Assessment of livelihood status of farmers of Himachal Pradesh trained by CSKHPKV, Palampur

THESIS

By

NEHA DHADWAL

(A-2018-30-008)

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

(DEPARTMENT OF AGRICULTURAL ECONOMICS, EXTENSION EDUCATION & RURAL SOCIOLOGY)

(AGRICULTURAL ECONOMICS)

2020

Dr. Rajesh Kumar Thakur
Principal Scientist
(Agricultural Economics)

Department of Agricultural Economics,
Extension Education & Rural Sociology,
College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya Palampur - 176 062 (H.P.) India

CERTIFICATE – I

This is to certify that the thesis entitled **"Assessment of livelihood status of farmers of Himachal Pradesh trained by CSK HPKV, Palampur"** submitted in partial fulfillment of the requirements for the award of the degree of **Master of Science (Agriculture)** in the discipline of **Agricultural Economics** of CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur is a bonafide research work carried out by **Ms. Neha Dhadwal (A-2018-30-008)** daughter of Sh. Mohinder Singh Dhadwal 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.

Place: Palampur
Dated: 18.November 2020

(Dr. Rajesh Kumar Thakur)
Major Advisor

CERTIFICATE- II

This is to certify that the thesis entitled **"Assessment of livelihood status of farmers of Himachal Pradesh trained by CSK HPKV, Palampur"** submitted by **Ms. Neha Dhadwal (A-2018-30-008)** daughter of Sh. Mohinder Singh Dhadwal to the CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur in partial fulfillment of the requirements for the degree of **Master of Science (Agriculture)** in the discipline of **Agricultural Economics** has been approved by the Advisory Committee after an oral examination of the student in collaboration with an External Examiner.

(Dr. Rajesh Kumar Thakur)
Chairperson
Advisory Committee

( )
External Examiner

(Dr. Virender Kumar)
Member

(Dr. Naveen Kumar)
Member

(Dr. Desh Raj Chaudhary)
Member

(Dr. (Mrs.) Raj Pathania)
Dean's Nominee

Head of the Department

Dean, Postgraduate Studies

ACKNOWLEDGEMENTS

First and foremost, I would like to extend my gratitude to the Almighty God-The supreme power for always being by my side and in whose belief, I was able to accomplish my research work. with fervor and zest.

I extend my sincere thanks to Dr. Hon'ble Vice Chancellor ***H.K. Chaudhary****, Dean, Postgraduate Studies,* ***Dr. Madhumeet Singh*** *Dean College of Agriculture* ***Dr. R.K Kataria****,* ***Dr. Virender Kumar****, Head, Department of Agricultural Economics, Extension Education and Rural Sociology and other officials of CSK HPKV, Palampur for providing me necessary facilities for timely completion of this study.*

Words are inadequate to express my deep sense of gratitude to my major advisor ***Dr. Rajesh Kumar Thakur****, Principal Scientist (Agricultural Economics) for his sustained encouragement and impeccable guidance. I shall always be indebted to him for his persistent efforts and enthusiasm that pushed me through to work hard. I owe to him a lot more than i can express.*

I owe earnest gratitude and deep sense of regards to the distinguished members of the advisory committee Dr. Virender Kumar, Principal scientist and Head (Department of Agricultural Economics, Extension Education and Rural Sociology), Dr. Naveen Kumar, Principal scientist (Department of Agronomy), Dr. Desh Raj Chaudhary, Professor (Vegetable Science) and Dean's nominee Dr. (Mrs.) Raj Pathania, Professor and Head (College of Home Science) for their valuable suggestions and tremendous cooperation during the course of the investigation and preparation of this manuscript. I take this opportunity to express my heartfelt thanks to all the teachers of the Department for their help in one or the other way. Furthermore, I would like to acknowledge with much appreciation, the crucial role of ***Mr. Ravinder Rana (Section officer), Madam Kamini Kapoor (Technical Assistant Grade-I)*** *and the office staff of the Department for their ever-willing help in various forms during the course of my study in the university.*

All the words in the lexicon will be futile and meaningless, if I fail to divulge my accolade to my respected grandparents, parents and family who brought me to this stage. For that I am thankful to my grandmothers ***Smt. Bhaga Devi*** *and* ***Smt. Asha Devi,*** *my father* ***Sh. Mohinder Singh Dhadwal,*** *my beloved mother* ***Smt. Kiran Dhadwal*** *whose continuous encouragement and affection, boosted my moral everlastingly. My most cordial thank goes to my brother* ***Nishant*** *for his help, love and care.*

I take this opportunity to convey my gratitude to my worthy seniors viz., ***Shivalika, Kanika*** *and* ***Diksha.*** *I have learnt a lot from them. Thanks for being a support and source of motivation throughout the time and. I avail myself this rare opportunity to express my gratitude to my dearest friends,* ***Akshita, Dev Shaynee, Ishani, Diksha, Rushali, Jasmeet, Rahul, Anju, Shilpi, Aanchal.***

I thank ***Ajay walia sir*** *for his efforts in bringing the manuscript in presentable form*

Acknowledgements are inherently endless & incomplete, as I requested indulgence from many friends and helpful people whom I could not name here due to paucity of space. All are not mentioned, but none is forgotten. Needless, to say, errors and omissions are mine.

Place: Palampur
Dated: ***(Neha Dhadwal)***

TABLE OF CONTENTS

LIST OF ABBREVIATIONS USED

Sr. No.	Abbreviation	Meaning
1.	%	per cent
2.	/	Per
3.	et al.	et alii (and others)
4.	Fig.	Figure
5.	i.e.	id est (that is)
6.	viz.	vi delicet (namely)
7.	UR	Unirrigated
8.	IR	Irrigated
9.	ha	Hectare
10.	kg	Kilogram
11.	q	Quintal
12.	p.a	per annum
13.	l	Litre
14.	P	Page
15.	pp.	Pages
16.	No.	Number
17.	sq	Square
18.	km	Kilometer
19.	IF	Integrated farming
20.	VF	Vegetable farming
21.	FYM	Farm Yard Manure
22.	LSI	Livelihood security index
23.	CLSI	Composite Livelihood Security index

LIST OF TABLES

LIST OF FIGURES

Department of Agricultural Economics, Extension Education & Rural Sociology, College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya Palampur-176062 (H.P)

Title of thesis	:	Assessment of livelihood status of farmers of Himachal Pradesh trained by CSK HPKV, Palampur
Name of the student	:	Neha Dhadwal
Admission number	:	A-2018-30-008
Major discipline	:	Agricultural Economics
Minor discipline	:	Agronomy
Date of thesis submission	:	18 Nov., 2020
Total pages of the thesis	:	113
Major Advisor	:	Dr. Rajesh Kumar Thakur

ABSTRACT

Agriculture is the major source of livelihood for majority of the rural population in the developing countries like India. The livelihood security is a complex concept that is location specific, subjective and dynamic. It comprises of food, financial, health, cultural and educational securities and among these, food security is undoubtedly the major contributor of livelihood security. The farmers often face the problem of low level of productivity and farm income due to lack of proper knowledge regarding the usage of modern farming techniques. In Himachal Pradesh, imparting trainings to the farmers is one of the mandates of CSK HPKV, Palampur. During the period of 2016 to 2018, Satluj Jal Vidyut Nigam Ltd. Shimla has sponsored 52 training programmes to CSKHPKV in which 1300 farmers were trained in different streams. In the present study an attempt has been made to assess the livelihood status of trained farmers with respect to their farm resources, level of awareness & adoption of farm technologies and the different domains of livelihood security. Among the different districts of the state, the highest number of trained farmers were from the district Kangra and hence the district was selected purposively. In order to meet out the requirements of the objectives of the study, primary data were collected from 60 trained farmers through a two-stage sampling design. The secondary data pertaining to various trainings programmes conducted by CSKHPKV, Palampur were collected from records of Directorate of Extension Education, CSKHPKV, Palampur. The results were presented by working out averages, percentages and various indices for livelihood security. The average size of land holding was found to be quite low i.e. 0.3595 ha out of which 0.3055 ha was cultivated on overall farm situation. As far as employment of active workers was concerned, the majority (60.11 %) were associated with farming; while private jobs and government services was the major source of occupation for about 13 and 6 per cent of sample population, respectively, on overall farm situation. As far as the livestock inventory of the sample households was concerned, the average size of herd was found to be 1.62, having the value of Rs. 25,870/farm. The inventory of farm tools, implements and machinery on per farm basis was to the tune of Rs. 39,897 on overall basis. The analysis of the cropping pattern indicated that paddy and wheat were the major crops accounting for about 24 and 19 per cent of the total cropped area. The cropping intensity on the sample households was estimated at 204.75 per cent on overall basis. The analysis of awareness and knowledge about the different crop production practices indicated that the awareness level of sample households was quite good except for that of the weed management through the chemical application. As far as the use of FYM was concerned, it was on the lower side and the gap ranged between 3 to 17 per cent in different crops while in case of N, P and K, the percent gap ranged between 20 to 65 per cent for K among different crops. The per capita household income from different sources was estimated at Rs 4,96,086 in which the share of farm income was highest (60.69 per cent). The values of major domains of livelihood security index indicated that the sample households were relatively more secured with respect to education (0.46) followed by economic (0.30), food (0.27) and social (0.20) security aspect. The value of composite livelihood security index and weighted composite livelihood security index was found to be 0.31 and 0.39, respectively

(Neha Dhadwal)
Student
Date: , 2020

(Dr. Rajesh Kumar Thakur)
Major Advisor
Date: , 2020

Head of the Department

1. INTRODUCTION

Agriculture sector has been an important source of livelihood for majority of rural population in the developing countries like India. Keeping in view the diversity in culture, customs, agro-climatic conditions, etc., a wide range of farming systems and associated livelihood occupations have been adopted by the farmers in different regions of the country. Since independence, efforts have been made by the government for improving the livelihood options of the households with key focus on agriculture, as the major chunk of the active workforce (more than 50 per cent) of the country is directly or indirectly associated with agriculture. Although, over the time, there has been a remarkable growth in various components of agriculture yet at the same time, the share of agriculture in Gross Domestic Product (GDP) of the country has declined from about 50 per cent in 1950 to about 15.4 per cent in 2017. The agrarian crisis in the country are mainly on account of factors like; land fragmentation, out-dated tenancy laws, lack of modern market and rural infrastructure, inappropriate input pricing policies, etc. (Shetty et al., 2014). Apart from these factors, other constraints like practices for traditional methods of cultivation, lack of access to modern technology, low productivity of crops, in-adequate capital formation and low investment, widespread illiteracy among farmers, etc., have become a major threat to the educational, food, economic and social securities, thus ultimately affecting the livelihood status of farming households in the country (Hatai and Sen, 2008).

The livelihood security is a complex concept that is location specific, subjective and dynamic (Hogger and Ruedi, 2004). It comprises of food, financial, health, cultural and educational securities and among these, food security is undoubtedly the major contributor of livelihood security. The success of green revolution in the country is definitely the most classic illustration of achieving national food sufficiency in the country in times of hunger and starvation. However, the adoption of green revolution practices was not uniform throughout the country. These practices were adopted by farmers of resource rich regions that accounted for

only about 35 per cent of total cropped area and there has been a pre-dominance of rainfed farming in remaining 65 per cent of the area which exhibited wide variations in technology adoption (Hiremath and Misra, 2012). In view of increasing demand of food grains on account of continuous increase in human population, there is a need for increasing the production from the rainfed areas. It can be achieved through the adoption of different conservation practices which can be ensured through the skill upgradation of farming community by way of need-based trainings. The government has been making continuous efforts through various programmes, policies and incentives in order to improve the socio-economic conditions of the farming community. Since, a large fraction of farmers in the country lives in the rural areas, they have no proper knowledge regarding the usage of modern farming techniques. Often their low level of education and lack of communication has resulted into a lack of general awareness regarding the modern research and inventions on agriculture (Makal et al. , 2017).

In the context of technological development, it is observed that there has been a huge development in the agricultural sector. This evolution is well reflected by development of new improved high yielding varieties (HYV), high quality fertilizers & pesticides, improved farm implements, etc. But irrespective of these developments, the livelihood status of farmers has not been improved much in these years. One of the major reasons for this failure is wide gap in adoption of agricultural technology. This gap can be filled by the agricultural extension and training services in the country. In agriculture, extension and training are the most important factors for generating awareness and technical know-how about the new technological interventions. The major players providing extension services in public sector are Krishi Vigyan Kendras (KVKs), State Agricultural Universities (SAUs) and ICT-led extension interventions by Department of Agriculture, Cooperation and Farmers Welfare (DAC&FW), Government of India. They are responsible for catering to the needs of farmers in agricultural development as well as assisting the farmers in adoption of innovations. Since the SAUs through KVKs also operates in a very micro areas for technical support and refinement of area specific technology based on micro situation. The KVKs have become increasingly associated with the process of grass-root development (Saha, 2013). Farmers' training is that part of agricultural extension

which helps the farmers in understanding the application of latest agricultural technologies in daily farming activities. It improves the knowledge of the trainees about the improved farm practices (Srinivas and Sailaja, 2013).

Farming in hilly state like Himachal Pradesh is mixed and subsistence in nature. The average size of land holdings in the state is decreasing mainly due to fragmentation of holdings and allocation of land for non-agricultural uses. The proportion of arable land in the state is quite low i.e. around 10 per cent of the total geographical area. In addition to this, the majority of land holdings (more than 85 per cent) in the state are marginal/small and scope for off-farm income and employment opportunities is also limited. The magnitude of farm income from the small land holdings is not sufficient, thus migration of family members in search of livelihood earning is a common practice. The rural households are practicing diversified farm enterprises along with off-farm income and employment generation avenues to meet out their basic needs of attaining better possible livelihood. In order to improve the socio-economic status of farming community, there is a need for intensification and diversification of farm production systems. The key stake holders associated with the development of agriculture in the state are emphasizing on skill up-gradation of the farmers to facilitate the adoption of improved farm practices or technologies.

In this context, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya (CSK HPKV) through its KVKs, is imparting need-based trainings to the farmers in their routine activities as well as sponsored by various departments/agencies. In this regard, Satluj Jal Vidyut Nigam (SJVN) Ltd. Shimla has sponsored 52 training programmes (each for six days) under Corporate Social Responsibility (CSR) policy to CSK HPKV in which 1300 farmers from different districts of the state were trained by Directorate of Extension Education, CSK HPKV, Palampur till 2018. The trainings were sponsored on bee-keeping, mushroom cultivation, organic agriculture, commercial vegetable production, protected cultivation, integrated farming etc. keeping in view the interest of farmers in particular field. It is expected that the trained farmers may have adopted the improved agricultural technologies in their production systems due to which their livelihood status may have improved. Therefore, it is imperative to assess the livelihood status of the trained farmers especially with respect to their resource endowments, status of adoption of improved farm technologies, pattern of farm production system, income and employment, etc.

1.1 Objectives

The present study has been undertaken with following specific objectives:

i. To examine farm resources, production system, level of awareness and adoption of farm technologies by trained farm households.

ii. To study the pattern of employment and to estimate income and livelihood status of selected farm households.

1.2 Significance of the study

The quantitative assessment of farm resources, production system, awareness & adoption of farm technologies, pattern of employment, income and livelihood status of trained farm households was of utmost importance as many programmes have been initiated by the government for skill improvement of the farmers. The analysis of status of farm resources will indicate the level technology adoption and will be helpful for the development departments to bridge the gap through appropriate interventions. In the same way, the study of farmers' awareness and adoption of farm technologies will be useful for the institutions like SAUs, KVKs, etc. to modify the modalities of imparting training for the overall benefit of the farming communities. The analysis of various components of livelihood securities of the trained farmers of the study area will indicate the critical areas requiring the intervention of the government through different social welfare programmes.

1.3 Organization of study

The entire study has been systematically planned and arranged in five chapters. Chapter-1 describes the background and present scenario of research problem, its objectives and scope. This is followed by Chapter-2 which presents the comprehensive review of relavent research done in India and abroad. Chapter-3 presents the detailed methodology adopted for selection of respondents, collection and analysis of data. The results of this study have been documented with the conclusions in various sections of Chapter-4. Finally, the major findings have been summarized along with some suggestions for improvement. The references used in the study have been enlisted under literature cited.

2. REVIEW OF LITERATURE

A scientific investigation must rely on facts and information gathered from previous studies related to the topic of research. A deep insight into various important studies done in the past helps to build a theoretical background of the study and provides framework for finding empirical evidences related to present investigation. Various past studies done in abroad and in the country helps to outline the key features of research problem. A detailed review of literature guides the researcher to carry out the study in right direction. It provides guidance about various aspects of the research problem as well as addresses the key factors influencing it. Therefore, critical review of literature related to the research problem is indispensable component of research. Considering its importance, an extensive review of past studies regarding the assessment of livelihood status of trained farm household has been collected from various sources like journals, research articles etc. A brief description of relevant studies linked directly or indirectly to present topic has been given below under following sub-heads:

2.1 Awareness and adoption of agricultural technology

2.2 Livelihood status of farmers and production pattern

2.3 Training needs of farmers

Awareness and adoption of agricultural technology

Jabbar et al. (2003) analysed the role of knowledge in the adoption of new agricultural technologies. The authors attempted to overcome the deficiencies of static approach by analyzing adoption potential as a dynamic process. The study was based on primary data collected from 474 adopters beside the random sample of 120 non-adopters to identify various factors affecting the adoption pattern of these farmers over the period of 1990-1995. The study revealed that adequate knowledge of technology, decision making ability, access to credit etc. were the influential factors affecting the adoption of agricultural technologies.

Doss CR (2006) explored various drawbacks and problems faced in micro studies in carrying out adoption research. The study was based on the findings of earlier researches on the adoption of agricultural technologies and suggested alternative strategies for technology adoption. The results revealed that the lack of awareness, shortage of timely availability of technology and some non-profitable technologies were the major causes of non-adoption of technologies. Institutional constituents such as the policy background were also found to be key influencing factors affecting the availability of inputs (for credit) and outputs and thus, motivate the farmers for adoption of a technology.

Laxmi and Mishra (2007) examined the factors affecting the adoption of resource conservative technologies in zero tillage technology in rice-wheat farming systems. The study was based on the primary data collected from two states i.e. Bihar and Haryana. The analysis of data was done with the help of logit model. The factors responsible for non-adoption of zero tillage technology by the farmers were also analysed and it was found that the lack of machinery and scarcity of market for hiring services were the key factors.

Deshmukh et al. (2007) conducted a study to understand the knowledge level and rate of adoption of agricultural technologies by the farmers as recommended by MAU (Marathwara Agricultural University). The study was conducted in Parbhani and Nanded district of Marathwara to examine the status of fifty-four technologies recommended by MAU during 1999-2000, 2000-2001 and 2001-2002. The knowledge of farmers regarding agricultural technology was found to be low while their adoption was found to be very low among farmers. The major constraint behind it was found to be lack of adequate information and high cost of seeds.

Kumar et al. (2011) assessed the farmers' perception and awareness about various aspects of the crop insurance scheme as a tool for risk management in Tamil Nadu. The study was based on primary data collected from 600 farmers. Regarding education, it was found that less educated and aged farmers were more involved in the farming enterprise in comparison to other age groups. Majority of farmers were found to obtain agricultural information from government departments (70 %), neighbours and fellow farmers (13 %), agricultural universities and research institutes (9 %) and non-governmental organizations (2 %). The majority of farmers (about two-third)

were found to be aware about the government executed risk-mitigating measures, however, about 50 per cent sample farmers were found to be conscious about the crop insurance schemes.

Mahajan and Baburao (2012) conducted a study which explored the farmers' awareness regarding financial aspects of sugarcane farming in the selected villages of Sangli district of Maharastra. The study attempted to potray the growth of sugarcane farming (Maharastra and India) as well as assessed the attitude of farmers toward sugarcane cultivation. The study revealed an increasing trend of sugarcane production in the state over last few years however, the trend of rising production was not constant over the years. A hypothesis regarding farmers' awareness was developed which was tested by using chi-square test. It revealed significant difference between the three study villages in terms of the awareness about government schemes.

Raghav and Sen (2014) examined the socio-economic status of farmers and their perception about technology adoption. A sample of 100 respondents from two blocks of Uttarakhand was selected for primary data collection. The results indicated that females were least contributors as decision makers in the farming activity (8%). Therefore, gender emerged as one of the major constraints for non-adoption of technology as females did not have access to technical guidance. It was mainly due to the fact that they were not able to spare time from their household chores. Thus, in the study it was suggested to extend government assistance to promote participation of farmers, especially females in agricultural training and workshop.

Singh et al. (2015) conducted a study to explore the level of adoption of modern agricultural technology in Bihar. The study was entirely based on primary data obtained through survey of farm households, agricultural scientists and extension officers. It was revealed that the coverage of agricultural development programmes was limited to only few villages. It was inferred that the line departments remained to be dominant agencies for implementation of agricultural development schemes. Institutions like Agricultural Technology Management Agency (ATMA) and Krishi Vigyan Kendras (KVKs) were limited to few activities only. These institutions (ATMA and KVKs) performed key role in dissemination of the agricultural technological information, however, inadequacy of staff, infrequent supervision and lack of conveyance facility were the most important constraints faced by these in

transfer of technology to the farmers. As far as the awareness of farm households was concerned, it was found that majority of them were aware about technology and advanced horticultural methods while merely 1.88 per cent of farmers were aware about technology of advanced fisheries.

Mittal and Mehar (2015) analysed the socio-economic factors affecting adoption of different modern information sources related to agriculture by farmers. It was based on empirical model to analyse the factors affecting the adoption of various agriculture-related information sources. Primary data were collected from 1200 farm households of five Indo-Gangetic states of India. The results showed that various factors affect the farmer's choice in selecting information sources like age of farmer, family size, education level, etc. Older farmers were least willing to explore new sources of information and were found to be reluctant to adopt multiple sources. Similarly, farmers with better education were found to be early adopters of modern technologies and were applying modern inputs more efficiently.

Meena et al. (2017) highlighted various constraints faced by livestock farmers in adoption of scientific technologies. The study was carried out in Rohilkhand region of Uttar Pradesh. The respondents selected for the survey were beneficiaries of various training programmes. The preference of natural service, lack of good bredable bulls, lack of services like artificial insemination centre, high cost of treatment, lack of awareness among farmers, poor conception rate in animals, scarcity of resources for maintaining superior breeds of animals were found to be major constraints faced by livestock owners in adopting scientific technologies.

Nain et al. (2017) assessed the farmers' awareness about agricultural insurance scheme in Southern Haryana. The study area comprised of two districts of Haryana from which two blocks having lowest HDI (Human Development Index) were purposively selected. It was found that among farmers, the level of awareness among women was fairly low (19.7 %) as compared to male farmers (34.7 %). The study also brought into light the various constraints regarding awareness of farmers about agricultural insurance scheme. Low level of awareness among the farmers indicated the need of active participation by agricultural departments, extension services, administration offices etc.

Singhal and Vatta (2017) assessed the impact of KVK on the adoption of improved agricultural practices in some selected areas of Rajasthan. The authors tried to explore the socio-economic attributes of KVK beneficiaries and their impact on adoption of improved practices. The study revealed that majority of beneficiary respondents (nearly 85 %) had medium to high level of adoption of modern agricultural technologies. On the other hand, in case of non- beneficiaries, the low level of adoption was highly evident. Major reasons for higher adoption among beneficiaries included more number of vocational trainings, guidance from consultancy agency (KVK) and frontline demonstrations conducted by Krishi Vigyan Kendras.

Hinojosa et al. (2018) explored the farmers' perception of agricultural innovation in maize-legume intensification system in mid hill regions of Nepal. The study was based on primary data collected from the farmers of two selected villages of Nepal. The farmers' perception was evaluated by analyzing changes in perception about agricultural practices before and after the farm trial. It was observed that large proportion of medium resource endowment (MRE) and high resource endowment (HRE) farmers changed their perception positively towards the recommended agricultural practices required in maize-legume farming system. Major reasons behind non adoption of agricultural innovations by farmers were lack of labour, capital, lack of knowledge etc.

Matto et al. (2018) examined the adoption level of recommended agricultural practices among paddy growers in Budgam block of Kashmir. The primary data were collected from 150 respondents trained by Agricultural Technology Management Agency and 50 untrained respondents. The study revealed that 47.56 % trained farmers had high level of adoption of recommended practices while 20.73% and 31.71 % of trained farmers fall under the category of low and medium level of adoption respectively. It was concluded that high level of adoption of recommended practices in paddy production by trained farmers was attributed to their level of knowledge obtained during training conducted by ATMA. The study also revealed imperative relationship of age, experience in farming, education, information source with level of adoption of technology by farmers.

Mottaleb (2018) assessed the perceptions of farmers and adoption of new agricultural technologies with evidences from developing countries. A sample of 70 irrigation service providers from Bangladesh was used for primary data collection. The results of the study revealed that 55 respondents had shown willingness to adopt new technologies. Further, the willingness of farmers to adopt new technology was highly influenced by usefulness of technology. Thus, there was great scope of conducting demonstrations and awareness programmes for introducing new technologies to farmers.

Katke (2019) examined the challenges of Indian agriculture in adopting precision agriculture. The analysis was based on secondary data published in various studies conducted on precision farming. The findings of the study were categorized into challenges and strategies for adoption of precision farming in India. The major challenges faced by farmers as presented in the study were inadequate knowledge of agronomic factors, lack of skills for integrating information from diverse sources, limited availability of technology and usage, complexity of technology etc. Therefore, various strategies for promotion of precision farming such as promotion through progressive farmers, government participation like soil sampling, co-operative and contract farming approach were recommended.

Kumar et al. (2019) analysed the socio-economic profile for determining the adoption of innovations among the farmers of Bhagalpur district of Bihar. The study was conducted in three villages of Sabour block. The study revealed that better socio-economic conditions facilitate the farmers to try many alternatives and thus help in adopting new innovations. Education was found to have direct relationship with adoption of innovations since majority of innovator respondents were having better education in comparison to non-innovators.

Nandi and Swamikannu (2019) analysed the status of agricultural extension system prevailing in India to pave a way for improvement of extension system in the country. Various aspects of extension system were studied critically like importance of agricultural extension, role played by non-public players, agricultural extension approaches, extension through information and communication technologies (ICTs) and media, investment in agricultural extension etc. It was observed that a major

portion (nearly 70 %) of total agriculture R and E budget was diverted towards crop husbandry leaving a very small chunk for other sectors like animal husbandry. Further, it was found that the number of extension personals in the country had not risen in last many years (even less than the ideal ratio of 1:750) at a national level. Therefore, it was recommended to hire adequate number of extension personnel in the sector which could contribute to guide the farmers in right direction.

Livelihood status:

Bhandari and Grant (2007) examined the household livelihoods in highland and lowland communities of Kali-Khola agricultural watershed in western Nepal on the basis of economic, ecological and social security indicators. The study revealed significant differences in soil fertility status, pests and disease management, risk and uncertainties, use of agro-chemicals and access to social services, whereas variations in crop diversification, annual agricultural income and food sufficiency were almost similar in both the cases. It was found that agriculture production alone was not a viable livelihood option for people of watershed area, however, households growing crops with hired labour had relatively sustainable livelihood in Nepal's agricultural watershed.

Mahapatra (2007) evaluated the livelihood patterns of agricultural labour households in rural India by analysing the pattern of employment and income in Orissa. The research primarily used the literature and reports published on various aspects like income pattern, employment generation, level of indebtness and earnings by rural labourers etc. The results indicated a decreasing trend of employment of both male and female labourers. The trend of indebtness per household among agricultural labourers was found to be one of the major hindrances in earning livelihood.

Hatai and Sen (2008) conducted a study on economic analysis of agricultural sustainability in Orissa. The study comprised of evaluating ecological security index (ESI), economic efficiency index (EEI) and social equity index (SEI) for various districts. The results exhibited wide variations in their agricultural systems for the ecological and social aspects relative to their economic aspects. The sustainable livelihood security index (SLSI) was generated for reflecting the overall performance of a district in three dimensions of sustainability. The values of these indices indicated

that many coastal districts of the state performed better than the districts of western Orissa.

Ali et al. *(*2010) employed multiple methodological tools including participatory rural appraisal (PRA) and questionnaire survey to assess the livelihood status and socio-economic problems of fish farmers. The study was conducted in selected areas of Tarakanda Upazila of Mymensingh district of Bangladesh. The study revealed that lack of scientific knowledge, lack of quality seeds and feed, lack of money and lack of marketing facilities for fish culture, were most important constraints faced by the fishermen in the study area.

Biradar et al. (2013) analysed the livelihood status of livestock farmers of arid region of deccan plateau, emphasizing more on resource poor farmers using sustainable livelihood framework. The data were collected from 162 households representing 27 villages and 9 blocks of deccan plateau. The livelihood pentagon representing assets of livelihood (natural, human, social, physical and financial) indicated that the pentagon was dominated by human capital (about 22 per cent) followed by natural and physical (21 per cent each), financial (16.13 per cent) and social (10 per cent) factors. The pattern of employment indicated that daily wages was the main source of income for about 67, 70 and 70.37 per cent of the households in case of landless, marginal and small categories of farm households, respectively. The contribution of livestock was found to decrease with the increase in size of landholdings. Promotion of collective actions, technology dissemination and incessant research on livestock husbandry for resource poor farmers were suggested as a part of strategic plan to reduce agrarian crises and bring parity in rural areas.

Singh (2013) examined income and livelihood issues of farmers in Uttar Pradesh. Multi-stage stratified sampling design was used to select a sample of 3474 farm households representing 84 villages, 42 blocks and 24 districts of the state. The per- day per-capita income was estimated at Rs 15, 31, 45 and 84 in case of marginal, small, medium and large farm households, respectively, during 2011-12. Due to the inadequacy of agricultural income in meeting the household expenditure, the small and marginal farmers had been suggested sustainable livelihood strategies for their survival. The study revealed that integrated enterprises would provide sustenance to a

large number of farmers in this state. Therefore, the study suggested a multi-sectoral integrated strategy for promoting agricultural and non-agricultural activities in rural areas embedded in local conditions, resources and institutions to meet the challenge of sustainable development in the state.

Dhakar (2014) conducted an investigation on assessment of sustainable livelihood of rural women through income generating activities in Satna district of Madhya Pradesh. The district was purposively selected for the study as the National Rural Livelihood Mission project had been running in district since 2010 for improving the livelihood of women beneficiaries. The important suggestions which emerged from the investigations included providing more information about sustainable livelihood, organising trainings and other extension programmes at village/block level for sustainable livelihood, simplification of procedure of loans, improvement of transportation facilities, encouragement from the government to undertake livelihood development project in rural areas and provision of subsidy on technical inputs.

Nandi et al. (2014) examined the assessment of livelihood and poverty status of fish farmers in Delta state, Nigeria. The data were elicited using questionnaire and were analyzed by using descriptive statistics and poverty gap indices. Insufficiency of funds, fluctuations in the market prices and fish spoilage were found to be the major constraints faced by fisherman. In order to improve the livelihood status, it was suggested that there should be provision of soft loans to fishermen, canning and processing industries and deployment of extension agents in the study area.

Abdulwahab et al. (2015) assessed the livelihood diversification of rural farmers in Kwara state, Nigeria. Both quantitative and qualitative techniques were used to collect data for study. The study recommended that simple and functional micro credit delivery system that will enable them to access loans should be introduced by stakeholders in order to increase and strengthen their economic activities. Furthermore, business advisory services should be provided for enterprise groups to achieve their goals.

Yaseen et al. (2015) conducted a study to investigate the significance of capacity building/training for livelihood of farming community. The results revealed

that before training most of the respondents were in low income category as compared to after training in which majority of respondents shifted from low income to medium and medium to high. The study further explained that the government should design and implement capacity building/training programs for farming community to make them capable to improve their livelihood by raising their farm and livelihood income.

Kamruzzaman and Hakim (2016) investigated the livelihood status of fisherman Dhaleshwari river in Tangail district, the central part of Bangladesh. The study revealed that the fishermen of Dhaleshwari river were mostly illiterate, low income, lack of training exposure and lack of awareness about their health facility and sanitation. Therefore, measures like provision of providing soft term loans and capacity building needs for the improvement of awareness of people were suggested to improve the livelihood status of fishermen in Dhaleshwari river in Bangladesh.

Ramya (2016) conducted a study to analyse the personnel, socio-economic and psychological characteristics of tribal farmers and their livelihood security in Karnataka. Different livelihood systems followed by tribal farmers were taken into account and requisite data were collected by personnel interview method through a structured interview schedule and analysed by employing suitable statistical methods. Among the major problems as perceived by tribal farmers, landlessness and small landholdings were the major problems. Allotment of land for landless tribals, strengthening of wage employment avenues and subsidies and loans to establish on farm/off farm enterprise were the major suggestions given by the author to improve socio-economic status of tribals. The strategy was designed with a 5-step progressive approach by considering 6 core areas. The strategy analysed the reality of the situation and showed the right direction for the flow of efforts of stakeholders to strengthen the livelihood security of the tribal farmers.

Swathi (2016) analysed the livelihoods of tribal farmers in Andhra Pradesh. The primary data were collected from 240 tribal farmers of the state. A scale was developed for attitude by using summated rating technique and taken as important dependent variable. Similarly, a test was developed for the assessment of knowledge and it was taken as dependent variable. The study revealed that the majority of farmers had no schooling (48.75 %) and were engaged in occupation of agriculture

and wage worker and collection of non-timber forest products (77.50 %). The majority of tribal farmers were found to have medium level of livelihood (62.09 %).

Jodha and Dahiya (2018) assessed the livelihood problems of small and marginal farm families of Haryana. The information extracted from data analysis revealed that small land holdings ranked first among the problems faced by farmers followed by issues like high input cost, pest infestation, lack of farm implements, high production cost, post-harvest losses.

Palhania (2018) analysed the livelihood economics of Gujjars in Kangra district of Himachal Pradesh. The study aimed at examining the socio-demographic characteristics and livelihood pattern of Gujjar community in the study area. The study revealed that dairy farming was the main source of livelihood of gujjar community in which 74.82 % adult males and 86.18 % adult females were actively involved in this occupation. It was found that three-fourth part of total income was contributed by buffaloes alone.

Venu et al. (2018) examined the livelihood security of agricultural labour households in rainfed regions of north Karnataka. Various parameters of livelihood security viz., economic security, food security, health security, educational security and social security were worked out to compute household livelihood security index (HLSI). Also, a composite livelihood security index was developed to depict the livelihood status of migration and non-migration labour households. The value of composite livelihood security index (0.791) revealed that the households were moderately secured in terms of livelihood. The findings of the study revealed that migration was the key factor influencing the livelihood security of labour households. Lack of basic facilities, low wage rate and increased food prices were found to be the major constraints for attaining livelihood security.

Wondimagegnhu et al. (2019) analysed the major determinants of farm livelihoods of farmers in south west Ethiopia. The gender disaggregated data analysis made use of household survey from 334 farmers by the way of focussed group discussion and interview method. Farming was found to be the major livelihood source of majority of households. The results expressed female farmers as the disadvantaged group in comparison to the male farmers with respect to land

ownership, credit availability, production factors and input use. Physical capital, land availability, input facility, access to credit etc. were found to be major determinants of farm livelihood.

Training needs of farmers:

Surur O (2007) studied about the effectiveness of agricultural development training programme in case of livestock farmers of southern Ethiopia. The study aimed at assessing the outcome and achievements of the poultry farmers' trainings in the selected area. The primary data were collected from a total of 190 farmers (92 teff and 98 poultry farmers) which consisted of both trained and untrained groups. The study revealed large gap between the contents of trainings and identified needs of farmers. Therefore, participatory planning at all levels was recommended to make the trainings more effective.

Serin et al. (2009) examined the effects of formal education and trainings on farmers income and highlights the imperative role played by formal education in the productivity level and farmers' income. It was found that the respondents utilizing the technical support and guidance earn significantly better than those who were reluctant towards the process of learning and adoption.

Meena & Singh (2010) conducted a study to analyse the impact of training programmes imparted by Krishi Vigyan Kendras in Rajasthan. The study was carried out in four selected KVKs (one KVK from ICAR institute, two from SAU and one from NGO). The respondents of study comprised of both trained farmers and untrained farmers. The factors like knowledge index, adoption level and adoption quotient were recorded. It was observed that the knowledge index for selected crop practices was nearly 50 per cent for all KVKs. Therefore, more intensive efforts on part of KVKs were recommended for accelerating agricultural production.

Noor and Dola (2011) investigated the impact of training on perception and performance level of livestock farmers in Malaysia. The data were primarily collected by using the technique of mail survey and telephone survey. The provision of face to face feedback was also incorporated in the study. The study revealed positive impact of training in many ways viz. increase in farm products, enhancing work quality, rise

in the level of SKA (skill, knowledge and ability), boost in the morale of farmers, increase in income, increase in networking etc.

Sajeev et al. (2012) analysed the training needs of farmers and rural youth in KVKs of Manipur state. It was observed that farmers sought maximum trainings on integrated farming systems, integrated insect pest management and soil and water conservation. The results also revealed that even in the most popular areas of training, there was inadequacy in terms of frequency of trainings imparted by KVKs of Manipur. Therefore, a strong need for KVKs to re-orient their trainings was felt to fill the gap existing with respect to imparting need-based trainings in Manipur.

Bar et al. (2014) examined the impact of KVK training on development of tribal farmers in Odisha. After the primary data collection, appropriate statistical tools were used to reveal the results. The findings of the study revealed that not much improvement had been made by trainings in enhancing the family income. Therefore, recommendation for further strengthening of trainings was made to get desired production and productivity on farm level.

Singh and Singh (2014) assessed the effectiveness of training programmes under Agricultural Technology Management Agency in Patna and Muzaffarpur districts of Bihar. The primary data so collected were analyzed by using statistical package for social sciences (SPSS) software. The results revealed that 'animal husbandry & dairy' and 'vegetable cultivation' were the two major areas in which most of farmers attended trainings which indicated their interest towards these areas. A majority of farmers (58.3%) perceived that they were highly benefitted in terms of increase in knowledge followed by gain in skills (48.3%). Only 15 per cent farmers were of perception that they would start a new enterprise as a result of obtaining training.

Meena et al. (2015) analysed profile of participating and non-participating farmers under KVK training programmes in chickpea production technology in Madhya Pradesh. The primary data were collected from 60 untrained and 60 trained farmers randomly. The collected data were tabulated and subjected to suitable statistical analysis. The socio-psycho-economical and communicational features of the respondents were recorded for analysis. The trained farmers were found to be

better in adopting production technology of chickpea as well as knowledge. On the other hand, non-participants were found to lack in scientific orientation as well as economic motivation.

Prasad and Kushwaha (2015) examined the impact of KVK's training programmes on socio-economic status of farm women. The study was carried out as comparative analysis between beneficiary and non-beneficiary farm women. The primary data for the study were collected from 160 respondent farm women through well-structured survey schedules. The chi-square test was applied to access the impact of training on socio-economic status of farm women. The results indicated beneficial effects of the need based and skill-oriented trainings imparted by KVKs. The training guidance was found to have played prime role influencing technological changes viz. knowledge, skills, attitude. Moreover, total farm women were found to have better socio-economic status than non-beneficiary farmers.

Geetha et al. (2016) highlighted the impact of farmers training programmes conducted by KVK of Chikkaballapura district in Karnataka. The primary data were collected from 60 randomly selected trainees through well-structured pre-tested schedule. The training was found to be an efficient tool in spreading technical knowledge and adoption of scientific practices. However, a need to address the constraints for non-adoption was felt to improve the efficiency of trainings.

Kurbetta et al. (2017) investigated the effect of training programmes conducted by district agricultural training centre (DATC) on rural women of Karnataka. The study was based on primary data collected from a total of 300 rural women (150 trained and 150 untrained women). A close perusal of the study revealed that majority of the rural women (57.40%) were undergone two trainings followed by more than three trainings (39.30%). It was found that the training programmes conducted by the training centres helped rural women by creating awareness, increasing the knowledge about innovative technologies and practicing improved skills.

Medhi et al. (2017) conducted a study to analyse the effectiveness of training programmes of Krishi Vigyan Kendras toward socio-economic development of farmers in Meghalaya. The primary data were collected from selected respondents

with the help of pre-tested schedules using personal interview method. The study revealed that majority of respondents in KVK adopted villages had medium level of knowledge along with medium level of productivity of rice. It was also found that trainings were effective in increasing knowledge of trainees about improved farming practices. Therefore, it was recommended to increase the number of trainings to benefit more farmers.

Raina et al. (2017) studied about the training needs of dairy farmers. A field survey was conducted to collect information on wide array of training needs of rural dairy farmers of Jammu and Kashmir state. The primary data were collected from a total of 150 respondent farmers through personal interview method. The results revealed lack of frequent trainings even in the most popular area of trainings. Therefore, the study emphasised the need of conducting more need-based trainings, re-orienting trainings of extension agencies to reduce the technological and adoption gap among the dairy farmers.

Sarita et al. (2017) carried out a study to identify the perceived training needs of dairy farmers regarding scientific buffalo husbandry practices and its relation with their socio-economic traits in five districts of Haryana state. A sample of 250 randomly selected farmers was surveyed for data collection. The study revealed that majority of buffalo owners (75.2%) desired for medium level of training in all the scientific animal husbandry practices followed by high (15.6%) and low (9.2%) level training needs, respectively. The study also highlighted the need to develop suitable training modules for the dairy farmers in scientific animal husbandry practices for increasing the livestock productivity and improving the living standards of the farmers.

Mishra et al. (2017) examined the role of women and their training needs in the sector of dairy farming. The study was conducted in Kanpur nagar district. The two blocks i.e. Kalyanpur and Bidhnu were randomly selected for the study. It was found in the study that majority of women were illiterate (50 %) and were unable to adopt new technologies related to dairy farming the dairy industry. The rank analysis showed that women were actively involved in operations like chaffing the fodder, mixing green fodder with roughage, storage of feed and watering the animals.

Considering the important role of women in dairy farming, emphasis on formulation of training programmes by considering some important aspects like duration, time (season), place, month and interval of training was made.

Indoria and Balai (2018) highlighted the issue of farm women empowerment through secondary agriculture in Rajasthan. The study aimed to explore socio-economic profile, extent of adoption of modern technologies and income pattern of trainees. Trainings were provided to 200 farm women through KVKs in value addition and marketing of products. The majority of trainees opined that trainings had paved important way for value addition to fruits and vegetables as well as helped them to raise their income status.

Rahman et al. (2018) assessed the training needs of farmers for crop production in some selected areas of Bangladesh. Multi-stage stratified random sampling technique was used for collecting data from respondent farmers. The results of study showed that frequent trainings were required in field crop production, plantation crops, tuber crops, on-farm production of inputs etc. It was also observed that farmers emphasized on obtaining more trainings on integrated farming and water management for field crop production.

Roy A (2018) attempted to examine the impact of training programmes of KVK on the dairy farmers of West Bengal. The study was undertaken as comparative analysis of socio-personal profile of both trainees and non-trainees. It was found that the knowledge of farmers was positively correlated with extension contacts. Also, the ex-trainees and non-trainees were found to vary significantly in feeding and health care knowledge of dairy animals.

Sharma et al. (2017) assessed the impact of training programme conducted through KVK on the farmers' practices and livelihood in Jammu region. The primary data were collected through variety of methods namely questionnaires (pre-test, reaction and post-test), semi structured interview and farm visit etc. The conclusions that emerged from the analysis of data revealed positive impact of training especially in terms of improving the knowledge, skills and ability of farmers. The trainings were proved to bring about better management qualities among farmers, improved their abilities and helped in possession of new SKAs (skill, knowledge and attitude).

Shahjar et al. (2018) conducted a study in Jammu district of Jammu and Kashmir state to assess the relationship between socio-economic profile and perceived training needs of dairy farmers. The primary data were collected from 120 randomly selected respondents belonging to 4 blocks. The study revealed that majority of the respondents were middle aged with poor education with medium herd size, marginal land holdings and medium mass media exposure and extension contact. Only 45 percent of the respondents had undertaken training programmes regarding animal husbandry. Further, the correlation analysis revealed that age and experience had a significant and positive correlation, while mass media exposure, extension contact, education and social participation had a significant and negative correlation with perceived training needs of dairy farmers.

Prajapati et al. (2018) conducted a study in Krishi Vigyan Kendras operational area of Amreli district to assess the training needs of farmers with respect to new agricultural practices. The study revealed that majority of the respondents needed trainings in fields of vermi-composting followed by fertigation, micronutrient fertilizers, improved varieties and hybrids of different crops, pesticides for control of disease and insect and regarding farm machinery and implements.

Ahuja et al. (2019) conducted a study on perceived training needs of dairy farmers about animal management practices in Haryana. The primary data were collected from 160 dairy farmers selected from 12 villages of Hisar and Jind districts. The study revealed that approximately 72.50% of farmers had moderate level of training needs regarding management practices. The age of the respondents was found to be positively and significantly correlated with training needs regarding management practices. It was further stated that the construction of manger/feeding/water trough/floor/ventilation was an urgent needed training area as perceived by the dairy farmers.

Singh et al. (2020) conducted a study to assess the training needs of tribal farm women engaged in dairy farming in Eastern Rajasthan. The study revealed that the farm operations relating to housing, feeding and management were usually done by the farm women. It was found that the out of the five major farm operations studied,

the farm women needed more frequent trainings in the operation of housing followed by feeding and management and health care.

Barman et al. (2020) examined the training needs of women smallholder farmers in upper Siang district of Arunachal Pradesh. The study showed that smallholder women farmer needed training for their technological empowerment and socio-economic development. The results revealed that majority of women smallholder farmers opined of high training needs in the area of integrated farming systems, followed by seed production, water management and nursery management.

3. MATERIALS AND METHODS

A scientific and systematic methodology is indispensable for carrying out any scientific investigation. As a matter of fact, the accuracy, consistency, plausibility and validity of scientific conclusions/results to a large extent is determined by the scientific methodology adopted for the study. The descriptive presentation of the scientific methodology employed and materials used for the research purpose helps to build a broad framework of entire investigation. It gives an insight into the data requirement for attaining the stated objectives of the study. Taking various aspects of scientific methodology into consideration, the present chapter illustrates in detail the procedure followed to accomplish the requisite for present study. The methodology of the entire study has been portrayed under following sub heads:

3.1 Selection of the study area

The scientific awareness about the modern agricultural technology is essential for the profitable farming, which may be improved through the need-based trainings of the farmers. Imparting trainings to the farmers and officers of the line department is one of the mandates of CSK HPKV, Palampur and its constituents Krishi Vigyan Kendras (KVKs) and Research stations situated in different parts of the state. In addition to the mandated training programmes, the university also organizes trainings sponsored by various departments of the state. In this context, Satluj Jal Vidyut Nigam (SJVN), Ltd., Shimla, has sponsored 52 training courses under Corporate

Social Responsibility policy to CSK HPKV, Palampur during 2016-2018. In these training courses, a total of 1300 farmers from different districts of the state were trained up to 2018. The present study on "Assessment of livelihood status of farmers of Himachal Pradesh trained by CSK HPKV, Palampur" was focused on these farmers and hence, Himachal Pradesh forms the study area for the present study.

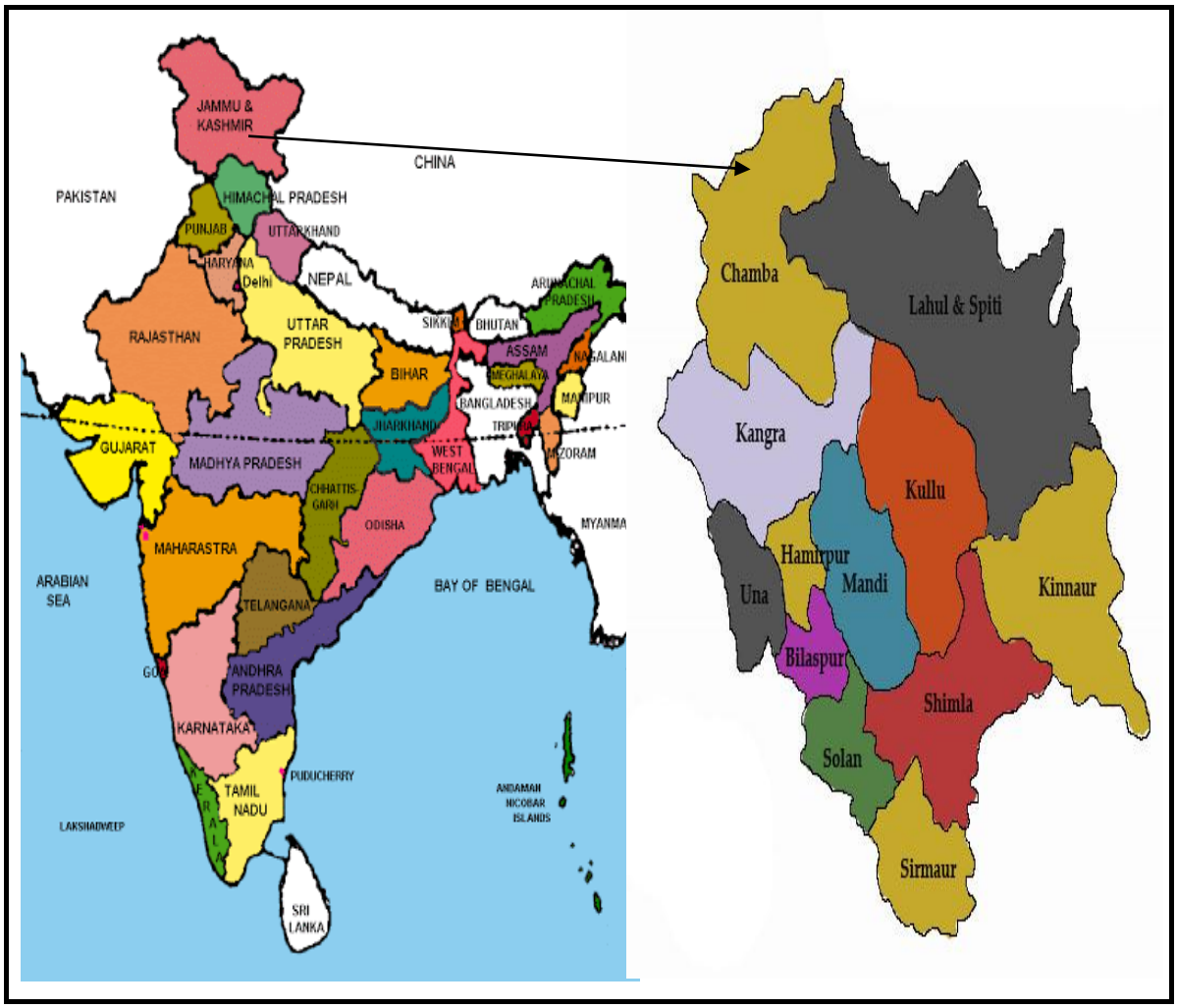

Fig. 3.1 Map of study area

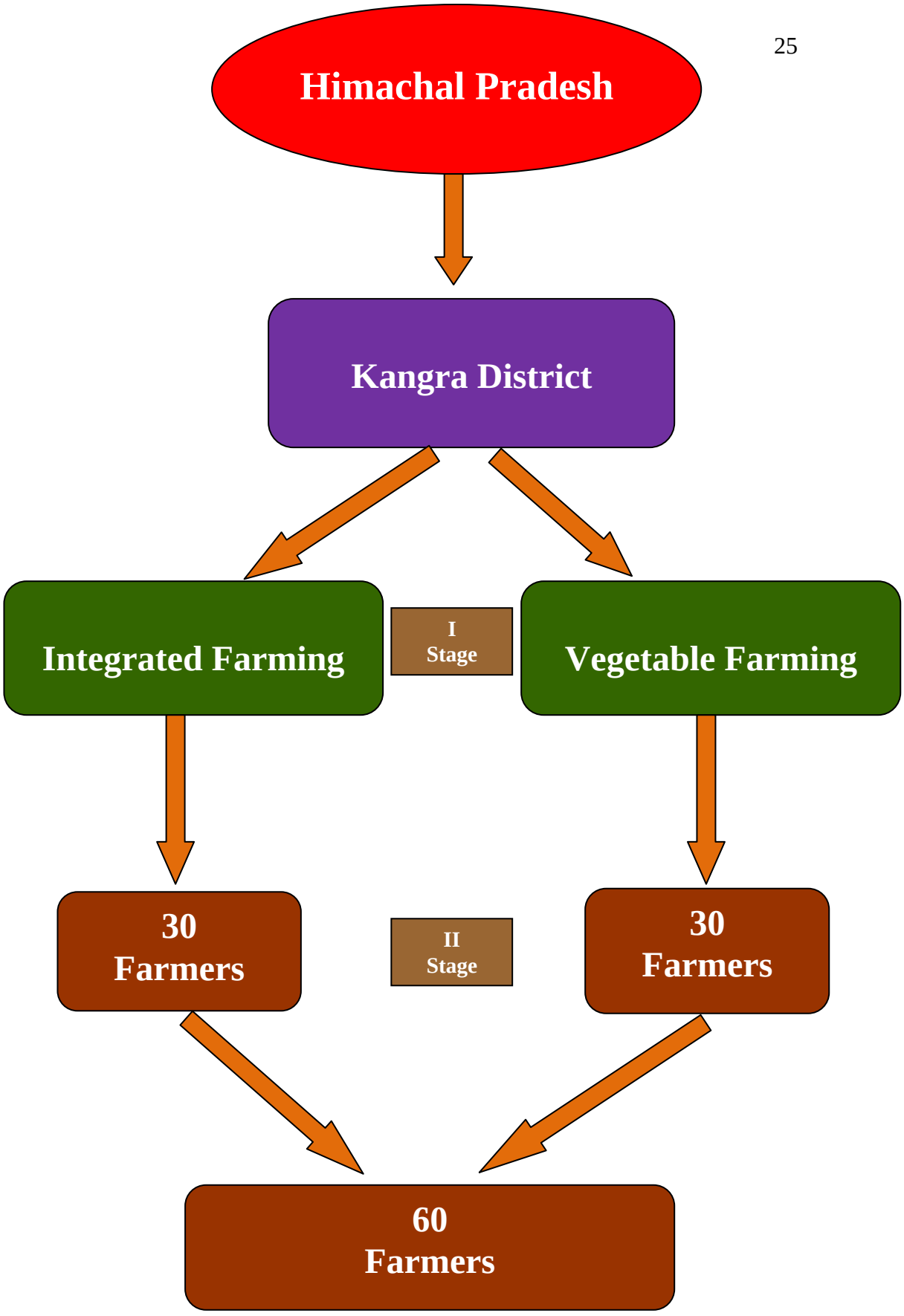

Fig. 3.2 Schematic representation of sampling plan

Table 3.1 Category wise details of farmers trained by CSK HPKV, Palampur sponsored by SJVN (2016-18)

Sr. No.	Fields of trainings	No. of trainings	No. of farmers
1	Protected cultivation	5	120
2	Vegetable cultivation	15	372
3	Organic agriculture	9	150
4	Integrated farming	16	388
5	Mushroom cultivation	7	270

Source: Directorate of Extension Education, CSK HPKV Palampur.

Table 3.2 District wise details of farmers trained by CSK HPKV, Palampur sponsored by SJVN (2016-18)

Sr. No.	District	Number of trained farmers
1	Kangra	954
2	Kullu	155
3	Shimla	139
4	Kinnaur	25
5	Hamirpur	27

Source: Directorate of Extension Education, CSK HPKV Palampur.

Table 3.3 Details of farmers trained by CSK HPKV, Palampur from Kangra sponsored by SJVN (2016-18)

Sr. No.	Fields of trainings	No. of farmers
1	Protected cultivation	85
2	Vegetable cultivation	255
3	Organic agriculture	120
4	Integrated farming	304
5	Mushroom cultivation	190

Source: Directorate of Extension Education, CSK HPKV Palampur.

3.2 Sampling design

Sampling design refers to the procedure through which the ultimate sampling units for data collection are selected. The Directorate of Extension Education, CSK HPKV Palampur conducted 52 trainings sponsored by SJVN in different fields of specialization in which 1300 farmers were trained (Table 3.1). Out the twelve districts of the state, district Kangra was selected purposively on the basis of highest number of trainees among the different districts of the state. For the selection of respondents, two stage sampling technique was adopted. At the first stage of sampling, out of 5 major fields of specialization i.e. integrated farming, vegetable farming, mushroom cultivation, bee keeping, protected cultivation, organic farming (Table 3.1), two fields of specialization i.e. integrated farming and vegetable farming were selected randomly. At the second stage of sampling, the list of trained farmers in the selected categories was prepared from the records of Directorate of Extension Education (DEE), CSK HPKV, Palampur. From the list so prepared, a sample of 60 trainees (comprising 30 trainees from each selected category) was also selected randomly. The two categories selected for the analysis were Integrated Farming (Category 1) and Vegetable farming (Category 2). The schematic representation of sampling plan has been depicted in figure 3.2.

3.3 Data collection

In order to meet out the requirements of specific objectives of the study, both primary as well as secondary data were collected.

3.3.1 Primary data

The primary data were collected by personal interview on well-structured survey schedules. The survey schedule so prepared was pre-tested in order to examine the relevance of structured questions. The objectives of scientific investigation were elucidated clearly to the respondents before recording the responses. The primary data from trained farm households were collected during the agricultural year 2019-20. The detailed information from respondents is as follows:

1. Demographic features like age, education, family size, main and subsidiary of respondent farmers etc.

2. Farm inventories like buildings, livestock, land utilization, farm implements and machinery etc.
3. Education and employment pattern of trained farm households.
4. Land use and cropping pattern
5. Awareness and adoption of farm technologies.
6. Household consumption pattern.
7. Livelihood security index.
8. Constraints faced by trained farm households.

3.3.2 Secondary data

The secondary data pertaining to various training programs for skill upgradation of farmers were collected from various published and unpublished sources like Directorate of Extension Education (DEE), CSK HPKV official reports, journals, books, internet etc. to fulfill the objectives of study.

3.4 Analytical framework

The primary and secondary data so collected were carefully scrutinized and compiled in excel worksheet and processed and tabulated by simple tabular method. The analysis of data was done by using appropriate mathematical and statistical tools like averages, percentages, indices etc. to meet out the specific objectives of the study. Various parameters of demographic features like age wise distribution, educational status, family size, inventory of farm buildings, inventory of implements and machinery, land utilisation and cropping pattern etc. have been presented through averages and percentages. The livelihood index of trained farm households has also been worked out in relevant chapter. In addition to averages and percentages, following ratio estimates and standard indices were used for analysing data.

3.4.1 Sex ratio

It represents the number of females per thousand males and was calculated for total sample population using the following formula:

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

3.4.2 Literacy rate

Literacy is the key of socio-economic progress of farmers. It is also one of the important criteria to estimate the quality of human resources available on the sample households. It was estimated by using following formula.

$$\text{Literacy rate (\%)} = \frac{\text{Total no. of literate persons}}{\text{Total population} - \text{Person below the age of 5years}} \times 100$$

3.4.3 Cropping pattern

The cropping pattern of the sample households was analyzed by computing proportion of area under various crops to the total cropped area, with the help of following formula.

$$Pi = \frac{Ai}{At} \times 100$$

where,

P_i =Proportion of area under i^{th} crop

A_i = Actual area under i^{th} crop

A_t = total cropped area during the agricultural year

3.4.4 Cropping intensity

The cropping intensity indicates the degree of using cultivated area for the cultivation of crops during the particular agricultural year. It has been worked out as the ratio of gross cropped area to the net sown area and expressed in percentage terms.

$$\text{Cropping intensity(\%)} = \frac{\text{Gross Cropped Area}}{\text{Net sown area}} \times 100$$

3.4.5 Technological gap

The package of practices with respect to seeds, fertilizers, plant protection measures for different crops and associated management practices has been given in Package of practices, Directorate of Extension Education, CSKHPKV, Palampur, HP. The variation in the adoption of recommended practices is considered as gap. Therefore, the extent of adoption of recommended practices with respect to parameters like seeds and fertilizers were estimated by formula

$$\text{Technological gap} = \frac{\text{Recommended technology} - \text{Existing technology}}{\text{Recommended technology}} \times 100$$

3.4.6 Livelihood security index (LSI)

The livelihood status of the trained farm households was analysed using the composite Livelihood Security Index (Venu et al., 2017 and Hatai and Sen, 2008). In addition to this, the LSI was also analysed using a balanced weighted average approach where each indicator is assumed to contribute equally to the overall index. The indicators are grouped into different domains i.e. economic, food, educational and social security. These domains were further categorized into different components which are specified as below:

Educational security: It includes average years of schooling of family members, number of educational institutions (within 2 km) and relative accessibility of educational institutes (distance in km) to trained households.

Food security: It comprises of per capita consumption of rice (kg/month), per capita consumption of wheat (kg/month), per capita consumption of vegetables (kg/month) and per capita consumption of milk (lts/month) of trained farm households.

Economic security: It consists of value of farm assets excluding land (Rs.), on farm income (Rs.), off-farm income (Rs.) and land ownership (in ha) of trained households.

Social security: It includes family members educated above senior secondary, active workers/ family, number of females in government jobs, females in private job and social participation (NGOs, Self Help Groups (SHGs), co-operative societies, etc.)

Since, each component has been measured on a different scale, therefore, the components have been standardized by using the approach adopted in measuring "Life Expectancy" in Human Development Reports (Shaheen and Sanzidur, 2012).

$$Z_{ijk} = \frac{X_{ijk} - {}_{k=1}^{n}\min X_{ijk}}{{}_{k=1}^{n}\max X_{ijk} - {}_{k=1}^{n}\min X_{ijk}}$$ where,

Z_{ijk}= standardized components of each domain

i = domains (i = 1, 2, 3 and 4 for educational, food, economic and social domains, respectively)

j = components (j = 1, 2, 3, ….., j)

k = farmers (k =1, 2, 3, ……, k)

Once each component representing a particular livelihood security domain was standardized, the relevant livelihood security indices for each domain i.e. educational, food, economic and social were constructed by averaging their respective standardized components by using the formula given as below:

$$LSI_{ik} = \frac{\sum Z_{ijk}}{J}$$

where,

j = components (j = 1, 2, 3, ….., j)

k = farmers (k =1, 2, 3, ……, k)

J = no. of components used to construct a particular domain

The Composite Livelihood Security Index (CLSI) for the sample households was obtained using the formula:

$$CLSI_k = \frac{\sum W_{ik} LSI_{ik}}{N}$$

where,

ΣLSI_{ik}= Livelihood Security indices for each domain

N = Total number of domains

W_{ik}= Weight assigned to the i^{th} domain of LSI

If the weights are identical and sum up to unity i.e. ($W_{i1} + W_{i2} + W_{i3} + W_{i4} = 1$) then CLSI is calculated as a simple mean. But when the weights are different across all domains then CLSI is calculated as a weighted mean. For distinction, the former has been denoted simply as ‘CLSI’ and the latter as ‘CLSI*’.

The CLSI* was calculated by firstly taking the inverse of the proportional contributions of Educational Security Index, Food Security Index, Economic Security Index and Social Security Index to CLSI is to be obtained. Then, the weights to be assigned to each domain will be the ratio of its inverse contribution to the sum of all the four inverse proportions.

Garrett ranking

To find out the major constraints which influences the trained farm households, Garrett's ranking technique was used. Basically, it gives the change of orders of constraints and advantages into numerical scores. The major advantage of this technique is that constraints are arranged on the basis of their importance from the point of view of respondents. Garrett's formula for converting ranks into per cent is given by

$$\text{Per cent position} = \frac{100 \times (R_{ij} - 0.5)}{N_j}$$

where,

R_{ij} = Rank given for i_{th} factors by j_{th} individual

N_j = Number of factors ranked by j_{th} individual

The per cent position of each rank was converted to scores referring to garrett ranking conversion table. For each factor, the scores of individual respondents were added together and divided by the total number of the respondents for whom scores were added. These mean scores for all the factors were arranged in descending order, ranks were given and most important factors were identified**.**

4. RESULTS AND DISCUSSION

This chapter is of utmost importance since the research findings of study have been presented. The results have been presented on various aspects of the sample farm households viz., socio-economic profile, cropping pattern, pattern of use of inputs, output, knowledge of the adoption of farm technologies, pattern of household consumption, problems faced by trained farmers etc. The study findings were described in the form of tables and figures, by presenting potential scientific explanations. Such findings are summarized and discussed in the sections below

4.1 Description of the study area

4.2 Farm resources and production system

4.3 Awareness and adoption of farm technologies

4.4 Employment pattern, income and livelihood status of farm households

4.5 Problems faced by trained farm households

4.1 Profile of the Study Area

4.1.1 Historical Background

Himachal Pradesh is considered a land of deities and is often referred to as Devbhoomi. The state came into being on April 15, 1948 through the integration of 30 former princely states as a centrally administered territory. The State comprised of four districts at that time viz. Chamba, Mahasu, Mandi and Sirmaur. Himachal Pradesh attained the tall status of statehood on 25th January, 1971. The reorganization of the districts occurred on 1st September, 1972 in which two more new districts namely Una and Hamirpur were created. Presently, the state has 12 districts, 145 tehsils and 80 blocks.

4.1.2 Location and boundaries

District Kangra of the state lies between 31˚ 21′ to 32˚ 59′ N latitude and 75˚ 47′ 55″ to 77˚ 45′ E longitude. It is situated on the southern escarpment of the *Himalayas*. The entire area of the district is traversed by the varying altitude of the *Shiwaliks, Dhauladhar* and the *Himalayas* from north-west to south-east. The altitude varies from 500 metres above mean sea level (amsl) to around 5,000 metres

(amsl). It is encapsulated in the north by Chamba and Lahaul-Spiti district, in the south by Hamirpur and Una, in the east by Kullu and Mandi and in the west by Gurdaspur district of Punjab.

4.1.3 Physiographic features

Based on topography, soil, temperature, precipitation and irrigation facilities etc., Kangra district comprises of four distinct regions *viz.*,

High hills wet sub-temperate region

Valley region

Chanital region and

Shivalik foot-hill region

Bara Bhangal and Chota Bhangal areas in Pir Panjal region constitute the wet sub temperate hilly region which initiates from inter district boundaries of Kullu, Chamba and Mandi on the northern most end of the district.

4.1.4 Climate and rainfall

Himachal Pradesh lies in the lap of Himalayas. Its climate is largely conditioned by that single factor. It varies from mild to cold with area under snowing winters. The climate of study district varies from sub-tropical to sub-humid. The summer season extends from March to June and winter period prevails from December to February while July to September accounts for the rainy months. The average rainfall of the state in 2018 was recorded to be 1182.2 mm. Maximum rainfall in the state is recorded in Kangra district. Snowfall is received in higher reaches of Dhauladhar. Kangra district is having topography like Milawan at 400 m altitude, while areas of Bara Bhangal are at the altitude of 5,500 m. The agro-ecological situation varies from sub-tropical to wet/dry temperate regions. The high hills of Dhauladhar and Pir Panjal receive heavy snow in winter. Palampur and Dharamsala fall under wet temperate zone where the temperature ranges from 15° to 19°C and annual rainfall is about 2,500 mm. Other parts of the Kangra district fall under hill area where the mean annual temperature varies from 13° to 20°C and annual rainfall is 1800-3000 mm. Kangra district comprises of diverse areas ranging from Pir Panjal mountains to the low foothills in Shiwalik ranges with climatic variations from temperate to subtropical. The tract is one of the most fragile ecosystems. This tract supports and provides habitat for various kinds of flora and fauna.

Table 4.1: Average annual rainfall in Himachal Pradesh (2015-2018)

Sr. No.	Year	Rainfall (mm)
1.	2015	1996.3
2.	2016	1602.5
3.	2017	1993.1
4.	2018	2019.8
5.	Average rainfall	1902.93

4.1.5 Relief

Slope and aspect of an area are vital parameters that decide the land use pattern of the area and vegetation. Slope is also very important while determining the suitability of land for irrigation, land use capability and has direct bearing on the runoff, recharge capability of land. Magnitude and direction of slopes developed in the district are the net results of tectonic activities and drainage patterns prevailed in the area over the years. The slope in the district varies from almost flat to highly steep.

Table 4.2: Himachal Pradesh and Kangra district at a glance (2018-19)

Sr. No.	Particulars	Himachal Pradesh	Kangra	Per cent w.r.t. State
1	Area (Sq. Km.)	55,673	5,739	10.31
2	Tehsil (No.)	106	19	17.92
3	Sub-Tehsils (No.)	63	11	17.46
4	Sub-Divisions (No.)	71	9	12.67
5	Population (No.)	68,64,602	15,10,075	22.00
6	Rural population (No.)	61,76,050	14,23,794	23.05
7	Urban population (No.)	6,88,552	86,281	12.53
8	Total cropped area ('000 ha)	9,40,597	2,21,830	23.58
9	Net sown area ('000 ha')	5,38,412	1,15,748	21.50
10	Cropping intensity (%)	174.70	191.65	
11	Sex-ratio (females per 1000 males)	972	1012	
12	Literacy rate (%)	82.80	85.67	
	Male	89.53	91.49	
	Female	75.93	80.02	

Source : Statistical Abstract of Himachal Pradesh (2018-19), Economics and Statistics Department, Govt. of H.P., India

The salient features of district Kangra are presented in Table 4.2. It can be seen from the table that Kangra district accounts for 22.00 per cent of the total

population of the state. A majority of the population (about 94%) is concentrated in the rural areas. The sex-ratio in the district is higher (1012 females per 1000 males) as compared to the state (972 females per 1000 males). The literacy level is 85.67 per cent which is also higher than that of the state as a whole (82.80%). The male and female literacy rate in the district is 91.49 per cent and 80.02 per cent, respectively. The cropping intensity realised in the district (191.65%) is higher than that of the state (174.70%).

The details of key features of the state (as per census 2011) are given in Table 4.2. It can be observed from the table that the state extends over an area of 55,673 sq. kms. Total population of the state was 68,64,602 with rural population of 61,76,050 and urban population of 6,88,552. Net sown area of the state was 5,38,412 ('000 ha) with cropping intensity of 174.69.

4.1.6 Land utilization pattern

There is a preponderance of small land holdings in Himachal Pradesh. Land is a scarce resource, whose supply is fixed for all practical purposes. The demand of land for various competing purposes is continuously increasing with the increase of human population and economic growth. The land utilization pattern of the state has been presented in Table 4.3. It can be seen from the table that total geographical area of the state was 45,77,742 hectares. Among the different land use categories, maximum area was under permanent pasture and grazing lands i.e. 15,07,965 ha in the state. Total cropped area in the state was reported to be 9,59,223 ha. Out of the total cropped area, net sown area in the state was 5,47,556 ha.

Table 4.3 Land utilization pattern of Himachal Pradesh (2018)

(in ha)

Sr. No.	Particulars	Himachal Pradesh
1.	Geographical Area by village papers	45,77,742
2.	Forest land	11,25,386
3.	Misc. Tree crops & Groves (Not included in net area sown)	66,595
4.	Permanent pastures & other grazing lands	15,07,965
5.	Culturable waste	1,21,714
6.	Land put to non-agricultural uses	3,52,407
7.	Barren and Unculturable land	7,78,998
8.	Current Fallows	55,754
9.	Other Fallows	21,367
10.	Net area sown	5,47,556
11.	Area sown more than once	4,11,667
12.	Total cropped area	9,59,223

Source: Statistical abstract of Himachal Pradesh (2018-19)

4.1.7 Area and production of different crops

Table 4.4 indicates the distribution of total cropped area among the different crops in a particular agricultural year. The analysis of area under different crops indicates the relative importance of crops in a particular region. Table 4.4 depicts area and production of different crops grown in the state. It can be seen from the table that maximum area was allocated for the cultivation of wheat in the state. The area under pulses, oilseeds and common millets in the state was reported to be 28,466 ha, 9,929 ha and 4,098 ha respectively. The table further indicates the production of different crops in the state. Total wheat production in the state was 5,65,736 M.T. respectively. A total oilseed production of 5,802 M.T. in the state was recorded in the state.

Table 4.4: Area and production of different crops in Himachal Pradesh (2018)

Sr. No.	Particulars	Himachal Pradesh	
		Area (ha)	Production (M.T.)
1	Wheat	3,18,874	5,65,736
2	Maize	2,80,811	7,11,114
3	Rice	71,613	1,14,785
4	Barley	19,160	33,878
5	Ragi	1,817	1,918
6	Pulses	28,466	57,370
7	Common millets	4,098	3,306
8	Total Food grains	7,24,839	14,88,107
9	Chillies	663	267
10	Ginger	2,505	15,947
11	Oil seeds	9,929	5,802

Source: Statistical abstract of Himachal Pradesh (2018-19).

4.2 Farm resources and production system

Farm resources

Land, labour, capital and management are the basic factors of production of any farm as well as non-farm enterprise. The seasonality of production, perishability of products, bulkiness of produce and processing requirements before consumption of most of agricultural products make the agricultural products quite different from that of industrial products. Similarly, the input requirements of these are also different i.e. most of the agricultural enterprises are land based and labour intensive. The scale of farming to a greater extent is influenced by size of holding, availability of family and

hired labour, access to infrastructural amenities, market etc. The analysis of these factors of production from the point of view of their availability and accessibility to the farm households is of utmost importance. Depending on the availability of these resources in different regions suitable policies may be designed to improve the socio-economic conditions and livelihood status of households. Keeping these considerations in mind an attempt has been made to assess the status of these resources in the study area.

Agricultural production is a biological process and is influenced by a large number of factors including land, labour, capital, management and other environmental factors. Among these factors of production, land, water and environmental conditions for a particular enterprise are nature's gift while other material inputs and labour are arranged and managed by farm manager. While planning for agricultural production, a farmer has to arrange land, irrigation, seeds, fertilizers, plant protection materials etc. The availability of these resources varies from farmer to farmer and region to region. The adoption of a particular enterprise to greater extent is influenced by availability as well as access of a farmer to critical factors of production. Keeping these factors into consideration, an attempt has been made to study the resource endowment of sample households. The details are as follows:

4.2.1 Human resources

Farming in hilly areas is a labour-intensive venture and the members of family work as a unit to accomplish the various farm operations. The majority of farmers in the state practice a mixed farming system where crops, livestock, horticulture and allied farm enterprises are taken up under a single management unit. All these activities are planned and executed in the light of availability of family members, active workers, and dependent members in the family. Thus, the availability of human resource, active workers and family status of sample households have been examined and discussed as under.

4.2.1.1 Age wise distribution

Age of an individual is an important factor which indicates his capacity to work and wisdom. It is generally observed that elder members of a farm household are

mainly responsible for decision making about farm activities. Their decisions are usually based on their life-long experiences. Agriculture itself is a nature bound enterprise which requires series of rational decisions from the point of production to marketing. Generally, various decisions involving investment, choice of crops to be grown, decisions regarding marketing etc., are jointly taken by head as well as family members. In this context, age-wise distribution of head as well as family members is given below:

i) Heads of the family

The age wise distribution of heads of the families of sample households is presented in Table 4.5. It can be observed from the table that majority of the heads of families i.e. 43.33 per cent were in the age group of 41-60 years. Farm category wise comparison shows that this proportion was relatively higher in integrated farming category in comparison to vegetable cultivation category. The proportion of heads of families in the age group of 25-40 years and above the age of 60 years accounted for about 33 and 23 per cent, respectively on overall farm situation. None of the head of family was below the age of 25 years on sample farms. It indicates that majority of heads of family were quite experienced and belonged to elder age groups.

Table 4.5: Age wise distribution of heads of families of sample farm households

(Numbers)

Sr. No.	Age Group	Integrated farming	Vegetable farming	Overall
1	< 25 years	-	-	-
		-	-	-
2	25-40 years	9	11	20
		(30.00)	(36.67)	(33.34)
3	41-60 years	14	12	26
		(46.67)	(40.00)	(43.33)
4	> 60 years	7	7	14
		(23.33)	(23.33)	(23.33)
	Total	30	30	60
		(100.00)	(100.00)	(100.00)

Note: Figures in parentheses indicate percentages to total.

ii) Family members

The age wise distribution of family members of sample households has been depicted in Table 4.6. The average size of family on sample farms was estimated at about 5 members. It was comparatively higher under integrated farming category as compared to vegetable farming category. The prevalence of nuclear family system may be responsible for the small family size. The age wise distribution of family indicates that majority of farm family members were in the age group of 25-40 years accounting for about 32 per cent of total population. The population under age group of 15-25 years accounted for about 16 per cent. Similarly, on different farm categories, the highest proportion of sample population was in the age group of 25-40 years and it accounted for 34 and 29 per cent on integrated farming and vegetable farming category, respectively. The sex ratio was estimated at about 901, 948 and 924 on integrated farming, vegetable farming and overall farm situation, respectively. It implies that proportion of males in sample population was relatively higher in the study area. The table further indicated that about 16 and 10 per cent family members belong to age groups up to 15 years and more than 60 years, respectively on overall farm situation. Most of the members up to age group of 15 years were school going while those above 60 years of age were in the category of senior citizens and reluctant to perform any physical operation on the farm. Therefore, the contribution of these age groups (less than 15 years and above 60 years) was found to be least toward the agricultural activities.

Table 4.6: Age wise distribution of family members of sample farm households

(Numbers)

Sr. No.	Age group in years	Integrated farming			Vegetables farming			Overall		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
1.	<15	15	7	22	15	11	26	30	18	48
		(18.52)	(9.59)	(14.29)	(19.48)	(15.07)	(17.33)	(18.99)	(12.33)	(15.79)
2.	15-25	13	12	25	13	12	25	26	24	50
		(16.05)	(16.44)	(16.23)	(16.88)	(16.44)	(16.67)	(16.46)	(16.44)	(16.45)
3.	25-40	26	27	53	23	20	43	49	47	96
		(32.1)	(36.98)	(34.42)	(29.87)	(27.4)	(28.67)	(31.01)	(32.19)	(31.57)
4.	41-60	22	20	42	18	19	37	40	39	79
		(27.16)	(27.4)	(27.27)	(23.38)	(26.03)	(24.67)	(25.31)	(26.71)	(25.99)
5.	>60	5	7	12	8	11	19	13	18	31
		(6.17)	(9.59)	(7.79)	(10.39)	(15.06)	(12.66)	(8.23)	(12.33)	(10.2)
	Total	81	73	154	77	73	150	158	146	304
		(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
	Average family size			5.13			5			5.07
	Sex ratio			901.23			948.05			924.05

Note: Figures in parentheses indicate percentages to total

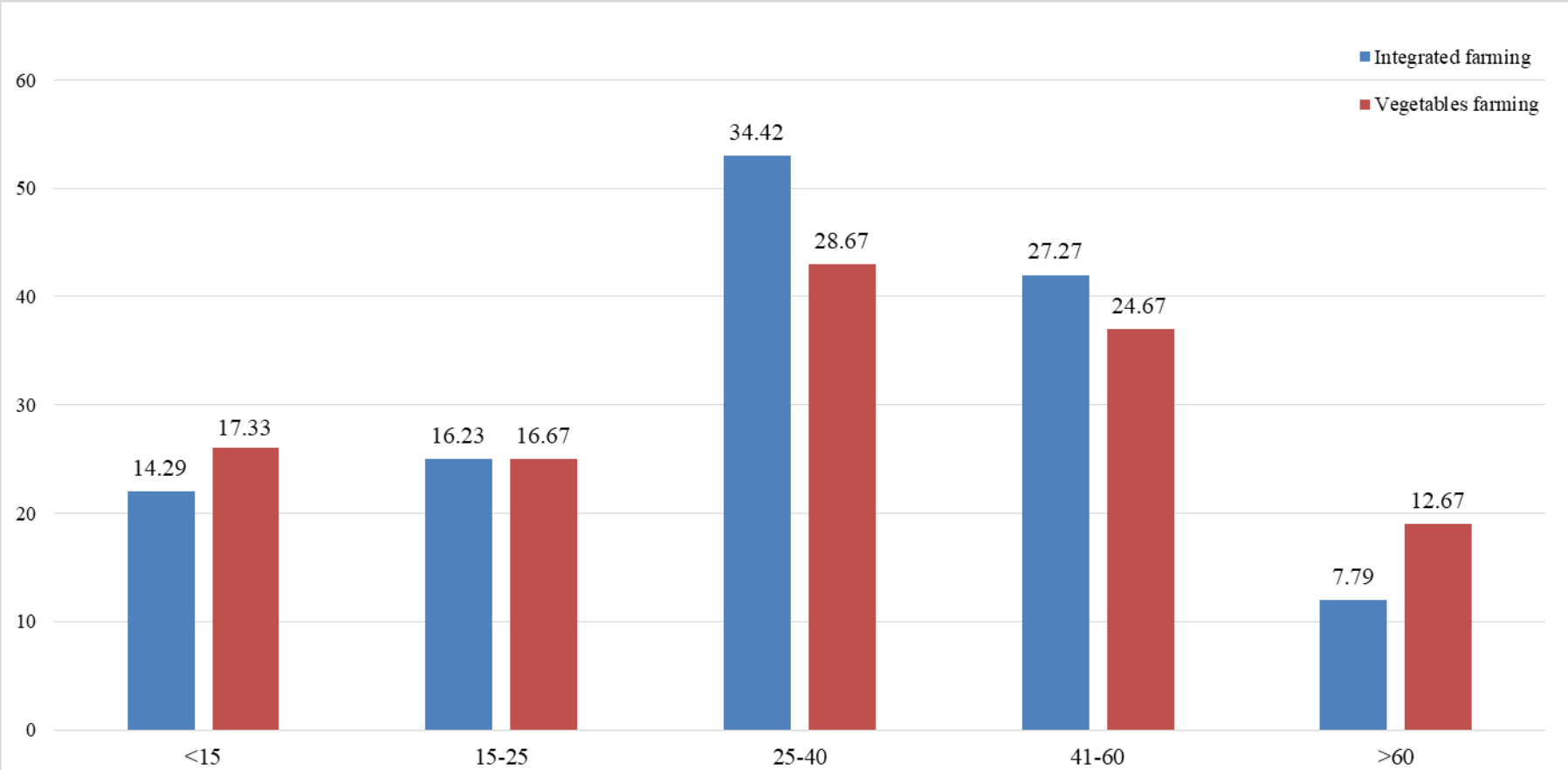

Fig 4.1 Age wise distribution of family members on sample farms

.

4.2.1.2 Availability of active work force

In general, all the members of a family do not participate in farm activities. It was observed that majority of the family members i.e. up to the age of 25 years were school/college going. In the same manner, the contribution of members above 60 years of age in farming was also quite low. Thus, these two age groups were dependent on other family members i.e. in the age group of 25-60 years. Thus, the family members available for on-farm and off-farm activities may be less than the actual size of family. Therefore, the examination of per day availability of human manpower, active workforce and dependent population of sample households is essentially important from farming point of view and the same has been analysed and depicted in Table 4.7. It indicates that the proportion of male population was relatively higher as compared to female members on different farm situations. In general, the population between the age group of 25-60 years was considered as active workers. On the other hand, the population below age of 25 years and above 60 years was considered as non-workers/dependent population. During the survey, it was observed that some senior citizens (above 60 years) who were in good health and population between 15-25 years who have left the school were also contributing in farm activities. Therefore, 20 per cent of members between 15-25 years (who have left the school) and 10 per cent of members above the age of 60 years were also considered as active workers. The population of active workers ranged between 2.9 members on vegetable farming category to 3.37 members in case of integrated farming category. On an average, per day availability of active workforce was estimated at 3.3 members on overall farm situation. The dependency ratio which was estimated as ratio of dependent population and active workforce was estimated at 0.38 on overall farm situation which indicates that 38 per cent population depends on active workforce population. It was found to be highest in case of vegetable farms (0.42) compared to integrated farms (0.34). The gender wise comparison indicates that the extent of dependency was relatively higher in case of males as compared to females. The extent of dependency in case of males was relatively higher on vegetable farms.

Table 4.7: Active workforce availability on the farm

(Per farm)

Sr. No.	Particulars	Integrated farming	Vegetables farming	Overall
1	Availability of total man power			
i	Male	2.7	2.57	2.63
ii	Female	2.43	2.43	2.43
	Total	5.13	5.00	5.07
2	Dependent Population			
i	Male	1.00	1.09	1.04
ii	Female	0.76	1.01	0.89
	Total	1.76	2.10	1.94
3	Active workforce			
i	Male	1.70	1.48	1.59
ii	Female	1.67	1.42	1.54
	Total	3.37	2.90	3.13
4	Dependency ratio			
i	Male	0.37	0.42	0.40
ii	Female	0.31	0.42	0.37
	Total	0.34	0.42	0.38

4.2.1.3 Family characteristics

Many socio-economic factors are core determinants for measuring the livelihood pattern of farmers. Besides age and education, other family features like type of family and economic status of family also play important role in the personality of human being. The number of members in the family generally depends on type of family system i.e. joint or nuclear. Traditionally, joint family system had been the most predominant system in rural areas. However, over the time, the trend of joint family system has been declining. The analysis of type of families is given in Table 4.8. The analysis revealed that under overall farm situation 58.33 per cent of the respondents had nuclear families while 41.67 per cent farmers lived in joint families. Since agriculture is a joint venture of family, therefore family resources and family labour are also influenced by the type of family. It can be clearly observed that the trend of nuclear families has been expanding these years even in rural communities. It is evident that economic status relates to availability of farm resources as well as financial stability of family. In such circumstances, livelihood attained by BPL families is not sufficient for sustaining entire family. Therefore, in order to uplift the

economic status of BPL farm households, supplementary sources of income may be introduced through need-based training. The analysis of economic status of farm households revealed that 43 families out of 60 sample farm households belong to above poverty line (APL) category accounting for 71.67 per cent of total farm households on overall farm situation. Farm category wise comparison indicated that the proportion of BPLs was found to be higher on integrated farms compared to vegetable farming category i.e. about 33 per cent and 23 per cent, respectively. On an average, about 28.33 per cent farm households belong to below poverty line (BPL) category.

Table 4.8 Economic status and type of family system of sample households

(Number)

Sr. No.	Particulars	Integrated	Vegetables	Overall
1	**Family system**			
i	Nucleus	19	16	35
		(63.33)	(53.33)	(58.33)
ii	Joint	11	14	25
		(36.67)	(46.67)	(41.67)
2	**Economic status**			
i	APL	20	23	43
		(66.67)	(76.67)	(71.67)
ii	BPL	10	7	17
		(33.33)	(23.33)	(28.33)
3	Total households	30	30	60
		(100.00)	(100.00)	(100.00)

Note: Figures in parentheses indicate percentages to total.

4.2.2 Land

Land is one of the basic and important factors of production as far as farming is concerned. Depending upon the various requirements of farming households, it may be put to several uses like cultivation of crops, orcharding, dairying, buildings, etc. In a society, the size of holdings varies from individual to individual and the individuals with relatively larger size of holdings have more opportunities for diversification and

upscaling of farm enterprises. In some cases, the selection of agricultural enterprises is also influenced by size of holdings. The size of holding and its utilization by integrated and vegetable farming categories of trained farm households has been examined and is depicted in Table 4.9 The average size of land holding was estimated at 0.3595 hectares on overall farm situation. The farmers were found to lease-in or lease out land but the area was quite low i.e. 0.0020 and 0.0010 hectares, respectively. The table indicates that the size of land holdings in case of integrated farming category was found to be larger (0.3840 hectares) compared to the vegetable farming category (0.3350 hectares). The major portion of the total land holding was rainfed (75.24 per cent) on overall farm situation. The proportion of irrigated area was found to be higher on vegetable farming category compared to integrated farming category, accounting for 25.07 per cent and 24.48 per cent of total size of holding, respectively.

The available land holding was used for various purposes like cultivation, forests, orchards, non-agricultural uses, barren and uncultivated land, permanent pasture & grazing lands, cultivable waste land fallow land. The major portion (84.98 %) of the available land was put under the cultivation of crops followed by fallow land. Among the different categories of farms, the proportion of cultivated land was comparatively higher in vegetable farming category in comparison to integrated farming category. The results further revealed that the major portion of total land holding was utilized for the cultivation of crops i.e. 0.3150, 0.2960 and 0.3055 hectares accounting for 82.03, 88.36 and 84.98 per cent on integrated farming, vegetable farming and overall farm situation, respectively. On an average, 91.57 per cent irrigated land was found to be cultivated land while 82.81 per cent of un-irrigated land were put under cultivation. In context of enterprise distribution, irrigated and un-irrigated cultivated land was found to be 87.23 and 80.34 per cent, respectively under integrated farming.

Table 4.9 Land inventory and utilisation pattern of sample households

(ha/farm)

Sr. No.	Particulars	Integrated farming			Vegetables farming			Overall		
		I	UI	Total	I	UI	Total	I	UI	Total
	Land owned	0.0900	0.3020	0.3920	0.0840	0.2590	0.3430	0.0870	0.2805	0.3675
	Leased in land	0.0040	-	0.0040	-	-	-	0.0020	-	0.0020
	Leased out land	-	0.0120	0.0120	-	0.0080	0.0080	-	0.01	0.01
	Total land	0.0940	0.2900	0.3840	0.0840	0.2510	0.3350	0.0890	0.2705	0.3595
	Land utilization									
	Cultivated land	0.0820	0.2330	0.3150	0.0810	0.2150	0.2960	0.0815	0.224	0.3055
		(87.23)	(80.34)	(82.03)	(96.43)	(85.66)	(88.36)	(91.57)	(82.81)	(84.98)
1	Land under forests	-	0.007	0.007	-	-	-	-	0.0035	0.0035
		-	(2.41)	(1.82)	-	-	-	-	(1.29)	(0.97)
2	Land under non-agricultural use	0.0040	0.0050	0.0090	-	-	-	0.0020	0.0025	0.0045
		(4.26)	(1.72)	(2.34)	-	-	-	(2.25)	(0.92)	(1.25)
3	Barren & uncultivable land	-	0.0070	0.0070	-	0.0050	0.0050	-	0.0060	0.0060
		-	(2.41)	(1.82)	-	(1.99)	(1.49)	-	(2.22)	(1.67)
4	Permanent pastures &grazing land	-	0.0140	0.0140	-	0.0050	0.0050	-	0.0095	0.0095
		-	(4.83)	(3.65)	-	(1.99)	(1.49)	-	(3.51)	(2.64)
5	Cultivable wasteland	-	-	-	-	0.0140	0.0140	-	0.0070	0.0070
		-	-	-	-	(5.58)	(4.18)	-	(2.59)	(1.95)
6	Fallow land	-	0.0100	0.0100	0.0030	0.0120	0.0150	0.0015	0.0110	0.0125
		-	(3.45)	(2.6)	(3.57)	(4.78)	(4.48)	(1.69)	(4.07)	(3.48)
7	Land under misc.	-	0.0020	0.0020	-	-	-	-	0.0010	0.0010
		-	(0.69)	(0.52)	-	-	-	-	(0.37)	(0.28)
8	Current fallows	0.0080	0.0120	0.0200	-	-	-	0.0040	0.0060	0.0100
		(8.51)	(4.14)	(5.21)	-	-	-	(4.49)	(2.22)	(2.78)
9	Total land holdings	0.0940	0.2900	0.3840	0.0840	0.2510	0.3350	0.0890	0.2705	0.3595
		(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Note: i) Figures in parentheses indicate percentages to total.

IR-Irrigated, UR-Un-irrigated.

4.2.3 Inventory of buildings on sample farms

Farm buildings are important assets for a farm household and signify their status. Thus, it is amongst the top priorities of respondents to invest lavishly on the building assets. During the survey, it was found that the respondents were having three type of constructions *Kutcha*, *Pacca* and *mixed*. The inventory of buildings like residential houses, cattle sheds, stores etc. of sample households have been documented and presented in Table 4.10. *Kuccha* type of residential houses are generally inherited from the previous generation while *pucca* type are the ones built by the respondents in recent years. However, it was observed that some respondents instead of building new residential buildings, modified the older kuccha type which is referred as *mixed* type. On an average, a household had 1.92 buildings comprising 1.00, 0.78 and 0.13 residential, cattle shed and store on overall farm situation, respectively. As far as different categories of farms were concerned, the total inventory was estimated at 1.75 on vegetable farms and 2.05 on integrated farm situation. The table further indicated that all the sample households were having 1 residential building while as far as cattle sheds were concerned, only about 55 per cent of vegetable farming category were having cattle sheds. It was due to the fact that the livestock inventory of vegetable farming households was low as compared to integrated farming category households. Some of the vegetables farming category households had not kept livestock and few were sharing cattle sheds with neighbours. On the other hand, the average inventory of cattle sheds on integrated farming category households was 1. It was mainly due to the fact that their livestock inventory was relatively higher and were in the needs of cattle sheds. As far as type of constructions of buildings on sample households was concerned, in case of residential buildings, the highest proportion was *pucca* (25.00 per cent) followed by mixed construction (20.83 per cent). On the other hand, in case of cattle sheds, the highest proportion was *kuccha* (39.06 per cent) followed by mixed type (1.56 per cent) on overall farm situation.

The investment pattern of farm buildings has been depicted in Table 4.11. It may be observed from the table that the total value of farm buildings on overall farm situation was to the tune of Rs. 10,36,188. In the total value of buildings, the proportion of value of residential buildings was quite high (95 per cent) while cattle

shed and store accounted for 5.04 and 0.77 per cent of total value of buildings, respectively. Almost similar pattern of investment was observed on integrated and vegetable farming categories. However, the value of total buildings on vegetable farming category was about 30 per cent higher as compared to integrated farming categories. It was mainly due to higher value of residential buildings on vegetable farming category i.e. Rs. 11,18,300 as against Rs. 8,28,575 on vegetables farming.

Table 4.10 Inventory of farm buildings on sample farms

(Number/farm)

Sr. No.	Particulars	Integrated farming	Vegetables farming	Overall
		No.	No.	No.
1	Residential			
i.	Kutcha	0.05	0.2	0.13
		(2.44)	(11.43)	(6.77)
ii.	Pucca	0.55	0.4	0.48
		(26.83)	(22.86)	(25.00)
iii.	Mixed	0.4	0.4	0.4
		(19.51)	(22.86)	(20.83)
	Subtotal	1	1	1
		(48.78)	(57.14)	(52.08)
2	Cattle shed			
i.	Kutcha	0.95	0.55	0.75
		(46.34)	(31.43)	(39.06)
ii.	Pucca	-	-	-
		-	-	-
iii.	Mixed	0.05	-	0.03
		(2.44)	-	(1.56)
	Subtotal	1	0.55	0.78
		(48.78)	(31.43)	(40.63)
3	Store			
i.	Kutcha	-	0.15	0.08
		-	(8.57)	(4.17)
ii.	Pucca	-	-	-
		-	-	-
iii.	Mixed	0.05	0.05	0.05
		(2.44)	(2.86)	(2.60)
	Subtotal	0.05	0.2	0.13
		(2.44)	(11.43)	(6.77)
	Total	2.05	1.75	1.92
		(100.00)	(100.00)	(100.00)

Note: Figures in parentheses indicate percentages to total.

Table 4.11 Investment pattern of farm buildings on sample farms

(Rs. /farm)

Sr. No.	Particulars	Integrated farming	Vegetables farming	Overall
		Value (Rs.)	Value (Rs.)	Value (Rs.)
1	Residential			
i	Kutcha	6575	25400	15988
		(0.73)	(2.16)	(1.54)
ii	Pucca	397000	432900	414950
		(44.21)	(36.87)	(40.05)
iii	Mixed	425000	660000	542500
		(47.32)	(56.20)	(52.35)
	Subtotal	828575	1118300	973438
		(92.26)	(95.23)	(93.94)
2	Cattle shed			
i	Kutcha	62000	42500	52250
		(6.91)	(3.62)	(5.04)
ii	Pucca	-	-	-
		-	-	-
iii	Mixed	5000	-	2500
		(0.56)	-	(0.25)
	Subtotal	67000	42500	54750
		(7.46)	(3.62)	(5.28)
3	Store			
i	Kutcha	-	9750	4875
		-	(0.83)	(0.47)
ii	Pucca	-	-	-
		-	-	-
iii	Mixed	2500	3750	3125
		(0.27)	(0.32)	(0.30)
	Subtotal	2500	13500	8000
		(0.28)	(1.15)	(0.77)
	Total	898075	1174300	1036188
		(100.00)	(100.00)	(100.00)

Note: Figures in parentheses indicate percentages to total.

4.2.4 Inventory of farm implements

Farming without tools is almost impossible hence, the farmers have been designing and continuously modifying tools and implements since long for executing different farm operations. The mechanical farm tools improve efficiency on one hand and reduce the drudgery of human labour on the other hand. Thus, the state government is promoting farm mechanization in the state through different schemes and incentives. Despite the efforts of the government, the extent of mechanization in the state is quite low as compared to the adjoining states like Punjab and Haryana. It may be due to the small size of holdings, poor financial status of the farmers, limited availability and high cost of machinery and tools suitable for hilly areas. Since, farming involves use of manual labour, it becomes time consuming and extremely exhausting venture. The respondents were found to be using various farm tools and implements. A detailed description of these farm implements is given in Table 4.12.

It is evident from the table that on an average household has 13.45 farm tools, implements and machinery comprising 1.9 and 11.55 major and minor implements, respectively. The farm category wise comparison shows that farm households under integrated farming category has 1.9 and 11.9 major and minor farm implements respectively. In case of vegetable farming category, these figures were found to be 1.9 and 11.2, respectively. The major farm implements included tractor, power tiller, chaff cutter, thresher, sprayer, water pump etc. Among these, the number of chaff cutter were found to be highest (0.65) followed by spray pump (0.63) and water pump (0.35) of the total. On the other hand, the number of tractors, power tiller, threshers were quite low i.e. in the range of 0.08 to 0.13, which may be attributed to the fact that the size of operational holdings of the sample household was quite low i.e. 0.3595 hectares on overall farm situation and it was not economical to purchase these on account of their high cost and less requirement on the farm. Hence, the services of these were hired from the local areas. In terms of category wise situation, it was found that farm households under integrated farming category and vegetables farming had similar number of major implements (about 1.9 each). The table further indicates that the number of minor implements and tools with the farmers were relatively more

compared to major implements. It was mainly due to the fact that minor implements like sickle, axe, hoe, spade etc. were of low cost and are frequently used on the farm for day to day farm operations like cutting and intercultural operations, hence were owned by the respondents depending upon the availability of active workers. Among the minor implements, the number was found to be highest in case of sickles (6.98) followed by spade (1.5), hoe (1.1), axe (1.05) and rake (0.8) of the total farm implements on overall farm situation. Almost similar pattern was observed for different categories of farms.

As far as the total value of farm tools, implements etc. was concerned, on an average it was about Rs. 39,897 on overall farm situation. However, in category wise situation, it was found to be relatively higher on integrated farming category (Rs. 45,203) compared to vegetable farming category (Rs. 34,586). Although, the average number minor implements on farm were relatively higher than major implements, the value of major implements was relatively higher (Rs. 37,980) than minor implements (Rs. 1917) since, the major implements were expensive.

4.2.5 Livestock inventory

Livestock rearing is a common practice among the majority of rural households in hilly regions. Generally, the farmers maintain a livestock unit of 2 to 5 animals to meet out their domestic and market needs for milk, milk products, eggs, meat, wool, farm yard manure (FYM) and draught power. In mixed farming, as is prevalent in Himachal Pradesh, livestock plays a vital role in generation of round the year income and employment opportunities. The livestock component of farming exhibits a symbiotic relationship with crop production as it provides a valuable critical input to it in form of farm yard manure (FYM) and in turn gets fodder from the crops. The size of livestock unit reared by a family is based on two important factors i.e. family needs and availability of fodder. The details of livestock inventory on sample households has been compiled and depicted in Table 4.13.

Table 4.12 Inventory of farm machinery, tools and implements on sample farms

(Number/farm)

Sr. No.	Particulars	Inventory			Value (Rs. /farm)		
		Integrated farming	Vegetables farming	Overall	Integrated farming	Vegetables farming	Overall
	Major implements						
1	Tractor	0.1	0.05	0.08	25537	13494	19516
		(0.72)	(0.38)	(0.59)	(56.49)	(39.02)	(48.92)
2	Power tiller	0.1	0.15	0.13	7250	9000	8125
		(0.72)	(1.15)	(0.96)	(16.04)	(26.02)	(20.37)
3	Chaff-cutter	0.75	0.55	0.65	4375	3572	3974
		(5.43)	(4.20)	(4.83)	(9.68)	(10.33)	(9.96)
4	Thresher	0.1	0.05	0.08	4345	5000	4673
		(0.72)	(0.38)	(0.59)	(9.61)	(14.46)	(11.71)
5	Sprayer	0.5	0.75	0.63	365	558	462
		(3.62)	(5.73)	(4.58)	(0.81)	(1.61)	(1.16)
6	Water pump	0.35	0.35	0.35	1155	1305	1230
		(2.54)	(2.67)	(2.60)	(2.56)	(3.77)	(3.08)
	Subtotal	1.91	1.93	1.92	43027	32929	37980
		(13.75)	(14.51)	(14.28)	(95.19)	(95.21)	(95.20)
	Minor implements						
7	Plough						
i.	Wooden	0.15	0.05	0.1	185	40	113
		(1.09)	(0.38)	(0.73)	(0.41)	(0.12)	(0.28)
ii.	Iron	0.05	-	0.03	400	0	200
		(0.36)	-	(0.22)	(0.88)	(0.00)	(0.50)
8	Spade	1.5	1.5	1.5	350	358	354
		(10.87)	(11.45)	(11.11)	(0.77)	(1.04)	(0.89)

9	Hoe	1.05	1.15	1.1	236	240	238
		(7.61)	(8.78)	(8.17)	(0.52)	(0.69)	(0.60)
10	Rake	0.65	0.95	0.8	119	177	148
		(4.71)	(7.25)	(5.94)	(0.26)	(0.51)	(0.37)
11	Sickle						
i.	Local	6.8	5.6	6.2	536	448	492
		(49.28)	(42.75)	(46.09)	(1.19)	(1.30)	(1.23)
ii	Cerated	0.55	1	0.78	56	120	88
		(3.99)	(7.63)	(5.79)	(0.12)	(0.35)	(0.22)
12	Axe	1.15	0.95	1.05	294	274	284
		(8.34)	(7.25)	(7.80)	(0.66)	(0.78)	(0.71)
	Subtotal	11.9	11.2	11.55	2176	1657	1917
		(86.23)	(85.50)	(85.87)	(4.81)	(4.79)	(4.80)
	Total	13.8	13.1	13.45	45203	34586	39897
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Note: Figures in parentheses indicate percentages to total.

The table revealed that the average size of livestock was 1.62 units on overall farm situation. It was found to be relatively higher on integrated farming categories (1.8) compared to vegetable farming category. It is clear from the table that among the milch animals, the respondents were found to rear only cattle, which were estimated at 1.08 units on overall farm situations. The inventory of cattle on integrated and vegetable farming category was estimated at 1.30 and 0.85 units, respectively. Among the cattle, on overall farm situation about 49 per cent were of local breed whereas the proportion of local cattle on integrated farming category was higher (53.84 per cent) compared to vegetable farming category (41.17 per cent). In addition to cattle, the respondents of integrated farm category were also found to rear sheep and goats but their number was quite low (0.5 each) while these were not reared on vegetables farming category.

The total value of livestock unit turned out to be Rs. 23,138 on overall farm situation which was found to be higher on integrated farming category (Rs. 25,870). Among the different categories of livestock, improved cattle accounted for about 47, 54 and 50 per cent of total value of livestock on integrated farming, vegetable farming and overall farm situation, respectively. From the above discussion, it may be concluded that livestock inventory of the sampled respondents was quite low and cattle were more popular milch animal. The popularity of cattle among the respondents was due to their low cost of maintenance, high productivity compared to buffaloes and preference for the low-fat milk. It is very interesting to mention here that all the respondents were associated with cultivation of crops but none of them has maintained draught animals. It may be due to small size of holdings and easy availability of hired tractor services at nominal rates.

Table 4.13 Inventory and investment pattern of livestock on sample farms

(Per farm)

Sr. No.	Particulars	Integrated farming No.	Vegetables farming No.	Overall No.	Integrated farming Value	Vegetables farming Value	Overall Value
1	Local cow						
i.	Milking	0.60	0.25	0.43	9500	3950	6725
		(33.33)	(17.86)	(26.54)	(36.72)	(19.36)	(29.06)
ii.	Dry	0.10	0.10	0.10	1350	955	1153
		(5.56)	(7.14)	(6.17)	(5.22)	(4.68)	(4.98)
	Subtotal	0.70	0.35	0.53	10850	4905	7878
		(38.89)	(25.00)	(32.72)	(41.94)	(24.04)	(34.05)
2	Improved cow						
i.	Milking	0.50	0.40	0.45	10600	9500	10050
		(27.78)	(28.57)	(27.78)	(40.97)	(46.56)	(43.44)
ii.	Dry	0.10	0.10	0.10	1650	1500	1575
		(5.56)	(7.14)	(6.17)	(6.38)	(7.35)	(6.81)
	Subtotal	0.60	0.50	0.55	12250	11000	11625
		(33.33)	(35.71)	(33.95)	(47.35)	(53.91)	(50.24)
3	Heifer	0.40	0.15	0.28	2300	1250	1775
		(22.22)	(10.71)	(17.28)	(8.89)	(6.13)	(7.67)
4	Young stock	-	0.40	0.20	-	3250	1625
		-	(28.57)	(12.35)	-	(15.93)	(7.02)
5	Sheep	0.05	-	0.03	190	-	95
		(2.78)	-	(1.85)	(0.73)	-	(0.41)
6	Goat	0.05	-	0.03	280	-	140
		(2.78)	-	(1.85)	(1.08)	-	(0.61)
7	Total	1.80	1.40	1.62	25870	20405	23138
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Note: Figures in parentheses indicate percentages to total.

4.2.6 Inventory of fruit trees

The climatic conditions of the state are suitable for growing fruits like mango, citrus, guava, litchi etc. The respondents were maintaining fruit trees mainly for household consumption. They were not having separate orchards but fruit trees were maintained on the field bunds where crops were being cultivated (Table 4.14).

It is evident from the table that average fruit tree inventory on overall farm situation was only 5.73. Among different fruits maintained by the respondents, mango accounted for highest number of trees i.e. 4.11 accounting for about 72 per cent of total fruit tree inventory on overall farm situation. Next to mango, in terms of number was kinnow (0.67) followed by litchi (0.38). Almost similar pattern of fruit tree inventory was observed in case of integrated and vegetable farming category. Average production on overall basis was found to be 4.8 q. Among the different fruit crops, highest production was recorded in mango (4.55 q) accounting for about 95 per cent of the total production on overall farm situation. It was followed by kinnow and litchi accounting for 1.46 q production each on overall basis.

4.2.7 Facilities available in residential area

In addition to factors mentioned above, there are other factors which also indicate the status and quality of living. Facilities like road connectivity, water availability, electricity etc. helps to determine the social status of farm household in the society. Therefore, the respondents were also enquired about availability/accessibility of basic facilities which have been compiled in Table 4.15.

Table 4.15 reveals that on overall situation, 20 per cent of farm households were situated near the market while majority of farm respondents (80 per cent) lived in rural areas. It is worthy to take a note that all farm households had access to facilities like safe drinking water, electricity, toilet facility and telephone connectivity. It is also observed from the table that 18.33 per cent of total sample farm households had facility of nearby market while 86.67 households had cable connection in their homes. The facility for proper dumping of garbage was only available to 35 per cent of households. As far as the matter of well-maintained furniture was concerned, it was available with 60 per cent farm households on overall farm situation. However, this proportion was relatively higher for farm households under vegetables farming

Table 4.14 Inventory and production of different fruits on sample farms

(Per farm)

Sr. No.	Particulars	Integrated farming		Vegetables farming		Overall	
		No.	Production (q)	No.	Production (q)	No.	Production (q)
1	Mango						
i	Bearing	2.02	4.12	2.52	4.98	2.27	4.55
		(34.65)	(92.79)	(45.00)	(97.08)	(39.62)	(94.79)
ii	Non bearing	2.03	-	1.65	-	1.84	-
		(34.82)	-	(29.46)	-	(32.11)	-
	Subtotal	4.05	4.12	4.17	4.98	4.11	4.55
		(69.47)	(92.79)	(74.46)	(97.08)	(71.73)	(94.79)
2	Kinnow						
i	Bearing	0.64	0.11	0.12	0.02	0.38	0.07
		(10.98)	(2.48)	(2.14)	(0.39)	(6.63)	(1.46)
ii	Non bearing	0.22	-	0.35	-	0.29	-
		(3.77)	-	(6.25)	-	(5.06)	-
	Subtotal	0.86	0.11	0.47	0.02	0.67	0.07
		(14.75)	(2.48)	(8.39)	(0.39)	(11.69)	(1.46)
3	Litchi						
i	Bearing	0.35	0.08	0.25	0.06	0.30	0.07
		(6.00)	(1.80)	(4.46)	(1.17)	(5.24)	(1.45)
ii	Non bearing	0.15	-	-	-	0.08	-
		(2.57)	-	-	-	(1.40)	-
	Subtotal	0.50	0.08	0.25	0.06	0.38	0.07
		(8.58)	(1.80)	(4.46)	(1.17)	(6.63)	(1.46)

4	Guava						
i	Bearing	0.10	0.02	0.11	0.03	0.11	0.03
		(1.72)	(0.45)	(1.96)	(0.58)	(1.92)	(0.63)
ii	Non bearing	0.12	-	0.10	-	0.11	-
		(2.06)	-	(1.79)	-	(1.91)	-
	Subtotal	0.22	0.02	0.21	0.03	0.22	0.03
		(3.77)	(0.45)	(3.75)	(0.58)	(3.84)	(0.63)
5	Aonla						
i	Bearing	0.15	0.11	0.05	0.04	0.10	0.08
		(2.57)	(2.48)	(0.89)	(0.78)	(1.75)	(1.67)
ii	Non bearing	0.05	-	0.45	-	0.25	-
		(0.86)	-	(8.05)	-	(4.36)	-
	Subtotal	0.20	0.11	0.50	0.04	0.35	0.08
		(3.43)	(2.48)	(8.93)	(0.78)	(6.11)	(1.67)
	Total	5.83	4.44	5.60	5.13	5.73	4.80
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Note: Figures in parentheses indicate percentages to total.

category (86.67 per cent) in comparison to integrated farming category (33.33 per cent). The facilities like ownership of a vehicle were available with 60, 63.33 and 61.67 per cent respondents on integrated farming, vegetables farming and overall farm category, respectively.

Table 4.15 Facilities available in residential area

(Number)

Sr. No.	Particulars	Integrated Farming	Vegetable Farming	Overall
1	Situated			
i	in market	-	-	-
		-	-	-
ii	near market	10	2	12
		(33.33)	(6.67)	(20.00)
iii	in rural area	20	28	48
		(66.67)	(93.33)	(80.00)
2	Road connectivity	27	3	30
		(90.00)	(10.00)	(50.00)
3	Safe drinking water	30	30	60
		(100.00)	(100.00)	(100.00)
4	Facility of market	6	5	11
		(20.00)	(16.67)	(18.33)
5	Electricity	30	30	60
		(100.00)	(100.00)	(100.00)
6	Toilet facility	30	30	60
		(100.00)	(100.00)	(100.00)
7	Cable connection	28	24	52
		(93.33)	(80.00)	(86.67)
8	Telephone	30	30	60
		(100.00)	(100.00)	(100.00)
9	Maintained furniture	10	26	36
		(33.33)	(86.67)	(60.00)
10	Dumping zone for garbage	16	5	21
		(53.33)	(16.67)	(35.00)
11	T.V facility	24	30	54
		(80.00)	(100.00)	(90.00)
12	Vehicle	18	19	37
		(60.00)	(63.33)	(61.67)

Note: Figures in parentheses indicate percentages to total.

4.2.8 Production system

Agriculture production system usually refers to the organizing of different components of farming on a single management unit so as to meet the diverse family needs. Typically, agricultural production system is comprised of crops, livestock, farm forestry, allied farm enterprises etc. as its major components. Depending upon the diverse domestic and market needs, a farm household allocates various factors of production for producing various farm enterprises. The farming system may be termed as cereal based, or vegetable based or livestock based or horticulture based or mixed farming system depending upon their relative share of those components in total household income/employment. In this section, the production system has been analysed by taking into account the gross income from various sources of the sample households.

Crop production

Crop production is a routine farm activity among the majority of farming households in the state. The patten growing crops and production thereof is as under:

4.2.9 Cropping pattern

The cropping pattern indicates proportion of total cropped area under different crops during an agricultural year. It provides deep insight into farm plan of farmer and his preferences for the crop cultivation. The study of cropping pattern also helps the policy makers in directing their efforts and policies towards the crops preferred by the farmers. Since the land is limited and fragmented in hilly areas, therefore, increasing productivity is the best choice for agricultural production. The cropping pattern also reflects relative importance of crops of any region. The existing cropping pattern followed by respondents have been analysed and depicted in Table 4.16.

It can be clearly seen from the table that on overall farm situation, total cropped area and net cropped area was 0.6255 and 0.3055 hectares respectively. The cropping intensity in the existing scenario turned out to be 204.75 in overall situation. In terms of category wise situation, it was found to be higher on vegetable farming category (207.43 %) compared to integrated farming category. It was mainly due to the fact that the proportion of area allocated for vegetable crops was relatively higher on vegetable farming category farms. The table further reveals that during *kharif* season, paddy occupies highest area (18.96 per cent) among the cereal crops, followed by okra (6.62 per cent), cucumber (5.66 per cent) and maize (5.07). It was reported by majority of respondents that there has been considerable decline in the area under

maize crop in the period of last 5-10 years, mainly due to increased menace of stray cattle and monkey menace. In *rabi* season, wheat occupied highest area (23.88 per cent), followed by cauliflower (7.05 per cent) and peas (5.13 per cent). Among various crops cultivated in *rabi* season, wheat occupied highest area (0.1494 ha) followed by cauliflower (0.0441 ha) and peas (0.0321 ha). Similar trend was observed for farming under category wise situation. The area allocated under each crop varied depending on various factors like household consumption pattern, market demand and market price.

Table 4.16 Cropping pattern on sample farms

(ha/farm)

Sr. No.	Particulars	Integrated farming		Vegetables farming		Overall	
	Kharif	Area	%	Area	%	Area	%
1.	Paddy	0.1132	17.76	0.1240	20.20	0.1186	18.96
2.	Maize	0.0522	8.20	0.0112	1.82	0.0317	5.07
3.	Mash	0.0048	0.75	-	-	0.0024	0.38
4.	Green gram	0.0048	0.75	-	-	0.0024	0.38
5.	Chari	0.0299	4.69	0.0280	4.56	0.0289	4.62
6.	Bajra	0.0395	6.20	0.0212	3.45	0.0303	4.84
7.	Brinjal	0.0188	2.95	0.0215	3.50	0.0202	3.23
8.	Okra	0.0336	5.27	0.0492	8.01	0.0414	6.62
9.	Cucumber	0.0188	2.95	0.0520	8.47	0.0354	5.66
	Sub total	**0.3156**	**49.52**	**0.3071**	**50.01**	**0.3113**	**49.77**
	Rabi						
1.	Wheat	0.1628	25.55	0.1360	22.15	0.1494	23.88
2.	Barley	0.0048	0.75	0.0026	0.42	0.0037	0.59
3.	Rapeseed and mustard	0.0078	1.23	0.0160	2.61	0.0119	1.90
4.	Berseem	0.0240	3.77	0.0052	0.85	0.0146	2.33
5.	Oats	0.0072	1.13	-	-	0.0036	0.58
6.	Ryegrass	0.0144	2.26	0.0112	1.82	0.0128	2.05
7.	Cauliflower	0.0350	5.50	0.0532	8.66	0.0441	7.05
8.	Spinach	0.0086	1.36	0.0060	0.98	0.0073	1.17
9.	Radish	0.0076	1.20	0.0020	0.33	0.0048	0.77
10.	Peas	0.0226	3.55	0.0415	6.76	0.0321	5.13
11.	Onion	0.0192	3.01	0.0132	2.15	0.0162	2.59
12.	Garlic	0.0044	0.69	0.0120	1.95	0.0082	1.31
13.	Others	0.0030	0.48	0.0080	1.30	0.0055	0.88
	Sub total	**0.3216**	**50.48**	**0.3069**	**49.98**	**0.3142**	**50.23**
	Total cropped area	0.6372	100.00	0.6140	100.00	0.6255	99.99
	Net sown area	0.3150	-	0.296	-	0.3055	-
	Cropping intensity	**(202.3)**	**-**	**(207.43)**	**-**	**(204.75)**	**-**

Note: Figures in parentheses indicate percentages to total.

Production and productivity of different crops

The production of agricultural produce is ultimate objective of farming. The quantity of produce obtained from production process depends on many factors like climate, management ability of farmers etc. The production of different crops on an average household depicts the income generated from different crops over a given land. Therefore, the total production of major crops cultivated by sample households as well as their production per unit area has been compiled and discussed as under:

4.2.10 Production:

The per farm production of various cereals and vegetables crops on sample households has been presented in Table 4.17. The production of cereal crops like paddy, maize, wheat was estimated at 3.09, 0.85 and 3.34 quintals per farm, respectively on overall farm situation. In case of category wise situation, production of these cereals was relatively higher for farm households under integrated farming category i.e. 3.26, 1.35 and 3.98 quintal, respectively in comparison to vegetables farming category in which these figures were at 2.91, 0.35 and 2.74, respectively. Similar trend was observed in cultivation of fodder crops like chari and bajra in which the per farm production on integrated farming category was relatively higher (7.97 and 7.2 quintals, respectively) than vegetables farming category (6.79 and 3.68 quintals, respectively). However, as far as cultivation of vegetables is concerned, the production of vegetables farming category was much higher than the integrated farming category except for radish and onion. The average production of vegetables like cucumber, cauliflower, okra was recorded to be 5.77, 5.43 and 4.68 quintals per farm, respectively.

4.2.11 Productivity:

The productivity of crops refers to production per unit area. The production as such cannot be undertaken as deciding factor for selection of particular crops, as it does not depict the actual potential of crops due to its dependence on size of holding. Therefore, productivity is important parameter that guides the farmers to take

decisions regarding adoption and profitability of crops on their farms. The productivity of crops has also been presented in Table 4.17. Among the different cereal crops, the productivity of maize was found to be highest followed by paddy i.e. 32.49 and 26.05 quintals per hectare, respectively. In case of pulses, the productivity of green gram and mash both was found to be 8.33 quintals per hectare. The productivity of fodder crops like chari, bajra and berseem was at 255.3, 179.54 and 522.6 quintals/ha, respectively on overall farm situation. In category wise situation, the productivity of fodder crops was found to be marginally higher under integrated farming (266.73, 182.37 and 523.75 quintals/ha, respectively) in comparison to vegetables farming category (242.5, 173.58 and 515.38 quintals/ha, respectively). In case of vegetable crops, highest productivity was recorded in case of cucumber followed by onion, radish and brinjal (162.99, 143.83, 127.08 and 123.27 quintals/hectares, respectively) on overall farm situation. In terms of category wise situation, the productivities of vegetables under vegetable farming category were found to be higher (163.27, 154.55, 130.87 and 129.30 quintals/hectares, respectively) as compared to integrated farming category (161.70, 136.45, 124.35 and 116.49 quintals/hectares, respectively).

Table 4.17: Production and yields of different crops

Sr. No.	Particulars	Production (q)			Productivity (q/ha)		
	Kharif	Integrated farming	Vegetables farming	Overall	Integrated farming	Vegetables farming	Overall
1.	Paddy	3.26	2.91	3.09	28.80	23.50	26.05
2.	Maize	1.35	0.35	0.85	25.84	31.11	26.81
3.	Mash	0.03	-	0.02	6.25	-	8.33
4.	Green gram	0.03	-	0.02	6.25	-	8.33
5.	Chari	7.97	6.79	7.38	266.73	242.50	255.36
6.	Bajra	7.20	3.68	5.44	182.37	173.58	179.54
7.	Brinjal	2.19	2.78	2.49	116.49	129.30	123.27
8.	Okra	3.71	5.65	4.68	110.42	114.84	113.04
9.	Cucumber	3.04	8.49	5.77	161.70	163.27	162.99
	Rabi						
1.	Wheat	3.98	2.74	3.34	24.14	20.15	22.36
2.	Barley	0.07	-	0.04	14.58	-	10.81
3.	Berseem	12.57	2.68	7.63	523.75	515.38	522.60
4.	Oats	2.63	-	1.32	365.28	-	366.67
5.	Ryegrass	4.69	3.41	4.05	325.69	304.46	316.41
6.	Cauliflower	4.22	6.64	5.43	120.43	124.81	123.13
7.	Spinach	1.35	1.16	1.26	156.25	193.33	172.60
8.	Radish	0.95	0.26	0.61	124.35	130.87	127.08
9.	Peas	2.29	4.6	3.45	101.15	110.84	107.48
10.	Onion	2.62	2.04	2.33	136.45	154.55	143.83
11.	Garlic	0.21	0.61	0.41	47.73	50.83	50.00

4.2.12 Production of livestock products

The livestock forms an integral part of rural agricultural production system as it exhibits a symbiotic relationship with the crop production. In addition to the supplementation of farm yard manure to the crop production, it is one of the major activities for round the year the year income and employment generation. The inventory and value of livestock component of the sample households has already been presented in the previous section (Table 4.13). The production and income generation of the livestock component of the sample households for different categories of the farms has been examined and is depicted in Table 4.18. The cursory look at the table indicates that milk, curd, ghee, eggs, salable stock and farm yard manure are the major products of livestock components. Among these, milk was the major product and on average its annual production was about 1767, 1276 and 1523 litres on integrated farming, vegetables farming and overall farm category, respectively. The productivity of milk on integrated farming category was about 38.48 per cent higher compared to vegetables farming category, which may be attributed to more number of cattle on integrated farming category. On average, about 1019 litres/year was utilized i.e. about 67 per cent of total annual production was consumed/sold as fresh on overall farm situation. Farm category wise proportion of fresh milk utilization was about 66 and 69 per cent of total production on integrated and vegetables farming category, respectively. The table further indicates that the remaining quantity of milk i.e. about 213, 120, 96 and 73 litres was used for preparation of curd, paneer, ghee and other purposes accounting for about 14, 8, 6 and 5 per cent of total production on overall farm situation, respectively. The proportion of milk used for the production of curd, paneer, ghee, and other purposes on integrated farming category was about 12.54, 10, 8 and 4 per cent, respectively.

Table 4.18 Availability of livestock products on sample farms

Sr. No.	Particulars	Integrated farming		Vegetables farming		Overall	
		Qty (L)	Value (Rs.)	Qty (L)	Value (Rs.)	Qty (L)	Value (Rs.)
1.	Milk Available	1766.87	88344	1276.24	63812	1523.06	76153
2.	Consumed as fresh milk	1158.36	57918	880.61	44031	1019.49	50975
		(65.56)		(69.00)		(66.94)	
3.	Used for making curd	221.57	16618	204.2	15315	212.89	15967
		(12.54)		(16.00)		(13.98)	
4.	used for Paneer	176.69	49473	63.81	17867	120.25	33670
		(10.00)		(5.00)		(7.90)	
5.	Used for making ghee	141.35	77743	51.05	28078	96.2	52910
		(8.00)		(4.00)		(6.32)	
6.	Others	68.91	4824	76.57	5360	72.74	5092
		(3.90)		(6.00)		(4.78)	
7.	FYM (q)	19.57	3913	12.79	2559	16.18	3236
	Total		210489		113210		161850

Note: Figures in parentheses indicate percentages to total.

4.3 Awareness and adoption of farm technologies.

The performance and profitability of farm enterprises depends upon knowledge about different farm operations and extent of adoption of recommended agricultural practices. The awareness about recommended farm technologies of different farm enterprises may be obtained from various sources like package of practices developed by state agricultural universities (SAUs), extension literatures, other media, trainings etc. In certain cases, it may be observed that some farmers were aware about scientific farming techniques but did not adopt the same due to one or the other reason. The respondents of the study area have got trainings at CSK HPKV in the area of integrated farming and vegetables farming. Therefore, in this section, an attempt has been made to assess their awareness, adoption and gap in adoption of different farm technologies.

4.3.1 Source of motivation for trainings

Trainings are indeed an important part of extension which helps in improving the awareness and adoption of farm technologies by the trained farm households. The respondents were inquired about their source of inspiration for getting trainings at CSK HPKV Palampur. The Table 4.19 indicates the various sources for motivation of respondents for trainings. It can be seen from the table that the majority of respondents were inspired by neighbours (33.33 per cent) followed by agricultural officers (20 per cent) and relatives (18.33 per cent) on overall farm situation. In case of integrated farming category, the highest proportion of respondents were motivated by neighbours (36.67 per cent) followed by relatives (23.33 per cent) and agricultural officers (16.67 per cent) while in case of vegetable farming category, about 30 and 23 per cent of the respondents were motivated by neighbours and agricultural officers, respectively. The table further indicates that about 13, 17 and 15 per cent respondents on integrated farming, vegetable farming and overall farming situation, respectively, were self-motivated. The proportion of respondents motivated through KVKs, radio and other medias was relatively low i.e. 8.33 and 5 per cent respectively on overall farm situation and almost similar trend was observed on different categories of farms.

Table 4.19: Source of motivation for training of respondents on sample farms

(Number)

Sr. No.	Particulars	Integrated farming	Vegetable farming	Overall
1.	Self	4	5	9
		(13.33)	(16.67)	(15.01)
2.	Neighbours	11	9	20
		(36.67)	(30.00)	(33.33)
3.	Relatives	7	4	11
		(23.33)	(13.33)	(18.33)
4.	Agricultural officers	5	7	12
		(16.67)	(23.33)	(20.00)
5.	KVKs	1	4	5
		(3.33)	(13.33)	(8.33)
6.	Radio and other media	2	1	3
		(6.67)	(3.34)	(5.00)
	Total	30	30	60
		(100.00)	(100.00)	(100.00)

Note: Figures in parentheses indicate percentage to total.

4.3.2 Level of awareness of farm households about farm production technologies.

The respondents were imparted six days trainings at CSK HPKV, Palampur in the field of integrated farming and vegetables farming. The main objective of the trainings was to improve their knowledge and skills about the recommended / scientific crop production practices. The awareness of the respondents about the recommended practices was examined and is depicted in Table 4.20. Land preparation is one of the most important practice of crop production. It comprises of operations like clearance of weeds, bushes etc., ploughing, application of manures and fertilizers etc. It may be observed from the table that majority of the households i.e. 87, 78 and 73 per cent of the total households were fully aware about the application of manures & fertilizers, clearance of weeds & bushes and about the number of ploughings, respectively, during field preparation on overall farm situation. The awareness among the integrated farming category was relatively higher in case of clearance of weeds & bushes, number of ploughings and application of manures & fertilizers, compared to vegetable farming category. Sowing/transplanting is the second function associated with crop production. It comprises of sub functions like pre-sowing irrigation, time of sowing/transplantation, adequate spacing, recommended seed rate. The proportion of respondents having full awareness about recommended practices varies from about 73 per cent in case of recommended seed rate to 85 per cent in case of pre sowing irrigation and ideal time for sowing/ transplanting on overall farm situation. Almost similar pattern for sowing operations was observed for integrated and vegetables farming category. The proportion of respondents varied from 70 per cent in case of recommended seed rate to about 87 per cent in case of ideal time of sowing on vegetables farming category. As far as intercultural operations were concerned, gap filling, hoeing and weed management were the major operations. Among these, majority of the farmers were having full awareness except chemical weed management. Weeding/hoeing holds vital importance since it is very important to eliminate unwanted weeds from the field to ensure proper growth of crop. For this, manual weeding has been a traditional method to eliminate the weeds. But there is lack in adequate awareness about chemical methods of weed control due to their specified doses. The proportion of respondents having full awareness about the use of herbicides for weed management was quite low as compared to other operations. It

Table 4.20 Awareness of respondents about recommended agricultural technologies

(Per cent)

Sr. No.	Name of technology	Integrated farming	Vegetables farming	Overall
1	Field preparation			
i	Clearance of weeds and bushes	25 (83.33)	22 (73.33)	47 (78.33)
ii	No. of ploughings	24 (80.00)	20 (66.67)	44 (73.33)
iii	Application of manures and fertilizers	28 (93.33)	24 (80.00)	52 (86.67)
2	Sowing			
i	Pre sowing irrigation	26 (86.67)	25 (83.33)	51 (85.00)
ii	Ideal time of sowing/transplanting	25 (83.33)	26 (86.67)	51 (85.00)
iii	Adequate spacing	25 (83.33)	24 (80.00)	49 (81.67)
iv	Recommended seed rate	23 (76.67)	21 (70.00)	44 (73.33)
3	Intercultural operations			
i	Gap filling	18 (60.00)	24 (80.00)	42 (70.00)
ii	Hoeing	26 (86.67)	24 (80.00)	50 (83.33)
iii	Weeding			
	Manual	27 (90.00)	25 (83.33)	52 (86.67)
	Chemical	13 (43.33)	16 (53.33)	29 (48.33)
4	Management of insect pest and diseases			
i	Use of insecticide/pesticide	25 (83.33)	22 (73.33)	47 (78.33)
ii	Recommended dose of chemicals	22 (73.33)	19 (63.33)	41 (68.33)

Note: Figures in parentheses indicate percentage to total.

was about 43, 53 and 48 per cent on integrated, vegetable and overall farming situation respectively. The operation of gap filling is important to maintain an ideal crop stand, since many plants die during the early growth stages. The awareness about gap filling practices was found to be prevalent among 60, 80 and 70 per cent respondents, respectively on integrated, vegetables and overall farming situations. Among the practices of insect pest management, use of ideal insecticide and applying their recommended doses hold vital importance. It was found in the analysis that only

78.33 per cent respondents were aware about the use of insecticides for insect pest control out of which only 68.33 per cent respondents were using recommended doses on overall basis. In terms of category wise situation, about 83 and 73 per cent respondents of integrated and vegetables farming category, respectively were found to be aware about the use of ideal insecticides for pest control. The per cent awareness about recommended dose of chemicals was found to be about 73 and 63 per cent, respectively for integrated and vegetables farming category.

4.3.3 Adoption of general production practices

Adoption of improved farm technologies is equally important as the awareness about recommended operations for the trained farm households. Mere application of various inputs like seeds, fertilizers, FYM, plant protection chemicals etc. does not guarantee desired yields. Accomplishment of different crop production operations like field preparation, pre-sowing irrigation, inter-cultural operations like hoeing, gap filling, adequate spacing, application of pesticides etc. are essential for crop development. Any deviation from requisite parameters of these operations leads to gaps in adopting crop specific management practices. The Table 4.21 depicts the gaps in general production operations on sample farms.

Any production is not successful without ideal field preparation. The field preparation is an important operation for crop production. It is recommended that a field should be completely free from weeds and bushes to minimize the risk of insect-pest attack. This operation was successfully performed by 76.67, 66.67 and 71.67 per cent respondents on integrated, vegetable and overall farming situation respectively. In context of number of ploughings, it is recommended that field should be ploughed 2-3 times so that soil is properly pulverized. This recommendation was adopted by 56.67 per cent respondents on overall basis. This proportion for category wise situation was higher for vegetable farming category (60 per cent) in comparison to integrated farming category (53.33 per cent). Application of manures and fertilizers at recommended rate is also an important farm activity determined by awareness among the farmers about the recommended dosage. It was found that nearly 78 per cent respondents (on overall basis) applied the manures and fertilizers in accordance with the recommendations.

Pre-sowing irrigation is important for establishing a good crop stand. In the analysis, it was found that on an average, about 73 per cent farm respondents were

adopting the practice of pre-sowing irrigation. In terms of category wise situation, this proportion was found to be 70 per cent and 76.67 per cent in case of integrated and vegetables farming categories, respectively. Sowing at ideal time and adequate spacing are equally important for efficient production. Both operations were taken by the farm households for agricultural production. On average, these two operations were taken up by 81.67 per cent and 66.67 per cent of farm respondents, respectively.

Intercultural operations like gap filling, hoeing, weeding are important contributors for crop production. From the time of sowing, some plants do not perform well due to which a need of gap filling is felt. The table reveals that on an average, 61.67 and 78.33 per cent respondents had adopted the operation of gap filling and hoeing, respectively. The weed management is important operation in crop production. It is imperative to remove the weeds from the field to ensure better growth of crops. Generally, there are two methods of weeding adopted by farmers- manual and chemical. As far as manual weeding is concerned, adoption among respondents was found that 83.33, 80.00 and 81.67 per cent, respectively for integrated, vegetables and overall farming category respectively.

Besides manual weeding, chemical methods of weed control have emerged as efficient method of weed management. However, the knowledge regarding their dosage and application needs to be precise for efficient weed management. Therefore, adequate awareness about chemical weeding has also been taken into consideration for successfully adopting the practice. The adoption of chemicals for weed control was found to be 33.33, 43.33 and 38.33 per cent, respectively for integrated, vegetables and overall farming category. Plant protection chemicals for insect pest control are important aspect for successful crop production. The respondents were found to be using insecticides for controlling insect pests for crop production. It was found that on an average, 58.33 per cent respondents were using chemicals for insect pest control. This proportion was found to be relatively higher for respondents under integrated farming in comparison to vegetables farming category i.e. 63.33 and 53.33 per cent, respectively. The recommended dosage of pesticides was found to be

adopted by 56.67, 46.67 and 51.67 per cent for integrated, vegetables and overall farming situation, respectively.

Table 4.21: Adoption of general production practices on sample farms

(Per cent)

Sr. No.	Name of technology	Integrated farming	Vegetables farming	Overall
1	Field preparation			
i	Clearance of weeds and bushes	23 (76.67)	20 (66.67)	43 (71.67)
ii	No. of ploughings			
	<2	13 (43.33)	10 (33.33)	23 (38.33)
	>2	16 (53.33)	18 (60.00)	34 (56.67)
iii	Application of manures and fertilizers	25 (83.33)	22 (73.33)	47 (78.33)
2	Sowing			
i	Pre sowing irrigation	21 (70.00)	23 (76.67)	44 (73.33)
ii	Ideal time of sowing/transplanting	24 (80.00)	25 (83.33)	49 (81.67)
iii	Adequate spacing	18 (60.00)	22 (73.33)	40 (66.67)
3	Intercultural operations			
i	Gap filling	14 (46.67)	23 (76.67)	37 (61.67)
ii	Hoeing	25 (83.33)	22 (73.33)	47 (78.33)
iii	Weeding			
a.	Manual	25 (83.33)	24 (80.00)	49 (81.67)
b.	Chemical	10 (33.33)	13 (43.33)	23 (38.33)
4	Management of insect pest and diseases			
i	Use of insecticide/pesticide	19 (63.33)	16 (53.33)	35 (58.33)
ii	Recommended dose of chemicals	17 (56.67)	14 (46.67)	31 (51.67)

Note: Figures in parentheses indicate percentage to total.

Technological gaps in existing technology

The ultimate aim of providing trainings to farm households is to create awareness about new farm production technologies so that the adoption of those technologies can be improved. The yield of any crop is highly influenced by adoption of specific package of recommended practices. These practices may vary from region to region and farmer to farmer which leads to variation in crop stand and crop yield. The extent of use of critical inputs like seeds, fertilizers, insecticides, FYM etc. also vary from farmer to farmer. The deviation of any of these components from recommended practice is referred to as technological gap. Therefore, to analyse the extent of adoption of recommended practices, it is necessary to figure out the technological gaps in adopting these practices. An attempt has been made in present section to analyse the gaps in recommended practices adopted by the farm households.

4.3.4 Seed

Seed is the most vital input in crop production. With the advent of technological development in agriculture field, many popular varieties have been introduced by private and public sectors of the country. Thus, there is wide range of available seed varieties which may be adopted by the farmers depending on their requirements. The seed rates of *kharif* and *rabi* crops have been recommended by the State Agricultural Universities (SAUs) keeping in view the profile of state, germination per centages, spacing, seed weight and plant densities of different crops. Therefore, the description of seed rate adopted by farm households, recommended seed rate and gaps in their use has been given in Table 4.22. It was found that farmers of study area were using popular seed varieties for cultivation of crops. The careful examination of the table revealed that majority of farmers used higher seed rate than the recommended doses for cultivation of maize. The per cent gap was found to be -26, -23 and -24.5 per cent for integrated farming, vegetable farming and overall category respectively. Among vegetables, higher seed rate was used by farmers in cultivation of Okra and cucumber. Their per cent gap in using recommended seed rate of okra was found to be -22.15, -16.7, -19.45 per cent for integrated farming, vegetable farming and overall category respectively. Lowest technological gap of 6.88 per cent on overall basis was found in cultivation of paddy.

Table 4.22 Gaps in use of recommended seed rate in major crops on sample farms

(kg/ha)

Sr. No.	Crops	Particulars	Existing seed rate	Recommended seed rate	Per cent gap
		Integrated farming	25.2		-26.00
1.	Maize	Vegetable farming	24.6	20	-23.00
		Overall	24.9		-24.50
		Integrated farming	75.4		24.60
2.	Wheat	Vegetable farming	85	100	15.00
		Overall	80.2		19.80
		Integrated farming	74		7.50
3.	Paddy	Vegetable farming	75	80	6.25
		Overall	74.5		6.88
		Integrated farming	24.43		-22.15
4.	Okra	Vegetable farming	23.34	20	-16.70
		Overall	23.89		-19.45
		Integrated farming	3.12		-24.80
5.	Cucumber	Vegetable farming	3.22	2.5	-28.80
		Overall	3.17		-26.80
		Integrated farming	0.5		33.33
6.	Cauliflower	Vegetable farming	0.65	0.75	13.33
		Overall	0.58		22.67
		Integrated farming	70		12.50
7.	Peas	Vegetable farming	74	80	7.50
		Overall	72		10

4.3.5 Farm Yard manure

The application of FYM is a traditional practice adopted by most of farm households. The per cent gap in adopting recommended dose of FYM/ha has been given in Table 4.23.

Table 4.23 Gaps in use of recommended FYM application of major crops on sample farms

(q/ha)

Sr. No.	Name of crop	Particulars	Existing rate	Recommendation	Per cent gap
1	Maize	Integrated farming	90	100	10.00
		Vegetable farming	85		15.00
		Overall	87.5		12.50
2	Wheat	Integrated farming	95.02	100	4.98
		Vegetable farming	90.83		9.17
		Overall	92.93		7.07
3	Paddy	Integrated farming	45.75	50	8.50
		Vegetable farming	46.38		7.24
		Overall	46.07		7.86
4	Okra	Integrated farming	85.57	100	14.43
		Vegetable farming	80.65		19.35
		Overall	83.11		16.89
5	Cucumber	Integrated farming	85.58	100	14.42
		Vegetable farming	95.62		4.38
		Overall	90.6		9.40
6	Cauliflower	Integrated farming	241.58	250	3.37
		Vegetable farming	245.55		1.78
		Overall	243.57		2.57
7	Peas	Integrated farming	145.32	200	27.34
		Vegetable farming	190.51		4.75
		Overall	167.92		16.04

Recommended rates of FYM have also been stated by the SAUs for maintenance of soil health. The table below shows that although FYM application has been undertaken by all farm households, there is a gap in adoption of recommended dose which has been reflected through the analysis. The table shows that gap in adoption of recommended FYM dose ranges from 2.57 per cent in cauliflower to 16.89 per cent in Okra on overall basis. Among vegetables, the application of FYM was found to be 83.11, 90.6, 243.57 and 167.92 q/ha in okra, cucumber, cauliflower, and peas, respectively. In case of cereal crops, the FYM applied was found to be 87.5, 92.93 and 46.07 q/ha in maize, wheat and paddy, respectively.

4.3.6 Fertilizers application

Fertilizer application is very helpful in raising the crop production yields since they provide nutrients for proper plant growth. FYM application alone is not sufficient for proper plant development. Moreover, the percentage of nutrients supplied through FYM is quite low. Therefore, application of fertilizers is very important for enhancing the quality and yield of crop stand. The details of existing use of plant nutrients (N, P, K), recommended doses and gaps in application has been given in Table 4.24.

The table shows that per cent gap in recommended N application ranges from 6.03 kg/ha in paddy to 16.71 kg/ha in peas. On an average, nitrogen application was found to be 112.77, 110.55 and 79.63 kg/ha for maize, wheat and paddy, respectively as against the recommendation of 120, 120 and 90 kg/ha. The per cent gap in recommended nitrogen application was found to be 11.64, 12.74, 6.75 and 16.71 for okra, cucumber, cauliflower, and peas, respectively on overall basis. The application of nitrogen was found to be ranging between 62.47 kg/ha in peas to 116.56 kg/ha in cauliflower on overall basis. The table further revealed that all farmers were applying lower doses of nitrogen than the recommended doses.

The application of phosphorus was found to be ranging from 18.79 kg/ha in paddy to 65.52 kg/ha in cauliflower. In terms of category wise condition, application of phosphorus in paddy was found to be 21.18, 16.4 and 18.79 kg/ha for integrated farming, vegetable farming and overall category respectively. In cauliflower, the phosphorus application was found to be 62.11, 68.93 and 65.52 kg/ha for integrated

farming, vegetable farming and overall categories against the recommendation of 75kg/ha. Among the vegetable crops under cultivation, highest application was found in cauliflower followed by cucumber (65.52 kg/ha and 42.56 kg/ha, respectively). The per cent gap in phosphorus application was found to be ranging from 12.64 per cent to 53.03 percent. The lowest gap was found in cauliflower cultivation where the per cent gap was observed to be 17.19, 8.09, 12.64 per cent for integrated farming, vegetable farming and overall category, respectively. Similarly, highest gap was recorded for paddy cultivation i.e. 47.05, 59.00 and 53.03 per cent for integrated farming, vegetable farming and overall category respectively.

The table also indicates per cent gaps in recommended application of K in all selected crop cultivations. The range of per cent gap for K was found to be 19.9 per cent in maize to 65.00 per cent in paddy. The smallest gap in adopting recommended dosage of K was found in cultivation of maize where this percentage was 15, 24.8 and 19.9 for integrated farming, vegetable farming and overall category, respectively. The highest gap was found in cultivation of paddy where these proportion were found to be 57.85, 72.18 and 65 per cent respectively for integrated farming, vegetable farming and overall category.

Table 4.24: Gaps in use of plant nutrients in major crops on sample farms.

			Existing			Recommendation			Extent of adoption/gap		
Sr. No.	Crop	Particulars	N	P	K	N	P	K	N	P	K
		Integrated farming	111.26	45	34				7.28	25.00	15.00
1.	Maize	Vegetable farming	114.28	54.5	30.08				4.77	9.17	24.80
		Overall	112.77	49.75	32.04	120	60	40	6.03	17.08	19.90
		Integrated farming	112.27	50	15.58				6.44	16.67	48.07
2.	Wheat	Vegetable farming	108.83	47.7	10.11	120	60	30	9.31	20.50	66.30
		Overall	110.55	48.85	12.85				7.88	18.58	57.17
		Integrated farming	81.1	21.18	16.86				9.89	47.05	57.85
3.	Paddy	Vegetable farming	78.15	16.4	11.13	90	40	40	13.17	59.00	72.18
		Overall	79.63	18.79	14				11.52	53.03	65.00
		Integrated farming	68.8	28.59	35.54				8.27	42.82	35.38
4.	Okra	Vegetable farming	63.74	26.68	46.88	75	50	55	15.01	46.64	14.76
		Overall	66.27	27.64	41.21				11.64	44.72	25.07
		Integrated farming	85.68	43.67	31.23				14.32	12.66	47.95
5.	Cucumber	Vegetable farming	88.83	41.44	25.76	100	50	60	11.17	17.12	57.07
		Overall	87.26	42.56	28.5				12.74	14.88	52.50
		Integrated farming	114.45	62.11	33.46				8.44	17.19	52.20
6.	Cauliflower	Vegetable farming	118.66	68.93	34.56	125	75	70	5.07	8.09	50.63
		Overall	116.56	65.52	34.01				6.75	12.64	51.41
		Integrated farming	60.5	28.8	28.86				19.33	42.4	51.90
	Peas	Vegetable farming	64.44	34.45	46.6	75	50	60	14.08	31.10	22.33
		Overall	62.47	31.63	37.73				16.71	36.74	37.12

4.4 Employment pattern, income, and livelihood security

4.4.1 Employment pattern

In order to meet out the day to day requirements of household for food, education, mobility, communication and other socio-cultural chores, a farmer has to earn generated income. The level of income of farm families depends upon the occupational and employment pattern of their family members. The income may be generated from the various farm as well off-farm activities. The on-farm activities include undertaking of farm as well as allied farm enterprises like cultivation of crops, growing fruits, rearing of livestock, poultry, mushroom production, processing & value addition of farm products, etc., while the off-farm activities include business, government/private services, labour, technical services (weaving, tailoring, welding), etc. In a typical rural farm family, there may be more than one source of employment and income generation. In this section, attempt has been made to assess the availability of active workforce and patten of their association with different farm and off-farm avocations and details are as under:

i) Availability of active workforce

The details of per farm availability of human population, active workforce and the active man power associated with farm and off-farm activities are depicted in Table 4.25. The average family size on the sample households was 5.07 which was found to be marginally higher on integrated farming category. As discussed earlier in Table 4.6, about 16 and 10 per cent of the total family was below the age of 15 years and above 60 years of age which was considered as dependent population. The availability of active workforce on the sample farm was worked out by deducting the dependent population from the total population. It was figured at 3.37, 2.90 and 3.13 persons/farm/day on integrated, vegetable and overall farm situation, respectively. The table clearly indicates that the proportion of the females in active workforce was slightly less than 50 per cent to the total available workforce. The proportion active workers to the total persons available on the farms was found to be 61.74 per cent on overall farm category, while on integrated and vegetable farming category it was

estimated at 65.69 and 58.00 per cent, respectively. The gender wise analysis reveals that the proportion of active workers in case of male was about 63 per cent in case of integrated farming category, 57.20 per cent in case of vegetable farming category and 60.08 per cent on overall farm situation. The corresponding figures for female population were at 68.72, 58.85 and 63.79 per cent respectively.

Table 4.25 Pattern of employment of active workers in farm and off farm activities on sample households

(persons/farm/day)

Sr. No.	Particulars	Integrated Farming	Vegetable Farming	Overall
1	Availability of total man power			
i.	Male	2.70	2.57	2.63
ii.	Female	2.43	2.43	2.43
iii.	Total	5.13	5.00	5.07
2	Active workforce			
i.	Male	1.70	1.47	1.58
ii.	Female	1.67	1.43	1.55
iii.	Total	3.37	2.90	3.13
3	Population engaged in farm activities			
i.	Male	0.93	0.74	0.83
		(42.86)	(41.11)	(41.92)
ii.	Female	1.24	1.06	1.15
		(57.14)	(58.89)	(58.08)
iii.	Total	2.17	1.80	1.98
4	Population engaged in off farm activities			
i.	Male	0.77	0.73	0.75
		(64.17)	(66.36)	(65.22)
ii.	Female	0.43	0.37	0.40
		(35.83)	(33.64)	(34.78)
iii.	Total	1.20	1.10	1.15
5	Annual availability of family farm workers			
i.	Male	339.45	270.10	302.95
ii.	Female	452.60	386.90	419.75
iii.	Total	792.05	657.00	722.70
6	Proportion of active farm worker to total available manpower			
i.	Male	62.96	57.20	60.08
ii.	Female	68.72	58.85	63.79
iii.	Total	65.69	58.00	61.74
7	Proportion engaged in farm activities to total available man power			
i.	Male	34.44	28.79	31.56
ii.	Female	51.03	43.62	47.33
iii.	Total	42.30	36.00	39.05
8	Proportion engaged in farm activities to total active workforce			
i.	Male	54.71	50.34	52.53
ii.	Female	74.25	74.13	74.19
iii.	Total	64.39	62.07	63.26

The table further indicates that the annual availability of active workforce was about 723 on overall farm situation and 792, 657 on integrated and vegetables farming categories respectively. The gender wise distribution reveals that annual availability of female active workforce was relatively higher than male active workforce in both categories and overall distribution. As indicated above, the active workforce of the sample respondents was found to perform various farm and off-farm activities to earn their livelihood. It can be observed from the table that on average about 1.98 persons/farm (0.83 males and 1.15 females) were found to be associated with farm activities accounting for about 63 per cent of available workforce on the overall farm situation. The persons associated with farm activities on integrated farm were about 21 per cent higher compared to vegetable farming category i.e. 2.17 and 1.80 persons, respectively. On the other hand, average persons per household associated with off-farm activities were found to be less than the farm activities i.e. 1.15 (0.75 males and 0.40 females) on overall farm situation, while these were at 1.20 and 1.10 persons on integrated and vegetable farming category, respectively. The number of persons associated with off-farm activities were about 9 per cent higher on integrated farming category than vegetable farming category.

ii) Occupation pattern

In above section, the availability of active workforce and their association with farm and off-farm activities has been examined. The details of adoption of different farm and off-farm activities of head of families and family members has been examined and presented in Table 4.26 and Table 4.27 respectively.

Occupation of heads of families

The occupational pattern of heads of families in various on farm and off-farm activities has been given in Table 4.27. It was found that farming (crops) was the main occupation of majority of the heads i.e. 75 per cent. This proportion was marginally higher for farmers under vegetables farming category in comparison to integrated farming category 76.67 and 73.33 per cent, respectively. Among the other activities, private services were found to be the main occupation of about 10, 17 and 13 per cent heads of families under integrated, vegetables and overall farming category

respectively. Some heads of families were also found to be engaged in entrepreneurship as the major occupation i.e. about 3.33 per cent. The category wise comparison shows that only heads under integrated farming were engaged in entrepreneurship i.e. about 7 per cent. However, some heads were also found to be involved in other activities like tailoring, weaving etc. as their major occupation. On an average, 8.33 per cent respondents were found to be engaged in these activities as their occupation. This proportion was found to be 10.00 and 6.67 per cent under integrated and vegetables farming categories, respectively.

Occupation of family members

The occupational activities of family members of sample respondents have been presented in Table 4.27. Among various jobs, farming (crops) was found to be the main occupation of majority of family members i.e., 60.11 per cent. In category wise situation, this proportion was reported to be 59.41 and 60.92 per cent for integrated farming and vegetable farming category respectively. Moreover, 6.37 per cent family members depend on other activities like tailoring, weaving etc. for their main source of occupation. As far as subsidiary occupation is concerned, 58.51 per cent family members were engaged in livestock rearing activity followed by farming/crop cultivation which was subsidiary source of income for 34.57 per cent family members.

Table 4.26 Occupational pattern of heads of families of sample households

(Number)

Sr. No.	Particulars	Main occupation			Subsidiary occupation		
		IF	VF	Overall	IF	VF	Overall
1	Farming						
i.	Crops	22	23	45	2	7	9
		(73.33)	(76.67)	(75.00)	(5.71)	(20.59)	(13.04)
ii.	Livestock	-	-	-	22	17	39
		-	-	-	(62.86)	(50.00)	(56.52)
iii.	Fruit crops	-	-	-	3	4	7
		-	-	-	(8.57)	(11.76)	(10.14)
iv.	Others	-	-	-	-	-	-
		-	-	-	-	-	-
2	Govt. Job	-	-	-	-	-	-
		-	-	-	-	-	-
3	Private service	3	5	8	-	-	-
		(10.00)	(16.67)	(13.33)	-	-	-
4	Labour	-	-	-	6	3	9
		-	-	-	(17.14)	(8.82)	(13.04)
5	Entrepreneur	2	-	2	-	-	-
		(6.67)	-	(3.33)	-	-	-
6	Others	3	2	5	2	3	5
		(10.00)	(6.67)	(8.33)	(5.71)	(8.82)	(7.25)
	Total	30.00	30.00	60.00	35.00	34.00	69.00
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Note: i) Figures in parentheses indicate percentages to total.
ii) IF-Integrated Farming, VF-Vegetables Farming

Table 4.27 Occupational pattern of family members

(Number)

Sr. No.	Particulars	Main occupation			Subsidiary occupation		
		IF	VF	Overall	IF	VF	Overall
1	Farming						
i.	Crops	60	53	113	31	34	65
		(59.41)	(60.92)	(60.11)	(30.69)	(39.08)	(34.57)
ii.	Livestock	5	1	6	65	45	110
		(4.95)	(1.15)	(3.19)	(64.36)	(51.72)	(58.51)
iii.	Fruit crops	-	-	-	3	3	6
		-	-	-	(2.97)	(3.45)	(3.19)
iv.	Others	-	-	-	-	-	-
		-	-	-	-	-	-
2	Govt. Job	6	5	11	-	-	-
		(5.94)	(5.75)	(5.85)	-	-	-
3	Private service	11	13	24	-	3	3
		(10.89)	(14.94)	(12.77)	-	(3.45)	(1.60)
4	Labour	9	7	16	-	-	-
		(8.91)	(8.05)	(8.51)	-	-	-
5	Entrepreneur	3	3	6	-	1	1
		(2.97)	(3.45)	(3.19)	-	(1.16)	(0.53)
6	Others	7	5	12	2	1	3
		(6.93)	(5.75)	(6.37)	(1.98)	(1.15)	(1.60)
	Total	101.00	87.00	188.00	101.00	87.00	188
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Note: i) Figures in parentheses indicate percentages to total.
ii) IF-Integrated Farming, VF-Vegetables Farming.

4.4.2 Income pattern of trained farm households:

As stated earlier that in order to meet out the various family expenditures, the sample households were found to undertake different activities. The source wise income derived by sample households under different categories of farms has been presented in Table 4.28. It can be observed from the table that the average annual income of sample households was estimated at Rs. 4,96,086 per farm on overall farm situation. It was found to be Rs. 5,20,102 on integrated farming category which was about 10.20 per cent higher compared to vegetable farming category (Rs. 4,71,957 per farm). Among the major sources of income, the major portion of household income was contributed by farm income i.e. Rs. 3,16,902, Rs. 2,85,157 and Rs. 3,01,086 per

annum per farm on integrated, vegetable and overall farm category, respectively. The contribution of farming sector was about 61 per cent to the total annual household income on overall farm situation. As far as farm income is concerned, its major portion is derived from livestock component i.e. Rs. 1,82,159 per annum. It was found to be higher on integrated farming category (Rs. 2,10,488 per annum) compared to vegetable farming category. It may be attributed to relatively higher inventory of milch animals on integrated farming category compared to vegetable farming category. The table further reveals that next to livestock, vegetables were the important source of household income contributing at Rs. 56,170, Rs. 93,360 per annum for integrated and vegetable farming categories respectively. The income derived from vegetable production was found to be 66.21 per cent higher on vegetable farming category compared to integrated farming category which may be due to allocation of more area for vegetables on these categories of farms. On an average, the contribution of income from cereals, fodder and other crops was comparatively low which was to the tune of 2.56, 3.26, and 3.07 per cent, respectively on overall farm situation.

The table further indicates that about 39 per cent of total annual farm income was contributed by off-farm occupations like government and private services, labour, entrepreneurship and other activities (weaving, carpentry, tailoring, welding etc.). Among these off-farm sources of income, the major contribution to family income was found to be from government and private jobs accounting for about 16 and 12 per cent of total annual household income, respectively. The income from government services was found to be relatively higher on integrated farming category while from private services, it was more on vegetable farming category. The income from labour, entrepreneurship and other activities was relatively low and these sources jointly account for about 12 per cent of total annual household income which was relatively higher on integrated farming category.

Table 4.28: Pattern of gross income from different sources on sample households (Rs.)

Sr. No.	Particulars	Integrated Farming	Vegetables Faming	Overall
1	Crops	106414	131328	118927
		(20.00)	(28.00)	(24.00)
i.	Cereals	15246	10193	12720
		(2.93)	(2.16)	(2.56)
ii.	Vegetables	56170	93360	74820
		(10.80)	(19.78)	(15.08)
iii.	Fodder	20832	11482	16157
		(4.01)	(2.43)	(3.26)
iv.	Other crops	14166	16292.5	15230
		(2.72)	(3.45)	(3.07)
2	Livestock	210488	153829	182159
		(40.47)	(32.59)	(36.72)
	Farm income	316902	285157	301086
		(60.93)	(60.42)	(60.69)
3	Govt. job	84000	70000	77000
		(16.15)	(14.83)	(15.52)
4	Private service	52800	62400	57600
		(10.15)	(13.22)	(11.61)
5	Labour	28800	22400	25600
		(5.54)	(4.75)	(5.16)
6	Entrepreneurship	18000	18000	18000
		(3.46)	(3.81)	(3.63)
7	Others	19600	14000	16800
		(3.77)	(2.97)	(3.39)
	Off farm income	203200	186800	195000
		(39.07)	(39.58)	(39.31)
	Total	520102	471957	496086

Note: Figures in parentheses indicate percentages to total.

4.4.3 Livelihood pattern of trained farm households

Livelihood basically implies means of securing necessities of life. It symbolises the ways of earning income and employment to fulfill the needs of food, clothing, housing and other basic facilities of life. It is characterised by type of occupation in which family members are involved, resources available on the farm (land, labour, capital), livestock reared, various sources of employment, income pattern, consumption pattern etc.

The livelihood security index comprises of adequate access to basic amenities (including sufficient food, safe drinking water, health facilities, housing facilities) and income generating opportunities for the farm household members. Thus, the livelihood status of farm households is a resultant of various sub-components like education security, food security, economic security and social security. The various components of livelihood of sample households have been worked out and discussed in following section.

4.4.3.1 Education status

The quality of human resource is reflected through their educational status and skills obtained through trainings in their professional fields. At present times, agriculture is becoming a skill-based occupation rather than only a mere crop cultivation process. In this era of digitalisation, immense information on agricultural practices, on-going schemes is available in print and electronic media. An educated person has an upper hand in accessing these resources in comparison to an illiterate person. Thus, the educational status of heads of family and family members has been examined and described as below:

i) Head of family

The education level of head of the family has a large influence on adoption of modern farming technologies. The education helps the farmers in making rational decisions and is the key for securing better livelihood and profitability in farm business. The educational status of heads of families has been examined and summarized in Table 4.29.

The table indicates that the literacy rate of heads of families was quite high i.e. about 93 and 90 per cent on integrated farming and vegetable farming category, respectively. The majority of heads of families i.e. 40 per cent had received education up to primary level while about 8 per cent heads were illiterate on overall farm basis. The major proportion of the heads (about 53 per cent) had received education up to middle school level. It was further observed that merely 8.33 per cent of heads had received education higher than senior secondary. In terms of farm category wise distribution, the highest proportion of farmers in integrated farming category had attained primary education i.e. about 53 per cent. In vegetable farming category, the majority of heads were found to have primary and senior secondary education (26.66 per cent each).

Table 4.29 Educational status of heads of families on sample households

(Number)

Sr. No.	Education category	Integrated farming	Vegetables farming	Overall
1.	Illiterate	2	3	5
		(6.67)	(10.00)	(8.33)
2.	Primary	16	8	24
		(53.33)	(26.67)	(40.00)
3.	Middle	5	3	8
		(16.67)	(10.00)	(13.34)
4.	High school	1	4	5
		(3.33)	(13.33)	(8.33)
5.	Senior secondary	5	8	13
		(16.67)	(26.66)	(21.67)
6.	Graduation	1	2	3
		(3.33)	(6.67)	(5.00)
7.	Higher studies	-	2	2
		-	(6.67)	(3.33)
	Total	30	30	60
		(100.00)	(100.00)	(100.00)
	Literacy rate (%)	93.33	90.00	91.67

Note: Figures in parentheses indicate percentages to total.

ii) Family members

In majority of the farm families, the selection of farm enterprises and investment on assets was reported to be a joint decision of head of family and family members. Therefore, the education of family members is equally important in farming business. The educational status of family members of trained farm households has also been analysed and depicted in the Table 4.30. The table indicates that about 6 per cent of the family members were non-school going while 9 per cent were illiterate on overall farm situation. The children below the age of 5 years were considered as non-school going. The proportion of family members having primary education was found to be about 23 per cent on overall situation. The corresponding figures for integrated farming and vegetable farming category were found to be about 28 and 18 per cent, respectively. On an average, the proportion of family members having education up to matriculation and senior secondary level was 13 and 16 per cent, respectively. The table further shows that about 14 per cent of female members were educated up to matriculation level and only about 9 per cent of female members were in graduate and above category. The corresponding figures for their male counter parts were at about 13 and 22 per cent, respectively.

Table 4.30 Educational status of family members on sample households

(Number)

Sr. No.	Education category	Integrated farming			Vegetables farming			Overall		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
1.	Non-school going	8	3	11	2	4	6	10	7	17
		(9.88)	(4.11)	(7.14)	(2.60)	(5.48)	(4.00)	(6.33)	(4.79)	(5.59)
2.	Illiterate	6	13	19	4	5	9	10	18	28
		(7.41)	(17.81)	(12.34)	(5.19)	(6.85)	(6.00)	(6.33)	(12.33)	(9.21)
3.	Primary	18	25	43	8	19	27	26	44	70
		(22.22)	(34.25)	(27.92)	(10.39)	(26.03)	(18.00)	(16.46)	(30.14)	(23.03)
4.	Middle	16	15	31	10	11	21	26	26	52
		(19.75)	(20.54)	(20.13)	(12.99)	(15.07)	(14.00)	(16.46)	(17.81)	(17.11)
5.	Matriculation	8	9	17	12	12	24	20	21	41
		(9.88)	(12.33)	(11.04)	(15.58)	(16.43)	(16.00)	(12.65)	(14.38)	(13.48)
6.	Senior secondary	15	6	21	17	11	28	32	17	49
		(18.52)	(8.22)	(13.64)	(22.08)	(15.07)	(18.67)	(20.25)	(11.65)	(16.12)
7.	Graduation	7	2	9	18	8	26	25	10	35
		(8.64)	(2.74)	(5.84)	(23.38)	(10.96)	(17.33)	(15.82)	(6.85)	(11.51)
8.	Higher studies	3	-	3	6	3	9	9	3	12
		(3.70)	-	(1.95)	(7.79)	(4.11)	(6.00)	(5.70)	(2.05)	(3.95)
	Total	81	73	154	77	73	150	158	146	304
		(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
	Literacy rate	91.78	81.43	86.71	94.67	92.75	93.75	93.24	87.05	90.24

Note: Figures in parentheses indicate percentages to total.

It may be observed that overall literacy of males was relatively better (93.24 per cent) than females (87.05 per cent). The literacy rate of family members was estimated at 86.71, 93.75 and 90.24 per cent for integrated farming, vegetable farming and overall farm situation respectively.

iii) Accessibility of educational institutions

The educational status of individuals of a region on a greater extent depends on the accessibility of educational institutions. It has been observed that majority of respondents had education up to primary level (Table 4.29). It may be due to the fact that respondents may have access to primary schools at a manageable distance. Majority of them may have not gone for higher education due to availability of institutions at distant places. Thus, the accessibility of educational institutions may play important role in educational security. The availability and accessibility of educational institutions to farm households has been analysed and is depicted in Table 4.31. The analysis showed that on an average, more than 40 per cent households had 6-10 average years of schooling which pertains to their high literacy rate in the study area. However, merely 1.67 per cent households had average years of schooling of more than 15 years. This attributes to lack of awareness among farm households about improved agricultural practices. In case of availability of number of educational institutes within the range of 2 km, it was found that 45 per cent farm households had accessibility of middle and high schools within the radius of 2 km. It was followed by accessibility of senior secondary schools to 28.33 per cent farm households. However, the accessibility of higher education institutes in the vicinity of 2 km radius was limited to merely 5 per cent farm households. The relative accessibility of educational institutions was found to be highest on the range of 0.6-1 km i.e. about 37 per cent households had nearest educational institute at a distance 0.6-1 km range. Only 15 per cent households had nearest educational institutions located beyond 1.5 km distance from home. It is worth noting that the majority of households had the basic education facility available at their doorsteps. However, their accessibility to higher education was fairly low. This can be accounted as one of the reasons for lack of awareness about improved farm technologies among farm households but high literacy rate on the other side.

Table 4.31: Average years of schooling, availability and accessibility of educational institutes to sample households

Sr. No.	Particulars	Integrated farming	%	Vegetable farming	%	Overall	%
1	Average years of schooling						
i.	0-5 years	5	16.67	-	-	5	8.33
ii.	6-10 years	23	76.67	19	63.34	42	70.00
iii.	11-15 years	2	6.66	10	33.33	12	20.00
iv.	> 15 years	-	-	1	3.33	1	1.67
2	No. of institutions (within 2 km)						
i.	Primary	8	26.67	5	16.67	13	21.67
ii.	Middle and high school	12	40.00	15	50.00	27	45.00
iii.	Senior secondary	9	30.00	8	26.67	17	28.33
iv.	Higher education	1	3.33	2	6.67	3	5.00
3	Relative accessibility (distance in km)						
i.	0-0.5 km	8	26.67	6	20.00	14	23.33
ii.	0.6-1km	10	33.33	12	40.00	22	36.67
iii.	1.1-1.5 km	8	26.67	7	23.33	15	25.00
iv.	>1.5km	4	13.33	5	16.67	9	15.00

4.4.3.2 Food security

The food security is a basic and essential component of livelihood security. The consumption pattern of food items vary from region to region depending on the food habits and average income of households. There are various types of food items consumed in a family like pulses, cereals, meat, fish, beverages, milk, eggs etc. In the following section, the consumption pattern of major food items by the sample households has been analysed for the different categories of farmers.

i) Consumption of major food items

Although there are large number of food items which are consumed by the family but some of them are not regularly consumed in normal routine. However, rice, wheat, maize, pulses, fruits, vegetables and milk etc. were found to be consumed by sample households and their monthly consumption is presented in Table 4.32. The results indicate that among cereals, the quantity of wheat consumed by family was found to be highest i.e. 23.97 kg/month/household on overall farm situation. Its consumption was about 25 per cent higher on integrated farming category compared to vegetable farming category. Rice was found to be the important cereal next to wheat and its per household monthly consumption was estimated at 23 kg on overall farm situation. The average consumption of rice was found to be higher for integrated farming category i.e. 27.46 kg/month/household in comparison to vegetable farming category i.e. 18.53 kg/month/household. The table further indicates that the quantity of maize consumed by the households was quite low as compared to others. It was estimated at 7.5, 5.82 and 6.66 kg/household/month/, respectively. The average consumption of pulses was estimated at 9.98 kg per month for integrated farming category and 11.07 kg per month for vegetable farming category. The monthly consumption of fruits was found at 4.13 kg on overall farm situation which was marginally higher on vegetables farming category in comparison to integrated farming

Table 4.32 Average monthly consumption of food items

(kg/family/month)

Sr. No.	Particulars	Integrated Farming	Vegetable Farming	Overall
1	Rice	27.46	18.53	23.00
2	Wheat	26.60	21.33	23.97
3	Maize	7.50	5.82	6.66
4	Pulses	9.98	11.07	10.52
5	Fruits	4.00	4.25	4.13
6	Vegetables	16.80	14.30	15.55
7	Milk	25.48	28.70	27.09

category i.e. 4.25 and 4 kg respectively. In contrast, the monthly consumption of vegetables was higher for integrated farming category relative to vegetables farming category i.e. 16.8 and 14.3 kg, respectively. The other important component of food

items is milk. Its average monthly consumption was found to be 25.48, 28.7 and 27.09 kg/month for integrated farming, vegetables farming and overall farming category, respectively.

ii) Per capita consumption of food items

The per capita consumption of food items for different categories of farms has been computed and depicted in Table 4.33. On an average, the per capita consumption of rice was found to be 5.35, 3.71 and 4.54 kg per month, respectively. The average consumption of wheat was marginally higher than rice i.e. 4.73 kg per month on overall basis. The per capita consumption of maize and was found to be 1.31 kg/ month on overall farm situation. The per capita consumption of pulses was estimated at 2.07 kg/month on overall farm situation against the recommended per capita consumption of 1.41 kg/month/person (ICMR recommendations). The fruits consumption in rural households was found to be relatively less i.e. 0.78, 0.85 and 0.81 kg per month for integrated farming, vegetables farming and overall farming category respectively. The average per capita consumption of milk was computed as 4.97, 5.74 and 5.34 kg/month for integrated farming, vegetables farming and overall farming category, respectively.

Table 4.33 Per capita consumption of food items

(kg/ month/person)

Sr. No.	Particulars	Integrated Farming	Vegetable Farming	Overall
1	Rice	5.35	3.71	4.54
2	Wheat	5.19	4.27	4.73
3	Maize	1.46	1.16	1.31
4	Pulses	1.95	2.21	2.07
5	Fruits	0.78	0.85	0.81
6	Vegetables	3.27	2.86	3.07
7	Milk	4.97	5.74	5.34

iii) Range wise distribution of per capita food consumption

For the purpose of computation of food security indices (on the basis of per capita consumption), the respondents were further divided into different ranges of consumption of four major food items (Table 4.34). The table reveals that in case of

rice, the major proportion of farm families had per capita consumption in the range of 1-5 kg/month on overall farm situation. In context of category wise comparison, about 53 per cent of farm households belonging to category of integrated farming had per capita consumption of rice in the range of 1-5 kg/month while 40 per cent of the farm families had per capita consumption in the range of 5.1-10kg/month. Only a small fraction of farm families i.e. about 7 per cent had average consumption of more than 10 kg/month. On the other hand, in per capita consumption of rice under the vegetable farming category, about 77 and 23 per cent of total households were coming in the range of 1-5 kg and 5.1-10 kg, respectively while none of the households in this category consumed rice more than 10 kg/month. In case of wheat consumption per month, majority of households (55 per cent) had per capita consumption of wheat in the range of 1-5kg/month on overall farm situation. In category wise distribution, about 60 per cent of farm families belonging to vegetable farming category had average consumption in the range of 1-5 kg/month while remaining 40 per cent farm families had per capita consumption in the range of 5.1-10 kg/month. On the other hand, in integrated farming category, 50 per cent of farm families had average consumption in the range of 1-5 kg/month and about 47 per cent households had average consumption int range of 5.1-10 kg/month. Only a small fraction of households i.e. about 3 per cent had average consumption of more than 10 kg/month. As far as vegetables are concerned, the per capita consumption on overall basis was found in the range of 1-5kg/month accounting for 78.33 per cent of households. In category wise situation, about 67 per cent farm families of vegetable farming category had average per capita consumption in the range of 1-5 kg/month while about 23 per cent of family members had average per capita consumption in the range of 5.1-10 kg/month. Furthermore, 10 per cent of farm families under this category had per capita consumption of vegetables more than 10 kg/month. In integrated farming category, 90 per cent households had per capita consumption in the range of 1-5 kg/month while the remaining 10 per cent farm families had average per capita consumption in the range of 5.1-10 kg/month. None of the households in this category consumed vegetables more than 10 kg/month. Milk consumption is also an important

attribute of attaining food security at farm level. On an average, majority of farm families (55 per cent) were found to be consuming milk in the range of 1-5 kg/month. In category wise comparison, 50 per cent of farm families belonging to the integrated farming category had average per capita consumption in the range of 1-5 kg/month while about 37 per cent farm families had average per capita consumption in the range of 5.1-10 kg/month. Only about 13 per cent of farm families had average per capita consumption more than 10 kg/month. In vegetable farming category, 60 per cent of farm families had per capita consumption in the range of 1-5 kg/month and 30 per cent farm families had average consumption in the range of 5.1-10 kg. Also, a fraction of 10 per cent farm families of this category had per capita consumption of milk higher than 10 kg/month.

Table 4.34: Ranges of per capita consumption of food

(kg/ month)

	Per capita consumption	IF	%	VF	%	Total	%
1	Rice						
i.	1.0-5.0 kg	16	53.33	23	76.67	39	65.00
ii.	5.1-10.0 kg	12	40.00	7	23.33	19	31.67
iii.	>10.0 kg	2	6.67	-	-	2	3.33
2	Wheat						
i.	1.0-5.0 kg	15	50.00	18	60.00	33	55.00
ii.	5.1-10.0 kg	14	46.67	12	40.00	26	43.33
iii.	>10.0 kg	1	3.33	-	-	1	1.67
3	Vegetables						
i.	1.0-5.0 kg	27	90.00	20	66.67	47	78.33
ii.	5.1-10.0 kg	3	10.00	7	23.33	10	16.67
iii.	>10.0 kg	-	-	3	10.00	3	5.00
4	Milk						
i.	1.0-5.0 L	15	50.00	18	60.00	33	55.00
ii.	5.1-10.0 L	11	36.67	9	30.00	20	33.33
iii.	>10.0 L	4	13.33	3	10.00	7	11.67

Note: IF-Integrated farming, VF-Vegetable farming

4.4.3.3 Economic security

The economic security of a household is reflected through its total annual earnings from various sources i.e. farm activities, off farm sources like government job, private services, land ownership, farm assets owned (value of all the major and minor farm implements owned by the farmer) etc. and has direct relationship with magnitude of annual income. Since, depending on the household, resource

endowments and pattern of employment of family, there has been wide variations in the level of income of the sample households. In order to compute the economic security indices of different categories of farms, the sample households were divided into four income categories (Table 4.35). The careful analysis revealed that 73.33 per cent of farm households owned farm assets of value worth less than Rs. 10,000 while 23.33 per cent of farm households owned farm assets of value worth more than Rs. 50,000. In terms of category wise condition, the integrated farming category and vegetable farming category followed the similar trend for investment in assets. The other criteria of establishing economic security was farm income earned by households. On overall basis, majority of farm households were found to have annual household income in the range of 2.5 lakhs to 5 lakhs followed by a small fraction of households earning annual household income from farm activities worth less than 2.5 lakh. In category wise situation, it was found that 3.33 per cent of farm

Table 4.35: Range wise distribution of Economic security components of farm households

Sr. No.	Particulars	IF	%	VF	%	Overall	%
1	Value of farm assets (Excluding land) (Rs.)						
i.	< 10,000	22	73.33	22	73.34	44	73.33
ii.	10,000-50,000	1	3.33	1	3.33	2	3.33
iii.	>50,000	7	23.33	7	23.33	14	23.33
2	Farm income						
i.	<2.5 lakh	6	20.00	10	33.33	16	26.67
ii.	2.5 lakh - 5 lakh	23	76.67	19	63.34	42	70.00
iii.	>5 lakh	1	3.33	1	3.33	2	3.33
3	Off farm income						
i.	<2.5 lakh	24	80.00	24	80.00	48	80.00
ii.	2.5 lakh - 5 lakh	2	6.67	3	10.00	5	8.33
iii.	>5 lakh	4	13.33	3	10.00	7	11.67
4	Land ownership						
i.	<0.2 ha	3	10.00	7	23.33	10	16.67
ii.	0.2-0.4 ha	15	50.00	20	66.67	35	58.33
iii.	0.4-0.6 ha	11	36.67	1	3.33	12	20.00
iv.	>0.6 ha	1	3.33	2	6.67	3	5.00
	Total	30	100.00	30	100.00	60	100.00

Note: IF-Integrated farming, VF- Vegetables farming

households were earning annual income more than 5 lakh from farming alone in case of integrated farming category as well as vegetables farming category. The famers do not rely on farming alone for earning their livelihood. A large fraction of total household income is contributed by off farm activities. The table shows that 80.00 per cent households had annual off farm income of less than 2.5 lakh while remaining 8.33 per cent farm households had income in range of 2.5 lakh to 5 lakhs from off-farm activities. Also, 11.67 per cent farm households had annual income more than 5 lakhs. Land ownership is another important indicator of economic security. It was found in the study that on an average, about 58 per cent farm respondents had land holding of size in the range of 0.2-0.4 ha. Land holding of size more than 0.6 ha was owned by 5 per cent of farm households. In terms of category wise condition, this proportion was found to be 3.33 per cent and 6.67 per cent in integrated farming and vegetables farming category respectively.

4.4.3.4 Social security

Social security parameters hold equal importance like other parameters in assessing the livelihood security of farm households. The detailed analysis of social security indicators like education above senior secondary, active workers/family, females in government job and private job, social participation of farm households etc., have been presented in Table 4.36. The table shows that 15.46 per cent farm household members had attained qualification higher than senior secondary. This proportion for the integrated and vegetable farming category was found to be 7.79 and 23.33 per cent respectively. In context of female employment, only 3.42 and 6.85 per cent females were found to be engaged in government jobs and private services, respectively, on overall farm situation. Farm category wise comparison shows that it was relatively higher (4.11%) in case of government jobs under vegetable farming category while in case of private jobs, the proportion of females was higher (8.22%) under integrated farming category. The social participation of farm households i.e. in Non-Governmental Organizations (NGOs), Self Help Groups (SHGs), panchayats, etc. was found to be 8.44, 7.33 and 7.89 per cent for integrated farming, vegetables farming and overall situation respectively.

Table 4.36: Social participation of sample households

Sr. No.	Particulars	IF	%	VF	%	Overall	%
1	Education above senior secondary	12	7.79	35	23.33	47	15.46
2	Active workers/family	0.61		0.53		1.15	
3	Females in govt. job	2	2.74	3	4.11	5	3.42
4	Females in private job	6	8.22	4	5.48	10	6.85
5	Social participation	13	8.44	11	7.33	24	7.89

Note: IF-Integrated farming, VF- Vegetables farming

4.4.4 Individual indices of different domains of livelihood security

In order to capture the livelihood security, contribution of different components of each domain i.e. educational security, food security, economic security and social security were computed. The indices of individual indicators of the domains for the two categories of farm households have been compiled in Table 4.37. The indices for average years of schooling, the number of educational institutions (within 2 km) and relative accessibility were found to be 0.36, 0.56 and 0.42 under integrated farming category, while theses indices in case of vegetable farming category were 0.39, 0.55 and 0.46, respectively. This indicates that vegetable farming category households were relatively better off as far as individual indices for educational security were concerned. These indices for overall farm situation were at 0.38 for average years of schooling, 0.55 for number of educational institutions (within 2 km) and 0.44 for relative accessibility of educational institutions.

In case of food security, disparity in per capita monthly consumption of rice, wheat, vegetables and milk was observed among integrated and vegetables farming categories. The indices for integrated farming category were found to be 0.23, 0.31, 0.23 and 0.38 in case of per capita consumption of rice, wheat, vegetables and milk, respectively. While for vegetables farming category, these figures were found to 0.37, 0.38, 0.24 and 0.20, respectively. This indicates that as far as individual indices for food security were concerned, the vegetable farming category households were better off compared to integrated farming category households except for that of milk consumption. However, in case of overall farm situation, the indices with respect to per capita consumption of rice, wheat, vegetable and milk were at 0.30, 0.34, 0.26 and 0.17, respectively.

The value of farm assets (excluding land), on farm income, off farm income and land ownership (ha) were the major component taken into account for economic security. On an average, the individual indices in case of value of assets, on farm income, off farm income and land ownership for overall farm situation were estimated at 0.14, 0.53, 0.30 and 0.23, respectively. As far as the category wise value of indices were concerned, these were 0.15, 0.58, 0.36 and 0.25 in case of integrated farming category and 0.17, 0.45, 0.29 and 0.20 for vegetable farming category, respectively. It implies that as far as the individual indices of economic security were concerned, the integrated farming households were found to be better off than the vegetable farming household category except for that of the value of farm assets in which the vegetable farming households were comparatively better.

Table 4.37: Educational, food, economic and social security indices for livelihood security index

Educational security index	Integrated Farming	Vegetables Farming	Overall
Average years of schooling	0.36	0.39	0.38
Quality of institutions (within 2 km)	0.56	0.55	0.55
Relative accessibility	0.42	0.46	0.44
Food security index (kg/month)			
Per capita consumption of rice	0.23	0.37	0.30
Per capita consumption of wheat	0.31	0.38	0.34
Per capita consumption of vegetables	0.23	0.24	0.26
Per capita consumption of milk	0.38	0.20	0.17
Economic security			
Value of farm assets	0.15	0.17	0.14
On farm income	0.58	0.45	0.53
Off-farm income	0.36	0.29	0.30
Land ownership	0.25	0.20	0.23
Social security			
Education above senior secondary	0.13	0.23	0.20
Active workers/family	0.55	0.42	0.50
Females in government jobs	0.07	0.05	0.04
Females in private job	0.10	0.13	0.08
Social participation	0.22	0.18	0.20

The various indicators for capturing the social security were education above senior secondary, active workers/family, females in government job, females in private job and social participation of sample households. The individual indices

estimated at 0.20 in case of education above senior secondary, 0.50 in case active workers/family, 0.04 for females in government job, 0.08 for females in private job and 0.20 in case of social participation of sample households on overall farm category. The value of indices in case of active worker/ family (0.55), females in government job (0.07) and social participation (0.22) were found to be higher on integrated farming category, whereas, education above senior secondary (0.23) and females in private job (0.13) were found to be comparatively higher on vegetable farming category.

4.4.5 Composite livelihood security index

The education, food, economic and social security indices have been worked out by averaging the individual indices of their respective components. and have been presented in Table 4.39. These indices were than used to analyse the overall Composite Livelihood Security Index (CLSI) and weighted Composite Livelihood Security Index (CLSI*) and the results have been presented in Table 4.38. While CLSI and CLSI* reflects the picture of overall performance of farm households, the component indices (education security index, food security index, economic security index, social security index) indicates the performance of different farm households in different domains of livelihood security. The values of education security index were found to be 0.45 and 0.47, respectively for integrated farming and vegetables farming category. For food security index, the values reported were 0.28 and 0.30 respectively while for economic security index, these figures were 0.34 and 0.28. The values of

Table 4.38 Computation of composite livelihood security index (CLSI) of sample households

Particulars	Integrated Farming	Vegetables Farming	Overall
Education security index	0.45	0.47	0.46
Food security index	0.28	0.30	0.27
Economic security index	0.34	0.28	0.30
Social security index	0.23	0.22	0.20
Overall Composite livelihood security index	0.32	0.31	0.31
CLSI *	0.40	0.40	0.39

social security index for integrated farming and vegetables farming category were found to be 0.23 and 0.22. Moreover, the values of overall composite livelihood security index (CLSI) and weighted composite livelihood security index (CLSI*) were found to be 0.32 and 0.31 for integrated farming category and 0.40 each for vegetables farming category, respectively.

4.4.6 Range of livelihood securities of sample households

The range of livelihood security of sample households has been depicted and presented in Table 4.39. The table reveals that values of index ranged between 0.05 to 0.82 for education security, 0.03 to 0.85 for food security, 0.02 to 0.65 for economic security and 0.01 to 0.63 for social security. These ranges indicated wide variations in the education, food, economic and social efficiency. Similarly, the value of overall composite livelihood security ranged from 0.17 to 0.55 while the range for weighted composite livelihood security index was found to be 0.22 to 0.66. These values indicate significant variations between composite livelihood security index and weighted composite livelihood security index.

Table 4.39: Range of livelihood securities of sample households

Particulars	Integrated Farming		Vegetables Farming		Overall	
	Low	High	Low	High	Low	High
Education security index	0.07	0.77	0.12	0.8	0.05	0.82
Food security index	0.07	0.89	0.04	1	0.03	0.85
Economic security index	0.02	0.64	0.04	0.67	0.02	0.65
Social security index	0.03	0.45	0	0.56	0.01	0.63
Overall livelihood security index	0.16	0.55	0.16	0.59	0.17	0.55
LSI *	0.24	0.64	0.21	0.73	0.22	0.66

4.5 Constraints faced by trained farm households

The present section attempts to identify problems faced by farmers who have undergone trainings conducted by CSK HPKV, Palampur. The severity of constraints faced by the farmers vary from farmer to farmer and region to region. The responses given by each respondent were gathered and thus, the problems were ranked according to priority by Garrett's ranking technique. The Table 4.40 reveals that supply of High Yielding Varieties (HYV) was the most prominent problem faced by

the trained farm households. Another major constraint confronted by the farm households was lack of cost-effective machinery. Since, the farmers have small and fragmented land holdings, the operation of machinery becomes difficult. Furthermore, these machineries were not cost effective in nature. Another important constraint faced by the farmers was lack of availability of quality planting material.

Table 4.40 Ranking of problems related to input supply

Sr. No.	Particulars	Average Score	Ranks
1.	Lack of timely supply of imp. varieties	38.08	6
2.	Supply of HYV after training	69.58	1
3.	Non availability of quality planting material	54.42	3
4.	Timely availability of fertilizers	43.42	5
5.	Cost effective machinery	62.3	2
6.	Distant input supply centre	50.93	4
7.	Lack of store house	31.27	7

The Table 4.41 revealed the financial problems of the respondents in the study area. The lack of finance to purchase inputs was the problem faced by majority of respondents. Another serious constraint faced by the farmers was high cost of inputs like pesticides, fertilizers and other machineries due to which they were unable to adopt the improved practices completely There was also general issue about lack of credit facilities to the respondents which was one of the reasons of decline in the preference of farming as a profession. Majority of the farmers were deprived of credit facilities from institutions like banks due to one or the other reason. Therefore, they tend to seek these facilities from moneylenders which causes major exploitation of farmers.

Table 4.41 Ranking of problems related to financing facilities

Sr. No.	Particulars	Average Score	Rank
1.	Lack of finance to purchase inputs	52.1	1
2.	High cost of inputs	51.37	2
3.	Lack of credit facilities	48.63	3
4.	Poor economic conditions	45.48	4

5. SUMMARY AND CONCLUSIONS

5.1 Introduction

Agriculture is the major source of livelihood for majority of the rural population in developing countries like India. There are wide variations in the adoption of farming systems and associated livelihood occupations on account of diversities in culture, customs, agro-climatic conditions, etc., in different regions of the country. The livelihood security is a complex concept that is location specific, subjective and dynamic. It comprises of food, financial, health, cultural and educational securities. There has been a paradigm in the agricultural production after green revolution and the country has not only attained the self-sufficiency in food grain production but has also emerged as major exporter of agricultural commodities. However, the green revolution practices were mostly adopted by farmers of resource rich regions while about 65 per cent of the total cropped area of the country was not benefited as was expected. The production potential of these areas can be improved through the adoption of different conservation practices which can be ensured through the skill up-gradation of farming community by way of need-based trainings. The government has been and is making continuous efforts for the development of agriculture through various programmes, policies and incentives.

In the context of technological development, the evolution is well reflected by development of High Yielding Varieties (HYVs), high quality fertilizers & pesticides, improved farm implements, etc. But irrespective of these developments, the extent of adoption of modern agricultural technologies varies significantly among the farmers and regions. It may be on account of their low level of education, lack of communication, poor economic status, non-availability of inputs, marketing, etc. The gap in adoption of agricultural technologies can be filled by the agricultural extension and need based training services to the farmers. In agriculture, training is very important for generating awareness and technical know-how about the new technological interventions. The major players providing extension services in public sector are Krishi Vigyan Kendras (KVKs), State Agricultural Universities (SAUs) and

ICT-led extension interventions by Department of Agriculture, Cooperation and Farmers Welfare (DAC&FW), Government of India. They are responsible for catering to the needs of farmers in agricultural development as well as assisting the farmers in adoption of innovations.

Farming in hilly state like Himachal Pradesh is mixed and subsistence in nature. The average size of land holdings in the state is decreasing mainly due to fragmentation of holdings and allocation of land for non-agricultural uses. In addition to this, the majority of land holdings (more than 85 per cent) in the state are marginal/small and scope for off-farm income and employment opportunities is also limited. The magnitude of farm income from the small land holdings is not sufficient, thus migration of family members in search of livelihood earning is a common practice. The rural households are practicing diversified farm enterprises along with off-farm income and employment generation avenues to meet out their basic needs of attaining better possible livelihood. In order to improve the socio-economic status of farming community, there is a need for intensification and diversification of farm production systems. The key stake holders associated with the development of agriculture in the state are emphasizing on skill up-gradation of the farmers to facilitate the adoption of improved farm practices or technologies.

In this context, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya (CSKHPKV) through its KVKs, is imparting need-based trainings to the farmers in their routine activities as well as sponsored by various departments/agencies. In this regard, Satluj Jal Vidyut Nigam (SJVN) Ltd. Shimla has sponsored 52 training programmes (each for six days) under Corporate Social Responsibility (CSR) policy to CSKHPKV in which 1300 farmers from different districts of the state were trained by the Directorate of Extension Education, CSK HPKV, Palampur, till 2018. The trainings were sponsored on bee-keeping, mushroom cultivation, organic agriculture, commercial vegetable farming, protected cultivation, integrated farming etc. keeping in view the interest of farmers in particular field. It is expected that the trained farmers may have adopted the improved agricultural technologies in their production systems due to which their livelihood status may have improved. Therefore, it is imperative to assess the livelihood status of the trained farmers especially with respect to their resource endowments, status of adoption of

improved farm technologies, pattern of farm production system, income and employment, etc.

5.2 Objectives

The present study has been undertaken with the following specific objectives:

i) To examine farm resources, production system, level of awareness and adoption of farm technologies by trained farm households.

ii) To study the pattern of employment and to estimate income and livelihood status of selected farm households.

5.3 Methodology

A scientific and systematic methodology is indispensable for carrying out any scientific investigation. The accuracy, consistency, plausibility and validity of scientific conclusions/results to a large extent is determined by the scientific methodology adopted for the study. The present study "Assessment of livelihood status of farmers of Himachal Pradesh trained by CSK HPKV, Palampur" was conducted in Himachal Pradesh. Imparting trainings to the farmers and officers of the line department is one of the mandates of CSK HPKV, Palampur and its constituents Krishi Vigyan Kendras (KVKs) and Research stations. Under Corporate Social Responsibility (CSR) policy, Satluj Jal Vidyut Nigam (SJVN), Ltd., Shimla, sponsored 52 training courses (six days duration each) to CSK HPKV, Palampur during 2016-2018. In these training courses, a total of 1300 farmers from different districts of the state were trained up to 2018.

Two stage sampling technique was used for the selection of respondents. Among the different districts of the state, the highest number of participants were from district Kangra, hence it was selected purposively. At the first stage of sampling, out of the six major fields of trainings i.e. integrated farming, vegetable farming, mushroom cultivation, bee keeping, protected cultivation, organic farming, two fields of specialization i.e. integrated farming and vegetable farming were selected randomly. At the second stage of sampling, the list of trained farmers in the selected categories was prepared from the records of Directorate of Extension Education

(DEE), CSK HPKV, Palampur. From the list so prepared, a sample of 60 trainees (comprising 30 trainees from each selected category) was also selected randomly.

In order to meet out the requirements of specific objectives of the study, both primary as well as secondary data were collected. The primary data were collected by personal interview on specifically designed, well-structured and pre-tested survey schedules. The primary data from trained farm households were collected during the agricultural year 2019-20. The detailed information of demographic features (age, education, family size, type of family, main and subsidiary occupations etc. of respondent farmers), farm inventories (buildings, livestock, land, farm implements and machinery, etc.), income and employment pattern of trained farm households, land use and cropping pattern of important crops, awareness and adoption of farm technologies, household consumption pattern, livelihood security index and constraints faced by trained farm households was analysed during the study. The secondary data pertaining to various training programs for skill upgradation of farmers were collected from Directorate of Extension Education (DEE), CSK HPKV, various published and unpublished sources like official reports, journals, books, internet etc. The primary and secondary data so collected were carefully scrutinized, compiled and analysed by tabular method. The analysis of data was done by standard mathematical and statistical tools like averages, percentages, indices etc. to meet out the specific objectives of the study.

5.4 Major findings

1. The family system of majority of the sample households was nuclear (58.33 %) and the average size of family was 5.07 members on overall farm situation. It was marginally higher on integrated farming category (5.13) in comparison to vegetable farming category (5.00).

2. The majority of the heads of families were in the active workers'age group as about 43 and 33 per cent of the heads were in the age group of 41-60 and 25-40 years, respectively, on overall farm situation. Almost similar trend was found in case of integrated and vegetable farming categories.

3. The age wise distribution of the sample population indicated that the major portion of sample population was in the age group of 25-40 years (31.57 %)

followed by 41-60 years (25.99 %) on overall farm situation. The gender wise distribution of population revealed that the proportion of male population was higher compared to the female counter part. The sex ratio was found to be about 901, 948 and 924 on integrated farming, vegetable farming and overall farming situations.

4. The educational status of heads of the family and sample population was quite good as the literacy rates were estimated at about 92 and 90 per cent, respectively. Among the different farm categories, the literacy rate was relatively better on the vegetable farming category (93.75%) while gender wise it was relatively better in case of males (93.24%).

5. The economic status of the sample households was found to be good as about 72 per cent of total households were above poverty line. The proportion of respondents above poverty line was higher on vegetable farming category compared to integrated farming category households i.e. about 77 and 67 per cent, respectively.

6. On an average, per day availability of active workers was 3.13 members /farm while 1.94 members /farm were dependent on active workforce. The dependency ratio for integrated farming, vegetable farming and overall farm situations was 0.34, 0.42 and 0.38, respectively.

7. Among the farm resources, land was reported to be the most important resource for planning of different farm activities. The size of land holding on the sample farms was quite low and was estimated at 0.3595 hectares on overall farm situation. It was 0.3840 hectares on integrated farming category and 0.3350 hectares in case of vegetable farming category. On an average, the land put under cultivation was about 85 per cent of total land holding on overall farm situation.

8. *Kuhls*, bore wells and wells were used as the sources of irrigation by about 28, 25 and 22 per cent sampled households, respectively. On an average, about 25 per cent of total land holding was having irrigation facility which was marginally higher on vegetable farming category.

9. The total inventory on buildings was 1.92 on overall farm situation which comprised of one residential, 0.78 cattle shed and 0.13 stores, on overall farm situation. The inventory of buildings was relatively higher on integrated farming category (2.05). As far as the total value of buildings was concerned, it was estimated as Rs. 8,98,075, Rs. 11,74,300 and Rs. 10,36,188 in case of integrated, vegetable and overall farm situation, respectively. Among the different buildings the value of residential houses accounted for more than 90 per cent of total value of buildings in different categorised of farms.

10. As far as the total number of farm tools, implements and machinery were concerned, it was estimated at 13.45 in which the proportion of minor implements was around 86 per cent on overall farm situation. The value of total farm implements and machinery ranged from Rs. 34,586 in case of vegetable farming category to Rs. 45,203 on integrated farming category.

11. The average size of livestock unit of sampled households was estimated at 1.80, 1.40 and 1.62 on integrated, vegetable and overall farm situations, respectively. The total value of livestock unit was to the tune of Rs. 23,138 on overall farm situation.

12. The sample households were found to cultivate fruit plants like mango, kinnow, litchi and guava on the field bunds but the inventory of these fruits was quite less. It was estimated at around six in which the proportion of mango was the highest (about 72%).

13. The cropping pattern of the sampled households revealed that among cereals, wheat and paddy were the major crops as they accounted for about 24 and 19 per cent of the total cropped area, respectively. The area allocated for vegetable crops was about 34 per cent on overall farm situation, which was relatively higher on vegetable farming category (about 41 %). The cropping intensity on the sample households was estimated at 202.3, 207.43 and 204.75 per cent on integrated, vegetable and overall farm situations, respectively.

14. Among the cereals crops, the productivity of maize was found to be highest (32.58q/ha) followed by paddy (26.05q/ha). Among vegetables, it was highest in case of spinach (172.6q/ha) followed by cucumber, while the productivity

of fodder crops ranged from 179.54q/ha in case of bajra to 522.6q/ha in case of berseem, on overall farm situations.

15. It was found that the majority of respondents were inspired by neighbours (33.33 %) followed by agricultural officers (20 %) and relatives (18.33 %) on overall farm situation for training at CSK HPKV, Palampur.

16. The analysis of awareness and knowledge about the farming technologies indicated that the awareness level of sample households was quite good. On an average more than 80 per cent of households were aware about farm operations like application of manure & fertilizers, adequate spacing, ideal time of sowing and transplanting, hoeing & manual weeding. However, only about 48 per cent of the farmers were aware about weed management through the application chemicals.

17. Although the farmers were well aware about the farm technologies yet their adoption at field level was low especially in case of ideal number of ploughings, use of recommended doses of chemicals for weeds and insect-pest management. The proportion of household adopting farm practices like ideal time of sowing/transplanting, and manual weeding was quite high i.e. about 82 per cent each.

18. The analysis of gaps in the adoption of recommended practices revealed that the sample households were using higher seed rates than the recommendations in case of maize, okra and cucumber while it was on lower side in case of wheat, paddy, cauliflower and peas.

19. The application of farm yard manure in all the crops grown was below the recommendations. The percent gap ranged from about 3 per cent in case cauliflower to 17 per cent in case of okra on overall farm situation.

20. Similarly, the application of major plant nutrient i.e. Nitrogen (N), Phosphorus (P) and Potassium (K) was lower than the recommended doses for major crops. On average, the percent gap ranged between 6 to17, 13 to 53, 20 to 65 per cent for N, P and K, respectively among different crops

21. The occupational pattern of heads of the families indicated that about 75 per cent of them were associated with farming on overall farm situation and this proportion was relatively higher for vegetable farming category. However, about 10, 17 and 13 per cent respondents under integrated, vegetables and overall farming categories, respectively, were employed in private jobs.

22. As far as the employment of family members of sample households was concerned, it was found that on an average, about 60 per cent of the sample population was associated with farm activities as their main occupation. The private jobs, government services, labour and entrepreneurship were the major source of occupation for only about 13, 6, 9 and 3 per cent of sample population on overall farm situation, respectively.

23. The annual per farm gross income of the sample households from all the sources of income was estimated at about Rs 4,96,086. It was at Rs. 5,20,102 on integrated farming category which was about 10.20 per cent higher compared to vegetable farming category.

24. Among the major sources of income, the major portion of household income was contributed by farm income (61%) followed by government and private services i.e. 15.52 and 11.61 per cent, respectively on overall farm situation.

25. As far as farm income was concerned, the magnitude of income from crops was found to be higher on vegetable farming category (Rs 1,31,328) than the integrated farming category (Rs 1,06,414) whereas in case of income from livestock, it was higher on integrated farming category than the vegetable farming category i.e. Rs 2,10,488 and 1,53,829/farm/annum, respectively.

26. The analysis of average years of schooling revealed that on an average, 70 per cent households had 6-10 average years of schooling which pertains to their high literacy rate in the study area which was about 77 and 63 per cent in case of integrated and vegetable farming categories, respectively. About 40, 50 and 45 per cent of respondents were having middle and high schools within 2 kilometers from their homes in case of integrated, vegetable and overall farming situations, respectively.

27. The relative accessibility of educational institutions was found to be highest in the range of 0.6-1.0 km i.e. about 37 per cent households had nearest educational institute at a distance of 0.6-1 km range.

28. The consumption pattern of sample households indicated that rice, wheat, maize, pulses, fruits and milk were reported to be the major food items consumed by the sample households. Among the cereals, per farm monthly consumption of wheat was highest (23.97 kg) followed by rice (23 kg). The consumption of vegetables and pulses was estimated at 15.55 and 10.52 kg/farm/month, respectively on overall farm situation.

29. The consumption of milk was 25.48, 28.70 and 27.09 liters/month/farm on integrated, vegetable and overall farm situations, respectively. Among the different food items, the consumption of fruits was quite low i.e. 4.13 kg/farm/month on overall farm situation.

30. The value of individual indices of educational security were estimated at 0.38, 0.55 and 0.44 for average years of schooling, number of educational institutions within 2 km and relative accessibility of educational institutions, respectively. With respect to individual educational indices taken for educational security, the vegetable farming category households were better off than the integrated categories of households.

31. The individual indices for per capita food consumption in case of rice, wheat, vegetables and milk were at 0.30, 0.34, 0.26 and 0.17, respectively, on overall farm situation. The farm category wise comparison indicated that the vegetable farming category households were better off compared to integrated farming category households except in case of milk consumption.

32. As far as the individual indices of economic security were concerned, the values for farm assets, on-farm income, off-farm income and land ownership (ha) were estimated at 0.14, 0.53, 0.30 and 0.23, respectively. The integrated farming category of households were found to be better off than the vegetable farming household category except for value of farm assets in which the vegetable farming category households were comparatively better.

33. In case of social security, the value of individual indices was 0.20 in case of education above senior secondary, 0.50 in case of active workers/family, 0.04 for females in government job, 0.08 for females in private job and 0.20 in case of social participation of sample households on overall farm category. The value of indices in case of active workers/ family, females in government job and social participation were found to be higher on integrated farming category, whereas, the education above senior secondary and females in private job were found to be comparatively higher on vegetable farming category.

34. The education, food, economic and social security indices were estimated by averaging their different components. This indicated that the sample households were more secured with respect to education (0.46) followed economically (0.30), food (0.27) and socially (0.20).

35. There have been wide variations in the value of indices of among households on different categories of farms. These ranged between 0.05 to 0.82 in case of education security, 0.03 to 0.85 in food security, 0.02 to 0.65 for economic security and 0.01 to 0.63 in case of social security index on overall farm situation. Almost similar pattern was observed in case of integrated and vegetable farming categories of households

36. The farm category wise comparison revealed that vegetable farming category households were relatively more secured in case of educational and food securities while in case of economic and social security aspects the integrated farming households were relatively better.

37. The values of the major domains of livelihood security domains i.e. education, food, economic and social were used to worked out the overall livelihood security (LSI) and weighted livelihood security (LSI*) indices. The values of LSI and LSI* for the sample households were estimated at 0.31 and 0.39, respectively. The integrated farming category and vegetable farming category were almost same as far as their overall livelihood security was concerned.

38. Among the sample households the value of overall livelihood security index was found to vary been 0.17 to 0.55 whereas weighted livelihood security

index varies between 0.22 to 0.66 on overall farm situation. These variations were relatively higher on vegetable farming category of households compared to integrated farming category of households.

39. As far as the problems related to the supply of inputs were concerned, the problem of non- availability of seed of HYV was the major problem followed by high charges for hiring machinery and non-availability of quality planting material, while the problem related to non- availability of fertilizers in time, non-availability required varieties and lack of store house were not so serious.

5.5 Suggestions

1. The average land holding of the sample households was quite low i.e. 0.3595 hectares on overall farm situation. None of the households was associated with less land demanding agri-farm enterprises like; backyard poultry, mushroom cultivation, processing and value addition activities, etc. Thus, it is suggested that they may be motivated to adopt one or more of such enterprises along with existing fam activities so that their farm income may be increased. The products of these enterprises have high market demand and at the same time also fetch remunerative prices.

2. The level of awareness of the majority of sample households about the farm technologies was quite good except plant protection chemicals. However, the extent of adoption of these technologies at the field level was relatively low compared to awareness. Therefore, it is suggested that there is a need for regular upgradation of skills of farmers by the officers of department of agriculture and subject matter specialists of Krishi Vigyan Kendras. In order to improve the extent of adoption of farm technologies, there is need ensure the timely availability of critical inputs especially seeds of high yielding varieties, plant protection material etc.

3. The analysis of inventory of farm tools, implements, machinery, etc. indicated that it was quite low in case of major farm implements. The majority of the respondents reported that it is not economical for them to purchase such high cost assets for a meagre size of holding and the cost of hiring their services in very costly. In order to address both the problems it is suggested the farmer

may be motivated to form the groups at the village level. The department of agriculture should provide tractor/power tiller, thresher, nursery planter, etc. to the group under ongoing schemes of the department as is being done under JICA in the state. The maintenance and operational cost of the assets will be shared by the group members depending the use of assets by them.

LITERATURE CITED

Abdulwahab ASA, Nwachukwu SC, Salawu OL and Popoola PO. 2015. Assessment of livelihood activities of farmers in Kwara state, Nigeria. *Ethiopian Journal of Environmental Studies and Management* 8: 120-129

Ahuja R., Singh S.P., Sangwan S.S., Gautam, Sarita. 2019. Perceived training needs of dairy farmers about animal management practices in Haryana. *The Pharma Innovation Journal* 8: 192-196

Ali H, Azad MAK, Anisuzzaman Md, Chowdhury MMR, Hoque M and Shariful IM. 2010. Livelihood status of the fish farmers in some selected areas of Tarakanda upazila of Mymensingh district. *Journal of Agroforestry and Environment* 3: 85-89

Bar N, Dash SR and Mishra P. 2014. Impact of KVK training on development of tribal farmers- A study in Odisha. *Journal of Environment and Ecology* 5

Barman I., Debnath M.C., Baruah N., Tabin T., Megu O., Islam R. 2020. Training needs of women smallholder farmer of upper siang district of Arunachal Pradesh. *The Journal of Rural and Agricultural Research* 20: 1-8

Bhandari BS and Grant M. 2007. Analysis of livelihood security: A case study in the Kali- Khola watershed of Nepal. *Journal of Environmental Management* 85: 17-26

Biradar N, Sharma P, Pandey S, Satyapriya, Singh M and Radotra S. 2013. Livelihood analysis of livestock farmers in arid region of Deccan Plateau. *Range Management and Agroforestry* 34: 131-136

Deshmukh P.R., Kadam R.P., Shinde V.N. 2007. Knowledge and adoption of agricultural technologies in Marathwada. *Indian Research Journal of Extension Education* 7: 41-43

Doss CR. 2006. Analyzing technology adoption using microstudies: Limitations, challenges and opportunities for improvement. *Agricultural Economics* 34: 207-219

Dhakar R. 2014. An assessment of sustainable livelihood of rural women through income generating activities in Satna District (M.P.). M.Sc. Thesis, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur

Geetha MN, Yankanchi M and Gowda M. 2016. Impact of farmers training programmes conducted by KVK, chikkaballapura district, Karnataka. *International Journal of Applied and Pure Science and Agriculture* 2

Hatai LD and Sen C. 2008. An economic analysis of agricultural sustainability in Orissa. *Agricultural Economics Research Review* 21: 273-282

Hinojosa VA, Speelman EN, Thapa A, Wei HE, McDonald AJ, Tittonell P and Groot JCJ. 2018. Exploring farmer perceptions of agricultural innovations for maize-legume intensification in mid hills regions of Nepal. *International Journal of Agricultural Sustainability* 16: 74-93

Hiremath BN and Misra H. 2012. Enhancing livelihood security of tribal farmers through agribusiness: Successful experiences from Gujrat. *International conference on Agribusiness and food industry*

Hogger and Ruedi. 2004. In search of sustainable livelihood systems: Managing resources and change. Ruedi Baumgartnet and Ruedi Hogger, pp1-381, Sage publications, New Delhi

Indoria D and Balai CM. 2018. Farm women empowerment through secondary agriculture. *International Journal of Current Microbiology and Applied Sciences* 7: 4131-4137

Jabbar MA, Saleem MAM, Gebreselassie S and Beyene H. 2003. Role of knowledge in the adoption of new agricultural technologies: An approach and application. *International Journal of Agricultural Resources, Governance and Ecology* 2: 312-327

Jodha R and Dahiya M. 2018. Livelihood Problems of small and marginal farm families in rural areas of Haryana state, India. *International Journal of Current Microbiology and Applied Sciences* 7: 1624-1629

Kamruzzaman M and Hakim MA. 2016. Livelihood status of fishing community of Dhaleshwari river in Central Bangladesh. *International Journal of Bioinformatics and Biomedical Engineering* 2: 25-29

Katke. 2019. Precision Agriculture adoption: Challenges of Indian Agriculture. *International Journal of Research and Analytical Reviews* 6

Kumar DS, Barah BC, Ranganathan CR, Venkatram R, Gurunathan S and Thirumoorthy S. 2011. An analysis of farmers' perception and awareness towards crop insurance as a tool for risk management in Tamil Nadu. *Agricultural Economics Research Review* 24: 37-46

Kumar S., Singh S.R., Kumari C., Christopher K. 2019. Socio-economic profile determining the adoption of innovations among the farmers of Bhagalpur district of Bihar. *Journal of Pharmacognosy and Phytochemistry* 9: 1274-127.

Kurbetta NC, Hiremath US and Dolli SS. 2017. Effectiveness of training programmes conducted by district agricultural training centre. *International Journal of Pure and Applied Bioscience* 5: 416-423

Laxmi V and Mishra V. 2007. Factors affecting the adoption of resource conservation technology: Case of zero tillage in rice-wheat farming systems. *Indian Journal of Agricultural Economics* 62: 126-138

Mahajan SS and Baburao WS. 2012. Farmers' awareness of sugarcane cultivation and its financial management: A micro level study of selected villages of Sangli district. *Encouraging Technology Hands on Science* 5: 44-52

Mahapatra SK. 2007. Livelihood pattern of agricultural labour households in rural India: Evidence from Orissa. *South Asia Research* 27: 79-103

Makal A, Banerjee A, Roy A, Hazra S and Polley K. 2017. Issue and problems in agricultural development: A study on farmers of West Bengal. In Agricultural Anthropology P 179-189

Matto JM, Dar MA, Jan R, Shah ZA and Mir R. 2018. A study on adoption about the recommended agricultural practices through ATMA by paddy growers in Budgam region of Kashmir. *Journal of Pharmacognosy and Phytochemistry* 7: 45-49

Medhi S, Singha AK, Singh R and Singh RJ. 2017. Effectiveness of training programmes of Krishi Vigyan Kendra (KVK) towards socio-economic development of farmers in Meghalaya. *Economic Affairs* 62: 677-682

Meena BS and Singh B. 2010. Impact of training programmes imparted by Krishi Vigyan Kendras in Rajasthan. *International Journal of Agricultural Sciences* 6: 213-215

Meena LK, Bairwa SL, Lakra K and Sirohiya L. 2015. Analysis of the profile on participating and non-participating farmers in chickpea production technology. *Agriculture Update* 9: 31-36

Meena KL, Meena HR, Chauhan TR, Kumar M and Chowdhury P. 2017. Constraints faced by livestock's farmer in adoption of scientific technology. *Indian Journal of Hill Farming* 30: 192-197

Mishra S., Kunwar N., Tripathi S. 2017. Involvement of women in dairy enterprise and used modern technologies and training needs in dairy farming. *International Journal of Home Science* 3: 234-237

Mittal S and Mehar M. 2015. Socio-economic factors affecting adoption of modern information and communication technology by farmers in India: Analysis using multivariate probit model. *Journal of Agricultural Education and Extension* 22: 199-212

Mottaleb KA. 2018. Perception and adoption of a new agricultural technology: Evidence from a developing country. *Technology in Society* 55: 126-135

Nain M.S, Singh R, Mishra JR. 2017. A study of farmers' awareness on agricultural insurance schemes in southern Haryana. *Indian Journal of Extension Education* 53: 75-79

Nandi JA, Gunn P, Adegboye GA and Barnabas TM. 2014. Assessment of fish farmers' livelihood and poverty status in Delta State, Nigeria. *Agriculture, Forestry and Fisheries* 3: 427-433

Nandi R and Swamikannu N. 2019. Agriculture extension system in India: A Meta-analysis. *Research Journal of Agricultural Sciences* 10: 473-479

Noor KBM and Dola K. 2011. Investigating training impact on farmers' perception and performance. *International Journal of Humanities and Social Science* 1

Palhania A. 2018. Livelihood economics of Gujjars in Kangra district of Himachal Pradesh. M.Sc. Thesis. Department of Agricultural Economics, Extension Education and Rural Sociology, CSK HP KV Palampur, Himachal Pradesh, India

Prajapati P.J, Chhodavadia H.C., Joshi N.S., Parmar V.S. Patel M.L. 2018. Training Needs of farmers with respect to New agricultural practices. *International Journal of Current Microbiology and Applied Sciences* 7: 577-582

Prasad HN and Kushwaha RK. 2015. Impact of KVK's training programmes on socio-economic status of farm women. *Plant Archives* 15: 421-428

Rahman MS, Khatun M, Rahman ML and Haque SR. 2018. Assessment of training needs on crop production for farmers in some selected areas of Bangladesh. *Bangladesh Journal of Agricultural Research* 43: 669-690

Raina V., Sharma N., Khajuria S., Kumar K, Choudhary S., Syed Z., Hussain K. 2017. Training needs of dairy farmers. *International Journal of Agriculture, Environment and Biotechnology* 10: 245-251

Raghav S and Sen C. 2014. Socio-economic status of farmers and their perception about technology adoption: A case study. *International Journal of Economic and Business Review* 2: 7-13

Ramya HR. 2016. Livelihood analysis of tribal farmers in high altitude tribal zones of Karnataka state. MSc. Thesis. Department of Agricultural Extension, Acharya NG Ranga Agricultural University, Hyderabad, India

Roy A. 2018. Assessing impact of training programmes of Krishi Vigyan Kendra on dairy farmers of West Bengal. *International Journal of Farm Sciences* 8: 1-3

Sajeev MV, Singha AK and Venkatasubramanian V. 2012. Training needs of farmers and rural youth: An analysis of Manipur state, India. *Journal of Agricultural Science* 3: 103-112

Sarita, Singh S.P., Rachna, Sangwan S.S. 2017. Perceived training needs of buffalo dairy farmers regarding scientific animal husbandry practices in Haryana. *Asian Journal of Agricultural Extension, Economics & Sociology* 21: 1-7

Serin V, Bayyurt N and Civan A. 2009. Effect of formal education and training on farmers income. *European Journal of Social Sciences* 7

Sharma S, Mistri R and Choubey M. 2017. Nonfarm based livelihood in rural Sikkim: An Analysis. *Economic Affairs* 62: 263-273

Sharma VK, Vaid A, Sharma PK, Ajrawat B, Jamwal A, Sharma N, Mahajan V and Gupta S. 2017. Impact assessment of training on farmer's perception, performance and entrepreneurship development. *Maharashtra Journal of Agricultural Economics* 20: 154-156

Shahjar F., Khandi S.A., Bafabda A., Bhushan B., Khateeb A.M. 2018. Study of relationship between socio-economic profile and perceived training needs of dairy farmers in Jammu district of Jammu and Kashmir, India. *The Pharma Innovation Journal* 7: 71-76

Shetty PK., Manorama K., Murugan M., Hiremath MB. 2014. Innovations that shaped Indian agriculture-Then and now. *Indian Journal of Science and Technology* 7: 1176-1182

Singh AK. 2013. Income and livelihood issues of farmers: A field study in Uttar Pradesh. *Agricultural Economics Research Review* 26: 89-96

Singh B., Indoria D., Meena K.C. and Meena G.S. 2020. Training needs of tribal farm women in dairy farming in eastern Rajasthan. *International Journal of Current Microbiology and Applied Sciences* 9: 3302-3305

Singh DK and Singh P. 2014. Effectiveness of training programmes under Agricultural Technology Management Agency in Bihar. *Indian Research Journal of Extension Education* 14: 93-95

Singh RKP, Singh KM and Kumar A. 2015. A study on adoption of modern agricultural technologies at farm level in Bihar. *Economic Affairs* 60: 49-56

Singhal S and Vatta L. 2017. Impact of Krishi Vigyan Kendra on adoption of improved agricultural production practices. *International Journal of Science, Environment and Technology* 6: 993 – 1000

Srinivas A and Shailja A. 2013. A review on impact of training programmes conducted by different training institutes. Indian Journal of Research 2: 266-267

Surur O. 2007. Effectiveness of agricultural development training program: the cases of teff and livestock farmers of alaba woreda, Southern Ethiopia. M.Sc. Thesis. Department of Rural Development and Agricultural Extension. School of Graduate Studies, Haramaya University.

Swathi G. 2016. A study on livelihoods of tribal farmers in Andhra Pradesh. Ph.D. Thesis. Department of Agricultural Extension. Acharya NG Ranga Agricultural University, Hyderabad, India.

Venu BN, Umesh KB and Gujanana TM. 2018. Livelihood security of agricultural labour households in rainfed region of north-Karnataka-An economic analysis. *Indian Journal of Agricultural Research* 52: 463-471

Wondimagegnhu BA, Huluka AT and Nischalke SM. 2019. Determinants of farm livelihoods of smallholder farmers in Yayu biosphere reserve, SW Ethiopia: A gender disaggregated analysis. *Cogent Economics & Finance* 7

Yaseen M, Hassan S, Tunio MT, Ameen M and Abbas S. 2015. Role of capacity building and training for sustainable livelihood of farming community in Pakistan. *European Academic Research* 3: 3085-3096

APPENDICES

Appendix I: Household schedule for data collection on assessment of livelihood status of farmers of Himachal Pradesh trained by CSKHPKV Palampur.

Objectives:

a. To examine farm resources, production system and level of awareness in adoption of farm technologies of trained farm households.

b. To study the pattern of employment and to estimate income and livelihood status of selected farm households.

1. **Farmers' information:** **Date of survey:**

Name:	Village:
Age:	Block:
Contact No.:	Post Office:
Size of family:	Type of family (Joint/Nucleus):
Education:	Social caste: SC/ST/GEN/OBC/Others
Contact no.:	Category of farmers: BPL/APL
Main occupation:	Subsidiary occupation:
Monthly income from main occupation (Rs):	Monthly income from subsidiary occupation (Rs):

2. **Family information:**

Sr. No.	Relation with head	Age (yrs)	Sex (M/F)	Educationalstatus (P/M/HS/SS/G	Occupation and annual income			
					Main occupation (A/GS/PJ/B/R/L/Others)	Income (Rs.)	Subsidiary Occupation (A/GS/PJ/B/R/L/Others)	Income (Rs.)

Note: M/F=Male/Female, A=Agriculture, GS=Govt. service, PJ=Private job

3. Educational pattern:

Sr. No.	Particulars	Primary school		Middle school		Senior secondary		Higher education (College/University		Remarks
1.	Distance of Edu. Institute from home (km)	Private	Govt.	Private	Govt.	Private	Govt.	Private	Govt.	
2.	Road facility from home to Edu. Institute (Y/S)									
3.	Mode of conveyance & stay during study									
i.	On foot									
ii.	School/College Van									
iii.	Daily up down from home									
iv.	Day scholar									
v.	Hostler									
4.	Expenditure on conveyance/staying/hostel (Rs/month)									
5.	Tuition Fee (Rs/month)									
6.	Others									

Problems associated with education of your ward:

Sr. No.	Constraints	Rank
1.	Quality education is not available in the village	
2.	Schools are at distant place	
3.	School are too high	
4.	Problem of staff in government schools	
5.	Quality education is not available in the village	
6.	Schools are at distant place	
7.	School are too high	
8.	Others if any	

4. Inventory of Farm Buildings:

Sr. No.	Particulars	Type of building (No.)			Year of construction	Present Value (Rs)	Annual Repairs (Rs)	Source of funds (PS/L)
		Kuccha	Pucca	Mixed				
1.	Residential							
2.	Cattle Shed							
3.	Stores							
4.	Any other							

Note: PS-Personal savings, L-Loan from bank

5. Location of residential area: Within the city/ Periphery of city/Outskirts in rural area
6. Various facilities available in the residential area:

Sr. No.	Facilities	Yes/No
1.	Road connectivity	
2.	Safe drinking water	
3.	Well maintained furniture	
4.	Electricity	
5.	Facility of T.V for entertainment	
6.	Vehicle in the household	
7.	Telephone facility	
8.	Facility of market nearby	
9.	Others	
10.		

7. Constraints /problems in the residential area:

Sr. No.	Constraints	Rank	Remarks
1.	Disputes with neighbourhood		
2.	Far distant market facility		
3.	Disputes over drainage water		
4.	Issues regarding location		
5.			
6.			
7.			

Land inventory and land utilization**:**

Sr. No.	Particulars	Area (Bigha/Kanal)			Source of irrigation
		Irrigated	Unirrigated	Total	
1.	Land owned				
2.	Leased in land				
3.	Leased out land				
4.	Total land (1+2-3)				
Land utilization					
5.	Land under forests				
6.	Land under non-agricultural use				
7.	Barren and uncultivable land				
8.	Permanent pastures & grazing land				
9.	Cultivable wasteland				
10.	Fallow land				
11.	Land under Misc. (Trees/Grasses/Bushes)				
12.	Fallow land				
13.	Current fallows				
14.	Net area sown				

Land rent: a) Leased-in land Rs ……. (per bigha) b) Leased-out land Rs……(per bigha)

9. Inventory of farm machinery and implements **:**

Sr. No.	Particulars	No.	Year of purchase	Present Value (Rs.)	Annual repairs (Rs)	Source of funds (PS /L)
A	**Major Implements**					
i.	Tractor					
ii.	Power tiller					
iii.	Chaff-cutter					
iv.	Thresher					
v.	Sprayer/Duster					
vi.	Water pump					
vii.	Seed drill					
viii.	Any other					
B	**Minor Implements**					
i.	Plough					
a.	Wooden					
b.	Iron					
ii.	Spade					
iii.	Hoe					
iv.	Rake					
v.	Sickle					
a.	Local					
b.	Cerated					
vi.	Axe					
vii.	Planker					
viii.	Any other					
ix.						

Note: PS-Personal savings, L-Loan from bank

10. Inventory of livestock

Sr. No.	Particulars		No.	Lactation (No.)	Present value (Rs)
1.	Local cow	Milk			
		Dry			
2.	Improved cow	Milk			
		Dry			
3.	Buffalo	Milk			
		Dry			
4.	Bullocks				
5.	Heifer				
6.	Young stock				
7.	Sheep				
8.	Goat				
9.	Poultry Birds				
10.	Horse				
11.	Mule				
12.	Others				

11. Availability and utilization of Livestock products:

Sr. No.	Particulars	Unit	Production (Per month)	Consumption (Per month)	Quantity Sold (per month	Sale price (Rs/unit)
1.	Milk					
2.	curd					
3.	Ghee					
4.	Paneer					
5.	Khoya					
6.	Wool					
7.	Meat					
8.	Eggs					
9.	FYM					
10.	Vermi-cmpost					
11.	Others if any					
12.						

12. Cropping pattern and Production of different crops

Sr.No.	Season/Crop	Area (Bigha)		Production (q)		Remarks
		I	UI	MP	BP	
A	*Kharif season*					
I	Cereals					
II	Oilseed & Pulses					
III	Fodder					
IV	Vegetables					
B.	Rabi season					
I	Cereals					
II	Oilseed & Pulses					
III	Fodder					
IV	Vegetables					

13. Fruit crops:

Sr. No.	Particulars		No. of plants	Area (Karnal/Bigha)	Production (Annual)
1.	Apple	Bearing			
		Non bearing			
2.	Mango	Bearing			
		Non bearing			
3.	Citrus	Bearing			
		Non bearing			
4.	Litchi	Bearing			
		Non bearing			
5.	Kiwi	Bearing			
		Non bearing			
6.	Plum	Bearing			
		Non bearing			
6.	Pear	Bearing			
		Non bearing			
6.	Others	Bearing			
		Non bearing			

14. Trainings obtained from CSKHPKV:

Sr. No.	Particulars	Duration	Date & year	Venue
1.	Organic Agriculture			
2.	Vegetable Production			
3.	Protected Cultivation			
4.	Others			

15. Why the need for training felt?

a. Do you receive sufficient income from training?
b. Did you get motivation to receive the training from your neighbourhood?
c. Were you motivated by extension service agents to adopt training?
d. Did anyone in your relatives receive training?
e. Did you witness better livelihood of any farmer nearby who has received training?

16. Adoption pattern of recommended technology:

Sr. No.	Recommendations (Y/N)	Protected cultivation	Mushroom Production	Organic agriculture	Vegetables Production	Others
1	Ploughing before sowing					
2	Seed rate(Kg/ha)					
3	Seed treatment					
a	Chemical(qty)					
4	HYV					
5	Application of FYM before sowing					
a	Quantity(q/ha)					
6	Application of fertilizers below seed(Y/N)					
7	Ideal cropping pattern					
8	Green manuring					
9	Mulching					
10	Irrigation					
a	At time of sowing					
b	At critical period					
11	Chemicals for disease and pest control					
a	Chemical qty					
12	Use of biofertilizers					
13	Rhizobium					
14	Others					

17. Pattern of employment:

a. Source of household employment:

How many members of the household are involved in employment activities?

Family member	Farming	Govt. Job	Private service	Labour	Entrepreneur	Others

b. No. of hours devoted and annual income:

Particulars	No. of hours devoted	Annual income
Farming		
Govt. Job		
Private service		
Labour		
Entrepreneur		

Others		
Particulars	**No. of hours devoted**	**Annual income**
Farming		
Govt. Job		
Private service		
Labour		
Entrepreneur		
Others		
Particulars	**No. of hours devoted**	**Annual income**
Farming		
Govt. Job		
Private service		
Labour		
Entrepreneur		
Others		
Particulars	**No. of hours devoted**	**Annual income**
Farming		
Govt. Job		
Private service		
Labour		
Entrepreneur		
Others		

c. Is farming the main source of employment of household? Y/N

d. How many members of the household are active workers in farming activity?.....

e. Is the occupation seasonal or permanent?

f. No. of working days per year of the active workers

Sr. No.	**Total no. of working days per year**	
	Before training	**After training**
1.		
2.		
3.		
4.		
5.		

18. Annual income from farm and non-farm resources:

Sr. No.	**Sources**	**Quantity (Kg)**		**Value (Rs)**		**Annual income Rs.**	
A.	**FARM**	Before training	After training	Before training	After training	Before training	After Training

1	Sales of cereal crops						
2	Sales of pulses						
3	Sales of vegetables						
4	Sales of fruits						
5	Sales of milk & products						
6	Sales of flowers						
7	Sales of fodder						
8	Sales of FYM						
9	Sales of compost						
B	**NON FARM**						
1	Govt. Job						
2	Private service						
3	Entrepreneurship						
4	Daily paid labour for others						
5	Others						

19. Livelihood status of farm households:

a. Educational security

i. Are there any schools/educational institutes available nearby? Y/N

ii. Years devoted for schooling

Particulars	**No. of years devoted**
Schooling of males of households	
Schooling of females of households	
Schooling of children in the family	

iii. What is the distance of school/institute from home?

iv. Is the fee structure of educational institute affordable to you? Y/N

v. Annual cost of travelling? .....

b. Health security

i. Are there any primary health centres available nearby? Y/N

ii. Is the annual medical fee affordable? Y/N

iii. Are there any special hospital services available nearby?

iv. If the PHC is quite distant, whatis the annual expenditure o travelling?

v. Is malnutrition a common problem among family members? Y/N

c. Food security

i. What are the various sources of nutrition of household? Farm products/PDS/Market

ii. Which of the following is available for daily nutrition?

Cereals	Pulses	Oilseeds
Milk	Fruits	Eggs
Fish	Meat	Others

iii. Quantity consumed of each component of diet in a month (kg/family/month) and annual consumption expenditure

Particulars	**Quantity consumed (kg/family/month)**	**Annual consumption expenditure (Rs.)**
Cereals		
Pulses		
Oilseeds		
Fruits		
Milk		
Eggs		
Fish		
Meat		
Others		

d. Economic security

Net profits earned per annum by the household? …….

e. Habitat security

f. Type of household accommodation Kuccha/Pucca

ii. Availability of safe drinking water? Yes/No

iii Presence of toilet facility to household? Yes/No

20. Problems and suggestions:

Sr. No.	**Particulars/Constraints**	**Response(Y/N)**	**Suggestions**
A	**INPUT SUPPLY**		
1	Seeds of improved varieties not available		
2	Lack of HYV		
3	Planting material of uniform quality not available		
4	Fertilizers are not available timely		
5	Fertilizers are costly		
6	Labour shortage		
7	Lack of adequate machinery		
8	Machinery is not cost effective		
9	Input supply centre is far away		
10	Storage problem		
2	Extension facilities not available		
C	**FINANCIAL**		
1	Lack of finance to purchase inputs		
2	High cost of inputs		
3	Lack of credit facilities		
4	Poor economic conditions		

Brief Biodata of student

Name : Neha Dhadwal

Father's Name : Sh. Mohinder Singh Dhadwal

Mother's Name : Smt. Kiran Dhadwal

Date of Birth : 4th December, 1995

Permanent Address : Village- Darir, P.O-Sanhoon, Teh. Palampur, Distt. Kangra (H.P.) Pin code- 176093

Academic Qualifications:

Qualification	Year	School/Board/ University	Marks (%)	Division	Major subjects
10th	2011	D.A.V Senior Secondary School, Alampur, Kangra (H.P.)	91.20	First	Hindi, English, Maths, Science, Social science, Computer science
12 th	2013	D.A.V Senior Secondary School, Alampur, Kangra (H.P.)	72.20	First	English, Maths, Physics, Biology Chemistry.
B.Sc. (Agriculture)	2018	CSK HPKV, Palampur (HP)	78.30	First	All subjects of Agriculture
M.Sc. (Agriculture)	2020	CSK HPKV, Palampur (HP)	84.10	First	Agricultural Economics and Agronomy
Title of Thesis in M.Sc.			Assessment of livelihood status of farmers of Himachal Pradesh trained by CSK HPKV, Palampur		
Fellowships/Scholarships/Gold Medals/Awards/Any Other Distinction:			i) Merit scholarship at the rate of Rs. 750 per month from CSK HPKV, Palampur, H.P, India ii) Two months internship at NABARD, Shimla.		
Publications/Research paper/Published abstract			Nil		