 1970-71. The exploitation of ground water as source of irrigation started rapidly after adoption of modern farm technology. However, the cropped area under pulses, oilseeds and maize has declined over time.

Naik and Behura (1997) while examining the growth of individual crops in different time frames in Eastern India reported substantial growth of agricultural production in the seventies due to both expansion of area under individual crops and improvement in productivity. The increase in production of food grains during 1980-81 to 1993-94 was mainly due to improvement in productivity while associated with a decline in area under food grains after eighties. The area growth under oil seeds was negative during seventies and started increasing significantly in the eighties. The change in productivity of all crops was more in eighties as compared to seventies. The productivity rise was more than 45 percent for non-food crops (cotton, jute, oilseeds) as compared to 30 to 40 per cent for food grains during 1980-81 to 1990-91.

Another study by Shah (1997) on diversification of Indian agriculture brought out decline in the area under food grains especially in the states of Andhra Pradesh, Bihar, Kerala, Orissa and Rajasthan right from the beginning of 1980s, the decline was

experienced in a large number of food crops except wheat and rice. The area under all major oilseed crops however, has increased.

Sharda and Raman (1997) revealed that due to increase in population density the number of marginal and small holding in Himachal Pradesh witnessed a significant increase from 1971 to 91 and correspondingly the proportion of large holdings declined. Moreover, there was hardly any significant reduction in number of labour employed in agriculture. The land has got pressurized resulting into decreasing productivity per worker in agricultural sector.

Sharma *et al.* (1997) studied in detail the trends in area under different crops, productivity growth of major food grain and non-food grain crops and spread of new agricultural technology in mountainous states. In general, the gross cultivated area, gross irrigated area and area under high yielding varieties increased in all eastern and western mountainous states from 1970-71 to 1990-91. Here, it is worth nothing that the gross irrigated area did not change at all in Assam. The fertilizer consumption increased substantially with in two decades of time. On the whole, the area under rice, maize and wheat and their yield increased in mountainous states over this period.

Maibangsa (1998) studied the growth of hill agriculture in Meghalaya using secondary data from 1970-71 to 1985-86. They pointed out that land utilization remained constant over the years. The average size of holding was increased marginally but food crops occupied maximum area and no commercialization was there. So new technology in agricultural production and productivity was below satisfactory level. However, high yielding varieties and fertilizers showed positive effect on agricultural development.

Tulachan (2001) studied the trends in mountain farming system in Hindukush Himalayan countries over 10-15 years. He showed that, in some areas crop productivity has increased but as a whole area under food grain crops has not increased and their yield

had not declined as much as is often perceived because of food grain crops for food security reasons. He also showed rapid expansion of area under horticultural crops indicating growing importance of horticultural and cash crops in mountain farming systems and house hold economy. However, there is a general decline in the cattle population and increase in the number of stall fed buffaloes and goats with increased use of external inputs and purchased feed.

3.3 Problems and constraints of agricultural development

Ashthana (1981) studied the constraints of agricultural development in North Eastern hill region. According to him, the major yield constraints were climatic and soil conditions, altitude and topography, system of cultivation and cropping sequence, disease, pest, and social structure along with lack of incentives and trade practices.

Thakur *et al.* (1994) studied the production and marketing problems faced by the farmers of Saproon valley of district Solan in Himachal Pradesh by survey method during 1989-90 to 1991-92. In production front, inadequate or no irrigation facilities, shortage of skilled labour, lack of good quality seeds, high cost and non-availability of pesticides and weedicides, non-availability of fertilizers in time, lack of finance and lack of extension programmes were the main problems. However, in marketing front, unorganized marketing, high and undue marketing margins, lack of market information, lack of price regulation and control, lack of processing units and co-operative societies and lack of village roads were the main problems. There was a need for an integrated approach to tackle the production and marketing problems faced by farmers.

Lal *et al.* (1996) studied marketing problems faced by farmers in Himachal Pradesh using primary data. They concluded that lack of remunerative food grain market, lack of government procurement system, lack of co-operative marketing, lack of market information, non availability of credit, high cost of transformation, malpractices in sample

taking, lack of support prices and procurement for the public distribution system and delayed payments are the major marketing problems faced by farmers in marketing of major food grains.

Maibangsa (1998) studied the constraints in growth of hill agriculture in Meghalaya using secondary data. The main constraints were inadequate irrigation facilities, roads and transportation, market structure and processing and storage facilities. He felt a need for transformation of agriculture through development of infrastructure facilities, easy availability of high yielding variety seeds, fertilizers, credit, extension and marketing services in Meghalaya.

Saini *et al.* (1999) studied the problem and constraints of sustainable growth of mountain agriculture in general and off-season vegetables in Himachal Pradesh. He pointed out major problems as non- availability of superior quality strains and varieties, lack of package of practices/ improved technologies, high initial investment, sensitivity to climate and weather aberration, non- availability of planting material, marketing hindrance due to poor and inaccessible roads, short working season, reduced area etc.

Lal *et al.* (2000) studied the vegetable marketing in Himachal Pradesh using primary data and worked out the steps for improving marketing efficiency and producers share in the prevailing marketing system. They emphasized the need for establishing the regulated markets, modern storage facilities to avoid forced sale of vegetables at low prices, forming market cooperative to strengthen the bargaining power and extension activities for promoting off- season vegetables. They also emphasized on the modern marketing for efficient marketing and exporting vegetable commodities.

Thakur (2000) studied the constraints in doubling food grain production in hills and worked out the problems as environmental i.e. soil erosion and water run off due to sloppy hill terrain, lack of transportation facilities due to difficult inaccessible and sloppy

hill terrain, lack of sound advisory system, lack of necessary political will and weak extension which hinders the technology flow to the farmers and hence a major constraint in hill agriculture. Moreover, he also emphasized on measures to be undertaken to overcome these problems.

Chauhan and Mehta (2002) studied the problems and constraints faced by the farmers in Himachal Pradesh using primary data. They reported unremunerative prices for vegetables during peak season to be the foremost problem. Lack of storage facilities was the major constraint (94 per cent). The other important problems perceived by vegetable growers include, road blockade due to land slides (71 per cent) and costly packaging material (24 per cent each). Moreover, non-availability of modern inputs at doorstep of vegetable producers or in the market yard was also reported to be another problem faced by the farmers.

Ghosh (2002) studied the sustainable mountain development and revealed that the problems confronting mountain areas and communities arose largely from a combination of unique feature of their environment. He stressed the need to create research assistance to identify and develop competitive products (organic products, herbs and medicinal plants) and markets for them possibly through mountain product differentiation. He suggested steps to prevent the exploitation of mountain resources by external agents.

3.4 Suitable strategy and policy implications

Shah (1979) in his study on farming systems in hill areas emphasised that the optimal farming systems for hills should include consideration of different farming activities like cultivation of field and plantation crops, animal husbandry, medicinal herbs, fodder grasses etc., determined according to the soil capability and potentiality of the area and justified in terms of economic viability and social acceptability. He also stressed the need for developing a cadre of well trained persons on hill farming systems.

Mehta *et al.* (1982) studied the agricultural development in Himachal Pradesh and gave various suggestions for improvements in agriculture. They emphasized that farmers have not shifted from cereal crops to commercial crops, indicating they have not shifted to modern technology and there are no employment opportunities with increase in population. However, they stressed the need for developing cottage industries, technology for labour-surplus economy and land redistribution programmes for strengthening the position of small and marginal farmers. Moreover cattle-breeding has also tremendous potential for employment next to agriculture.

Mixed farming having integration of improved milch animals and crop production under scientific management was recommended by Thakur (1982) which could increase agriculture production, income and profit of farmers 2 to 5 times even with the existing technology and knowledge due to complementary and inter-relationship between crops and dairy.

Johl (1984) highlighted some determinants of growth and development of agriculture, namely research infrastructure that could develop location-specific alternatives and feasible farm technologies, delivery and recipient system for dissemination of improved technology through extension network, policy environment giving due attention to efficient marketing and pricing system and rural infrastructure which could be the mainstream of development.

Jodha (1986) pointed out that the development of new technology for dry land farming remained neglected and had uncertain future and stagnation in production. He emphasised the need for systematic research in this area for different soil and rainfall zones. According to him, the emphasis should be laid on total farming system rather than individual crop. Finally, it was added that livestock improvement and other non-farm

activities that could supplement the farm income should be regarded as vital and important components of farm development strategy.

Sharma (1989) developed integrated farming systems for different farming systems for different agro-climatic zones of Himachal Pradesh and observed that there were vast opportunities to increase the farm income and employment even under existing technology by changing the enterprise-mix in different zones of Himachal Pradesh.

Moorti and Sharma (1991) highlighted the greater scope of commercialized and viable farming through development of irrigation works in Himachal Pradesh. The irrigation facilities could tilt the cropping pattern towards more profitable crop enhancing income and employment.

Saini *et al.* (1995) suggested the policy implication that land reform and land consolidation measures can increase agricultural production significantly. The technological development must be consistent with the size of holding and must be region specific. So they stressed to develop or modify technology for smaller land holdings in hilly areas.

Lal *et al.* (1996) suggested need to increase the marketed surplus in all agricultural commodities by latest technical knowledge, development of markets and better marketing channels, price support and market intervention programmes must be followed and government should provide better extension as well as proper market information to farmers in Himachal Pradesh for boosting agricultural production.

Thakur *et al.* (1996) studied the constraints of hill agriculture and stressed the need to exploit the hidden potential of hill agriculture by creating economic and social overheads in form of irrigation facilities, transportation facilities, extension services and agricultural institutions, soil and water conservation schemes and development of market infrastructure in Himachal Pradesh.

Saini *et al.* (1999) studied the scope, potential and strategies of High-Tech agriculture in Himachal Pradesh and stated that the diverse agro-climatic conditions of the state provides conducive environment for the cultivation of off-season vegetable, hybrid vegetable seed production, floriplants, high value crops (kalazira, saffron, hops, kuth), apiculture, mushroom and plant raising through tissue culture. Also, the average productivity and economic potential of these crops revealed that off-season vegetable production was 3 to 9 times more profitable than maize. However, adequate awareness among the farmers regarding improved techniques of High-Tech enterprises needs special emphasis through extensive extension programmes and poor and inefficient inputs supply mechanism in the state needs to be revamped so as to reap the benefits of modern High-Tech agro venture in the state.

Samra *et al.* (1999) gave multifarious dimension of hill farming in their base paper on problems and prospects of natural resources management in Indian Himalayas and suggested the need for upgrading and diversification of physical and non-physical resources in hills. They highlighted different opportunities for developing farming in Himalayan zone of the country and highlighted the thrust areas of research like breeding of hill-specific crop varieties, promotion of high density apple orchard, improvement in livestock sector, stable agro-forestry interventions, research on small production systems, commodity based transfer of technology and empowerment of women for sustainable natural resource management.

Kumar (2001) developed resource efficient farm plans for agriculture development in backward and remote Chuhar region of Mandi district in Himachal Pradesh and found that income and employment in this backward region could be enhanced by cultivating vegetables and growing fruit trees along with cereal based farming for which proper input delivery and marketing system should be developed.

Otsuka (2002) studied the poverty reduction issues in village economy and worked out the policy implications for effective poverty reduction based on the secondary data. He emphasized the need that land reform programmes should encourage tenancy transactions, market-assisted land reforms programmes must be sought and it was imperative to continue the development of yield increasing grain technologies for favourable areas, thereby increasing the food security for the poor. Moreover, he also emphasized for investment in schooling of the children of the rural poor and development of rural industries.

Partap (2003) highlighted the emerging challenges, opportunities and livelihood concern of mountain farmers and found that the marginal farmers living on sloping lands have not benefited much through diversification. He also pointed some of the burgeoning second-generation problems of cash crops farming and stressed the need for gearing agricultural research and extension network to respond to the emerging needs of farming communities of hills with changing economic scenario.

MATERIALS
&
METHODS

Chapter- III

MATERIALS AND METHODS

Systematic methodology is the base of any scientific study as the precision, reliability and validity of a scientific enquiry depends upon the appropriate methodology. This chapter describes the locale of the study, sampling design and analytical frame work employed for this study.

3.1 Locale of the study

The present study pertains to the Malana village, district Kullu of Himachal Pradesh (Fig. 3.1). Till now, this region has remained alienated from the mainstream of socio-economic transformation and economic development due to inaccessibility and remoteness. Agriculture assumes special significance for this backward and remote area as almost entire population is dependent on this sector due to lack of other non- farm avenues of employment. So, study of changing scenario of agriculture would always help in knowing the development in agriculture over the years and for formulating better development strategy for the area.

3.2 Sampling plan

Simple random sampling (without replacement) technique was employed to select a sample of households in the study area.

3.2.1 Selection and classification of the farmers

A complete list of households residing in Malana village was framed with the help of *Patwari* and the head of the community. From this list of 272 households, a sample of 101 farmers was chosen by employing simple random sampling technique using lottery method. Selected farmers were arranged in ascending order on the basis of their total land holdings. With the help of cube root cumulative frequency ($\sqrt[3]{f}$) method (Dalenius and

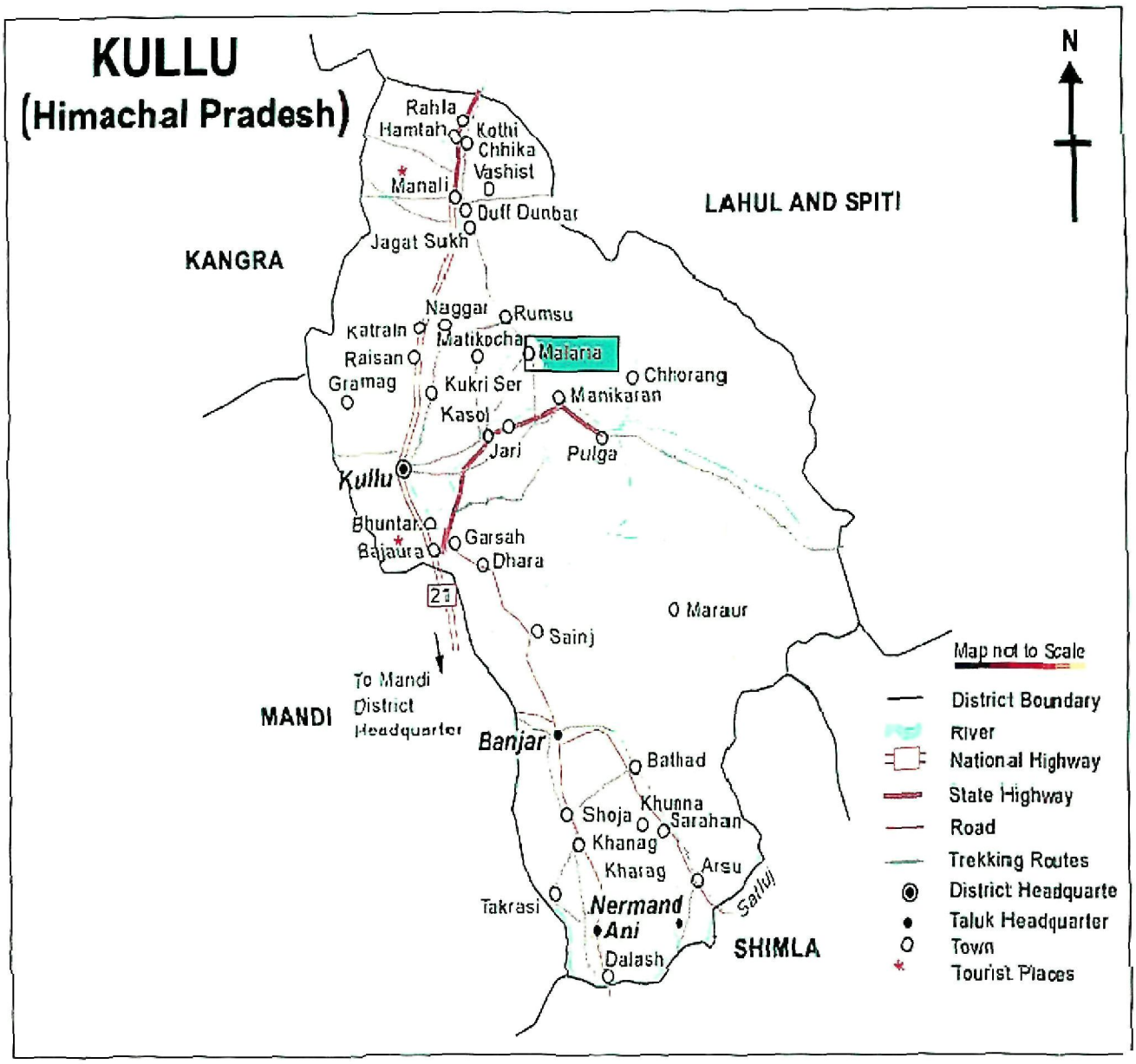


Fig. 3.1: Map of Kullu district (Himachal Pradesh) showing study area.

Hodges, 1950), the farmers were classified into three categories viz; marginal, small and medium categories (Table 3.1).

Table 3.1: Distribution of selected sample

Sr. No.	Category	Size of holding (ha)	Number of farmers
1.	Marginal	Less than 0.4	48 (47.52)
2.	Small	0.4 – 0.96	31 (30.69)
3.	Medium	More than 0.96	22 (21.79)
4.	All farms	-	101 (100)

Figures in parentheses represent per cent to total farmers

3.3 Time dimension of study

The present study pertains to the agricultural year 2002-03.

3.4 Data collection

Both primary and secondary data have been collected for the study.

3.4.1 Primary data

The data for the present study have been collected on well designed, pre- tested schedules through survey method by personally visiting the area twice during October and November, 2003. The primary data included the household information on the following aspects.

- Demographic parameters: Age, caste, family size and structure, sex-ratio, education, occupation etc.
- Farm inventories: Inventory of buildings, land utilization, farm implements and tools, livestock etc.
- Farm resources utilization: Cropping pattern, cropping systems, input use pattern, human labour, farm prices, consumption and utilization of farm produce etc.

- Problems and constraints: Production, financial, marketing, institutional and miscellaneous problems.
- Economic aspects: Input-output prices, cost concepts in different crops.

3.4.2 Secondary data

Secondary information pertaining to different physiographic and socio- economic aspects of Malana village were collected from Block Development Officer, Naggar and Patwar circle, Ziya, Kullu, Himachal Pradesh. Information regarding package of practices for different crops was gathered from the Directorate of Extension Education, CSKHPKV, Palampur while information regarding Survey report on Malana village was obtained from the Agro- Economic Research Centre, Himachal Pradesh University, Shimla. Physiographic and socio- economic aspects of Kullu district were obtained from State Statistical Abstract and Statistical Outlines of Himachal Pradesh.

3.5 Analytical framework

To meet out the objectives of the study, tabular, statistical and mathematical techniques were employed for analysis and interpretation of data.

3.5.1 Tabular analysis

The primary data collected through survey method were tabulated to work out the family structure, demographic features, cropping pattern and per cent area under different crops, cropping intensity, input–use pattern, livestock production and productivity. The existing level of employment, extent of adoption of improved practices, problems and constraints faced by the farmers were also analyzed by following this technique.

3.5.1.1 Demographic and crop indices

The following type of indices was worked out:

$$\text{Sex ratio (Per 1000 males)} = \frac{\text{Total population of females}}{\text{Total population of males}} \times 1000$$

$$\text{Literacy rate (Per cent)} = \frac{\text{Total number of literate persons}}{\text{Total population excluding non-school going children}} \times 100$$

$$\text{Cropping intensity (Per cent)} = \frac{\text{Total cropped area}}{\text{Operational holding}} \times 100$$

$$\text{Yield gap (Per cent)} = \frac{\text{Potential yield–actual yield}}{\text{Potential yield}} \times 100$$

3.5.1.2 Standard conversions

Different species of livestock were converted in to animal cattle units (ACUs) as per conversion factor used by Singh, 1989 given below:

1 Buffalo/Cow/Bullock = 1.00 ACU

1 Young Buffalo/Cow = 0.75 ACU

1 Sheep/Goat =0.15 ACU

For standardization of labour, the following conversion rates suggested by Dhongade and Dangat, 1985 were used:

Adult male = 1.00 unit

Adult female =0.90 unit

Adolescent boys and girls (13-21 years) = 1.00 unit

Children's (9-13 years) = 0.80 unit

3.5.1.3 Cost concepts

Various concepts used in computing cost of cultivation and net returns are as under. The calculations have been made on per hectare basis (Reddy *et al.*2004).

Cost A_1 = Imputed value of owned seed + imputed value of manures+ land revenue + depreciation on farm machinery, implements, equipments + interest on working capital.

Cost A_2 = Cost A_1 + Rent paid for leased in land.

Cost B_1 = Cost A_1 or A_2 + Interest on amount of own capital invested in the business excluding the value to land.

Cost B_2 = Cost B_1 + rental value of owned land (less land revenue) + rent paid for leased in land.

Cost C_1 = Cost B_1 + imputed value of family labour

Cost C_2 = Cost B_2 + imputed value of family labour

3.5.1.4 Returns from crop enterprises

Net profitability of the crop enterprises was computed as follows:

$$NR = GR - VC$$

Where, $GR = Y_M P_M + Y_B P_B$

GR = Gross returns of the crop enterprise (Rs.)

Y_M = Yield of main product (Qt.)

P_M = Price per unit of main product (Rs.)

Y_B = Yield of by-product (Qt.)

P_B = Price per unit of by-product (Rs.)

$$VC \text{ (variable cost)} = \sum_{i=1}^{n} P_i X_i$$

Where,

P_i = per unit price of i^{th} input

X_i = Quantity of i^{th} input

The various inputs included were seed (owned and purchased), family labour, repair of farm implements and machinery and interest on working capital for half of the production period.

3.5.2 Statistical and mathematical techniques

To examine the input–output relationship, following Cobb-Douglas type of production function was employed:

$$Y = ax_1^{b1}x_2^{b2}x_3^{b3}e^u$$

Where,

Y = Yield of the i^{th} crop in q/ha

a = Constant term

X_1 = Seed rate (kg/ha)

X_2 = Farm yard manure (q/ha)

X_3 = Human labour (man days)

b_1 to b_3 = Regression coefficients

e^u = Error term

To know the extent to which all the explanatory variables affect the dependent variable, the coefficient of multiple determination (R^2) was computed. The value of R^2 also increases as the number of variables in the function increases. Thus, to overcome this lacuna adjusted R^2 ($\bar{R}^2$) was calculated as follows:

$$\bar{R}^2 = 1 - (1 - R^2)\frac{n - 1}{n - k - 1}$$

Where,

$\bar{R}^2$ = Adjusted coefficient of multiple determination

R^2 = Coefficient of multiple determination

n = Number of observations

k = Number of parameters to be estimated excluding constant term.

The returns to scale were worked out by summing up the elasticity coefficients of auxiliary variables. The significance of R^2 was tested by employing F-test as follows:

$$F = \frac{R^2/(K-1)}{1-R^2/(n-K)}$$

RESULTS

Chapter – IV

RESULTS

The results of the study obtained from the analysis of factual data pertaining to different aspects in Malana village of Himachal Pradesh have been presented systematically in this chapter under the following four heads:

4.1 Socio-economic profile

4.2 Existing cropping pattern, livestock, productivity and economic analysis

4.3 Changes in farm enterprises

4.4 Problems and constraints of the study area

4.1 Socio-economic profile

This section attempts to describe the geography, agriculture, demographic features and general socio- economic features of Malana village which are pertinent to formulate the development strategy for the region.

4.1.1 Demographic features of the study area

Malana village is located on the North-Eastern side of Kullu district of Himachal Pradesh. It is a part of Naggar Development Block. It is located at $32^0$9'15"N to $32^0$05'06" N latitude and $77^0$15'26" E to $77^0$16'51" E longitude at an elevation of 2650 m above mean sea level.

It can be visualized from Table 4.1 that Malana village accounts for about 0.04 per cent of the total geographical area of Kullu district. As per 2001 census, the total population of Malana was 1355, accounting for 0.36 per cent of the total population of Kullu district. However, total population of livestock in the village was 6050 and played a crucial role in providing livelihood to the farmers.

Table 4.1: Malana village vis-a-vis district Kullu at a glance

Sr. No.	Particulars	Malana*		Kullu**
1.	Total geographical area as per village paper (ha)	179	(0.04)	5,01.100
2.	Total population (Number)	1,355	(0.36)	3,81,571
	-Male	675	(0.34)	1,98,016
	-Female	680	(0.37)	1,83,555
3.	Households (Number)	272	(0.47)	57,407
4.	Area under cultivation (ha)	128	(0.34)	37,200
5.	Livestock	6,050	(1.84)	3,28,302
	-Cattle	550	(0.35)	1,58,893
	-Sheep and goat	4,700	(2.81)	1,67,284

Figures in parentheses shows percentage to district figures

*** Patwar circle, Jiya, District Kullu, Himachal Pradesh**

**** State statistical abstract of Himachal Pradesh, 1999**
Statistical outline, Himachal Pradesh, 2002-2003

4.1.2 Location and approach

Malana village is situated in the remote corner of Parvati valley in North–East of Kullu district of Himachal Pradesh (Plate 4.1). The village is located at an elevation of 2650 m above mean sea level. The village is situated on the right bank of Malana torrent that confluence Parvati river at Jari. The village is surrounded on all sides by sharp vertical rocks. On the East, it is surrounded by Manikaran, Kasol and Rasol while on the South by Jari. On the West, it is surrounded by Chanderkhani pass and Naggar valley while to the North, the view is dominated by the glittering white peaks of the Deotibba mountain in the Spiti hills. Village is at a distance of 40 Km from the district headquarter of Kullu in Himachal Pradesh. The village is inaccessible by road and is approachable only by rough and tough trekable terrain. There are four approaches to the village:

1) Naggar-Rumsu-Chanderkhani-Malana-18 km trek route



Plate 4.1: An overview of the study area

2) Jana-Chanderkhani-Malana- 17 km trek route

3) Manikaran-Rasol-Malana- 16 km trek route

4) Jari-Malana along Malana *nalah*- 15 km trek route

All trek routes are very narrow with steep gradient, quite awful, difficult and it takes about 7-18 hours for a stranger. However, the easiest trek route is Jari-Malana along Malana *nalah* and takes 7-8 hours. On the way, one does not know where he is

Table 4.2: Infrastructural facilities in Malana village

Sr. No	Particulars	Distance (km)
1.	Road (metalled)	14
2.	Telegraph office	0
3.	Bank	14
4.	Agricultural credit Co-operative society	16
5.	Primary school	0
6.	Middle school	0
7.	High school	16
8.	Senior secondary school	16
9.	Local market	14
10.	Water flour mill/ *gharat*	0
11.	Repair shop for tools / machinery	0
12.	Primary Health Centre	14
13.	Veterinary hospital	15
14.	Other agro- industries	49

leading for while passing through these tough treks amidst heavy boulders, thick wood, sand, bushes along side terrible *nalah.* The village is located in such a unique situation that it is not visible from other places. On the way, terrain is so tough that stranger goes out of breath after continuous walking for five minutes.

Table 4.3: Age- wise distribution of family members on different categories of farm

(Number)

Age group(yrs)	Marginal			Small			Medium			Overall		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	20	36	56	12	18	30	13	16	29	45	70	115
	(16.13)	(27.27)	(21.88)	(13.19)	(21.18)	(17.05)	(17.81)	(23.53)	(20.57)	(15.63)	(24.56)	(20.07)
5-15	37	31	68	25	25	50	17	15	32	79	71	150
	(29.84)	(23.48)	(26.56)	(27.47)	(29.41)	(28.41)	(23.29)	(22.06)	(22.70)	(27.43)	(24.91)	(26.18)
15-40	55	51	106	39	29	68	31	26	57	125	106	231
	(44.35)	(38.64)	(41.41)	(42.86)	(34.12)	(38.64)	(42.46)	(38.24)	(40.42)	(43.40)	(37.19)	(40.31)
40-60	9	12	21	9	10	19	7	8	15	25	30	55
	(7.26)	(9.10)	(8.20)	(9.89)	(11.76)	(10.79)	(9.59)	(11.76)	(10.64)	(8.68)	(10.53)	(9.60)
60 &	3	2	5	6	3	9	5	3	8	14	8	22
above	(2.42)	(1.51)	(1.95)	(6.59)	(3.53)	(5.11)	(6.85)	(4.41)	(5.67)	(4.86)	(2.81)	(3.84)
Total	124	132	256	91	85	176	73	68	141	288	285	573
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
Sex- ratio (F / 1000 M)		1065			934			932			990	

Figures in parentheses show percentage to total in each column

Village seems to have missing even the basic facilities such as road i.e. the village is yet not connected with metalled or unmetalled motorable road. It can be visualized from Table 4.2 that there is no bank, high school and local market in the village. The village did not have a hospital but a dispensary is present there. However, the villagers use local medicinal herbs like Karu *(Picrorhiza kurrooa),* Patish *(Heterophyllum spp),* Dorighash*anjwas (Potentilla nepalenses),* chura *(Angelica glauca), Kardwai and losar* to treat their ailments. For animals there is not even a dispensary, so they are surviving at their own or by the grace of God.

4.1.3 Age-wise distribution

Farming being a labour intensive vocation, the age-wise distribution is important to determine the number and age composition of the family members available for farming and thus, the well being of the farm household. The age wise distribution of the family members revealed that about 46.25 per cent of the total population was below 15 years of age group (Table 4.3).The proportion of female children was found more on all the farms. The working population in the age group of 15-60 years of age constituted about 49.61 per cent, 49.43 per cent and 51.06 percent on marginal, small and medium farm categories, respectively. The sex- ratio of the village was 990.

4.1.4 Family size and composition

The family size and structure play an important role in farming. The average size of the family was found to be 5.90, comprising of 3-4 adults and 2-3 children. Most of the families (60.4 per cent) in the study area had nuclear structure, where parents were living with their unmarried children (Table 4.4).

Table 4.4 Sex-wise family composition on different categories of farm

(No./ household)

Sex/Family type	Marginal	Small	Medium	Overall
Male				
Adult	1.40 (54.05)	1.74 (56.31)	1.95 (58.91)	1.62 (55.86)
Children	1.19 (45.95)	1.35 (43.69)	1.36 (41.09)	1.28 (44.14)
Sub total	2.59 (100)	3.09 (100)	3.31 (100)	2.90 (100)
Female				
Adult	1.35 (49.09)	1.68 (50.60)	1.69 (54.69)	1.52 (50.67)
Children	1.40 (50.91)	1.64 (49.40)	1.40 (45.31)	1.48 (49.33)
Sub total	2.75 (100)	3.32 (100)	3.09 (100)	3.00 (100)
Overall				
Adult	2.75 (51.50)	3.42 (53.35)	3.64 (56.87)	3.15 (53.39)
Children	2.59 (48.50)	2.99 (46.65)	2.76 (43.13)	2.75 (46.61)
Total	5.34 (100)	6.41 (100)	6.40 (100)	5.90 (100)
Family type				
Nuclear	35	14	12	61
Joint	13	17	10	40

Figures in parentheses indicate percentage to total

4.1.5 Caste structure

The caste-wise distribution of the sample households showed the predominance of *Rajput* community (Table 4.5). Interestingly, all the small and medium farmers

Table 4.5 Distribution of households according to caste

(Number)

Size of holding	Scheduled caste	*Rajput*	Total
Marginal	4 (8.33)	44 (91.67)	48 (100)
Small	-	31 (100)	31 (100)
Medium	-	22 (100)	22 (100)
Total	4 (3.96)	97 (96.04)	101 (100)

Figures in parentheses indicate percentage to total

Table 4.6: Sex- wise educational status of family members on different categories of farm

(Number)

Education level	Marginal			Small			Medium			Overall		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Illiterate	19	53	72	15	31	46	12	27	39	46	111	157
	(15.32)	(40.15)	(28.12)	(16.48)	(36.47)	(26.14)	(16.44)	(39.71)	(27.66)	(15.97)	(38.95)	(27.40)
Primary	63	41	104	40	29	69	27	20	47	130	90	220
	(50.81)	(31.06)	(40.63)	(43.96)	(34.12)	(39.20)	(36.99)	(29.41)	(33.33)	(45.14)	(31.58)	(38.39)
Middle	16	1	17	18	2	20	18	2	20	52	5	57
	(12.90)	(0.76)	(6.64)	(19.78)	(2.35)	(11.36)	(24.66)	(2.94)	(14.18)	(18.06)	(1.75)	(9.95)
Matric	2	-	2	-	-	-	-	-	-	2	-	2
	(1.61)		(0.78)							(0.69)		(0..35)
Senior secondary	1	-	1	2	-	2	2	-	2	5	-	5
	(0.81)		(0.39)	(2.20)		(1.14)	(2.74)		(1.42)	(1.74)		(0.87)
Non-school going	23	37	60	16	23	39	14	19	33	53	79	132
	(18.55)	(28.03)	(23.44)	(17.58)	(27.06)	(22.16)	(19.17)	(27.94)	(23.41)	(18.40)	(27.72)	(23.04)
Total	124	132	256	91	85	176	73	68	141	288	285	573
Literacy rate (%)	66.13	31.82	48.44	65.93	36.47	51.70	64.38	32.35	48.94	65.63	33.33	49.56

Figures in parentheses show percentage to total in each column

belonged to *Rajput* community. The scheduled caste families belong to marginal category only and in the entire village only four families belong to scheduled caste category and served as a blacksmith and some played instruments during fair and festivals. No other community was noticed in the village.

4.1.6 Educational status

The level of education plays a catalytic role in the scientific management of farms, adoption of recommended technology and efficient marketing of the farm products. On an average, literacy rate for male was 65.63 per cent, whereas for female it was only 33.33 per cent (Table 4.6). Interestingly, the highest education received by a person in the village was senior secondary and those too only five males in a population of 1355. None of the villagers had a graduation or a professional diploma. Further, it was noticed that even the primary education was lacking in females. Among the enrolled students only 20-30 per cent attended the school regularly.

4.1.7 Occupational pattern

The occupational pattern of working person revealed that agriculture was the

Table 4.7: Occupational distribution of sample farms

Occupation	Number	Percentage of total household
Agriculture	87	86.14
Government service (regular)	2	1.98
Government service (contract basis)	1	0.99
Shop	4	3.96
Carpenter	2	1.98
Sawmill	2	1.98
Water flour mill (*gharat*)	1	0.99
Guest house	2	1.98
Total	101	100

main occupation and only 1.98 per cent household were having permanent job (Table 4.7). The other professions were shopkeeper, carpentry, sawmill, water flour mill (*gharat*), guest house etc.

4.2 Existing cropping pattern, livestock, productivity and economic analysis

4.2.1 Existing cropping pattern

The cropping pattern showed the spatial distribution of different crops with respect to area and determined the type of agriculture of a region. For most part of the year, the land remained covered with snow and thus, restricted the villagers to take more than one crop in the same piece of land. It was found that buckwheat in *Kharif* and wheat

Table 4.8: Cropping pattern on different categories of farm

(Hectare/ farm)

Crops	Marginal		Small		Medium		Overall	
	Area	Per cent	Area	Per cent	Area	Per cent	Area	Per cent
Maize	0.011	6.11	0.036	7.10	0.051	6.01	0.027	6.34
Rajmash	0.014	7.78	0.037	7.30	0.068	8.02	0.033	7.75
Potato	0.019	10.55	0.067	13.21	0.107	12.62	0.053	12.44
Amaranthus	0.018	10.00	0.062	12.23	0.087	10.26	0.047	11.03
Buckwheat	0.025	13.89	0.072	14.20	0.111	13.09	0.058	13.62
Wheat	0.079	43.89	0.210	41.44	0.360	42.45	0.180	42.25
Barley	0.014	7.78	0.023	4.54	0.064	7.55	0.028	6.57
Total cropped area	0.180	100.00	0.507	100.00	0.848	100.00	0.426	100.00
Cropping intensity (%)		98.90		96.76		96.15		97.04

in *Rabi* seasons were the most predominant crops grown by the farmers in different categories (Fig. 4.1-4.4). On overall basis buckwheat and wheat accounted for around 14 per cent and about 42 per cent of the total cropped area, respectively (Table 4.8).

The other important crops were maize, rajmash, barley, potato and amaranthus which were grown under rainfed conditions only. No crop enterprise was grown under irrigated conditions as land was sloppy and due to non-availability of assured irrigation facilities.

4.2.2 Crop yields

The productivity of different crops on marginal, small, medium and overall farms in Malana village has been depicted in Table 4.9. It can be clearly visualized that among food crops the yield of potato was higher than the cereals. However, productivity of crops grown by *Malanese* is much lower than the optimum level, clearly indicating very low level of technology adopted by the farmers.

The comparison across different categories of farm revealed that the average yield of crops was relatively higher on small farms because of better use of inputs and labour on this category of farm which led to better management.

Table 4.9: Average yield of crops on different categories of farm

(q/ha)

Crop	Marginal	Small	Medium	Overall
Maize	10.96	10.37	10.92	10.70
Rajmash	7.91	7.93	7.11	7.55
Potato	54.04	59.31	54.58	56.33
Amaranthus	5.80	6.13	5.42	5.78
Buckwheat	10.75	11.26	10.51	10.84
Wheat	8.16	7.90	8.47	8.20
Barley	6.58	6.76	6.63	6.65

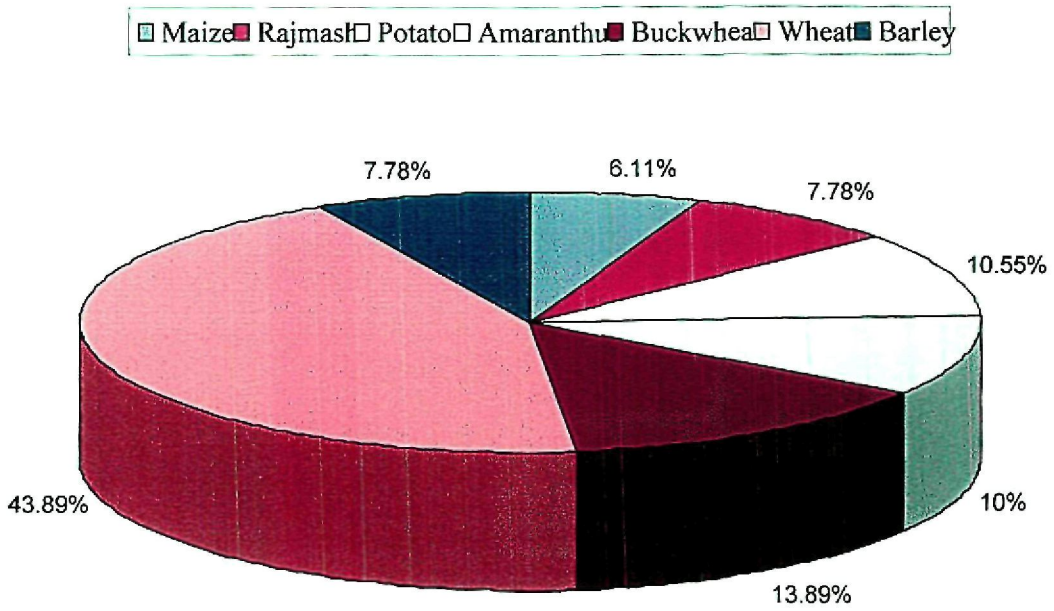


Fig 4.1: Cropping pattern on marginal farms in Malana village

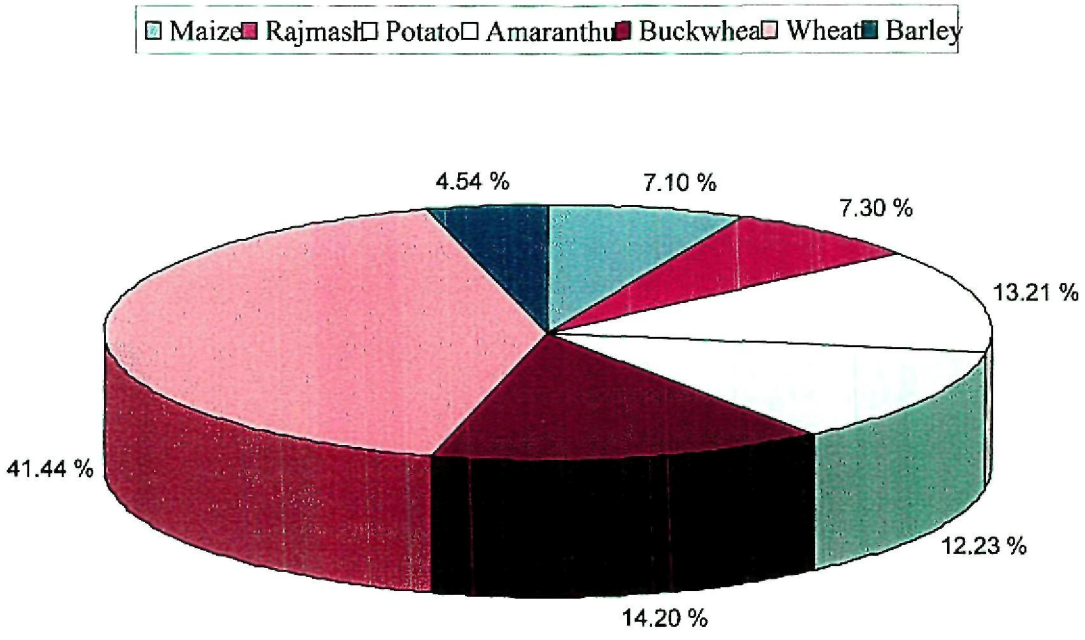


Fig. 4.2: Cropping pattern on small farms in Malana village

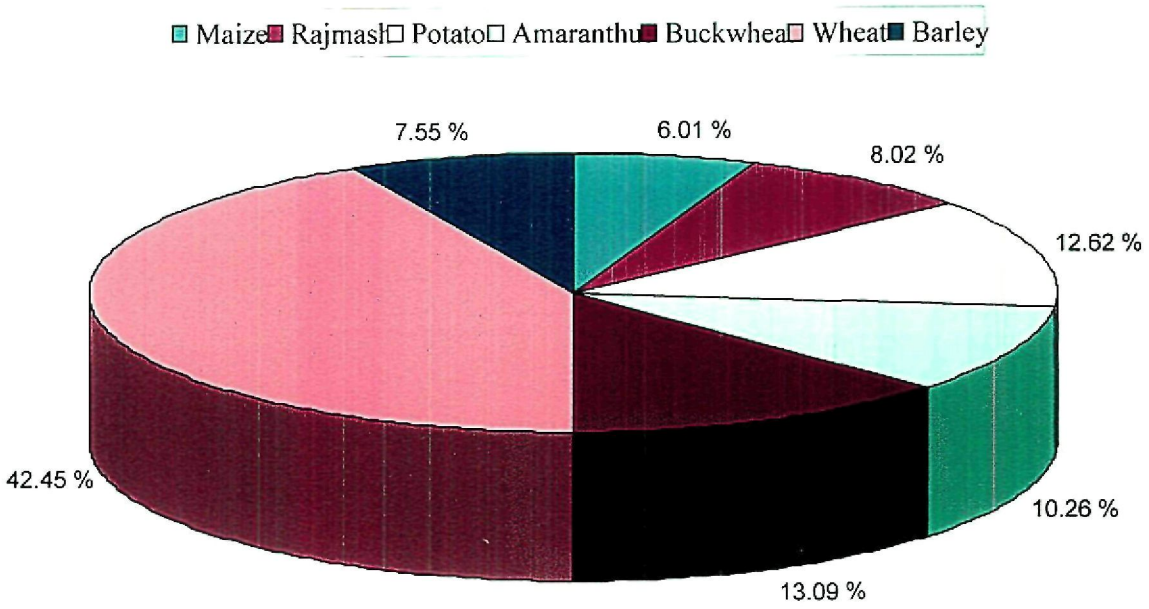


Fig 4.3: Cropping pattern on medium farms in Malana village

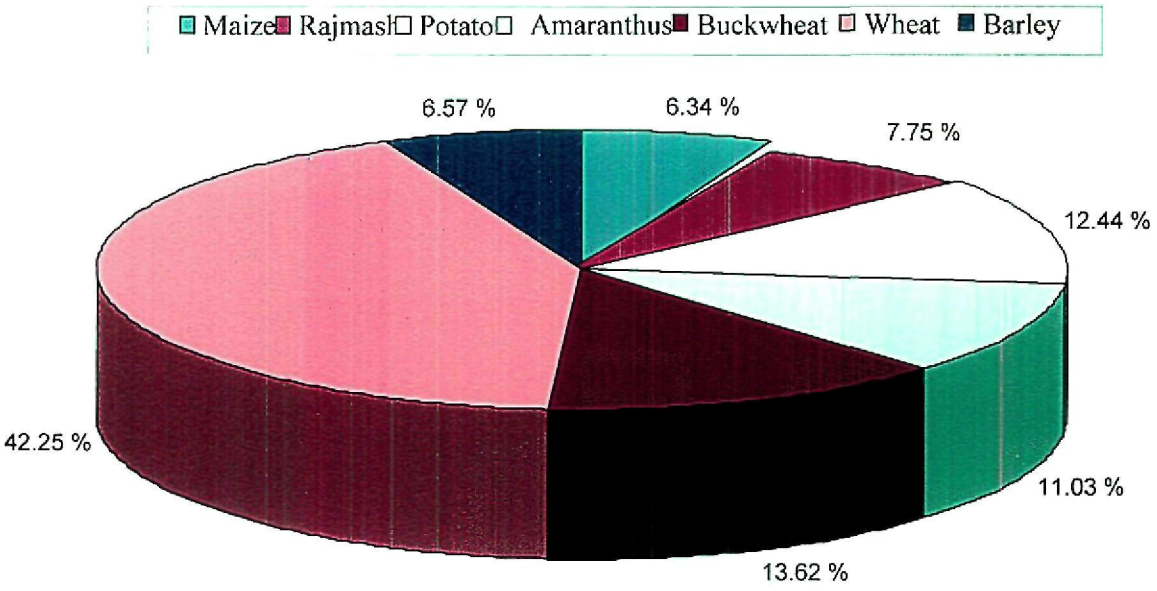


Fig 4.4: Cropping pattern on overall farms in Malana village

Table 4.10: Inventory and investment on farm implements on different categories of farm

(Per farm)

Particulars	Marginal			Small			Medium			Overall		
	No.	Value (Rs.)	Per cent	No.	Value (Rs.)	Per cent	No.	Value (Rs.)	Per cent	No.	Value (Rs.)	Per cent
Sickle	2.67	80.00	10.23	2.74	82.26	9.31	3.73	111.82	9.43	2.92	87.62	9.72
Axes	1.19	95.00	12.14	1.39	110.97	12.56	1.86	149.09	12.57	1.40	111.68	12.39
Clod breaker	1.17	23.33	2.98	1.65	32.90	3.73	2.50	50.00	4.21	1.60	32.08	3.56
Kudali	2.63	105.00	13.43	2.90	116.13	13.15	4.00	160.00	13.49	3.01	120.40	13.36
Storage bin	1.15	343.75	43.94	1.35	406.45	46.02	1.82	545.45	45.99	1.36	406.93	45.14
Other*	2.02	135.19	17.28	2.06	134.52	15.23	2.23	169.79	14.31	2.08	142.68	15.83
Total	10.83	782.27	100.00	12.09	883.23	100.00	16.14	1186.15	100.00	12.37	901.39	100.00

* includes scissors, spades, kilta etc.

4.2.3 Inventory and investment on farm implements

Table 4.10 depicted the availability and investment on farm implements of sample rmers. It has been observed that no major farm machinery was used in the study area. n overall farms, the total investment on all type of farm tools and machinery was timated at Rs 901 per farm. The maximum investment was made on storage bins (45.14 r cent). However, the farmers were not using bullock labour and ploughs in the field ıe to religious beliefs.

.2.4 Input-use pattern

Modern agriculture has been found to be input intensive and required better anagement. Thus, the input use pattern in different crops grown in the Malana village ıs been presented in Table 4.11. It can be seen from the table that on an average farm tuation, higher seed rate was used for all crops to warrant poor germination of these ops grown under rainfed conditions. Farm yard manure was being applied before wing in all the crops due to large number of animals on every farm household. No rtilizers and pesticides were applied at all to all the crops grown in the area due to lack awareness and non-availability of these inputs. Interestingly, owing to religious beliefs, llock labour was banned in the village. Agricultural operations like ploughing, sowing d threshing, which are usually done by bullocks in other part of the state, were carried ıt by the human labour with the help of small tools. So, human labour was found to play gnificant role in crop production. The comparative picture of input-use pattern on arginal, small and medium farms has been depicted through the table.

Table 4.11: Input-use pattern for different crops on sample farms

(Per hectare)

Category /crops	Seed (Kg)	FYM (q)	Human labour (Mandays)
Marginal			
Maize	91.16	165.94	155.88
Rajmash	124.24	168.18	168.38
Potato	676.37	207.69	140.65
Amaranthus	2.93	95.45	89.14
Buckwheat	69.92	110.59	123.43
Wheat	138.55	167.24	93.67
Barley	153.03	168.18	103.31
Small			
Maize	88.24	158.17	141.60
Rajmash	127.19	136.84	161.95
Potato	563.94	143.27	133.63
Amaranthus	3.08	105.42	105.87
Buckwheat	62.72	104.91	120.39
Wheat	145.96	150.62	80.40
Barley	152.08	145.83	108.50
Medium			
Maize	82.90	164.47	149.74
Rajmash	118	161.33	154.57
Potato	576.27	161.44	133.85
Amaranthus	3.20	101.33	96.45
Buckwheat	67.21	117.62	129.04
Wheat	146.46	162.75	87.51
Barley	136.43	138.57	110.79
Overall			
Maize	86.60	162.15	147.54
Rajmash	122.42	154.24	159.88
Potato	588.17	162.12	134.92
Amaranthus	3.10	101.92	98.95
Buckwheat	65.98	111.25	124.60
Wheat	144.66	159.42	86.28
Barley	144.42	147.48	116.20

On an average, marginal farmers used more labour and seed as compared to other farms.

4.2.5 Comparison of existing and potential yields on all farms

The knowledge of potential yields of crop indicated the possible levels of yield which could be obtained from a given crop if recommended package of practices are adopted. It also helps in comparing the yield gaps which the crop suffered due to different reasons which could be related to various problems. The study of yield gap is very important as it helps in giving the due emphasis on the crops having high yield gap and also finding the possibilities for the high yield gaps in those crops.

Table 4.12: Technological gap in crop yields

Crops	Potential yield * (q/ha)	Existing yield (q/ha)	Yield gap (%)
Maize	19.9	10.70	46.23
Rajmash	19	7.55	60.26
Potato	95	56.33	40.71
Amaranthus	11	5.78	47.45
Buckwheat	25	10.84	56.64
Wheat	25	8.20	67.20
Barley	25	6.65	73.20

*Package of Practices - Directorate of Extension Education, CSKHPKV, Palampu

In the present study, it was observed from the Table 4.12 that highest yield gap was found in case of barley (73.20 percent) and lowest was in case of potato (40.71 per cent). In general the yield gap was above 50 per cent in all the crops except maize, potato and amaranthus (Fig. 4.5).

4.2.6 Economic viability of crops in the study area

In the present section an attempt has been made to work out the economics of different crops in the study area. Production being capital and labour intensive process provided ample employment opportunities to farm families. The economics of different

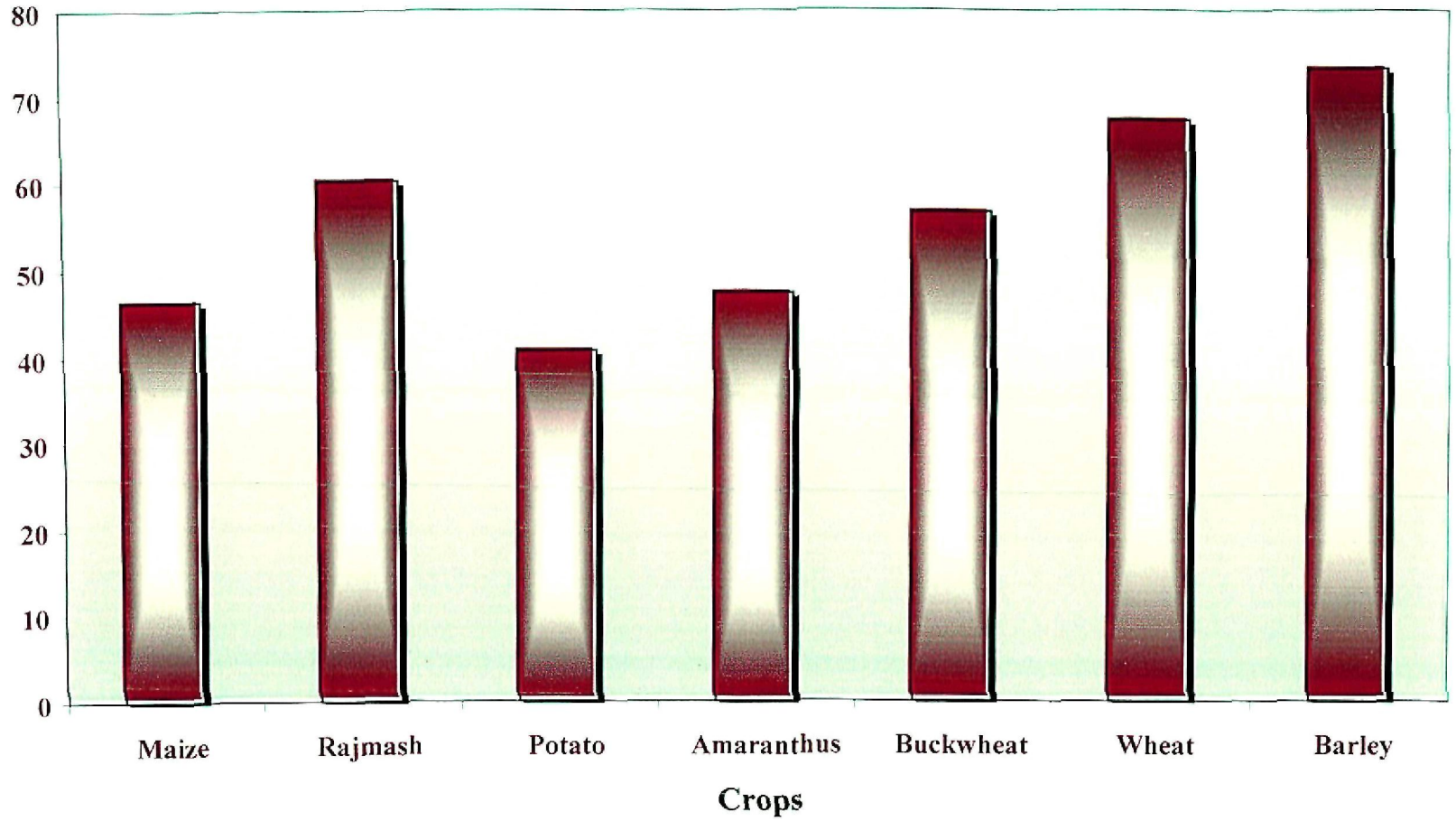


Fig 4.5: Technological gap (%) in yield of crops of the study area

crops was influenced by various factors like available infrastructural facilities, input supply system, market availability and market price. Thus, computation of cost gave an idea of profitability of various crops. The economic analysis helped in identifying the capital intensive and more profitable crops which could be taken up to reap comparative advantage in future.

Different aspects under the economics of various crops have been presented as under:

4.2.6.1 Per hectare returns and cost of cultivation in maize

Maize was an important crop in *Kharif* season in the study area. On an overall farm situation, the gross returns from maize were estimated to be Rs 8,562 per hectare (Table 4.13). However, the gross returns on marginal farms were maximum followed by medium and small farms.

Table 4.13: Per hectare returns and cost of cultivation in maize

(Per cent)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
A.	**Gross returns (Rs)**	8768	8297	8736	8562
B.	**Cost**				
1.	Seed	3.54	3.76	3.36	3.55
2.	FYM	10.31	10.78	10.68	10.65
3.	Family labour	84.74	84.48	85.07	84.79
4.	Depreciation	0.79	0.32	0.25	0.37
5.	Land revenue	0.23	0.25	0.24	0.24
6.	Interest on working capital (for half of the crop period)	0.39	0.41	0.40	0.40
7.	Total cost (Rs)	12,877	11,734	12,322	12,182

It was observed that family labour had dominating share (84.79 per cent) in the variable cost on overall farm situation. Viewing individual farms the share was highest on medium farms followed by marginal and small farms. The next important input for variable cost was FYM. Its highest share being on small farms (10.78 per cent) followed by medium (10.68 per cent) and marginal farms (10.31 per cent). On overall farms it was 10.65 per cent.

In maize, highest cost (cost C_2) was observed on marginal farm conditions (Rs. 24,251 per hectare) followed by medium farms (Rs. 23,612 per hectare) and small

Table 4.14: Different costs of cultivation for maize production

(Rs/ha)

Sr. No.	Costs	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	1,966	1,822	1,840	1,854
2.	Cost A_2	1,966	1,822	1,840	1,854
3.	Cost B_1	2,089	1,872	1,880	1,914
4.	Cost B_2	13,339	13,122	13,130	13,164
5.	Cost C_1	13,001	11,784	12,362	12,242
6.	Cost C_2	24,251	23,034	23,612	23,492

farms (Rs. 23,034 per hectare). Whereas, on overall farm category it was Rs. 23,492 per hectare. Similar trend followed for cost A_1, cost A_2, cost B_1, cost B_2 and cost C_1 (Table 4.14).

Net returns over different costs were computed and presented in Table 4.15.The perusal of the table showed that the net returns over cost A_1 and cost B_1 on overall farm situation were Rs. 6,708 and Rs. 6,648, respectively. However, net returns over cost A_1 were found to be highest on medium farms followed by marginal and small farms.

Table 4.15: Net returns over different costs in maize

(Rs/ha)

Sr. No.	Returns over	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	6,802	6,475	6,896	6,708
2.	Cost A_2	6,802	6,475	6,896	6,708
3.	Cost B_1	6,679	6,425	6,856	6,648
4.	Cost B_2	-4,571	-4,825	-4,394	-4,602
5.	Cost C_1	-4,233	-3,487	-3,626	-3,680
6.	Cost C_2	-15,483	-14,737	-14,876	-14,930

4.2.6.2 Per hectare returns and cost of cultivation in rajmash

Rajmash was an important pulse crop of *Kharif* season in the study area. It was observed that on an overall farm situation family labour was having highest share

Table 4.16: Per hectare returns and cost of cultivation in rajmash

(Per cent)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
A.	**Gross returns (Rs)**	15,820	15,860	14,220	15,100
B.	**Cost**				
1.	Seed	15.66	16.79	16.12	16.26
2.	FYM	8.48	7.23	8.82	8.20
3.	Family labour	74.29	74.82	73.93	74.33
4.	Depreciation	0.70	0.28	0.22	0.32
5.	Land revenue	0.19	0.20	0.20	0.20
6.	Interest on working capital (for half of the crop period)	0.68	0.68	0.71	0.69
7.	Total cost (Rs)	15,865	15,151	14,636	15,057

in the variable cost. Similar pattern was observed on other farm categories. The next important input was seed and its share was maximum on small farms (16.79 per cent)

followed by medium farms (16.12 per cent) and marginal farms (15.66 per cent). However, on overall farms it was 16.26 per cent of the total cost (Table 4.16).

Table 4.17: Different costs of cultivation for rajmash production

(Rs/ha)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	4,079	3,815	3,816	3,865
2.	Cost A_2	4,079	3,815	3,816	3,865
3	Cost B_1	4,203	3,864	3,856	3,925
4.	Cost B_2	15,453	15,114	15,106	15,175
5.	Cost C_1	15,989	15,200	14,676	15,117
6.	Cost C_2	27,239	26,450	25,926	26,367

In rajmash, cost C_2 was found to be highest on marginal farms, followed by small and medium farms category (Table 4.17). However, on overall farms it was Rs. 26,367 per hectare. It was observed that cost A_1 was highest on marginal (Rs 4,079 per hectare) and almost equal on small and medium farms. However, it was observed that marginal farms were having highest cost A_2, cost B_1, cost B_2 and cost C_1 among various farms.

Table 4.18: Net returns over different costs in rajmash

(Rs/ha)

Sr. No.	Returns over	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	11,741	12,046	10,404	11,235
2.	Cost A_2	11,741	12,046	10,404	11,235
3.	Cost B_1	11,617	11,996	10,364	11,175
4.	Cost B_2	367	746	-886	-75
5.	Cost C_1	-169	660	-456	-17
6.	Cost C_2	-11,419	-10,590	-11,706	-11,268

13449

Net returns over cost A_1 in rajmash were highest on small farms (Rs 12,046) followed by Rs. 11,741 on marginal farms and Rs 10,404 on medium farms (Table 4.18). While net returns over cost C_2 were found negative on all the categories of farms.

4.2.6.6 Per hectare returns and cost of cultivation in potato

Potato was an important *Kharif* crop of the study area. It was observed that maximum returns of Rs. 23,724 per hectare were computed on small farms category followed by Rs. 21,832 for medium farm category and Rs. 21,618 per hectare for marginal farms (Table 4.19). However, it was Rs. 22,532 per hectare for overall farm category. Family labour accounted for 71.18 per cent of the total cost for overall farm category. It was maximum on small farms (72.41 per cent) while its share on medium and marginal farm categories was 71.38 and 68.10 per cent, respectively. Another important

Table 4.19: Per hectare returns and cost of cultivation in potato

(Per cent)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
A.	**Gross returns (Rs)**	21,618	23,724	21,832	22,532
B.	**Cost**				
1.	Seed	18.71	17.46	17.56	17.73
2.	FYM	11.49	8.87	9.84	9.78
3.	Family labour	68.10	72.41	71.38	71.18
4.	Depreciation	0.64	0.28	0.21	0.31
5.	Land revenue	0.20	0.23	0.23	0.22
6.	Interest on working capital (for half of the crop period)	0.86	0.75	0.78	0.78
7.	Total cost (Rs)	14,458	12,918	13,126	13,269

input was seed which accounted for 17.73 per cent of the total cost on overall farm category. However, category wise analysis revealed that it was highest on marginal farms and lowest on small farms.

Cost C_2 was found highest Rs. 25,832 per hectare in marginal farm, followed by Rs. 24,415 per hectare for medium farms and Rs. 24,217 for small farm (Table 4.20). Overall it was Rs. 24,579 per hectare. Cost A_2 followed similar trend on all the farm categories. On overall farms, it was Rs. 3,824 per hectare.

Table 4.20: Different costs of cultivation for potato production

(Rs/ha)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	4,613	3,564	3,756	3,824
2.	Cost A_2	4,613	3,564	3,756	3,824
3.	Cost B_1	4,736	3,613	3,796	3,884
4.	Cost B_2	15,986	14,863	15,046	15,134
5.	Cost C_1	14,582	12,967	13,165	13,329
6.	Cost C_2	25,832	24,217	24,415	24,579

Net returns in potato over cost C_2 showed negative values for all the farm categories (Table 4.21). However, highest net returns over cost C_2 were obtained from small farms (-493) and the lowest (-4,214) were obtained from marginal farms.

Table 4.21: Net returns over different costs in potato

(Rs/ha)

Sr. No.	Returns over	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	17,005	20,160	18,076	18,708
2.	Cost A_2	17,005	20,160	18,076	18,708
3.	Cost B_1	16,881	20,111	18,036	18,648
4.	Cost B_2	5,631	8,861	6,786	7,398
5.	Cost C_1	7,036	10,757	8,667	9,203
6.	Cost C_2	-4,214	-493	-2,583	-2,047

Small farms also recorded highest returns over cost A_1, cost A_2, cost B_1, cost B_2 and cost C_1, followed by medium farms and marginal farms.

4.2.6.7 Per hectare returns and cost of cultivation in amaranthus

Amaranthus was the *Kharif* season crop of the study area having gross returns Rs 11,033 per hectare for small farms followed by Rs 10,448 per hectare for marginal farms and Rs 9,759 for medium farms (Table 4.22). However, for overall farms it was

Table 4.22: Per hectare returns and cost of cultivation in amaranthus

(Per cent)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
A.	**Gross returns (Rs)**	10,448	11,033	9,759	10,407
B.	**Cost**				
1.	Seed	0.74	0.66	0.75	0.71
2.	FYM	10.65	10.05	10.54	10.34
3.	Family labour	87.07	88.30	87.75	87.88
4.	Depreciation	0.81	0.34	0.26	0.38
5.	Land revenue	0.41	0.35	0.38	0.38
6.	Interest on working capital (for half of the crop period)	0.32	0.30	0.32	0.31
7.	Total cost (Rs)	7,167	8,393	7,694	7,882

Rs 10,407 per hectare. It was observed that the share of family labour was more than 87 per cent of the variable cost in all the categories of farms. However, FYM contributed about 11 per cent towards the total cost of production.

Table 4.23: Different costs of cultivation for amaranthus production

(Rs/ha)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	928	982	943	956
2.	Cost A_2	928	982	943	956
3.	Cost B_1	1,051	1,031	982	1,016
4.	Cost B_2	12,301	12,281	12,232	12,266
5.	Cost C_1	7,291	8,442	7,734	7,942
6.	Cost C_2	18,541	19,692	18,984	19,192

Cost C_2 was found highest on small farms followed by medium farms and marginal farms. However cost B_1 was recorded to be lowest on medium farm category (Rs 982 per hectare). On overall farm category it was Rs 1016 per hectare (Table 4.23).

Both cost B_2 and cost C_2 showed negative returns on all the farms while over cost

Table 4.24: Net returns over different costs in amaranthus

(Rs/ha)

Sr. No.	Returns over	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	9,521	10,051	8,817	9,451
2.	Cost A_2	9,521	10,051	8,817	9,451
3.	Cost B_1	9,397	10,002	8,777	9,391
4.	Cost B_2	-1,853	-1,248	-2,473	-1,859
5.	Cost C_1	3,157	2,591	2,026	2,465
6.	Cost C_2	-8,093	-8,659	-9,224	-8,785

C_1 highest return was Rs. 3,157 per hectare for marginal farms followed by Rs. 2,591 per hectare for small farm and Rs. 2,026 for medium farms (Table 4.24). However, it was Rs. 2,465 per hectare on overall farms.

4.2.6.3 Per hectare returns and cost of cultivation in buckwheat

Buckwheat was another important crop which was grown in the study village during *Kharif* season. It was revealed from Table 4.25 that on an overall farm situation, the gross returns from buckwheat were estimated to be Rs. 27,097 per hectare. However, the gross returns were maximum on small farms followed by marginal farms and medium farms.

It was observed that family labour was having a dominant share in variable cost being highest on small farms (76.87 per cent) followed by medium farms (76.65 per cent) and marginal farms (75.40 per cent). In buckwheat cost C_2 and cost C_1 were highest on medium farm, comparatively low in marginal farms and still lower in small farms (Table 4.26). On overall farm Cost C_2 was Rs 22,712 per hectare.

Table 4.25: Per hectare returns and cost of cultivation in buckwheat

(Per cent)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
A.	**Gross returns (Rs.)**	26,864	28,150	26,275	27,097
B.	**Cost**				
1.	Seed	15.26	14.30	14.26	14.47
2.	FYM	7.72	7.65	7.98	7.81
3.	Family labour	75.40	76.87	76.65	76.50
4.	Depreciation	0.71	0.29	0.23	0.33
5.	Land revenue	0.26	0.27	0.25	0.26
6.	Interest on working capital (for half of the crop period)	0.65	0.62	0.63	0.63
7.	Total cost (Rs)	11,458	10,964	11,785	11,402

Table 4.26: Different costs of cultivation for buckwheat production

(Rs/ha)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	2,818	2,537	2,752	2,679
2.	Cost A_2	2,818	2,537	2,752	2,679
3.	Cost B_1	2,942	2,587	2,792	2,739
4.	Cost B_2	14,192	13,837	14,042	13,989
5.	Cost C_1	11,581	11,013	11,825	11,462
6.	Cost C_2	22,831	22,263	23,075	22,712

Buckwheat was the only crop in the study area where all the costs showed positive returns. Highest returns over cost C_2 were found to be Rs. 5,887 per hectare on small farms category (Table 4.27). The returns were Rs. 4,033 per hectare on marginal farms and Rs. 3,200 per hectare on medium farms. Overall it was Rs. 4,386 per hectare. Similar trends were observed in other costs too.

Table 4.27: Net returns over different costs in buckwheat

(Rs/ha)

Sr. No.	Returns over	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	24,047	25,613	23,523	24,418
2.	Cost A_2	24,047	25,613	23,523	24,418
3.	Cost B_1	23,923	25,564	23,483	24,358
4.	Cost B_2	12,673	14,314	12,233	13,108
5.	Cost C_1	15,283	17,137	14,450	15,636
6.	Cost C_2	4,033	5,887	3,200	4,386

4.2.6.4 Per hectare returns and cost of cultivation in wheat

In *Rabi* season, wheat was an important crop of the area. Table 4.28 revealed that on an overall farm category the gross returns from wheat were estimated to be Rs. 6,970 per hectare. The gross returns were maximum on medium farms (Rs. 7,200 per hectare), on marginal farms it was Rs. 6,938 per hectare and on small farms it was

Table 4.28: Per hectare returns and cost of cultivation in wheat

(Per cent)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
A.	**Gross returns (Rs)**	6,938	6,715	7,200	6,970
B.	**Cost**				
1.	Seed	9.36	11.20	10.44	10.46
2.	FYM	15.08	15.42	15.47	15.36
3.	Family labour	73.85	71.98	72.79	72.77
4.	Depreciation	0.69	0.27	0.22	0.32
5.	Land revenue	0.33	0.38	0.35	0.36
6.	Interest on working capital (for half of the crop period)	0.69	0.75	0.73	0.73
7.	Total cost (Rs)	8,878	7,819	8,416	8,299

Rs. 6,715 per hectare. It was observed that family labour was having highest share 72.77 per cent to total cost on overall farms category. Similar trends followed in other farm categories, with the share of family labour of more than 70 per cent of total cost Perusal of data from Table 4.29 revealed that of all the farm categories (marginal, small and medium), cost C_2 was highest (Rs. 20,252 per hectare) in marginal farms. On small and

Table 4.29: Different costs of cultivation for wheat production

(Rs/ha)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	2,322	2,191	2,291	2,260
2.	Cost A_2	2,322	2,191	2,291	2,260
3.	Cost B_1	2,446	2,240	2,330	2,320
4.	Cost B_2	13,695	13,490	13,580	13,570
5.	Cost C_1	9,002	7,868	8,456	8,360
6.	Cost C_2	20,252	19,118	19,706	19,610

medium farms the respective values were Rs. 19,118 and Rs. 19,706 per hectare. On overall farm category cost C_2 was Rs. 19,610 per hectare. Similar trends were obtained in cost A_1, cost A_2, cost B_1, cost B_2 and cost C_1, with highest values on marginal farms followed by medium and small farms.

Maximum net returns (Rs 4,909 per hectare) over cost A_1 were found on medium farms, while net returns over cost A_1 on marginal and small farms were Rs. 4,616 per hectare and Rs. 4,524 per hectare, respectively (Table 4.30).

Table 4.30: Net returns over different costs in wheat

(Rs/ha)

Sr. No.	Returns over	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	4,616	4,524	4,909	4,710
2.	Cost A_2	4,616	4,524	4,909	4,710
3.	Cost B_1	4,492	4,475	4,870	4,650
4.	Cost B_2	-6,757	-6,775	-6,380	-6,600
5.	Cost C_1	-2,064	-1,153	-1,256	-1,390
6.	Cost C_2	-13,314	-12,403	-12,506	-12,640

4.2.6.5 Per hectare returns and cost of cultivation in barley

Another important crop of *Rabi* season was barley. It was observed that small farm category was having highest gross returns of Rs. 6,002 per hectare followed by Rs. 5,884 per hectare on medium farm category (Table 4.31). It was Rs. 5,902 per hectare on overall farm category.

Table 4.31: Per hectare returns and cost of cultivation in barley

(Per cent)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
A.	**Gross returns (Rs)**	5,837	6,002	5,884	5,902
B.	**Cost**				
1.	Seed	10.91	10.70	9.62	10.20
2.	FYM	13.71	11.72	11.16	11.91
3.	Family labour	73.69	76.35	78.10	76.60
4.	Depreciation	0.69	0.29	0.23	0.36
5.	Land revenue	0.30	0.30	0.30	0.30
6.	Interest on working capital (for half of the crop period)	0.70	0.64	0.59	0.63
7.	Total cost (Rs)	9,814	9,948	9,931	9908

It was found that on all the farm categories family labour alone accounted for more than 73 per cent of total variable cost. On medium farms category it was highest (78.10 per cent). However, on overall farm situation it was 76.60 per cent.

In barley, cost C_2 was found to be Rs. 21,247 for small and Rs. 21,220 medium farms. Moreover, it was Rs. 21,219 per hectare on overall farms (Table 4.32). Cost B_2 was highest on marginal farms (Rs. 13,956 per hectare) followed by Rs. 13,652 per hectare for small farms and Rs. 13,465 per hectare for medium farms. On overall farm

Table 4.32: Different costs of cultivation for barley production

(Rs/ha)

Sr. No.	Particulars	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	2,582	2,353	2,175	2,318
2.	Cost A_2	2,582	2,353	2,175	2,318
3.	Cost B_1	2,706	2,402	2,215	2,378
4.	Cost B_2	13,956	13,652	13,465	13,628
5.	Cost C_1	9,938	9,997	9,970	9,969
6.	Cost C_2	21,188	21,247	21,220	21,219

category it was Rs. 13,628 per hectare.

The net returns over cost A_1 were computed as Rs. 3,584. Moreover, for cost B_1 maximum returns were found to be Rs. 3,669 per hectare for medium farms followed

Table 4.33: Net returns over different costs in barley

(Rs/ha)

Sr. No.	Returns over	Size of farm			
		Marginal	Small	Medium	Overall
1.	Cost A_1	3,255	3,649	3,709	3,584
2.	Cost A_2	3,255	3,649	3,709	3,584
3.	Cost B_1	3,131	3,600	3,669	3,524
4.	Cost B_2	-8,119	-7,650	-7,581	-7,726
5.	Cost C_1	-4,101	-3,995	-4,086	-4,067
6.	Cost C_2	-15,351	-15,245	-15,336	-15,317

by Rs. 3,600 per hectare for small farms and Rs. 3,131 per hectare for marginal farm category (Table 4.33). On overall farms it was Rs. 3,524 per hectare.

4.2.7 Regression analysis

To examine the input- output relationship linear as well as Cobb- Douglas type of production functions were tried. The Cobb- Douglas production function was tried

because its regression coefficients are the direct measure of elasticities of production with respect to individual input. The returns to scale are obtained directly by summing the regression coefficients. The computational work involved in fitting this function is manageable.

The present chapter explains the results obtained for various crops on all farms situations by using Cobb- Douglas production function because of better fit as compared to linear production function.

4.2.7.1 Cobb-Douglas function for maize on all farms

The results of Cobb-Douglas production function for maize for all farms have been presented in Table 4.34. The study of the table revealed that the regression coefficients in respect of human labour, farm yard manure and seed were turned out to be in significant. The value of $\overline{R}^2$ was computed as -0.0028 while the F- value was 0.9203.

Table 4.34: Cobb-Douglas production function for maize on all farms

Particulars	Constant (a)	Human labour (X_1)	Farm Yard Manure (X_2)	Seed (X_3)
Regression coefficients	1.0087	0.0629	0.1194	0.0570
Standard error	0.8889	0.0982	0.0804	0.1110
t- value	1.1348	0.6405	1.4851	0.5135
R^2	0.0326			
$\overline{R}^2$	-0.0028			
F- value	0.9203			
Degrees of freedom	82			

4.2.7.2 Cobb-Douglas production function for rajmash on all farms

The results of Cobb-Douglas production function for Rajmash on all farms revealed that the regression coefficient in respect of human labour was significant. The regression coefficient of human labour revealed that 1 per cent increase in human labour, on an average, will increase the Rajmash yield by 0.2243 per cent, keeping FYM and seed constant at their geometric mean levels (Table 4.35). The calculated value of F was 3.6964. The value of R^2 was 0.1420 revealing that the included

Table 4.35: Cobb-Douglas production function for rajmash on all farms

Particulars	Constant (a)	Human labour (X_1)	Farm Yard Manure (X_2)	Seed (X_3)
Regression coefficients	1.0173	0.2243 **	-0.1179	0.0992
Standard error	1.1788	0.0849	0.0658	0.2114
t- value	*0.8630*	*2.6419*	*-1.7918*	*0.4693*
R^2	0.1420			
$\bar{R}^2$	0.1036 *			
F- value	3.6964			
Degrees of freedom	67			

** Significant at 1 % level and * Significant at 5 % level

independent variables explained 14.20 per cent of variation in Rajmash yield. The value of $\bar{R}^2$ was significant at 5 per cent level of significance.

4.2.7.4 Cobb-Douglas production function for potato on all farms

Study of Table 4.36 showed the results of Cobb-Douglas production function for potato on all farms. It was observed that regression coefficient of human labour, FYM and seed were non significant. The value of R^2 and F were 0.0229 and 0.6637, respectively.

Table 4.36: Cobb-Douglas production function for potato on all farms

Particulars	Constant (a)	Human labour (X_1)	Farm Yard Manure (X_2)	Seed (X_3)
Regression coefficients	4.0686	0.0405	0.0145	-0.0763
Standard error	0.4807	0.0549	0.0385	0.0650
t- value	8.4639	0.7377	0.3766	-1.1738
R^2	0.0229			
$\bar{R}^2$	-0.0116			
F- value	0.6637			
Degrees of freedom	85			

4.2.7.5 Cobb-Douglas production function for amaranthus on all farms

The results of Cobb- Douglas production function for amaranthus have been placed in Table 4.37. It was observed that regression coefficient of human labour, FYM

Table 4.37: Cobb-Douglas production function for amaranthus on all farms

Particulars	Constant (a)	Human labour (X_1)	Farm Yard Manure (X_2)	Seed (X_3)
Regression coefficients	1.0936	0.0795	-0.3846	0.5102
Standard error	0.7602	0.2244	0.2984	0.4145
t- value	1.4386	0.3543	-1.2889	1.2309
R^2	0.2179			
$\bar{R}^2$	0.1527 *			
F- value	3.3423			
Degrees of freedom	36			

* Significant at 5% level

and seed were non significant. The regression coefficient of FYM was negative showing that one per cent increase in FYM, on an average, will lower the yield of amarnathus by 0.3846 pert cent, keeping all other inputs constant at their geometric mean level.

4.2.7.3 Cobb-Douglas production function for buckwheat on all farms

The results of Cobb- Douglas production function for buckwheat on all farms have been presented in Table 4.38. The study of the table revealed that regression coefficient of human labour and FYM were significant. The Regression coefficient of human labour and FYM revealed that one per cent increase in human labour and FYM, on an average, will increase yield of buckwheat by 0.3503 and 0.1555 per cent, respectively, keeping all other inputs constant at their geometric mean levels. The calculated value of F was 5.7566 and was significant at five per cent level of significance. The value of coefficient of multiple determination was computed as 0.2025 revealing that the

Table 4.38: Cobb-Douglas production function for buckwheat on all farms

Particulars	Constant (a)	Human labour (X_1)	Farm Yard Manure (X_2)	Seed (X_3)
Regression coefficients	0.4848	0.3503 *	0.1555 *	-0.0672
Standard error	0.8270	0.1729	0.0590	0.0938
t- value	0.5862	2.0260	2.6356	-0.7164
R^2	0.2025			
$\bar{R}^2$	0.1673 *			
F- value	5.7566			
Degrees of freedom	68			

* Significant at 5% level

included independent variables explained 20.25 per cent variation in the yield of buckwheat.

4.2.7.6 Cobb-Douglas production function for wheat on all farms

On the study of Table 4.39 showed the results of Cobb-Douglas production function for wheat on all farms. It was observed that regression coefficient of FYM was significant and revealed that one per cent increase in it, on an average, will increase the yield of wheat by 0.1991 per cent, keeping all other inputs constant at their geometric mean levels. The calculated value of F was 8.5014 and was significant at 5 per cent level of significance. The coefficient of multiple determination was computed as 0.2152 revealing that the included independent variables explained 21.52 per cent of variation in yield of wheat. The value of $\overline{R}^2$ was 0.1899 and was significant at five per cent level.

Table 4.39: Cobb-Douglas production function for wheat on all farms

Particulars	Constant (a)	Human labour (X_1)	Farm Yard Manure (X_2)	Seed (X_3)
Regression coefficients	0.7093	0.0456	0.1991 **	0.0332
Standard error	0.4841	0.0802	0.0408	0.0531
t- value	1.4652	0.5686	4.8799	0.6252
R^2	0.2152			
$\overline{R}^2$	0.1899 *			
F- value	8.5014			
Degrees of freedom	93			

** Significant at 1% level

* Significant at 5% level

4.2.7.7 Cobb-Douglas production function for barley on all farms

The results of Cobb-Douglas production function for barley on all farms have been presented in Table 4.40. The study of the table revealed that human labour and seed had significant regression coefficients. The regression coefficient of seed revealed that one per cent increase in seed, on an average, will increase the yield of barley by 0.1683 per cent, keeping all other inputs constant at their geometric mean levels. The calculated value of F was 9.0245 significant at 5 per cent level of significance. The value of

Table 4.40: Cobb-Douglas production function for barley on all farms

Particulars	Constant (a)	Human labour (X_1)	Farm Yard Manure (X_2)	Seed (X_3)
Regression coefficients	-1.4616	0.2867 **	0.2281	0.1683 **
Standard error	0.7628	0.1014	0.1446	0.0595
t- value	-1.9161	2.8274	1.5775	2.8286
R^2	0.4160			
$\bar{R}^2$	0.3699 *			
F- value	9.0245			
Degrees of freedom	38			

** Significant at 1% level and * Significant at 5% level

coefficient of multiple determination was computed as 0.4160 revealing that the included independent variables explained 41.60 per cent of variation in barley yield.

4.2.8 Livestock inventory and production

Livestock rearing is the integral part of farming especially in areas where crop productivity is low. In these areas dependence of inhabitants on livestock production for livelihood is quite high. Also, livestock and crop production are complementary to each

other as the by-product of crop enterprises is used as fodder for livestock production. Whereas, the farm yard manure from livestock was an input for the crops.

4.2.8.1 Livestock inventory

The average number of ACU (animal cattle unit) on overall farms in the study area was 6.76 (Table 4.41). Majority of the farmers had a flock of sheep and goat accounting for 68.34, 72.83 and 66.62 per cent of total animal cattle unit (Plate 4.2).

Table 4.41: Livestock inventory on sample farms

(ACU/ farm)

Particulars	Marginal	Small	Medium	Overall
Local cow				
- In milk	0.77	0.61	0.86	0.74
-Dry	0.63	0.45	0.77	0.61
Sub total	1.40	1.06	1.63	1.35
Cross-bred cow				
-In milk	-	-	-	-
-Dry	-	-	-	-
Bullocks	0.23	0.26	0.32	0.26
Buffalo				
-In milk	-	-	-	-
-Dry	-	-	-	-
Sub total				
Young stock				
- Heifer	0.41	0.26	0.24	0.32
- Calves	0.10	0.08	0.38	0.15
Sub total	0.51	0.34	0.62	0.47
Sheep/goat	4.62	4.45	5.13	4.68
Mules	-	-	-	-
Poultry	-	-	-	-
Total ACU	6.76	6.11	7.70	6.76

ACU = Animal cattle unit

on marginal, small and medium farms, respectively. Among the milch animals, only local cows were present. However, none of the farmers had cross-bred cow. Since the use of bullock is completely banned for tillage purpose, they were less in number. However, medium category farmers possessed maximum number of livestock as it is the only other source of livelihood for them as they possess small land holding with lower productivity.



Plate 4.2: A farmer shearing wool by an indigenous method

4.2.8.2 Livestock production and input use

As mentioned earlier, livestock is integral component of farming and gains prime

Table 4.42: Livestock production and input use on marginal farms

(Per animal/ annum)

Particulars	Local cow in milk	Local cow dry	Heifer local	Calves	Bullocks	Sheep/ goat
Concentrate (q)	0.49	0.11	0.17	-	0.37	-
Green fodder (q)	30.17	23.82	14.88	13.38	29.72	5.49
Dry fodder (q)	14.30	12.28	6.39	5.48	15.83	0.95
Labour (mandays)	66.19	56.58	31.59	32.24	58.29	6.49
Production (q)						
M.P*	3.81	-	-	-	-	0.005
B.P.** (FYM)	33.52	29.33	17.41	16.43	32.44	3.72

* M.P. = Main product i.e. milk (cow), wool/ hair (sheep/ goat)
** B.P. = By- product

Table 4.43: Livestock production and input use on small farms

(Per animal/ annum)

Particulars	Local cow in milk	Local cow dry	Heifer local	Calves	Bullocks	Sheep/ goat
Concentrate (q)	0.51	0.15	0.21	-	0.35	-
Green fodder (q)	31.12	23.98	16.43	14.02	30.26	5.82
Dry fodder (q)	16.20	12.74	6.68	5.94	16.24	0.98
Labour (mandays)	67.46	57.43	32.33	33.17	58.84	6.84
Production (q)						
M.P.*	3.89	-	-	-	-	0.005
B.P.** (FYM)	32.84	30.15	18.10	16.13	33.46	3.83

* M.P. = Main product i.e. milk (cow), wool/ hair (sheep/ goat)
** B.P. = By- product

importance in areas where crop productivity was low or land was scattered. Like crop production, the production capacity of livestock production system can be enhanced

through proper feeding and scientific management. The livestock production and inputs use pattern for different animals in the study area has been presented in Table 4.42 – 4.45.

Table 4.44: Livestock production and input use on medium farms

(Per animal/ annum)

Particulars	Local cow in milk	Local cow dry	Heifer local	Calves	Bullocks	Sheep/ goat
Concentrate (q)	0.57	0.22	0.19	-	0.40	-
Green fodder (q)	34.72	25.49	17.84	14.86	31.76	6.12
Dry fodder (q)	17.45	13.69	7.56	6.77	16.89	1.05
Labour (mandays)	69.84	59.39	34.44	34.67	60.22	7.22
Production (q)						
M.P*	4.12	-	-	-	-	0.006
B.P.** (FYM)	34.47	31.45	19.43	17.15	33.18	4.13

* M.P. = Main product i.e. milk (cow), wool/ hair (sheep/ goat)
** B.P. = By- product

Table 4.45: Livestock production and input use on overall farms

(Per animal/ annum)

Particulars	Local cow in milk	Local cow dry	Heifer local	Calves	Bullocks	Sheep/ goat
Concentrate (q)	0.52	0.15	0.18	-	0.37	-
Green fodder (q)	31.56	24.32	15.74	14.29	30.44	5.74
Dry fodder (q)	15.58	12.78	6.65	6.26	16.26	0.98
Labour (mandays)	67.44	57.56	32.23	33.72	58.98	6.77
Production (q)						
M.P*	3.91	-	-	-	-	0.005
B.P.** (FYM)	33.59	30.11	17.90	16.78	32.95	3.85

* M.P. = Main product i.e. milk (cow), wool/ hair (sheep/ goat)
** B.P. = By- product

It was observed that the maximum concentrate, green fodder and labour use was for local milking cow followed by bullocks. The least fodder requirement was in case of sheep and

goat as they undergo seasonal migration to other warmer areas like Ghagas (Bilaspur) and Tattapani (Mandi) of Himachal Pradesh as there was scarcity of fodder during winter month because of heavy snowfall in Malana and the surrounding areas. Per animal per annum human labour requirement varied from 67.44 mandays for local cow in milk, 57.56 mandays for local dry cow, 32.23 mandays for heifer, 33.72 mandays for calves, 58.98 mandays for bullocks and 6.77 mandays for sheep and goat as these animals were reared and grazed in herds

The productivity of milch animal was 3.91 q/ annum for local cow in milk and productivity of wool was estimated at 500 g/ sheep/ goat per annum. Low productivity of milk was there as improved facilities for animals and their improved breeds were not available.

It was found that inputs use pattern and productivity of animals did not vary much on marginal, small and medium farms as similar type of livestock and management practices were patronized by the framers irrespective of farm size in the study area.

4.3 Changes in farm enterprises

4.3.1Change in cropping pattern

Study of change in cropping pattern of different crops helped in knowing the changing scenario of the cropping pattern in the village over time. It can be visualized from the Table 4.46 that during 1980-81 there were only four traditional food crops grown by inhabitants. The highest area of 0.444 ha per farm was under millets while the lowest (0.013 ha/ farm) was under maize crop. The area of these crops declined in 1990-91 by about 54 per cent in maize and 27 per cent in millets. In wheat and barley the decline was around 21 and 15 per cent. The decrease in area was due to the introduction of new crops namely pulses, potato, kuth and mustard. Viewing the change in cropping pattern over the next decade i.e. 2002-03 over 1990-91 it was observed that there was an

increase in area under maize, potato and pulses by about 350,194 and 74 per cent respectively. The area under millets, wheat and barley decreased by 67, 42 and 36 per cent, respectively

Table 4.46: Change in cropping pattern

(ha/farm)

Crops	1980-81*	1990-91*	Per cent change	2002-03	Per cent change
Kharif crops					
Maize	0.013	0.006	-53.85	0.027	350.00
Millets	0.444	0.323	-27.25	0.105	-67.49
Pulses	-	0.019	-	0.033	73.68
Potato	-	0.018	-	0.053	194.44
Kuth	-	0.003	-	-	-
Rabi crops					
Wheat	0.392	0.311	-20.66	0.180	-42.12
Barley	0.052	0.044	-15.38	0.028	-36.36
Mustard	-	0.008	-	-	-

* Source: Survey report by Singh and Sikka (1992)

while kuth and mustard completely vanished from the scene. Viewing the individual area, highest (0.180 ha / form) was under wheat followed by millets (0.105 ha / farm) during 2002-2003.

4.3.2 Change in productivity of field crops

The data in Table 4.47 revealed that productivity of maize, buckwheat amaranthus, wheat and barley showed an increase in 1990-91 over 1980-81 by about 306,153,66,155 and 172 per cent, respectively. Potato, rajmash, mustard, kuth and other vegetable were not cultivated during 1980-81. However, during 1990-91 they came into the scene with highest productivity of potato (60.83 q/ ha) and the lowest productivity in mustard (2.10 q/ha).

During the second decade, except potato all the other crops showed an increase in productivity. The highest increase was in rajmash (59.62 per cent) followed by buckwheat

Table 4.47: Change in productivity of field crops

(q/ha)

Crops	1980-81*	1990-91*	Per cent change	2002-03	Per cent change
Maize	2.37	9.62	305.91	10.70	11.23
Buckwheat	3.07	7.76	152.77	10.84	39.69
Amaranthus	3.07	5.10	66.12	5.78	13.33
Potato	-	60.83	-	56.33	-7.40
Rajmash	-	4.73	-	7.55	59.62
Wheat	2.57	6.56	155.25	8.20	25.00
Barley	2.37	6.44	171.73	6.65	3.26
Mustard	-	2.10	-	-	-
Kuth	-	11.50	-	-	-
Other vegetables	-	20.00	-	-	-

* Source: Survey report by Singh and Sikka (1992)

(39.69 per cent). Productivity of potato decreased from 60.83 q / ha in 1990-91 to 56.33 q/ha in 2002-2003.

4.3.3 Dynamics of livestock population

During first decade (1980-1991) a tremendous growth in livestock wealth was observed (Table 4.48). Sheep and goats accounted for major component of livestock. Except bullocks, all the other animals showed a increasing trend. Cows per farm increased by about 42 per cent while sheep and goats increased by about 59 per cent. Bullocks' number per farm decreased from 0.20 in 1980-81 to 0.13 in 1990-91 while poultry decreased from 0.02 number in 1`980-81 to nil in 1990-91. Young livestock and horse / mules/ ponies were the new animals that were observed in the village during 1990-91.

During second decade (1990-91 to 2002-03) there was a slight increase in number of sheep/ goats (1.40 per cent). However, the increase in bullocks per farm

Table 4.48: Change in livestock composition/wealth

(Number/farm)

Animal class	1980-81*	1990-91*	Per cent change	2002-03	Percent change
Bullocks	0.20	0.13	-35.00	0.26	100
Cows	1.33	1.89	42.11	1.35	-28.57
Young livestock	-	0.85	-	0.63	-25.88
Sheep/goat	19.30	30.77	59.43	31.20	1.40
Horse/mules/ponies	-	0.08	-	-	-
Poultry	0.02	-	-	-	-

* Source: Survey report by Singh and Sikka (1992)

was 100 per cent, as the number of bullocks per farm increased from 0.13 in 1990-91 to 0.26 in 2002-2003. Cows and young livestock showed a decrease of around 29 and 26 per cent during this decade.

4.4 Problems and constraints of the study area

Table 4.49 highlighted the problems of marginal, small, medium and overall farms in study area. The production problems were non-availability of HYV seeds, chemical fertilizers, human labour shortage in peak season, input supply center was far away and non-availability of plant protection materials. All the farmers expressed these problems as major ones.

However, it was interesting to note that due to religious reasons the use of bullocks for ploughing the fields was completely restricted and they dig the fields with kudaal (spade like local tool). Financial problems were prevalent on all the farms which included lack of own finance to purchase inputs, high cost of inputs and lack of credit facilities to the farmers.

Table 4.49: Problems and constraints on sample farms

	Problems and Constraints	Marginal	Small	Medium
A. Production Problems				
1	Non-availability of HYV seeds	100	100	100
2	Non-availability of chemical fertilizers	100	100	100
3	Human labour shortage in peak season	12	24.5	33.33
4	Storage problem	58.33	51.61	50.00
5	Non-availability of plant protection material	100	100	100
B. Financial				
1	Lack of finance to purchase inputs	100	100	100
2	High cost of inputs	100	100	100
3	Lack of credit facilities	100	100	100
C. Marketing				
1	Lack of link road in the producing area	100	100	100
2	Non-remunerative prices	-	-	-
3	Delayed payment by traders	-	-	-
4	Uncertainty of prices	-	-	-
5	Lack of well established market in the area	100	100	100
D. Institutional				
1.	Lack of technical know-how	100	100	100
2.	Non existence of extension activities/ agencies	100	100	100
3.	Lack of irrigation schemes	100	100	100
E. Miscellaneous Problems				
1	Sloppy land	100	100	100
2	Land erosion	100	100	100
3	Uneconomical land holdings	100	70.97	9.09
4	Holdings are fragmented/scattered	100	100	100
5	Weather uncertainties	100	100	100
6	Irrigation not available	100	100	100
7	Scarcity of fodder	100	100	100
8	Farming is not profitable	100	100	100
9	Uncertainty in yield of crops	70.83	67.74	81.82
10	Birds/wild animals menace	70.83	70.97	79.52

Major marketing problems expressed by the farmers were lack of link road in the producing area and lack of market in the area. However, it was revealed that since total produce in the field was very low and no surplus were available so farmers did not respond to other market problems.

In the area there were only a few institutions to help the farmers. Moreover, institutional help regarding agricultural practices was not available. Therefore, the extent

of the problem pertaining to farming was very high. All the farmers reported the problem of lack of technical know-how.

Other miscellaneous problems faced by the farmers of Malana were due to tough terrain, undulating topography and inclement weather conditions. Numbers of other problems were also prevalent in the study area which included sloppy land, small and fragmented/scattered holdings, non-availability of irrigation facilities, scarcity of fodder and farming as non-remunerative vocation. All the farmers expressed these problems. However, next major problems were observed as uncertainty in yield of crops and birds/wild animals menace. The extent of these problems increased with increase in land holdings as management of land holdings became difficult with the increase in size.

DISCUSSION

DISCUSSION

The present study entitled "Changing scenario of agriculture in mountains: a case study of Malana village of Himachal Pradesh" was aimed at studying the changing scenario of agriculture over a decade in the mountainous village, Malana, popularly *known as Malana Democratic Republic. It is pertinent to mention that farming systems in* the hill regions are not entirely guided by economic rationale but also by the social profile, resource endowment and domestic compulsions. The results emanated in consonance with the objectives have been discussed in light of documented scientific literature in this chapter under the following broad heads:

5.1 Socio- economic profile

5.2 Existing cropping pattern, livestock, productivity and economic analysis

5.3 Changes in farm enterprise

5.4 Problems and constraints of the study area

5.1 Socio-economic profile

5.1.1 Demographic features of the study area

The demographic parameters of the farming community have significant bearing on cropping pattern and production systems of the study area. Geographically, the study area is located on the North Eastern side of Kullu district of Himachal Pradesh, at an elevation of 2650 m above mean sea level. The total geographical area is around 179 ha that accounts for 0.04 per cent of the total geographical area of Kullu district. The population of Malana village was 1355, while the livestock population in the village was 6050 and it played a crucial role in providing livelihood to the inhabitants.

As far as location is concerned the village is at a distance of 40 km from district headquarter of Kullu in Himachal Pradesh. It is located in such a unique situation that it is not visible from other places. Moreover, the village has no access by road and is approachable only by a tough trekable terrain. There are only four trek routes to the village. These routes are very narrow with steep gradient and it takes about 7 to 18 hrs for a stranger to reach the village. The easiest trek route is Jari–Malana along Malana nalah. Singh and Sikka in 1992 also reported the same.

Basic facilities like motorable road, bank, high school, local market, hospital etc. were missing in the village.

5.1.2 Age wise distribution

Age wise distribution played an important role in taking up farm enterprises as farming is a labour intensive vocation. About 46.25 per cent of the total population was below 15 years and the lowest was in the age group of above 60 years. Similar results were reported by Chand (1983) in his study on Bhotia village in Kumaun. The highest percentage (51.06 per cent) of working population in the age group of 15–60 years was in medium farm category.

5.1.3 Family size and structure

The average family size was found to be 5.90. The present study showed that most of the families (60.40 per cent) in the study area were nuclear. This was attributed to the tendency of the married couple to lead an independent life. However, this tendency may not be compatible with development of the agriculture as it was resulting into fragmentation and subdivision of holding into marginal farms. Similar results were reported by Chand (1983) and Sharma *et al.* (1999) confirming the regressive fragmentation and subdivision of holding caused by inheritance laws and tenancy reforms leading to marginalization of the holding in Himachal Pradesh.

5.1.4 Caste structure

The ethnic structure of the study area clearly depicted the predominance of *Rajput* community, all the small and medium farmers belong to this community. Singh and Sikka (1992) found the dominance of *Rajput* community in the same village during 1990. Moreover, only four families (3.96 per cent) belonging to scheduled caste category were present in the village.

5.1.5 Educational Status

The level of education played an important role in decision making and managerial skill. The gender bias was clearly visible as the literacy rate of male was 65.63 per cent while for female it was just half (33.33 per cent) Singh and Bhati (1996) and Sarswat *et al.* (1995) also reported that literacy percentage of males was higher than females particularly in hills. Interestingly, the highest education received by a person was only senior secondary.

5.1.6 Occupational pattern

The occupational pattern showed that agriculture was the main occupation in the village (86.14 per cent of the total households). Chand in 1983 in his study on Bhotia villages in Kumaun also reported that agriculture dominated the occupational structure. The other occupations in Malana village were shopkeeper, carpentry, sawmill, water flour mill (*gharat*), guest house etc.

5.1.7 Farm machinery and implements

The efficiency of farming and extent of mechanization of farming is determined by farm tools, implements and machinery. It was also observed that no major farm machinery was used in the study area, showing low level of mechanization in agriculture in the study area. This might be due to tough terrain, poor economic conditions of farmers and lack of transportation facilities. Thakur and Sharma (1984) also pointed out low level

of mechanization of agriculture due to lack of innovation in the developing of hill specific small tools and machinery. The maximum investment was made by the villagers on foodgrain storage bins.

5.2 Existing cropping pattern, livestock, productivity and economic analysis

5.2.1 Cropping pattern

Cropping Pattern of the study area showed that the most predominant crops grown by the farmers were Buckwheat in the *Kharif* and wheat in the *Rabi,* which accounted for about 14 and 42 per cent of the total cropped area, respectively. Guleria, (1994) also revealed predominance of wheat in different districts of Himachal Pradesh. The other important crops grown were maize, rajmash, barley, potato and amaranthus. The entire farming was rainfed due to lack of irrigation facilities. The type of crops that were being grown in the area showed that farming in the area was mainly of subsistence nature. Similar findings were supported by Thakur *et al.* (1996) and Ranjan and Singh (1998), revealing that farmer in the resource poor region gave more importance to their food security. The cropping intensity was worked out to be low as for most part of the year; the land remained covered with snow and thus restricted the villagers to take more than one crop in the same piece of land.

5.2.2 Input-use pattern

Input use Pattern is an important indicator to know the extent of adoption of new technology. It was found that the farmers were using higher seed rate for all the crops except potato, than the recommended level. This may be to avoid risk of poor germination of seeds as all the crops were sown by broadcasting method. In case of maize, the seed rate was very high as crop was also grown for fodder purpose. However, very low seed rate of potato was being used by the farmers as they were found to use very small sized

potato tubers as seed. Only local variety seeds were used and no hybrids were grown. No fertilizers and pesticides were applied to any of the crops. This may be due to lack of awareness and non-availability of these inputs. Farm Yard Manure (FYM) was applied in different crops before sowing and farmers were aware of this input in the crop production. Moreover, FYM was easily available as farmers possessed large number of animals. Interestingly, due to religious reasons the use of bullock labour was completely banned in the village and work was performed by human labour only.

5.2.3 Crop yields

It was observed that among food crops the yield of potato was higher than cereals. However, productivity of the crops was much lower than the potential yields. This may be due to the reason that farmers were using local seed without the use of fertilizers and pesticides. The average yield was relatively higher on small farms than medium and marginal farms because of better use of material inputs and more availability of labour in their category of farm leading to an overall better management.

5.2.4 Livestock production

Livestock rearing was an integral part of farming in this area. It was observed that farmers were rearing large flock of sheep and goat (4.68 ACU per farm). Rath (1992) also reported that sheep and goat constituted maximum share in livestock especially in poor regions of India. Of all the farm categories, medium category of farmers possessed maximum number of livestock this may be because of the fact that farmers had small land holdings and only other source of livelihood for them was livestock.

As far as input use in livestock production was concerned it was observed that maximum concentrate, green fodder and labour use was for local cow yielding milk. The least was in case of sheep and goat as they undergo seasonal migration to other warmer and plain areas like Ghaghas (Bilaspur) and Tattapani (Mandi) of Himachal Pradesh. The

migration occurred due to scarcity of fodder during winter months because of heavy snowfall in Malana and its surrounding areas. Per animal per annum human labour requirement ranged from 6.78 mandays for sheep and goats to 67.44 mandays for local cow in-milk. Production of milch animals was 3.91 q per annum for local cow in-milk and wool production was 500 grams per sheep / goat. Low productivity mainly owes their reason to lack of improved breeds and improved rearing practices for animals in the study area.

5.2.5 Comparison of existing and potential yields on all farms

The knowledge of potential yield of a crop is an important indicator for the extent of yield, which could be obtained from a given crop if recommended package of practices is adopted. It was observed that there was high gap in rajmash, buckwheat, wheat, barley and amaranthus but the yield gap in maize and potato was comparatively low. Singh *et al.* (1998) also studied yield gap in wheat and attributed the gap to various factors like very small size of land holdings, inadequate agricultural production infrastructure, inefficient agricultural development and extension network. In addition to this, typical socio-cultural traditions and strong religious beliefs constrainted the tribal community in adopting modern farm production technology. Similar factors were found for high yield gaps in various crops in Malana village.

5.2.6 Economic viability of crops in the study area

5.2.6.1 Per hectare gross returns and share of inputs in variable cost

Computation of economics of different crops in the study area showed that the maximum gross returns among all crops on overall farm situation were observed in buckwheat followed by potato, rajmash, amaranthus, maize, wheat and barley.

Maximum contribution in overall cost was of family labour in all the crops. On individual farms too family labour had maximum share in total variable cost for all the

crops. Second highest share was of seed in rajmash, buckwheat and potato. In maize, wheat, barley and amaranthus the second highest share was of FYM. Thus, it was observed that family labour followed by seed and FYM were the major inputs having significant share in total variable cost. Sharma *et al.* (2001) also reported that high amount of human labour was used by small farmers in different crops.

5.2.6.2 Cost C_2 and net returns over cost C_2 on all farms

Maximum cost C_2 among all the crops in overall farm category was observed in rajmash followed by potato, maize, buckwheat, wheat and amaranthus and similar trend was obtained in cost C_2 for other farm categories i.e. marginal, small and medium categories. The net returns over cost C_2 among all the crops on overall farm category were observed in buckwheat being Rs. 4,386. The minimum net returns over cost C_2 were observed in maize.

5.3 Changes in farm enterprise

5.3.1 Change in cropping pattern

Study of the changes in cropping pattern revealed that people of Malana shifted from just four traditional crops in 1981-91 to crops like potato, kuth and mustard during 1990-91 and area under the traditional crops decreased. Raman and Sharda in 1996 have also reported diversification of agriculture with cultivation of vegetables.

During 2002-03 there was a drastic increase in maize followed by potato over 1990-91. While in all the other crops like millets, wheat and barley there was a decrease. This may be because maize was giving comparatively more yields but wheat yields in the area were quite low.

5.3.2 Change in productivity of field crops

It was observed that productivity of maize, buckwheat, amaranthus, wheat and barley increased in 1990-91 over 1980-81 mainly because area under these crops

increased. Naik and Bahura in 1997 also reported an increase in production of food grains during 1980-81 to 1990-91. During second decade, similar trend followed in productivity of crops.

5.3.3 *Change in livestock population*

Livestock population increased in the first decade of all the animals except bullock which showed a decrease. This may be due to the reason that on religious grounds bullock were not used in the fields so the villagers did not find any usefulness of keeping these bullocks on their farms. Horses/ mules/ ponies were the new animals that were observed in the village during this decade. As there was no link road and other mode of transportation, horses/ mules and ponies came to the rescue of the villagers to move to other areas through the rough trek routes. It was also more comfortable to transport materials through these animals. However, poultry vanished due to harsh climatic conditions. During second decade, bullocks and sheep/goat population showed increase whereas, cows and young livestock decreased.

5.4 Problems and constraints of the study area

The main problems and constraints faced by the villagers of Malana on the input supply front were non-availability of improved seed, fertilizers, fungicides, insecticides and weedicides. These problems mainly aroused due to lack of linking road to the village, its remoteness and harsh climatic conditions. Ghosh (2002) also studied the problems confronting mountain areas and reported that these problems arose largely from a combination of unique feature of their environment.

Similar problems related to inputs in agriculture were also reported by Thakur *et al.* (1994) from the farmers of Saproon valley of district Solan in Himachal Pradesh.

On the financial front major problems faced by the villagers were lack of own finance to purchase inputs, high cost of inputs and lack of credit facilities. Agriculture

was of subsistence nature and the lack of other source of earning resulted in very low income of farmers.

Major marketing problems expressed by the farmers were lack of link road and lack of market in the area but as the agriculture produce was low, marketing problems were not very high. However, basic amenities were not available to the farmers due to lack of local market and they had to carry the material from far-off areas either on mules or ponies or on their own backs. Similar problems related to marketing were reported by Maibangsa (1998) and Lal *et al.* (1996) on their study in Meghalaya and Himachal Pradesh, respectively.

However, in the study area institutional problems were quite high. There were few institutions in the village while the institutions rendering agricultural technical know-how are not at all available. Thakur *et al.* (1994) found that similar problems were prevalent in Saproon Valley of Solan district in Himachal Pradesh.

SUMMARY

Chapter- VI

SUMMARY

6.1 Introduction

Malana is a small village situated in the North-East of Kullu district of Himachal Pradesh popularly known as Malana valley. Malana village is regarded as an oldest democracy which is often called as Malana Democratic Republic. The village has its own lifestyle, social status and a unique system of self governance (Singh and Sikka, 1992). The village accounts for 0.04 per cent of the total geographical area of Kullu district and 0.36 per cent of the total population of Kullu district. The village is located at an elevation of 2650m above mean sea level. In this village, agriculture sector assumes special significant as it is the mainstay of almost entire working population dwelling the hinter land due to lack of non farm avenues of employment. Moreover, agriculture in this part of the state is entirely different due to several factors like small and fragmented land holdings, lack of infra-structural facilities, low literacy rate, aloofness from the mainstream, unavailability of improved technology etc.

Thus, in the backward regions of Himachal Pradesh like Malana, traditional agriculture seems to be in equilibrium, though at a very low productivity level, which would require more strenuous efforts, in–depth analysis and comprehension to break this low productivity equilibrium trap in agriculture.

6.2 Objectives

The present investigation was carried out with the following specific objectives

1) to study the existing socio-economic characteristics of the households
2) to analyze the extent of change in production, productivity and resource use pattern in different farm enterprises

3) to study the problems and constraints of the village and suggest suitable strategy for boosting agricultural production.

6.3 Methodology

Malana village in Kullu district was selected purposely for this study. The study was based on both primary and secondary data. Primary data were collected on a pre tested, well designed schedule from the farmers in Malana village using survey method by personally visiting the area. However, secondary data were collected from Patwar circle, Ziya (Kullu), office of the Block Development Officer (BDO), Naggar, survey report (Malana: an oldest democracy sustainability issues In village economy- Himachal Pradesh). Out of the total households, 101 households were randomly selected for the present investigation.

The farmers were classified in three categories using cube root cumulative frequency method. The marginal farmers (less than 0.40 ha) were 48, small (0.40-0.96 ha) 31 and medium (> 0.96 ha) were 22 in number. The data were tabulated and analyzed using simple mathematical and statistical tools.

6.4 Main Findings

The main findings emerged out from present investigation are summarised here under:

- The village was not linked to any type of road and lacked basic infrastructural facilities like bank, high school, local market and hospital.
- About 46.25 per cent of total population was below 15 years of age and most of the families were nuclear with average family size of 5.90. *Rajput* community dominated the village.
- Educational status of village was poor with literacy rate of 65.63 per cent for male and 33.33 per cent for female. The highest education received by a person in the

village was only senior secondary. There was no graduate and diploma holder in the village.

- Agriculture was the main occupation and about 86.14 per cent households were dependent on it. However, agriculture was of subsistence nature and the only inputs used by the farmers were human labour, seed and farm yard manure.
- Buckwheat in *Kharif* and wheat in *Rabi* were the most predominant crops grown in the village. Other crops were maize, rajmash, potato, barley and amaranthus. The entire faming was rainfed and the yields were quite low.
- Livestock rearing was the integral part of farming. Sheep and goat accounted for highest share (4.68 ACU per farm). But only local breeds of animals were being kept in the village.
- Highest gross returns were obtained from buckwheat followed by potato, rajmash, amaranthus, maize, wheat and barley and maximum share in variable cost was of family labour in all the crops. Cost C_2 was maximum in rajmash (Rs. 26,367/ ha), whereas net returns over cost C_2 were highest in buckwheat (Rs. 4,386 /ha) and it was the only crop with positive returns over cost C_2.
- Area under traditional crops decreased while other crops like potato, rajmash etc. came into the scene. There was an increase in productivity of crops. Viewing the livestock population horses/ponies/ mules were the new animals that were observed in the village.
- The technological gap in yield was more than 40 per cent.
- The regression analysis with Cobb-Douglas production function revealed that both human labour and FYM were significant in buckwheat, human labour alone was significant in rajmash and barley, FYM alone was significant in wheat and seed alone was significant in barley.

- There were a number of problems faced by the villagers which mainly related to productional, institutional, financial and marketing.

6.5 Policy Options

- Emphasis should be laid on education, infrastructure and agricultural development
- The state should increase its research efforts to evolve and suggest suitable technology for the prevailing climatic conditions in the area.
- The possibility for new enterprises like improved cattle and horticultural crops must be explored.

LITERATURE CITED

LITERATURE CITED

Anonymous. 2002. Patwar circle, Ziya, District Kullu, Himachal Pradesh.

Ashthana, A.N. 1981. Agriculture in the North-Eastern Hills region. Agricultural Situation in India 35(10): 831.

Bangroo, Virendra and Stronski, Krzysztof. 2004. Malana: A lost Utopia in the Himalayas. http://www.ignca.nic.in/ex_0055.html.

Bhalla, G.S. and Singh, Gurmail. 1997. Recent developments in Indian Agriculture: A state level analysis. Economic and Political Weekly 34(13): A(2-18).

Chand, K.P., Sharma, M.L. and Singh, Ranveer. 1986. Diversification of Agriculture in Himachal Pradesh. Agricultural Situation in India 41(6): 451-454.

Chauhan, Ramesh. 1998. Himachal Pradesh – A Perspective. Menerava Book House 46, The Mall, Shimla: 424

Chauhan, S.K. and Mehta, P. 2002. Problems and constraints in vegetable marketing: A case study of Himachal Pradesh. The Bihar Journal of Agricultural Marketing 10(1): 25-30.

Dalenius, T. and Hodges, J.C. 1950. The problems of optimum stratification. Journal of American Statistical Association: 88-101

Das Hem Chandra Lal. 1997. Performance of agriculture and regional variations in Eastern India (1976-77 to 1995-96). Indian Journal of Agricultural Economics 52(3): 425-426.

Dhongade, M.P. and Dangat, S.B. 1985. Bench-mark survey of Sina medium Irrigated Project command area in Maharashtra. Department of Agricultural University Rahuri, Maharashtra: 10.

Gangwar, L.S. and Sen, C. 1997. The comparative analysis of technology adoption and its impact on cropping pattern and productivity. Nainital Vs. Uttar Pradesh. Agricultural Situation in India 54(8): 501-504.

Gauraha, A.K. 1996. Crop diversification over decade: A village case study. Indian Journal of Agricultural Economics 51(4): 696-697.

Ghosh, N. 2002. Sustainable mountain development. Yojana 46: 48-52.

Gill, Harbans Singh and Thakur, Mahabir Chand. 1984. Growth and instability in Himalayan Agriculture: 1954-55 to 1980-81- A case study of Jammu and Kashmir & Himachal Pradesh. Himalayan Research & Development 2(II): 35-40.

Guleria, R.S. 1994. Constraint analysis for increasing foodgrain production in Himachal Pradesh. Ph.D. thesis (unpublished). Department of Agricultural Economics, Himachal Pradesh Krishi Vishvavidyalaya, Palampur.

Janalah, A., Bose, Manik, L. and Agarwal, A.G. 2000. Poverty and income distribution in rainfed and irrigated ecosystems: village studies in Chhattisgarh. Economic and Political Weekly 35(52): 4664-4669.

Jodha, N.S. 1986. Research and technology for dry farming in India- Some issue for the further strategy. Indian Journal of Agricultural Economics 41(3): 234-237.

Johl, S.S. 1984. Some determinants of agricultural growth and development in India. Indian Journal of Agricultural Economics 29(1): 1-19.

Kumar, Vinod. 2001. Optimising farm production systems in hills – a study of Chuhar Valley in Mandi District of Himachal Pradesh. M.Sc. thesis (unpublished). Department of Agricultural Economics, CSKHPKV, Palampur.

Lal, Harbans, Saini, A.S. and Thakur, D.S. 1996. Marketing food grains in Himachal Pradesh. Indian Journal of Agricultural Marketing 10(3): 63-70.

Lal, Harbans, Sharma, K.D. and Thakur, D.S. 2000. Vegetable marketing in Himachal Pradesh: Constraints and opportunities. The Bihar Journal of Agricultural Marketing 8(4): 406-415.

Maibangsa, M. 1998. Growth of hill agriculture in Meghalaya. The Bihar Journal of Agricultural Marketing 6(1): 31-38.

Mamoria, C. B. 1978. Commercial and Economic Geography of India. Published and enlarged in 2001. Shivalik Agarwalla and Company, Agra- 3: 1-8

Mehta, Prakash, Vashisht, G.D. and Mahajan, N.C. 1982. Agricultural Development in Himachal Pradesh. Himalayan Research and Development 1(11): 121-130.

Moorti, T.V. and Sharma, K.D. 1991. Farming in irrigated areas of Himachal Pradesh. IASSI Quarterly 9(3): 152-163.

Nadkarni, M.V. and Vedini, K.H. 1996. Accelerating commercialization of Agriculture: Dynamic agriculture and stagnating Peasants. Economic and Political Weekly 31(26): A(63-73).

Naik, Dibakar and Behura, Deldutt. 1997. An economic analysis of regional variation in agricultural development with special reference to eastern region. Indian Journal of Agricultural Economics 52(3): 429-430.

Otsuka, Keijiro. 2002. Poverty Reduction Issues: Village economy perspective. Asian Development Review 19(1): 98-116.

Partap, Tej. 2003. Himachal farmers' livelihood concerns and opportunities in agriculture- The University must respond. Concept Booklet, CSK HPKV, Palampur: 31.

Pope, R.D. and Richard Prescott. 1980. Diversification in relation to farm and other socio-economic characteristics. American Journal of Agricultural Economics 62(3): 554-559.

Raman, T. and Sharda, N.K. 1996. Diversification of Agriculture in Himachal Pradesh. Indian Journal of Agricultural Economics 51(4): 705-706.

Ranjan, K.P. and Singh, R.K.P. 1998. Cropping pattern in backward agriculture- A case of North Bihar. Agriculture Situation in India 54(2): 69-72.

Rath, N. 1992. Economics of sheep and goat in Maharashtra. Indian Journal of Agricultural Economics 47(1): 62-78.

Reddy, Subba S., Raghu Ram, P., Neelakanta Sastry, T. V. and Bhavani Devi, I. 2004. Agricultural Economics. Oxford and IBH Publishing Corporation Private Limited, New Delhi: 346-347

Roy, Aditi Deb. 2002. A social profile of the Garo hills district. Man in India 82(1&2): 165-176.

Saini, A.S., Sharma, K.D. and Lal, Harbans. 1999. Hi-tech agriculture in Himachal Pradesh. Scope, Potential and Strategies. The Bihar Journal of Agricultural Marketing 7(2): 118-126.

Saini, A.S., Sharma, K.D. and Moorti, T.V. 1995. Impact of consolidation on technology adoption and inequalities in Himachal Pradesh. The Bihar Journal of Agricultural Marketing 3(3): 242-248.

Samra, J.S., Dhyani, B.L. and Sharma, A.R. 1999. Problems and prospects of natural resource management in Indian Himalayas – A base paper. Hill and Mountain Agro Ecosystem. Directorate, Dehradun- National Agricultural Technology Project (NATP): 146.

Saraswat, S.P. 1996. Diversification in cropping pattern and farming system in Himachal Pradesh: A case study of Kot village. Indian Journal of Agricultural Economics 51(4): 704-705.

Saraswat, S.P., Singh, Ranvir and Dahiya, Prem Singh. 1995. Structural changes in farm and non-farm employment in Himachal Pradesh: A Case Study of Kot Village. Indian Journal of Agricultural Economics 50(3): 430-436.

Satyasai, K.J.S. and Viswanathan, K.U. 1996. Commercialisation and diversification of Indian Agriculture. Economic and Political Weekly 31(45 & 46): 3027-3028.

Shah, Amita. 1997. Food security and access to natural resources: A review of recent trends. Economic and Political Weekly 32(26): A (46-54).

Shah, S.L. 1979. Farming system in hill areas. Indian Journal of Agricultural Economics 34(1): 19-20.

Sharda, N.K. and Raman, T. 1997. Implications of changing agrarian structure in Himachal Pradesh. Agricultural Situation in India 53(12): 823-827.

Sharma, H.R., Jog Raj and Kumar, Virender. 2001. New agricultural technology and farm size productivity relationship: A village level analysis. Asian Economic Review 43(2): 210-222.

Sharma, K.D. 1989. Farming system in Himachal Pradesh. Ph.D. thesis (unpublished). Department of Agricultural Economics, Himachal Pradesh Krishi Vishvavidyalaya, Palampur.

Sharma, K.D., Thakur, D.C. and Saini, A.S. 1999. Poverty in hills: Causes and cures, ICSSR Seminar on poverty and income distribution in North-Western states of India. Organized by Department of Agricultural Economics, Himachal Pradesh Krishi Vishvavidyalaya, Palampur, May 28-29, 1999.

Sharma, R.K., Brij Bala and Sharma, H.R. 1997. Regional Disparities in agricultural development : A study of mountainous states. Indian Journal of Agricultural Economics 52(3): 394-405.

Sharma, R.K., Sharma, H.R. and Brij Bala. 1996. Crop diversification and food security: An exploratory state wise analysis. Indian Journal of Agricultural Economics 51(4): 689-690.

Singh, D.V. and Bhati, J.P. 1996. Pattern of energy consumption in farming household of Himachal Pradesh. Agricultural Situation in India 53(7): 629-634.

Singh, D.V. and Sikka, B.K. 1992. Malana-An oldest democracy sustainability issues in village economy (Himachal Pradesh). Agro-Economic Research Centre. H.P. University, Shimla, India.

Singh, Dalbir. 1989. Common property resources and livestock farming in Chila village of Himachal Pradesh. In Livestock Economy of India. India society of Agricultural Economics. Oxford & IBH Co. Pvt. Ltd., New Delhi: 113-123.

Singh, Sahdev, Tripathi, R.S., Singh, V.B. and Singh, S. 1998. Technological gap in adoption of recommended wheat production practices in Jaunsar-Bhawar tribal farming system of Uttar Pradesh. Annals of Agricultural Research 19(1): 39-43.

Sood, A.K. 1990. Economic analysis in Sirmaur district of Himachal Pradesh. M.Sc. thesis (unpublished). Department of Agricultural Economics, Himachal Pradesh Krishi Vishvavidyalaya, Palampur.

Thakur, D.S. 1982. Management of problematic farm lands for higher production, profit and employment avenues. Financing Agriculture 149(1): 24-28.

Thakur, D.S. 2000. Constraints in doubling foodgrain production in Hills (Himachal Pradesh). The Bihar Journal of Agricultural Marketing 8(1): 69-81.

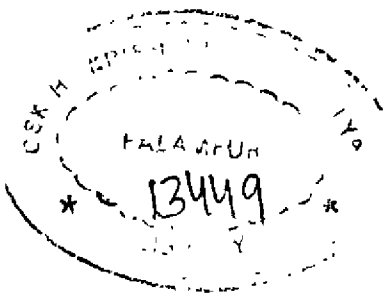
Thakur, D.S. and Sharma, K.D. 1984. Weaklings of agriculture in Himachal Pradesh- An introspection. Himachal Journal of Agricultural Research 10(2): 1-11.

Thakur, D.S., Sanjay, Thakur, D.R. and Sharma, K.D. 1994. Economics of off season vegetable production and marketing in Hills. Indian Journal of Agricultural Marketing 8(1): 72-81.

Thakur, D.S., Sharma, K.D. and Saini, A.S. 1996. Potential constraints of hill agriculture with pertinent solutions. In: S.L. Shah ed. Agricultural development in hilly areas. Indian Society of Agricultural Economics.

Topal, Yesh Pal, S. and Samal, Prasanna, K. 2001. Causes for variation in social and economic conditions among tribes of Indian Central Himalaya: A comparative study. Man in India 81(1&2): 87-102.

Tulachan, P.M. 2001. Mountain agriculture in the HinduKush-Himalaya: a regional comparative analysis. Mountain Research and Development 21(3): 260-267.



APPENDIX

APPENDIX-I

Prices of seeds and output of different commodities in Malana

Particulars	Input (Seed) (Rs./kg)	Output (Rs./q)	
		Main Product	By-product
Maize	5	500	200
Rajmash	20	2000	-
Potato	4	400	-
Amaranthus	18	1800	-
Buckwheat	25	2500	-
Wheat	6	600	200
Barley	7	700	150