ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF MAJOR VEGETABLE CROPS IN KULLU VALLEY OF HIMACHAL PRADESH

Thesis

by

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CERTIFICATE-I

This is to certify that the thesis titled **"Economic Analysis of production and marketing of major vegetable crops in Kullu valley of of Himachal Pradesh"** 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 Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan (HP) is a bonafide research work carried out by **Ms. Ishita Mandla (F-2018-06-M)** daughter of Shri Subhash Chander Mandla 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 has been fully acknowledged.

Place: Nauni, Solan
Dated: 2020

Dr. Manoj Kumar Vaidya
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CERTIFICATE-II

This is to certify that thesis entitled **"Economic analysis of production and marketing of major vegetable crops in Kullu valley of Himachal Pradesh"** , submitted by Ms. Ishita Mandla (F-18-06-M) daughter of Mr. Subhash Chander Mandla to Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan (HP), in partial fulfillment of the requirements for the award of degree of **MASTER OF SCIENCE (AGRICULTURE) AGRICULTURAL ECONOMICS** has been approved by the Student's Advisory Committee after an oral examination of the same in collaboration with the internal examiner.

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I solely claim the responsibility for the shortcomings and limitations in this work.

Place: Nauni, Solan **(Ishita Mandla)**

Dated:

CONTENTS

ABBREVIATIONS

%	:	Per cent
&	:	And
@	:	At the rate
∑	:	Summation
C.A.C.P.	:	Commission for Agricultural Costs and Prices
C.A.G.R.	:	Compound Annual Growth Rate
e.g	:	for example
Ep	:	elasticity of production
et al.	:	*et alii*(Co- workers)
etc.	:	Many more
Fig.	:	Figure
FYM	:	Farm Yard Manure
H.P.	:	Himachal Pradesh
Ha	:	Hectare
i.e.	:	that is
kg	:	Kilogram
MT	:	Metric Tonne
MVP	:	Marginal Value Product
No.	:	Numbers
Qtl	:	Quintal
r	:	Efficiency Ratio
R^2	:	Coefficient of multiple determination
$\bar{R}^2$	:	Adjusted R^2
Rs	:	Rupees
S.No	:	Serial Number
viz.	:	that is to say

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Chapter-1

INTRODUCTION

Vegetables are imperative to the general health of individuals, giving essential nutrients and minerals, dietary fibre, and phytochemicals, in this manner reducing risks from dangerous diseases and other ailments. Vegetables are grown worldwide in almost around 200 nations. A world vegetable survey showed 392 vegetable crops commercially being cultivated around the world. Most of the vegetables are marketed fresh with only a small quantity being processed.

Almost three-fourths of the world's vegetable production comes from Asia. China produces over half of the world's vegetables. The area under vegetables has been expanding because of its potential value income. Commercial vegetable production is a high input and labour-intensive vocation.

Vegetable consumption is enormously rising, reflecting the customer's increased income, want for assorted variety, and awareness about dietary advantages. Conventional marketing practices are giving way in developing countries to the more present day practices of the developed countries: super markets, distance transportation, global marketing, different processing and packaging practices, quality standards, supply chain management and product diversity. These changes have increased pressure on conventional, small, and poor farmers to keep up with the requirements of good seed, efficient practices, hiring of skilled manpower, market awareness, and the ability to provide safe and high quality produce.

India has been blessed with a wide range of climate and geographical conditions and is most suitable for growing various kinds of vegetable crops. India is now the second largest producer of vegetables in the world after China.

Vegetables are important constituents of Indian agriculture and are grown in an area of 10,463 thousand hectares with an annual production of 1,87,474 thousand MT (NHB 2018-2019).Vegetables with shorter duration and higher productivity have resulted in greater economic returns to farmers over the last two decades .The production of vegetables has increased from 58.50 million MT to 187.5 million MT about 3.5 percent more than that in 2016-2017(Anonymous, 2017).

The vegetable productivity in India is 17.70 MT/ha and contributes 14 per cent of the total world production of vegetables (Sahni and Kumari, 2017). The states comprising West Bengal, Uttar Pradesh, Bihar, Madhya Pradesh, Odisha, Gujarat and Karnataka are the leading vegetables producers contributing nearly 40 per cent of the total vegetable production of the country. A total vegetable export from India during 2018-2019 was Rs.5419.48 crores (Anonymous, 2019), sharing 2.25 per cent of total agricultural exports and 0.23 per cent of total national exports. Major importers of vegetables from India are UAE, Nepal, Sri Lanka and UK accounting for around 55 per cent of the total vegetable export from India. It ranks 24th in the export value of vegetables (Vanitha *et al.*, 2013).

Agriculture is the main occupation of the people of Himachal Pradesh. The total area under vegetable cultivation in the state is 8,576 thousand hectares with a total production of 1743.31 thousand MT in the year 2017-2018 (Anonymous, 2018). The major vegetables grown in the state are cabbage, okra, tomato, capsicum, chillies, french beans, radish, pea, carrot, cauliflower, spinach, ginger and potato.

Kullu is a broad open valley situated on the bank of Beas river. It is situated at an altitude of 1230m above the mean sea level. It is located at 31.9 latitude and 77.1 longitude. The area under vegetable production in Kullu is 6500 hectares, with an average productivity of 200 quintals per hectares and the total production is 141854 MT (HP Agriculture Department). The area under vegetables has increased in all the districts of the state during the last few decades. It is mainly due to the better agro-climatic conditions, increase in irrigational facilities and concerted efforts by the government in educating the farmers about the cultivation of cash crops.

There are a number of problems associated with the production and marketing of vegetables. The important ones are non-availability of skilled labours, higher cost of inputs, greater fluctuations in their prices and a high percentage of losses in their handling and transportation. Productivity of vegetable crops is unable to reach its optimum level. Low productivity may be attributed to poor infrastructure, poor irrigation, small and fragmented land holdings, and low investment capacity of the farmers, fragile ecosystem and inaccessibility to technology. The perishable nature of the vegetables also results in inability on the part of producers to manage supply in assembling markets. These parameters need to validate time to time for policy making and for the farmers to take judicious farm decisions.

Keeping all these points in mind the proposed study was conducted with the following specific objectives:

Objectives:

1. To study the socio economic conditions of vegetable growers.
2. To analyse the cost of cultivation of major vegetable growers in the area.
3. To study the resource use efficiency in vegetable cultivation.
4. To analyse the market structure and problem associated in production and marketing of vegetables.

Chapter-2

REVIEW OF LITERATURE

This chapter deals with the review of past work done in India and abroad on farmers socio economic status, cost and returns, resource use efficiency and marketing of field crops and vegetable yields as well as the problems and constraints faced by the farmers in the process of production and marketing of these vegetables. The work done by the research workers have been presented under the following different sections.

2.**1 Socio-economic status.**

2.2 Cost and returns.

2.3 Resource use efficiency.

2.4 Marketing.

2.5 Problems and constraints.

2.1 THE SOCIO-ECONOMIC PARAMETERS

Arya (2000) has analysed the significance of off-season vegetables been grown in the hills of Himachal Pradesh. The study revealed that the situation of the off-season vegetable production has changed inside and out and the zones under these vegetables are continually expanding in all the districts of Himachal Pradesh during the last four decades. Lahaul and Spiti recorded highest increase in area and production of vegetables, followed by Mandi, Shimla, Solan and other districts of the state. Shimla, Solan, Kullu, Mandi, Lahaul and Spiti and Kinnaur districts of the state are the main providers of off-season vegetables in the market of Northern India. The off-season vegetables, grown during the summer months, opened up avenues for sale in plains and created employment opportunities to the youthful jobless adolescents and to make better utilization of the small land holdings for growing such valuable off-season vegetables resulting in improvement of the socio economic status of the hill farmers. He proposed that the efficiency of the small land holding can be increased in Himachal Pradesh by adopting modern techniques of production.

Zhu *et al.* (2008) revealed that the vegetable production industry has grown incredibly over the last 40 years in Shanghai which incorporates greenhouse crop production. Confronting the prerequisite of improving quality and farmer's income to join into WTO and

to be more competitive in the market, Shanghai has started to adjust vegetable varieties, improve crop production conditions, expand their organic cultivation and develop contamination free healthy vegetables.

Asmatoddin *et al.* (2009) studied the Socio-economic status of tomato producer in Western Maharashtra. The results revealed that on an average, family size of kharif, rabi and summer tomato grower farmers was 5.97, 5.47 and 5.59 respectively. Education status of family members at overall level in kharif, rabi and summer season i.e. illiterate, primary, secondary, graduate farmers were 7.78, 24.44, 45.56 and 22.22 per cent respectively.

Busari *et al.* (2013) studied the impacts of socio-economic characteristics of women vegetable growers on the gross edge in two zone of Osun state .Study shows that larger part (76.15 %) of women vegetable growers fall between the ages of 41-60 years with a mean age of 50.85 years and 42.31 percent of women vegetable growers had education up to primary standard. While 24.61 percent got secondary education. All of the women vegetable growers were married. There is no noteworthy distinction in the socio-economic characteristics of women vegetable growers in the study zone. Likewise, there is no significant contrast in the gross margin of women vegetable grower groups in the study area. The mean gross margin obtained from the study depicts that the vegetable production is an essential income earner for rural women in the study area.

Mishra and Kalyan (2015) analysed the individual and socio-economic profile of vegetable growers of eastern Uttar Pradesh of India. The investigation revealed that 35.61 percent of the vegetable growers had high school education, about 61.5 percent had medium level of cultivating experience and about 25.37 percent of vegetable growers were the member of two organizations. The annual family income of about 56.59 percent of farmers were found in the medium income category i.e. Rs.55001 to Rs.190000. The study shows that 57.07 percent of vegetable growers had medium level of financial status.

Ramachari *et al*. (2016) conducted study in Majholi block of Jabalpur District in Madhya Pradesh. The study reveals that majority of the pea growers had (40.00%) medium technological gap followed by (30.40%) high and only (29.60%) had low regarding overall improved pea production technology. The study also concluded that in order to reduce technological gap in pea production, training should be given in production technology. The farmers should adopt the recommended production practices and extension services should be effectively implemented in rural pea growing areas.

2.2 COST AND RETURN

Singh (1993) has evaluated regional specialization in the cultivation of off-season vegetables on commercial scale in Himachal Pradesh. The study highlighted that the marginal and small vegetable growers were profited by cultivation of off-season vegetables as it gave more employment, better returns per unit of land, best utilization of their resources and higher returns. The study inferred that cultivation of off-season vegetables on commercial scale gave more economic advantages to the vegetable producers than the traditional cultivators in the state.

Thakur *et al.* (1994) worked out the comparative economics of off-season vegetable growers in the hills of Himachal Pradesh. The outcomes demonstrated that tomatoes are the most profitable vegetable followed by cabbage and capsicum. It was found that the vegetable production is exceptionally beneficial in the hills and can be utilized to expand the income of small and marginal farmers. It was found that there is a need for a coordinated way to deal with the production problems faced by the farmers.

Arora and Saxena (1999) conducted a study on vegetable marketing in hill region of Uttar Pradesh. The study was focused to examine the marketed surplus, marketing cost and price spread. The marketed surplus of vegetable was found from 89.33 per cent in potato to 97.51 per cent in cabbage. The marketing cost incurred by vegetable growers was very high which ranged from Rs.83.47 (radish) to Rs.201.27 (green pea) per quintal, due to high cost of transportation, packing and unauthorized commission.

Baruah and Barman (2000) studied the marketing cost, marketing margin, benefit-cost ratio and price spread involved in the production and marketing of tomatoes in Barpeta district, Assam, India. Net returns over costs showed direct relationship with the farm size. Producers share was found to be the highest when the farmers sold their produce through secondary wholesalers than through the primary wholesalers.

Kambhar (2000) studied the input use, to assess per hectare cost and returns, to examine the marketing costs, market margins and price spread of rabi onion and recognize the issues faced by the farmers in production and marketing of rabi onion in Pune region. The study shows that per hectare average gross returns and net benefit were Rs.65239.76 and Rs.20736.70 respectively. The per rupee returns were 1.46 which show that it is profitable venture, per quintal average marketing cost was found to be Rs.54.06. The major constraints faced by the onion cultivators were non accessibility of quality seeds at lower rates, high

fertilizers cost, wage rates and non-accessibility to loan facility in time. In marketing of onion the significant challenges expressed by the farmers were price variations, high transport cost and high commission charges.

Singla *et al*. (2006) studied the financial aspects of production and factors impacting the productivity of green peas in Punjab based on the primary data collected from pea producers. The outcomes of the study reveal that the green peas and wheat are the main crops in rabi season. It has been observed that 75.85 percent of the farmers purchase pea seeds from dealers directly. The yield of green peas has been found highest in small farms among all the farm-size categories. The total cost incurred has been higher in large followed by small and medium farmers because of more utilization of inputs by the former. The gross and net returns have been worked out higher in large as compared to small and medium farmers because of realization of higher expenses by them and exploring of different markets due to their higher marketable surpluses.

Bala *et al.* (2011) examined the cost and return structure for the promising enterprise of off-season vegetables in Himachal Pradesh and concluded that the per hectare cost was highest for tomato followed by cabbage, cauliflower and lowest for peas cultivation. Cost of cultivation per quintal has been found to be highest for peas followed by cauliflower, tomato and cabbage. Gross returns as well as net returns per hectare have been observed to be highest for tomato followed by cauliflower, cabbage and peas. The study has suggested promoting the cultivation of off-season vegetables and enhancement of the irrigation potential in these areas.

Akter and Islam (2011) analysed the economics of winter vegetables production in Narsingdi district of Bangladesh. The study examined the comparative profitability of selected winter vegetables viz tomato, cauliflower and cabbage. The result revealed that the production of all the selected vegetables was found profitable but cabbage was relatively more profitable than cauliflower and tomato. The per hectare cost of production of tomato, cauliflower and cabbage were Tk.118000.00, 116977.00 and 120522.00 and the gross returns of cabbage (Tk 220000.00) were higher than those of tomato (Tk 217020.00) and cauliflower (Tk 210000.00. The per hectare net returns of producing tomato, cauliflower and cabbage were Tk 97000.00, 93023.00 and 99478.00 respectively.

Dastagiri *et al.* (2013) investigated about the production trends, marketing efficiency and export competitiveness and concluded that the gap between prices received by the

farmers and those paid by urban consumers is large, indicating disorganized marketing arrangements. The study found that the area under total vegetable cultivation is grown at the rate of 4.12 per cent and the production growth rates were 6.48 per cent. The study showed that in most of the cases, marketing cost, transport cost, labour charges were adversely affecting the marketing efficiency.

Sreedhara *et al.* (2013) studied the financial aspects of capsicum production under protected cultivation in Northern Karnataka. The study reveals that the cost of establishment of capsicum production under protected condition was Rs.2,51,109 for each unit and the total cost of cultivation of capsicum production under protected conditions was Rs.55,080 per units. The total variable cost was Rs.20 374 per unit. Among all the variable costs, the labour cost was highest (Rs.10,291) followed by expenditure on material cost (Rs.8,487). The extent of total fixed cost was most elevated (Rs.34,707) compared to total variable cost (Rs.20,373). The total yield of capsicum production under protected conditions was seen as 5.50 tons per unit. The total returns and net returns from capsicum production under controlled conditions were Rs.l,54,734 per unit and Rs.l,15,279 per unit respectively.

Lokapur and Kulkarni (2014) investigated the cost and returns structure of major vegetables in the Belgaum area. The results showed that the average per hectare usage of human labour was (78.77 man days) in case of potato followed by onion (70.25 man days), tomato (66.37 man days) and green chilli (48.13 man days). The total cost incurred by the farmers on potato cultivation was highest of (Rs.47299.86/ha) as compared to onion (Rs.31240.2/ha), green chilli (Rs.25797.37/ha), and tomato (Rs.27532.42/ha). The high cost in potato was due to high seed rate. The gross returns in case of potato was (Rs.130410.60/ha) followed by onion (Rs.124518.60/ha), tomato (Rs.64969.70/ha), and green chilli (Rs.55250.00/ha). The net returns were found highest in case of onion (Rs.93278.43/ha) and least in case of green chilli (Rs.29452.63/ha).

Choudhary *et al*. (2017) conducted a study in Dhari block of Nainital district, Uttarakhand for selected four vegetables covering maximum area. On this basis, pea, cabbage, french bean and tomato were selected. The costs and returns from each vegetable crop was analyzed and found that the returns per rupee invested on pea, cabbage, tomato, beans were 1.56, 1.25, 1.20 and 1.10 respectively. Thus, it was concluded that vegetables are advantageous for growers to adopt cultivation in this region.

2.3 RESOURCE USE EFFICIENCY

Sankhayan *et al.* (1971) worked out the resource productivity and allocative proficiency on seed potato cultivation in Himachal Pradesh by using Cobb-Douglas and Quadratic Production Functions. The inputs like land, human labour, bullock labour, seed, composts and fertilizers were chosen for potato and maize crop. The analysis showed that constant returns to scale was observed for seed potato farms. In case of maize crop, diminishing returns to scale was observed. The farm resources within crop were ideally allocated in the case of seed potato.

Rathore *et al.* (1973) carried out the resource use efficiency and return from commercial crops of Himachal Pradesh. Five commercial crops, potato, ginger, tomato, french bean and chilli were studied and Cobb-Douglas production function was fitted to each crop on per hectare basis. The results shows that human labour use alone accounts for more than 33% of the total cost in all crops. The ratio of marginal value product to the factor cost for the selected commercial crops indicated that increased bullock labour use will be productive yet the small size of terraced plots permits restricted utilization of the resources.

Thakur *et al.* (1990) studied about the resource-use, farm size and returns to scale for the tribal district of Lahaul-Spiti in Himachal Pradesh. Cobb-Douglas production function was fitted to work out the elasticities of production of inputs. It was observed that factors of production were not proficiently used. The elasticity coefficients of inputs, especially labour does not vary altogether between marginal, small and large farm size. Farm size was significant factor to influence the productivity of inputs at farm level.

Venkataramana *et al.* (1996) analysed the resource-use efficiency in tomato cultivation in Kolar area of Karnataka by fitting Cobb-Douglas production function in order to determine the productivity of every resource in the production of tomatoes. The outcomes of analysis reveals that the marginal value product and factor cost ratio on account of small farmers for land, compost and staking materials were greater than unity, showing under-usage of these inputs in tomato production.

Priscilla and Singh (2016) analysed the resource use efficiency in Thoubal district of Manipur. The vegetable covered under study were cabbage, cauliflower and peas. To find the resource use efficiency in vegetable production, log linear production function was fitted independently for each of the three vegetables taking yield as the dependent variable and per hectare expenditure on seed, plant protection chemicals, concoction fertilizers, human labour,

machine and bullock labour as the explanatory variable. It was observed that the vegetable were not cultivated according to the package of practices and that these harvests were taken without thinking about resource productivity and the resource use efficiency.

2.4 MARKETING

Agarwal and Saini (1995) studied the marketing of vegetables in Jaipur market in Rajasthan and found that the marketing of vegetables are more prone to marketing problems on account of their basic attributes of perishability and massiveness. The middlemen control the circumstances by offering low rates to the farmers under the excuse of low demand and dishonestly rejecting the produce as being substandard. It was further concluded that the costs of vegetables were generally higher in the consuming markets than the producing markets. Therefore, both producers and consumers were poorly served with current system of vegetable marketing.

Sharma *et al*. (1995) in their study on marketing of vegetables in Himachal Pradesh reported that, costly wooden boxes, time consuming manual grading, distant markets, high transportation charges, malpractices in the market and lack of market information were the major problems faced by growers in storage, transportation and marketing of vegetables.

Shyamsunder and Achoth (1996) studied about the price spread in marketing of irrigated Onion in Chickballapur taluka of Kolar district. The study showed that there are three marketing channel prevalent in the area: - Channel I: Producer-Village trader - Wholesaler - Retailer-Consumer Channel II: Producer - Wholesaler Retailer - Consumer Channel III: Producer - Commission agent - Trader - Retailer – Consumer. The results showed that the producers were benefited with highest net price per quintal in channel–II and the lowest in channel–I. It could be concluded that channel–II was the best among all channels.

S. C. Mohapatra (1999) in his research study, "Production and Marketing of Onion in Bolangir District of Orissa" analysed the cost of production of onion. The study comprised of cost of production, various marketing operations, the price spread and marketing efficiency of various channels operating in the onion marketing and identified various constraints in onion marketing. Three marketing channels have been identified in the marketing of onion in the study area viz.

Channel -1 Producer - Consumer

Channel - II: Producer - Trader – Consumer

Channel-III: Producer -Trader -Wholesaler- Retailer – Consume

Channel - I marketing cost was only Rs.4 per quintal, Channel - II was Rs.30 per quintal and in the Channel - III was Rs.59 per quintal. The producer received the maximum share of consumer rupee in channel-l (97-99%), followed by channel-ll (79 09%) and channel-ill (53 03%). It indicates that the marketing efficiency was highest in case of channel-l followed by channel-ll and channel-ill.

C. R. Mirchandani (1998) in his research paper, "Regulated Market their survey and Impact on Market Structure and Efficiency" concluded that the fundamental goal of regulated markets was by regulating sales and purchases of agricultural commodities to create conditions for reasonable competition and in this manner, ensure a fair deal to the farmer.

Tripathi and Sharma (1999) examined the cost and margin of off-season vegetable pea in Garhwal hill of Uttar Pradesh. There were three main marketing channels identified in the study area for off-season vegetable peas were:

Channel I -Producer – Consumer

Channel II -Producer – Commission agent/Wholesaler – Retailer-Consumer

Channel III -Producer-Local/contractor-Forwarding agent Commission agent/Wholesaler-Retailer-Consumer.

The highest net sale price for green pods of pea for producer at farm-gate was in channel-II (Rs.1336.32/qt) in which the producer performed all the marketing functions to carry the produce in Dehradun mandi for wholesale. The lowest farm-gate sale price was for the channel-III (Rs.814.10/qt) in which the local contractor/forwarding agents were involved between commission agent and the producer.

Radha and Easwara (2001) in their study, "Economics of Production and Marketing of Major Vegetables grown in Karimnagar District of Northern Telangana Zone of Andhra Pradesh." revealed that there are three main marketing channels were identified in the area viz.

I - Producer - Consumer, 1]

II - Producer - Retailer - Consumer and

III - Producer - Primary Wholesaler - Secondary Wholesaler - Retailer - Consumer.

The study revealed that about 90 percent of the vegetables produced in the district were marketed through channel-III.

Pramanik and Prakash. (2010) evaluated the marketable surplus and marketing efficiency of vegetables in Indore district of Madhya Pradesh. The results of the study reveals that the marketable surplus of tomato, potato and cauliflower was found to be 90%, 89% and 95.5% respectively. It is concluded that marketing efficiency is influenced by market intermediaries and transitory nature of the products. In case of cauliflower, marketing efficiency is most noteworthy in case of Channel 1. Post-harvest loss during marketing is recorded highest in case of tomato (16 %) and least in cauliflower (4%).

Kotnala *et al.* (2013) studied the marketing pattern and marketing efficiency of major vegetable viz.tomato, green pea, cabbage and brinjal in Ramnagar of Nainital area in Uttarakhand. The most preferred marketing channel followed by all the three size group of farmers was producer-commission agent- distributer -retailer-purchaser as more than 91 percent of the farmers had sold their produce through this channel. The marketing costs and marketing margins as per the customer's prices were higher; marketing efficiency was extremely low for green pea followed by tomato, brinjal and cabbage. The major constraints in marketing of vegetables were high cost of packaging material, shortage of transport facilities and absence of market information related to costs. The study suggested that there is a need to provide timely supply of crucial inputs at reasonable prices, apart from providing good transportation facilities and market outlets.

2.5 PROBLEMS AND CONSTRAINTS

Kumar *et al.* (1999) conducted a survey to study the production and marketing of high value crops in Himachal Pradesh. The major problems reported in the study were availability of good quality seeds, lack of technical knowledge of application of pesticides, unavailability of perennial and reliable source of irrigation. The main marketing huddles were inadequate storage facilities, poor market intelligence, lack of availability of packing material at proper time and inadequate transportation facilities.

Sharma *et al.* (2000) evaluated the various problems associated with vegetable marketing and opportunities in Himachal Pradesh. The study shows that the marketed surplus reduced to nearly 90 per cent, 95 per cent and 93 per cent of total production of tomato, pea and cauliflower mainly due to post harvest losses. The major constraints in marketing of vegetables were high cost of packaging, insufficient transportation facilities and lack of market information about prices.

Chandrashekar *et al.* (2001) studied the production constraints faced by growers in Gadag district of Karnataka and found that the lack of technical guidance, incidences of pests and diseases, high cost of fertilizers, high cost of plant protection chemicals, non-availability of seed materials and fertilizer in time were some of the constraints being faced by the farmers in the study area.

Kumar and Singh (2002) studied the problems of vegetable production in Bharatpur district of Rajasthan and revealed that the vegetable growers faced the problems of non-availability of inputs at right time, poor and insufficient quality of inputs, non-availability of desired tomato varieties in the market, high cost of inputs, lack of knowledge about the correct method of their use and absence of subsidy. The study pointed out that these problems discouraged the vegetable growers to give boost to vegetable farming. They suggested that extensive demonstrations of improved and high yielding varieties of vegetable crops should be laid, provisions should be made for timely supply of crucial inputs at reasonable price to sustainable vegetable production on a profitable basis.

Vasava and Pandya (2003) conducted study to overcome the major problems of mango and tomato growers of tribal and non-tribal areas of South Gujarat. Study reported the various problems that were being faced by the growers viz high price of farm yard manure (FYM) and chemical fertilizers, lack of knowledge regarding plant protection measures and fertilizer application, lack of storage facilities, lack of processing units, lack of knowledge about storage and processing, lack of road facility at village level, low price of produce, problem of middlemen and quick deterioration of products. They suggested that farmers should themselves prepare farm yard manure (FYM) and reduce the cost, establish cold storage and processing units at block level through the co-operative agricultural service societies and the government should support the agro-based industries. Training regarding storage and processing should be organized by the departments and state agricultural universities, government should fix MSP and marketing should be done through co-operative agricultural service societies.

Sharma *et al.* (2004) conducted a study to know the resources contributing to shift of land from traditional crops to vegetables and the problems faced by 200 vegetable growers of Punjab. The study revealed that 90.5 per cent entered into vegetable cultivation due to the reason of easy cash payment. More than fifty per cent of the respondents were interested in increasing the area under cultivation, 60.5 per cent faced the problem of high cost of fertilizers whereas 48.5 per cent faced the problem of complexity of procedure for getting

loan from banks and 97.5 per cent reported that no minimum support price was fixed by Government. The problems such as vegetable glut in the market, lack of regulated market, lack of storage facilities and exploitation by commission agents were faced by 79.0, 46.0, 38.0 and 51.5 per cent of respondents respectively.

Thyagarajan and Prabu (2005) studied the recommended technologies adopted by the tomato growers of Tamil Nadu and reported that the problems faced by the tomato growers were mainly wide price fluctuations, lack of knowledge to identify pests and diseases, high cost of labour, inadequate water supply, non- availability of credit, exploitation by the middlemen by charging high rate of commission and brokerage, lack in adequate transport and market facilities and lack of storage facilities at the village level. They suggested that fixing a minimum economic price for tomato throughout the entire season, arranging intensive training programmes for tomato growers especially covering identification of pests and diseases, scientific storage, arranging adequate credit facilities and strengthening the existing rural marketing facilities with cold storage would help to overcome these major constraints.

Samantaray *et al.* (2009) evaluated the various constraints in vegetable production of tribal vegetable growers in Orissa. The major constraints highlighted in the study were lack of post-harvest technologies, absence of storage facilities, inadequate training programme and inadequate demonstration of new technology. It was also observed that the lack of proper follow up service, lack of location specific recommendations, lack of community awareness and lack of effective supervision were also contributing to the low production. Thus, organizing training programmes, proper demonstration of improved technologies, and post-harvest technologies to the farmers would not only encourage them but also make them more economically independent.

Sunil Kumar *et al.* (2010) studied the problem faced by tomato growers in Belgaum district of Karnataka. The study revealed that majority of the farmers (75.83 %) faced the problem of lack of technical knowledge about improved cultivation practices and post-harvest technology, 65 per cent of the respondents faced the problem of high fluctuation in market price, followed by high transportation cost (62.53 %), labour shortage and high wage rates (55.83 %), lack of irrigation facilities and power shortage by (46.66 %) farmers.

Khan and Khan (2012) conducted a study on the marketing of agriculture crop in rural Indian economy. The study revealed that the local rural markets were the best option for the

marginal and small farmers to dispose off their perishable surplus to get quick returns. Due to the lack of infrastructural facilities in the study area, most of the farmers preferred local rural markets instead of going to the specialised markets or near-by town area. The variation in the transaction of agricultural produce was mainly due to a number of factors like higher market demand, accessibility, nature of produce, transportation facility, market-size, fair price etc. The average price of individual crop also varies from market to market due to the various socio-spatial factors.

Patel *et al.* (2013) reported various constraints faced by vegetable growers in his study conducted in North Gujarat. The major production constraints faced by the vegetable growers were higher production cost, higher prices of insecticides/ pesticides. Problems of higher price fluctuations in the market and lack of transportation facilities. Small farmers had reported the problems of credit facility and lack of information about high yielding variety of vegetable crops. Further, reported the lack of marketing information and lack of co-operative marketing societies as the major marketing constraints.

Sharma and Devkota (2014) conducted study on performance of vegetable marketing system in Kangra district of Himachal Pradesh. Four major vegetable crops i.e., potato, tomato, peas and cauliflower and four farm practices viz., improved seeds, fertilizer applications, plant protection measures and storage and marketing were evaluated. The results revealed that high cost of chemicals, non-availability of disease free seeds, non-availability of chemicals, lack of skilled labour, lack of time, lack of technical knowledge, financial problem, poor shelf life, inadequate supply of storage material, lack of marketing facilities, less support price and fluctuation in prices were the main constraints faced by the vegetable growers in the adoption of recommended farm practices of vegetable crop.

Singla and Singh (2016) studied about the problems associated with the adoption of vegetable production technologies by the growers of Patiala district in Punjab. It was observed that input constraint such as non-availability of improved seed at the time of sowing was reported by 89.16 percent farmers and high costs of pesticides by 70.83 per cent followed by financial, technical and marketing constraints.

Sajad *et al*. (2016) conducted a study on post-harvest losses at different levels in solanaceous family of vegetables viz, tomato, brinjal, potato and chilli in different markets of Jabalpur, Madhya Pradesh. Major economic losses were observed in tomato followed by brinjal, potato and chilli. The results revealed that the overall losses at different stages were

around (28.32 %) in tomatoes, (25.32 %) in brinjal, (21.34 %) in potato and (19.18 %) in chilli. These losses at different levels can be controlled by development of scientific methods, proper handling, proper storage, transportation and management.

Ankita (2017) conducted the study on value chain analysis of commercial vegetables in Kullu district of Himachal Pradesh and reported that out of four channels, channel-C (Producer-Local trader/commission agent-Wholesaler-Retailer-Consumer) was most preferred channel as 65.38, 50.79 and 58.23 per cent of tomato, cauliflower and pea were traded through this channel. Major problems faced by farmers were shortage of skilled labours, high incidence of diseases and pests, high prices of inputs, price and yield risk, unavailability of good quality seeds and planting material. In case of traders and wholesalers, problems were related to poor and unhygienic condition of market yards and unhealthy competition.

Gupta *et al.* (2017) analysed the problems faced by cauliflower growers in western Uttar Pradesh and study revealed that majority (81.66 %) of cauliflower growers reported inferior quality seeds supplied by the input dealers. The other constraints face by growers were unavailability of fertilizers and micro nutrients when required, lack of technically sound labour and lack of knowledge regarding plant protection measures.

Kumar *et al*. (2018) conducted a study in Almora and Nainital districts of Uttarakhand to find out marketing behaviour of the vegetable growers and constraints in marketing of vegetable produce. The major marketing constraints revealed in the study were higher commission rate of middlemen, fluctuating market price, non-availability of nearby market, high transportation charges and high cost of packaging material. He suggested for creation of horticulture based self-help group at village level, strict compliance of rules and regulation of regulated market, guidance on market avenues from time to time to the vegetable growers.

Chapter-3

MATERIALS AND METHODS

This chapter deals with the description of sampling procedure and methods used in the study. It includes research design, tools and techniques for investigations used for data collection in the light of objectives of the study. A systematic methodology is necessary for scientific study because it gives reliability, validity and precision to the study.

The selection of the study area and sampling technique for investigation as well as analytical techniques used for data analysis have been explained in the following sub heads.

3.1 SELECTION OF THE STUDY AREA

3.1.1 Selection of study area:

During past two decades the total area under vegetable cultivation in Kullu District has shown an increase in area from 356 ha in the year 1995-1996 to 6500 ha in the year 2017-2018, registering an increase of more than 18 times. The vegetable grown in the district also enjoy price advantage due to their off-season nature in the area. Thus, Kullu district was selected purposively for the present study.

3.2 SAMPLING DESIGN AND SAMPLE SIZE

3.2.1 Selection of the respondents:

Multistage Random Sampling technique was used to select the respondents. At the first stage, 2 development blocks (Kullu and Naggar) out of 5 blocks in the districts viz Kullu, Naggar, Anni, Banjar and Nirmand) were selected randomly. At the second stage, 5 panchayats from each block were selected randomly. The panchayats selected from the

Kullu block were: Bajaura, Shamshi, Jia, Hatt and Mohal and the pachayats selected from the Naggar block were: Hallan-I, Hallan-II, Katrain, Badagran and Brann respectively. At the third stage, a list of farmers growing vegetables was prepared from the selected panchayats and a sample of 6 vegetable growers was taken assigning random number using simple random technique from each panchayat, thus comprising a sample of 60 vegetable growers in total for final survey.

3.2.2 Selection of Market and Market intermediaries:

Marketing is an important operation in vegetable production. Therefore, to examine the various marketing aspects of vegetables, five traders, five wholesalers and five retailers were selected randomly from the Bhunter market to study the functioning of market.

Table 3.1: Distribution of sampled households according to their land holdings

Category of farmer	Size of land holding (ha)	No. of farmers	Percentage of farmers	Average size of land holding (ha)
Marginal	< 1	25	41.67	0.62
Small	1 – 2	23	38.33	1.13
Medium	>2	12	20	2.12
Total	-	60	100.00	1.12

For the analysis of data, different households were divided into three categories according to the size of their land holdings, viz., marginal (< 1ha), small (1-2 ha) and medium (>2 ha). The distribution of the sampled farmers according to their size of land holdings is presented in Table 3.1. It can be seen from the table that 41.67 per cent of the selected farmers belonged to marginal category, 38.33 per cent to the small and 20.00 per cent to the medium category respectively. The average size of the land holding of the selected respondents worked out between 0.62 ha to 2.12 ha in marginal to medium farmers.

3.3 NATURE AND SOURCE OF DATA

To meet the objectives of the proposed study, both primary and secondary data was collected.

3.3.1 Primary data

Primary data was collected on a pre-tested and well-structured schedule by personal interview method from the selected respondents. It included the household information on socio-economic parameters viz. land utilization, farm inventory, livestock, cropping pattern,

income, cost of cultivation, marketing costs and problems faced by the farmers in production and marketing of vegetables.

3.3.2 Secondary data

Secondary data pertaining to the area, production, productivity, market arrivals and prices was collected from different government offices, revenue offices, Department of Horticulture, Department of Agriculture as well as from the various available literatures and websites.

3.4 ANALYTICAL FRAMEWORK

To fulfil the specific objectives of the study, the following analytical tools and techniques were adopted.

3.4.1 Tabular analysis

3.4.2 Cost concepts

3.4.3 Production function

3.4.4 Market analysis

3.4.5 Production and Marketing problems

3.4.1 Tabular analysis:

Simple tabular analysis was used to examine the socio-economic status, resource structure, income and expenditure pattern, marketing channels, price spread and grower's opinion about the production and marketing problems of vegetables. Simple statistical tools like averages and percentages were used to compare, contrast and interpret the results.

The following type of indices has been used for estimation of different parameters.

3.4.1.1Literacy rate

Literacy rate tells us the per cent of population in the household that are literate and it is obtained from the ratio of the total no. of literate persons in the population and the difference between the total population and population below five years times hundred.

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

3.4.1.2 Literacy index

Literacy index indicates the quality of education of the human resource and it is calculated by sum of weighted value for literacy category (primary, middle, high school and graduation) to the number of persons to be literate.

$$\text{Literacy Index} = \frac{\sum W_i X_i}{W_i}$$

Where;

W_i = Weights (0, 1, 2, 3, 4 and 5) for illiterate, primary, middle, high school and graduation.

X_i = Number of persons in respective category.

3.4.1.3 Dependency ratio

Dependency ratio has been calculated by the ratio of total number of dependents in a family to the average family size.

$$\text{Dependency ratio w.r.t. total workers} = \frac{\text{No. of dependents in a family}}{\text{Total workers}}$$

$$\text{Dependency ratio w.r.t. average size of family} = \frac{\text{No. of dependents in a family}}{\text{Average family size}}$$

3.4.1.4 Cropping intensity

The cropping intensity has been calculated as the ratio of gross cropped area to the net sown area and is expressed in percentage.

$$\text{Cropping intensity} = \frac{\text{Gross cropped area}}{\text{Net sown area}} \times 100$$

3.4.1.5 Compound growth rate (CGR)

The compound growth rates for different variables were calculated by fitting the exponential function to the figures of area, production and productivity of vegetables for the period of 2010-11 to 2018-19 of India and Himachal Pradesh. The ordinary least square method was used to fit the power function. It was converted into log linear function with the help of logarithmic transformation as under:

$$Y = ae^{bt}$$

Or

$\log Y = \log a + bt.$

Where,

Y = Dependent variable (area, production and productivity etc.)

t = Independent variable (time in a year).

Compound growth rate (CGR) was calculated by using the following formula:

CGR = b×100

For significance testing t value was calculated using the formula:

$$t = \frac{CGR}{SE\ (CGR)}$$

3.4.2 Cost concepts

Cost concepts mounted by CACP (Commission for Agricultural Costs and Prices) were used in the study to calculate the cost of cultivation and farm income measures.

3.4.2.1Cost analysis: Following farm management cost concepts were used

Cost A_1 includes

1) Value of seed/seedling.
2) Value of manures, fertilizers and plant protection chemicals.
3) Hired human labour.
4) Bullock labour/ tractor.
5) Owned and hired machinery.
6) Irrigation charges.
7) Depreciation on implements, farm buildings and irrigation structures.
8) Interest on working capital.
9) Other miscellaneous charges.

Cost A_2: Cost A_1 + rent paid for leased in land

Cost B_1: Cost A_1+ interest on the fixed capital

Cost B_2: Cost B_1 + rental value of owned land

Cost C_1: Cost B_1 + imputed value of family labour

Cost C_2: Cost B_2 + imputed value of family labour

Cost D: Cost C_2 + value of management input (10% of Cost C_2)

3.4.2.2 Farm income measures:

For the purpose of working out returns the following concepts were used:

Farm Business Income: Gross income – Cost A_1

Family Labour Income: Gross income – Cost B_2

Net Farm Income: Gross income – Cost C_3

Farm Investment Income: Farm Business Income – Imputed value of family labour

3.4.3 Production function and resource use efficiency

The Cobb-Douglas production function was used for studying the relationship between output of vegetables and the various inputs of each vegetable.

$$Y = aX_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5}$$

Or

$$\text{Log}Y = \text{Log}\, a + b_1 \text{Log}X_1 + b_2 \text{Log}X_2 + b_3 \text{Log}X_3 + b_4 \text{Log}X_4 + b_5 \text{Log}X_5 + U$$

Where,

Y	=	Gross return (quintal)
X_1	=	Expenditure on human labour (manday)
X_2	=	Expenditure on FYM (quintal.)
X_3	=	Expenditure on Plant protection (kg.)
X_4	=	Expenditure on fertilizers (kg.)
X_5	=	Expenditure on seed (kg)
a	=	intercept and b_1 to b_5 are the elasticity coefficients
u	=	error term

3.4.3.1 Adjusted coefficient of multiple determination

Adjusted R^2 is the modified version of R^2 that has been adjusted for the number of predictors in the model. Adjusted R^2 adjusts the statistic based on the number of 5

independent variables in the model which is the desired property of a goodness of fit statistic. The adjusted value of R^2 is calculated as follow:

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

Where,

R^2 = Coefficient of multiple determination

n = Number of sample observation

k = number of parameters estimated

$\overline{R^2}$ = Adjusted R^2

3.4.3.2 Test for overall significance of regression

'F' test has been used to test the overall significance of explanatory variables to check if they affect the dependent variable or not. The expression for the test is as under:

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

Where,

k = Number of parameters.

n = Number of observations in the sample.

R^2 = Coefficient of multiple determination.

3.4.3.3 Estimation of Resource Use Efficiency:

The marginal value product of a particular resource represents the expected addition to the gross returns caused by an additional unit of a resource, while other inputs are kept constant.

The marginal value product (MVP) of the resources employed in vegetable production was calculated by multiplying the marginal physical product (MPP) by the unit price of the output(y)

That is $MVP_{xi} = MPP_{xi}.Py$

Where,

MVP_{xi} = Marginal value product of i^{th} input.

MPP_{xi} = Marginal physical product of the i^{th} input.

P_y = Price of unit output.

3.4.3.4 Estimation of MVP-Factor Cost Ratio:

$r = MVP_{xi}/MFC$

Where,

r = Efficiency ratio.

MVP_{xi} = Marginal value product.

MFC = Marginal factor cost.

If r = 1 resource is efficiently used.

r > 1 resource is under-utilized.

r < 1 resource is over utilized.

3.4.3.5 Elasticity of production:

$e_p = MPP_{xi}/ APP_{xi}$

Where,

e_p = elasticity of production

MPP_{xi} = Marginal physical product

APP_{xi} = Average physical product

3.4.4 Market analysis

3.4.4.1 Marketing costs: The total cost, incurred on marketing by the farmers was calculated as:

$$TC_m = C_g + \sum_{i=1}^{n} MCi$$

Where,

TC_m = Total cost of vegetable marketing.

C_g = Cost paid by the grower in the marketing of his produce.

MC_i = Marketing costs incurred by i^{th} middleman.

3.4.4.2 Marketing margin: Total Marketing Margin of middleman is the difference between the total payments (marketing cost + purchase price) and receipts (sale price) of the middlemen and was calculated as follows:

$AM_{mi} = SP_{mi} - (PP_{mi} + MC_i)$

Where,

AM_{mi} = Absolute margin of the i^{th} middleman.

SP_{mi} = Selling price of the i^{th} middleman.

PP_{mi} = Purchase price of i^{th} middleman.

MC_i = Cost incurred on marketing per unit.

3.4.4.3 Marketing efficiency

Acharya's Formula (2001) was used for estimating the market efficiency which is given as:

$$\text{MarketingEfficiency} = \frac{FP}{(MC + MM)}$$

Where,

FP = Price received by the farmer.

MC = Total Marketing Cost.

MM = Net Market Margins.

3.4.4.4 Price spread: It is the difference between the price paid by the consumer and price received by the producer.

Producer's share in consumer's rupee: It is the ratio of price received by the farmer to the retail price. It was calculated by using the formula:

$$PS = \frac{PF}{PR} \times 100$$

Where,

PS = Producer's share in consumer's rupee.

FP = Price received by the farmer/ producer per unit of output.

RP = Retail price (consumer's price) per unit of output.

PF and PR was the farmer's price and retail price (consumer's price)/kg respectively.

3.4.5 Production and Marketing problems:

To test the various problems associated with the production and marketing of vegetables, Chi-square test of goodness of fit was carried out. The detail of approximate Chi-square test (χ^2) is given as under:

$$\sum_{i=1}^{K} \frac{(O_i - E_i)^2}{E_i} \sim \chi 2(K-1) \text{ d.f.}$$

Where,

O = Observed values

E = Expected values

K = number of farm size groups

Various other Mathematical and Statistical tools were also used as per the requirement of the data analysis.

3.5 DEFINITIONS OF TERMS AND CONCEPTS USED IN THE STUDY

Fixed cost

The various items viz., land rent, land revenue, depreciation, interest on equipment investment and interest on owned fixed cost.

Variable cost

Variable cost includes the expenditure on labour and material input cost and interest on working capital.

Inputs and costs

Following were the various inputs used in the vegetable cultivation.

Hired human labour cost

Hired human labour was estimated in terms of man-days where in 8 hours of work in a day was considered as one man day. The man days were valued at Rs. 350 per man day based on existing wage rate in the study area.

Family labour

Family labour cost was calculated on the basis of imputed charges paid to hired labour.

Seed/ Planting material cost

The seed/ planting material cost was worked out at the rate based on prevailing market rate in the study area.

Fertilizer cost

Expenditure on fertilizers had been evaluated by multiplying the physical quantities of fertilizers used in the vegetables cultivation by their respective prices in the study area including transportation cost up to farm site.

Farm yard manure

Expenditure on farm yard manure was evaluated by multiplying the physical quantities of farm yard manure used in the vegetable cultivation by their respective prices. Farm yard manure was valued at the prevailing market price in the locality @ Rs 150 per quintal.

Depreciation

The amount of depreciation for implements was calculated by the straight line method i.e., by dividing the original cost less junk value of implement by its expected life. This was apportioned to individual crop in proportion to the hectare under the crop.

Land rent

Actually paid land rent by the farmers was taken into the account.

Rental value of land

Rental value was calculated at the rate of one fourth of the total produce of traditional crops produced and then converted into monetary units by multiplying it with prevailing farm harvest price.

Interest on working capital

Interest on working capital was charged at the rate of 7 per cent per annum for half of the crop period excluding family labour.

Interest on fixed capital

Interest on fixed capital had been charged at the rate of 6.5 per cent per annum on the average value of farm buildings, farm implements and other fixed assets which are exclusively used for that particular crop.

Market intermediaries

Local Traders

A local trader acts as an intermediary between growers and the primary wholesaler. The main function of local trader was to collect produce from the growers and then sale this produce to primary wholesaler after collecting sufficient quantity from the producer.

Wholesalers

Wholesalers were the agency to receive produce from farmers/local traders and sell to the retailer/consumer.

Retailers

They purchased the produce from the wholesaler or producer and sell it to the ultimate consumers.

Consumers

Households and food industries are the ultimate consumers.

3.6 LIMITATIONS OF THE STUDY

The present investigation has been carried out using a systematic scientific methodology. The study has been based on the sample observations collected from 60 vegetable growers. As no records were maintained by the sample growers, the data was collected by survey method on the basis of an oral inquiry and the information given by the farmers is based on their memory and past experience only.

It may however, be recognized that the findings of the study need not to be generalized beyond the boundaries of the area under investigation and applicable to such other areas having similar agro-climatic and socio-economic conditions.

Due to the paucity of time study was based on the data collected for one year 2019-20 which may not be necessarily true for other periods.

Chapter-4

RESULTS AND DISCUSSION

This section incorporates the outcomes obtained after the systematic analysis and interpretation of data. In this chapter, results have been presented based on various aspects viz. socio economic status, land use pattern, cost of cultivation, returns, resource use efficiency and constraints in production and marketing of major vegetables in the study area. The whole chapter has been broadly discussed under the following sub heads:

4.1 Growth trends in area and production.

4.2 Socio-economic profile.

4.3 Cost of cultivation.

4.4 Cost and returns.

4.5 Profitability measures.

4.6 Production function analysis.

4.7 Marketing channels and margins.

4.8 Production and marketing constraints faced by the farmers.

4.1 GROWTH TRENDS IN AREA AND PRODUCTION.

The determination of growth in area, production and productivity of any crop can be worked out by computing the Compound Annual Growth Rate (CAGR). This measure reflects the pattern in the cultivation of vegetables in India and Himachal Pradesh from which we can know the performance of cultivation in the long term. The possible production patterns in the years to come can be anticipated through such trends which help us to decide the factors responsible for such performances.

Table 4.1 revealed the Compound Annual Growth Rate in area, production and productivity of vegetables in India and in Himachal Pradesh. The CAGR was worked out to be 2.29, 2.63 and 0.33 per cent respectively during 2011-12 to 2018-19 in the country as a whole. The area and productivity during the period under reference has shown an increasing trend. However, in Himachal Pradesh the Compound Annual Growth Rate in area, production and productivity was worked out to be 1.29, 2.65 and 1.39 respectively while the area and production in the state has shown a fluctuating trend during the period.

Table 4.1: Area, Production, Productivity and Compound Annual Growth Rate of vegetables in India and Himachal Pradesh.

Years	India			Himachal Pradesh		
	Area ('000 ha)	Production ('000 MT)	Productivity (MT/ha)	Area ('000 ha)	Production ('000 MT)	Productivity (MT/ha)
2011-12	8989.54	156325.48	17.39	85.68	1561.51	18.22
2012-13	9205.19	162186.57	17.62	79.46	1521.13	19.14
2013-14	9396.06	162896.91	17.34	86.60	1635.86	18.89
2014-15	9542.23	169478.23	17.76	83.75	1585.37	18.93
2015-16	10106.29	169063.93	16.73	88.28	1715.16	19.43
2016-17	10238.00	178172.00	17.40	93.12	1783.76	19.16
2017-18	10259.00	184394.00	17.97	89.32	1811.78	20.28
2018-19	10436.00	187474.00	17.96	88.37	1805.38	20.43
CAGR (%)	2.29* (.002)	2.63* (.001)	0.33* (.003)	1.29* (.006)	2.65* (.004)	1.39* (.003)

*Significant at 5 per cent level of significance

4.2 SOCIO-ECONOMIC PROFILE OF SAMPLED FARMERS.

4.2.1 Size and structure of family

The size and structure of the family, workforce and literacy status are the important factors which influence the agricultural production. These factors determine the socio-economic well-being of the family that plays an important role in farm business and marketing activities of perishables.

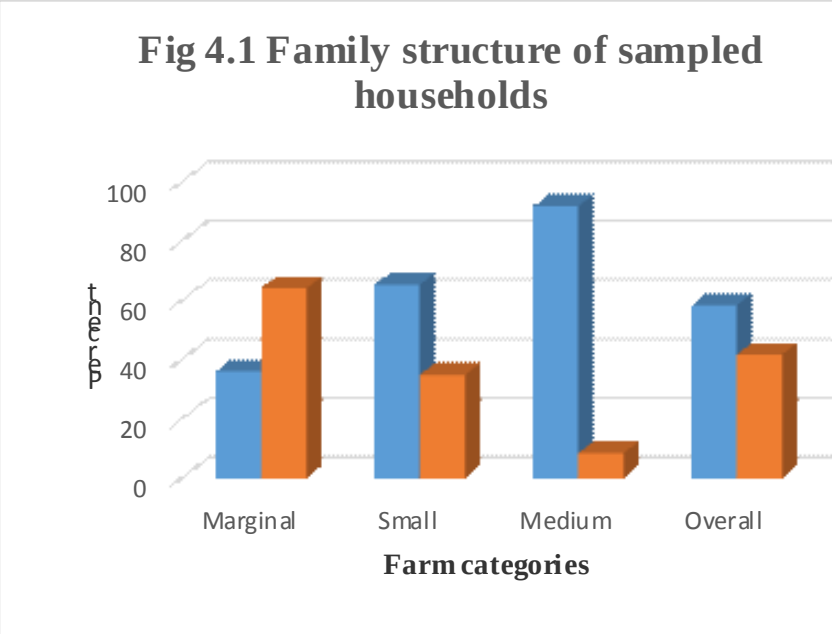
Table 4.2: Demographic profile of sampled households in the study area.

	Marginal	Small	Medium	Overall
Joint Family	9 (36.00)	15 (65.22)	11 (91.67)	35.00 (58.33)
Nuclear Family	16 (64.00)	8.00 (34.78)	1.00 (8.33)	25.00 (41.67)
Adult				
Male	2.12 (40.38)	2.61 (39.49)	3.25 (44.83)	2.53 (41.09)
Female	1.84 (35.05)	2.83 (42.81)	2.83 (39.03)	2.42 (39.22)
Children				
Male	0.49 (9.33)	0.70 (10.59)	0.42 (5.79)	0.55 (8.91)
Female	0.81 (15.24)	0.48 (7.11)	0.75 (10.35)	0.67 (10.86)
Average family size	5.25 (100.00)	6.61 (100.00)	7.25 (100.00)	6.17 (100.000)
Sex ratio	1011.66	996.80	975.50	1001.60

Figure in parentheses are percentages to average family size

The size and structure of the sampled households were analysed and is presented in the Table 4.2. The table reveals that majority (58.33%) households in the study area were having joint families while (41.67%) had nuclear families, among which the highest number of nuclear families were found in case of marginal farmers (64%), (34.78%) among the small farmers and only (8.33%) among medium farmers.

The data in the table shows that the average family size varies between 5.25 members per family in case of marginal farmers to 7.25 members per family in case of medium farmers. At overall level, the average family size was found to be 6.17 persons per household out of which (41.09%) were male adults and (39.22%) per cent were female adults.



4.2.2 Literacy status

Literacy rate is a reflection of good human capital. Higher level of literacy not only results in greater level of awareness and adoption of technology but also contributes to improvement of economic and social well-being of the societies.

The data related to educational status of sample households was analysed and is presented in the Table 4.3. The table reveals that the overall literacy rate was found higher in case of males (79.22 %) as compared to females (77.67 %). The literacy index varies from 2.22 to 2.69 in males and from 2.14 to 2.29 in case of females. The findings revealed that the literacy rate is high in the study area but the literacy index show that highest proportions of family members were educated up to high school and few up to graduation which indicates below average quality of education. Similar trend was observed among the different categories of farmers.

Table no. 4.03: Farm category wise educational status of sample households in study area:

Particulars	Marginal			Small			Medium			Overall		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Illiterate	18.39	18.94	18.67	15.71	15.45	15.58	15.8	18.72	17.24	16.88	18.12	17.5
Primary	9.2	15.15	12.19	7.85	7.88	7.87	6.81	9.22	8.00	7.79	10.68	9.24
Middle	24.52	22.73	23.62	15.71	17.27	16.49	13.62	23.18	18.34	18.51	20.39	19.45
High school	21.46	13.64	17.52	21.15	11.82	16.49	13.62	18.72	16.14	19.48	13.92	16.69
Graduation	22.99	26.52	24.76	35.35	40.91	38.12	45.5	27.93	36.83	33.44	32.69	33.06
Non-school going	3.45	3.03	3.24	4.23	6.67	5.45	4.63	2.23	3.45	3.9	4.21	4.05
Literacy Rate	78.16	78.03	78.1	80.06	77.88	78.97	79.56	79.05	79.31	79.22	77.67	78.44
Literacy Index	2.22	2.14	2.18	2.55	2.59	2.57	2.69	2.29	2.49	2.47	2.34	2.4

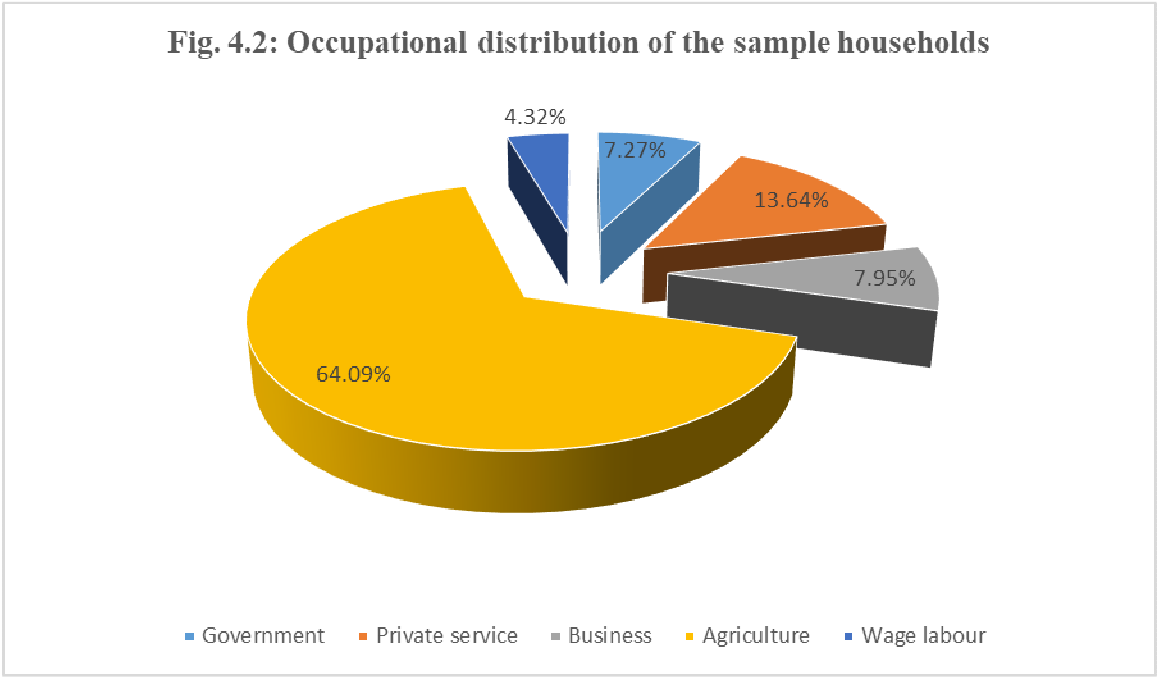
4.2.3 Occupational distribution

Occupational distribution of the family is important in defining the economic status of the family. It is assumed that if the area is more developed, there is more diversification in the employment pattern, which would result in increased income to the household. Generally, in the hills, there are few avenues other than farming, so the hilly people are always in search of alternative employment avenues to enhance the family income.

Table 4.4: Average occupational pattern of sampled households

Particulars	Marginal	Small	Medium	Overall
Agriculture	2.44 (66.84)	3.04 (60.80)	3.17 (65.63)	2.82 (64.09)
Private Service	0.56 (15.34)	0.74 (14.80)	0.42 (8.70)	0.60 (13.64)
Business	0.17 (4.66)	0.48 (9.60)	0.50 (10.35)	0.35 (7.95)
Government Service	0.24 (6.58)	0.35 (7.00)	0.42 (8.70)	0.32 (7.27)
Wage Labour	0.24 (6.58)	0.17 (3.40)	0.17 (3.52)	0.19 (4.32)
Rural artisan	0.00 (0.00)	0.22 (4.40)	0.15 (3.10)	0.12 (2.73)
Total	3.65 (100.00)	5.00 (100.00)	4.83 (100.00)	4.40 (100.00)

Figure in parentheses are percentage to average workers



It has been found from the Table 4.4 that about 64.09 per cent of people are engaged in agriculture as a main occupation in the area while 13.64 per cent of family members are involved in private services followed by own business (7.95 %), government services (7.27%) and about (4.32 %) were engaged as wage labours. Among the different categories of farms, the highest family members engaged in agriculture were found in the marginal categories followed by the medium and small farm categories, while service people were highest in medium farm categories.

4.2.4 Work force

The economies of households depends upon the strength of active workers. Per household distribution of workers and dependents of the sampled households was worked out and presented in Table 4.5. The proportion of active workers was worked out to be 75.64 per cent which was highest in small farms and lowest in medium farms (66.62 %). It was assured that persons in the age group of 15 to 65 years were actively engaged in useful economic activities and were termed as working force. The highest no of dependents are observed in case of medium farms (33.38%) followed by marginal farms (30.48%) and lowest (24.36 %) in small farm categories.

Table No. 4.5: Farm category wise dependency ratio of the sample households

Particulars	Marginal	Small	Medium	Overall
Average No. of workers	3.65 (69.52)	5.00 (75.64)	4.83 (66.62)	4.40 (71.31)
Average No. of dependents	1.60 (30.48)	1.61 (24.36)	2.42 (33.38)	1.77 (28.69)
Average Family Size	5.25 (100.00)	6.61 (100.00)	7.25 (100.00)	6.17 (100.00)
Dependency ratio w.r.t workers	0.44	0.32	0.50	0.40
Dependency ratio w.r.t family size	0.30	0.24	0.33	0.29

Figures in parentheses are percentages to average family size.

The overall dependency ratio with respect to workers was found to be 0.40 and among different categories, it was observed highest in case of medium (0.50) followed by marginal (0.44) and then small (0.32). Dependency ratio indicates that on an average, one worker has to support less than one member in the family in the study area.

The Table 4.6 depicts the gender wise distribution of farm workers. At overall level, 53.90 per cent of workers were males, whereas 46.10 per cent of workers were females. In marginal, small and medium categories, male workers were more engaged in agriculture than the female workers.

Table 4.6: Gender wise distribution of the farm workers in sampled households

Particulars	Marginal	Small	Medium	Overall
Male	1.36 (55.74)	1.56 (51.32)	1.75 (55.21)	1.52 (53.90)
Female	1.08 (44.26)	1.48 (48.68)	1.42 (44.79)	1.3 (46.10)
Average no of farm workers	2.44 (100.00)	3.04 (100.00)	3.17 (100.00)	2.82 (100.00)

Figure in parentheses are average farm workers

4.2.5 Land use pattern

Land use pattern determines the type of farming system in any area. Farm categories wise land use pattern of sample farmers was worked out and is summarized in Table 4.7.

On overall farm category basis, the average size of land holding was found to be 1.12 hectares out of which 47.51 per cent was under field crops. About 13.41 per cent area was put under non- agriculture use. The total cultivated area at overall level was found to be 81.58 per cent of the total land holding out of which (62.99%) was irrigated. The average size of holding on marginal, small and medium farms was found to be 0.62, 1.13 and 2.12 hectare respectively.

Table 4.7: Farm Category wise Land Utilization Pattern of the sampled households

	Marginal	Small	Medium	Overall
Total cultivated area	0.53 (85.48)	1.00 (88.50)	1.53 (72.17)	0.91 (81.58)
IR	0.47 (75.81)	0.79 (69.91)	1.02 (48.11)	0.70 (62.99)
UIR	0.06 (9.68)	0.21 (18.58)	0.51 (24.06)	0.21 (18.60)
Area under field crops	0.39 (62.90)	0.54 (47.79)	0.82 (38.68)	0.53 (47.51)
Ghasni and permanent fallow land	0.04 (6.71)	0.05 (4.31)	0.39 (18.40)	0.11 (10.22)
Land put to non-agricultural use	0.05 (7.28)	0.07 (6.19)	0.52 (24.53)	0.15 (13.41)
Total land holding	0.62 (100.00)	1.13 (100.00)	2.12 (100.00)	1.12 (100.00)

Figures in parentheses are percentage to total land holding

4.2.6 Cropping pattern

Cropping pattern in any region depends mainly on soil type, altitude, micro-climate, availability of resources and management factors. The changes in the per cent share of area under different crops in the gross cropped area revealed the extent of agricultural diversification which reflects the future scope of each crop along with tentative requirements of the inputs for different crops. The cropping pattern of sampled growers was examined and the results have been presented in Table 4.8.

Table 4.8: Farm Category wise Cropping Pattern of the sampled households

Particulars	**Marginal**	**Small**	**Medium**	**Overall**
Kharif crops				
Maize	0.08 (20.51)	0.15 (27.28)	0.37 (48.05)	0.16 (30.77)
Tomato	0.14 (35.9)	0.16 (29.09)	0.16 (20.78)	0.15 (28.85)
Capsicum	0.09 (23.08)	0.13 (23.64)	0.15 (19.48)	0.12 (23.08)
Beans	0.08 (20.51)	0.11 (20)	0.09 (11.69)	0.09 (17.13)
Sub-total	0.39 (100)	0.55 (100)	0.77 (100)	0.52 (100)
Rabi crops				
Wheat	0.08 (20.51)	0.14 (29.09)	0.4 (49.38)	0.17 (32.08)
Pea	0.16 (41.03)	0.18 (32.73)	0.22 (25.93)	0.18 (33.96)
Cauliflower	0.15 (38.46)	0.21 (38.18)	0.2 (24.69)	0.19 (33.96)
Sub-total	0.39 (100)	0.55 (100)	0.81 (100)	0.53 (100)
Orchard	0.14 (15.22)	0.46 (29.49)	0.71 (31)	0.38 (26.57)
Gross cropped area	0.92 (100)	1.56 (100)	2.29 (100)	1.43 (100)
Net sown area	0.53	1	1.52	0.91
Cropping intensity	173.58	156	150.66	157.14

Figures in parentheses are percentage to gross cropped area.

The Table 4.8 reveals that the main crops grown in kharif season were maize, capsicum, tomato and beans. It is evident from the table that on an overall farm category, 0.16 hectare area is cultivated under cereal crop and 0.36 hectare area was under vegetable crops. Among the vegetable crops, the highest area (28.85%) was cultivated under tomato followed by capsicum (23.08%) and beans (17.13%) respectively.

The total area cultivated under cereal crop in rabi season crops was 0.17 hectares and 0.37 hectare area was covered by vegetable crops.

The cropping intensity was highest in case of marginal farmers (173.58 %) followed by small (156.00 %) and medium (150.66 %) respectively. At overall level, the cropping intensity was found to be 157.14 per cent which indicates that there is a scope to improve farm management for better returns.

4.2.7 Livestock inventory

Livestock plays an important role in hill agriculture. The farming community used to maintain a livestock unit in order to meet their household needs for milk, milk products, meat, and wool and farm yard manure (FYM). These products also provide supplementary source of income for the farmers.

Table 4.9: Average Livestock inventory on different categories of farm

	Marginal	**Small**	**Medium**	**Overall**
Cattle (milch)	2.14 (60.45)	0.76 (33.93)	0.73 (25.89)	1.33 (45.96)
Improved	1.21 (34.18)	0.43 (19.20)	0.36 (12.77)	0.74 (25.60)
Local	0.93 (26.27)	0.33 (14.73)	0.36 (12.77)	0.59 (20.42)
cattle dry	0.29 (8.19)	0.48 (21.43)	0.55 (19.50)	0.41 (14.17)
Improved	0.15 (4.24)	0.29 (12.95)	0.55 (19.50)	0.28 (9.69)
Local	0.14 (3.95)	0.19 (8.48)	0.00 (0.00)	0.13 (4.50)
Young stock				
Calf	0.68 (19.21)	0.33 (14.73)	0.27 (9.57)	0.47 (16.26)
Sheep	0.07 (1.98)	0.19 (8.48)	0.18 (6.38)	0.14 (4.84)
Goat	0.36 (10.17)	0.48 (21.43)	1.09 (38.65)	0.55 (19.03)
Average number of livestock	3.54 (100.00)	2.24 (100.00)	2.82 (100.00)	2.89 (100.00)

Figures in parentheses are percentage to per farm number of livestock.

The data related to livestock was analysed and presented in Table 4.9. The data revealed that the marginal farmers kept more number of animals as compared to small and medium category farmers. Cattle, sheep and goat were the most preferred farm animals in the study area.

The major share of livestock was attributed by cattle followed by goat and sheep. At overall farm categories, the average number of livestock per household was found to be 2.89. The highest number of livestock was found in case of marginal farmers 3.54 per household followed by medium 2.82 and 2.24 in small category farmers.

Dairy is another factor which contributes to the farm income. Therefore, the production and disposal of milk on the selected farm categories have been examined and presented in Table 4.10.

Table 4.10: Farm category wise average milk production on sampled households

(In litres)

	Marginal	**Small**	**Medium**	**Overall**
Home consumed (L/day)	2.22 (46.27)	1.00 (29.17)	0.82 (25.00)	1.47 (35.46)
Quantity Sold (L/day)	2.57 (53.73)	2.43 (70.83)	2.45 (75.00)	2.49 (64.54)
Total production (L/day)	4.79 (100.00)	3.43 (100.00)	3.27 (100.00)	3.96 (100.00)
Annual production (lts)	1389.10	994.70	948.3	1148.40
Average annual sale(Rs)	41673	29841	28449	34452

Figures in parentheses are percentage to total production

It can be seen from the tables that the highest milk production was recorded in marginal category farms *i.e.*4.79 litres per day, followed by small 3.43 litres/day and lowest in medium 3.27 litres /day which is due to the number of milch cattle's in these categories.. At overall level, average sale per day of milk was estimated to be 2.49 litres and home consumption was estimated to 1.47 litres per day.

4.2.8 Farm investment pattern

In order to make farming activities easier to perform, farmers make investment on different tools and equipment's. Investments made by the farmers on different implements and tools was estimated and have been grouped into two categories namely major implements and minor implements which are presented in the table 4.11.

Table 4.11: Farm category wise average investment on implements and tools

(Rupees)

	Marginal	Small	Medium	Overall
major implements				
Plough	196.43 (0.65)	190.48 (0.46)	227.27 (0.33)	200.32 (0.48)
Yoke	192.86 (0.64)	228.57 (0.56)	272.73 (0.40)	222.52 (0.53)
Power sprayer	1785.71 (5.94)	1904.76 (4.64)	3409.09 (4.95)	2156.02 (5.13)
Foot sprayer	589.29 (1.96)	428.57 (1.04)	545.45 (0.79)	518.91 (1.23)
Power tiller	20350.14 (67.70)	30560.62 (74.40)	60727.27 (88.18)	32339.58 (76.92)
Cheff cutter	5142.86 (17.11)	5142.86 (12.52)	1636.36 (2.38)	4441.56 (10.56)
Rota-vator	2000.00 (6.65)	2666.67 (6.49)	2545.45 (3.70)	2364.65 (5.62)
Sub total	30060.85 (100.00)	41074.91 (100.00)	68868.63 (100.00)	42043.46 (100.00)
Minor implements				
Spade	500.00 (4.78)	714.29 (5.46)	818.18 (4.04)	645.78 (4.81)
Sickle	353.57 (3.38)	414.29 (3.16)	490.91 (2.42)	404.31 (3.01)
Khilna	171.43 (1.64)	247.62 (1.89)	290.91 (1.43)	224.53 (1.67)
Pruning Scissors	3771.43 (36.09)	4819.05 (36.81)	7200.00 (35.52)	4858.73 (36.19)
Axe	242.86 (2.32)	209.52 (1.60)	254.55 (1.26)	232.42 (1.73)
Grafting knives	1350.00 (12.92)	1600.00 (12.22)	2036.36 (10.04)	1583.11 (11.79)
Basket kiltas	589.29 (5.64)	1028.57 (7.86)	1363.64 (6.73)	912.55 (6.80)
Plastic crates	3185.71 (30.49)	3390.48 (25.90)	7272.73 (35.87)	4081.61 (30.40)
Ladders	285.71 (2.73)	666.67 (5.09)	545.45 (2.69)	483.69 (3.60)
Sub total	10450.00 (100.00)	13090.48 (100.00)	20272.72 (100.00)	13426.72 (100.00)
Average investment	40510.85	54165.39	89141.36	55470.19

Figures in parentheses are percentage to total implements

From the Table 4.11, it has been observed that total investment on implements has been found increasing with the size holding. At an overall farm categories, the farmers have invested about Rs.42043.46 on major implements and about Rs.13426.72 on minor implements constituting a total investment of Rs.55470.19 per farm.

Table 4.12: Farm category wise average investment on farm buildings

(Rupees/Farm)

	Marginal	**Small**	**Medium**	**Overall**
Residential house	388200.00 (89.13)	545217.39 (91.07)	995781.20 (94.98)	569906.24 (91.82)
Cattle shed	18840.00 (4.33)	27652.17 (4.62)	25083.33 (2.39)	23466.67 (3.78)
Store	28520.00 (6.55)	25826.09 (4.31)	27500.00 (2.62)	27283.33 (4.40)
Total investment	435560.00 (100.00)	598695.65 (100.00)	1048364.53 (100.00)	620656.24 (100.00)

Figures in parentheses are percentages to average investment pattern on building

Table 4.12 depicts that the investment per farm on residential and other farm building was found highest in medium farmers constituting about 95 per cent of total investment on farm buildings. The data in the table indicates rise in investment with the size of land holding.

4.2.9 Irrigation status

Table 4.13: Farm category wise average investment on irrigation structure in sampled household

(Rupees/farm)

Particulars	**Marginal**	**Small**	**Medium**	**Overall**
Kuhl	41307.7 (52.29)	167917 (65.38)	383076.92 (58.71)	158195 (60.41)
Tank	15153.8 (19.18)	53833.3 (20.96)	196923.08 (30.18)	66334.8 (25.33)
Drip	9923.08 (12.56)	7583.33 (2.95)	14000.00 (2.15)	9841.56 (3.76)
Sprinkler	12615.4 (15.97)	27500 (10.71)	58461.54 (8.96)	27490.4 (10.50)
Total	79000 (100.00)	256833 (100.00)	652461.54 (100.00)	261862 (100.00)

Figures in parentheses are percentages to average investment on irrigation structure

The availability of irrigation water is a major limiting factor for agricultural development and specifically in vegetable cultivation which requires more irrigation compared to cereal crops. Farm category wise investment on irrigation structure in sampled farm were analysed and are given in the Table 4.13.

It has been observed that the overall investment was worked out to Rs.261862. At an overall level, highest investment was made on kuhl Rs.158195 followed by tank Rs.66334.8, ,sprinkler system Rs.27490.4 and then the drip system Rs.9841.56.The investments made by medium category farm was the highest amongst the different farm categories.

4.2.10 Income structure

To examine the relevant importance of different crops in the economy of sampled households, source wise break up of farm income of different categories of farm was analysed and has been summarized in Table 4.14.

Table 4.14: Farm category wise gross income

(Rupees per annum)

Particulars	Marginal	Small	Medium	Overall
Kharif crops				
Maize	3200 (0.23)	5808.7 (0.27)	15733.3 (0.52)	6706.67 (0.34)
Tomato	52640 (3.84)	57869.6 (2.73)	64916.7 (2.13)	57100 (2.86)
Capsicum	22524 (1.64)	29719.6 (1.40)	35875 (1.18)	27952.5 (1.40)
Beans	10220 (0.75)	12934.8 (0.61)	11916.7 (0.39)	11600 (0.58)
Rabi crops				
Pea	57240 (4.18)	85913 (4.05)	95625 (3.13)	75908.3 (3.81)
Cauliflower	178436 (13.02)	245526 (11.58)	227950 (7.47)	214057 (10.73)
Total Vegetables	324260 (23.66)	437772 (20.64)	452017 (14.81)	393324 (19.72)
Fruit crop	520450 (37.98)	836594 (39.45)	1410627 (46.22)	819674 (41.10)
Dairy	41673 (3.04)	29841 (1.41)	28449 (0.93)	34452 (1.73)
Total farm income	1210643 (88.34)	1741979 (82.15)	2343110 (76.77)	1640774 (82.27)
Non-farm				
Business	35874.8 (2.62)	89043.4 (4.20)	124647 (4.08)	74010.5 (3.71)
Service	123976 (9.05)	289574 (13.66)	584534 (19.15)	279567 (14.02)
Total non-farm income	159851 (11.66)	378617 (17.85)	709181 (23.23)	353578 (17.73)
Total income	1370494 (100.00)	2120596 (100.00)	3052291 (100.00)	1994352 (100.00)

Figure in parentheses are percentage to total income

The data in table 4.14 reveals that agriculture contributed about 82.27 per cent of total household income at overall level and was highest (88.34%) in marginal category and lowest in medium farm category (76.77 %).

The average gross returns from fruit crop contributed about 41.10 per cent towards the total income of sampled households in the study area. Vegetable cultivation contributed about 19.72 per cent to total household income. It is evident from the data that total income from all sources per annum was highest in case of medium farmers Rs.3052291 and lowest in case of marginal farmers Rs.1370494 and it was Rs.1994352 in case of overall farm category.

4.3 COST OF CULTIVATION OF VEGETABLES

For proper scheduling of farm activities, data on cost of cultivation of agricultural commodity provides useful information to the farm planners which will help them to identify the areas of economical advantage in producing different commodities as well as for the development of agro based industries. These data also help the farm planner in making proper allocation of available farm resources and increasing the efficiency of crop production through the introduction of improved agronomic practices. Therefore, such data enables the researcher of farm management to study efficiency of various cultivation practices and modify the crop planning for efficient farm management. In the present study, the cost of cultivation of three major vegetables viz., tomato, cauliflower and pea has been computed using standard farm management cost concepts outlined by CACP (Commission for Agricultural Cost and Prices). These costs computed for different categories of farms growing vegetables are abbreviated as Cost A, Cost B and Cost C, the computation of which are useful in making comparisons with the benefits obtained from vegetable cultivation.

4.3.1 Cost of cultivation of tomato.

Farm category wise cost of cultivation of tomato was calculated on per hectare basis and results are presented in Table 4.15. It has been observed from the table that the total cost of cultivation of tomato ranges from Rs.127063.30 to Rs.130936.00 among the different farm categories and at overall level it worked out to be Rs.129036.00. The major share in total cost of cultivation was contributed by human labour constituting about 29.28 per cent and the share of FYM, seed, ploughing, fertilizers and plant protection was 27.49 per cent. A similar trend was observed among the different categories of farmers. The highest cost of cultivation was found in case of medium farm category as they are using more inputs per hectare in comparison to other farm categories.

Table 4.15 Cost of cultivation of tomato in the study area

	Marginal	Small	Medium	Overall
Cost A1				
Ploughing (Bullock labour / Tiller / Tractor)	4691.25 (3.69)	5030.38 (3.94)	5291.5 (4.04)	4941.3 (3.83)
Seed	8975.61 (7.06)	9046.92 (7.08)	9146.34 (6.99)	9037.09 (7)
FYM	11768.3 (9.26)	12195.1 (9.54)	13084.4 (9.99)	12195.12 (9.45)
Fertilizers	4332.32 (3.41)	4918.48 (3.85)	5229.29 (3.99)	4736.41 (3.67)
Plant protection	4272 (3.36)	4650 (3.64)	5020 (3.83)	4566.5 (3.54)
Hired Labour	14231.7 (11.2)	17056.6 (13.35)	20507.8 (15.66)	16569.81 (12.84)
Miscellaneous (Staking material, irrigation charges etc.)	6278.75 (4.94)	6727.63 (5.26)	6959.5 (5.32)	6586.97 (5.1)
Interest on working capital	1113.73 (0.88)	1217.35 (0.95)	1331.96 (1.02)	1197.09 (0.93)
Land Revenue	31.25 (0.02)	31.25 (0.02)	31.25 (0.02)	31.25 (0.02)
Depreciation	5005.72 (3.94)	3859.72 (3.02)	5145.12 (3.93)	4603.78 (3.57)
Cost A1	**60700.6** (47.77)	**64733.4** (50.65)	**71747.2** (54.8)	**64465.3** (49.96)
Interest on fixed capital	8134.29 (6.4)	6272.04 (4.91)	8360.82 (6.39)	7481.15 (5.8)
Cost B1=(Cost A1+Interest on fixed capital)	**68834.9** (54.17)	**71005.4** (55.56)	**80108** (61.18)	**71946.5** (55.76)
Rental value of owned land	23343.8 (18.37)	23343.8 (18.27)	23343.8 (17.83)	23343.75 (18.09)
Cost B2=Cost B1+Rental value of owned land)	**92178.7** (72.55)	**94349.2** (73.82)	**103452** (79.01)	**95290.3** (73.85)
Imputed value of family labour	22648.6 (17.82)	20848.5 (16.31)	18895.5 (14.43)	21207.95 (16.44)
Cost C1= Cost B1+ Imputed value of family labour)	**91483.5** (72)	**91853.9** (71.87)	**99003.5** (75.61)	**93154.5** (72.19)
Cost C2 = (Cost B2+ Imputed value of family labour)	**114827** (90.37)	**115198** (90.14)	**117899** (90.04)	**116498** (90.28)
Value of management input(10 % of cost C2)	12236.3 (9.63)	12607.2 (9.86)	13035.7 (9.96)	12538.37 (9.72)
C3 = (Cost C2+ Value of management input(10% of cost C2)	**127063.30** (100.00)	**127805.20** (100.00)	**130936.00** (100.00)	**129036.00** (100.00)

Figure in parentheses are percentage to cost C_3

4.3.2 Cost of cultivation of cauliflower

Table 4.16: Cost of cultivation of cauliflower in the study area

	Marginal	Small	Medium	Overall
COST A1				
Ploughing (Bullock labour / Tiller / Tractor)	4780.63 (4.64)	5291.5 (4.96)	5915.13 (4.89)	5203.36 (4.81)
Seed	9695.31 (9.42)	9859.04 (9.23)	10728.6 (8.87)	9964.74 (9.21)
FYM	11119.8 (10.8)	12567.9 (11.77)	13129.3 (10.86)	12076.8 (11.16)
Fertilizers	5250 (5.1)	5576.31 (5.22)	5805.12 (4.8)	5486.11 (5.07)
Plant protection	5170 (5.02)	5540 (5.19)	5960 (4.93)	5469.83 (5.06)
Miscellaneous	3000 (2.91)	3250 (3.04)	3500 (2.9)	3195.83 (2.95)
Hired Labour	12937.3 (12.57)	14349.9 (13.44)	16262.7 (13.45)	14143.9 (13.07)
Interest on working capital	454.59 (0.44)	493.80 (0.46)	536.38 (0.44)	485.98 (0.45)
Land Revenue	31.25 (0.03)	31.25 (0.03)	31.25 (0.03)	31.25 (0.03)
Depreciation	5005.72 (4.47)	3859.72 (3.61)	5145.12 (4.26)	4603.78 (4.26)
Cost A1	**57444.6** (55.41)	**60819.4** (56.95)	**67013.6** (55.44)	**60661.6** (56.07)
Interest on fixed capital	8134.29 (7.27)	6272.04 (9.16)	8360.82 (15.84)	7481.15 (9.89)
Cost B1=(Cost A1+Interest on fixed capital)	**65578.9** (62.68)	**67091.5** (66.11)	**75374.4** (71.27)	**68142.7** (65.96)
Rental value of owned land	23343.8 (22.67)	23343.8 (21.86)	23343.8 (19.31)	23343.8 (21.58)
Cost B2=Cost B1+Rental value of owned land)	**88922.7** (85.35)	**90435.3** (87.97)	**98718.2** (90.58)	**91486.5** (87.54)
Imputed value of family labour	10487.5 (10.19)	8364.47 (7.83)	6626.38 (5.48)	8901.46 (8.23)
Cost C1= Cost B1+ Imputed value of family labour)	**76066.4** (72.87)	**75455.9** (73.95)	**82000.8** (76.75)	**77044.2** (74.19)
Cost C2 = (Cost B2+ Imputed value of family labour)	**99410.2** (95.54)	**98799.7** (95.81)	**105345** (96.07)	**100388** (95.77)
Value of management input(10 % of cost C2)	4591.28 (4.46)	4477.42 (4.19)	4756.86 (3.93)	4580.75 (4.23)
C3 = (Cost C2+ Value of management input(10% of cost C2)	**104001.00** (100.00)	**103277.00** (100.00)	**110101.00** (100.00)	**104969.00** (100.00)

Figure in parentheses are percentage to cost C_3

Farm category wise cost of cauliflower was estimated and results are presented in Table 4.16. The cost of cultivation of cauliflower came out to be Rs.104001.00, Rs.103277.00 Rs.110101.00 and Rs.104969.00 in case of marginal, small, medium and overall farm category. The major share in total cost of cultivation was contributed by human labour 21.30 per cent followed by FYM 11.16 per cent , seed 9.21 per cent , fertilizers 5.07 per cent , plant protection 5.06 per cent and ploughing 4.81 per cent. A similar trend was observed in different categories of farms.

4.3.3 Cost of cultivation of Pea.

Table 4.17: Cost of cultivation of pea in the study area

	Marginal	**Small**	**Medium**	**Overall**
Cost A1				
Ploughing (Bullock labour / Tiller / Tractor)	5263.75 (4.32)	5487.25 (4.39)	5727.63 (4.26)	5442.2 (4.33)
Seed	10150 (8.32)	11358.7 (9.09)	12656.25 (9.4)	11114.58 (8.84)
FYM	9000 (7.38)	11304.35 (9.04)	13671.88 (10.16)	10817.71 (8.61)
Fertilizers	3593.75 (2.95)	4096.47 (3.28)	4479.17 (3.33)	3963.54 (3.15)
Plant protections	4250 (3.48)	4680 (3.74)	5120 (3.8)	4588.83 (3.65)
Miscellaneous (Staking material, irrigation charges etc.)	5542.88 (4.54)	5987.13 (4.79)	6277.88 (4.67)	5860.17 (4.66)
Hired Labour	17283.58 (14.17)	19582.54 (15.67)	22442.9 (16.68)	19196.71 (15.27)
Interest on working capital	1124.63 (0.92)	1275.97 (1.02)	1436.84 (1.07)	1245.09 (0.99)
Land Revenue	31.25 (0.03)	31.25 (0.02)	31.25 (0.02)	31.25 (0.02)
Depreciation	5005.72 (4.1)	3859.72 (3.09)	5145.12 (3.82)	4603.78 (3.66)
Cost A1	**61245.56** (52.28)	**67663.38** (55.78)	**76988.92** (59.07)	**66863.86** (55.09)
Interest on fixed capital	8134.29 (6.67)	6272.04 (5.02)	8360.82 (6.21)	7481.15 (5.95)
Cost B1=(Cost A1+Interest on fixed capital)	**69379.89** (56.89)	**73935.44** (59.15)	**85349.72** (63.42)	**74345.05** (59.16)
Rental value of owned land	23343.75 (19.14)	23343.75 (18.67)	23343.75 (17.35)	23343.75 (18.57)
Cost B2=Cost B1+Rental value of owned land)	**92723.64** (0)	**97279.19** (77.82)	**108693.5** (80.77)	**97688.8** (77.73)
Imputed value of family labour	24808.57 (20.34)	22623.98 (18.1)	20040.69 (14.89)	23017.57 (18.32)
Cost C1= Cost B1+ Imputed value of family labour)	**94188.46** (77.23)	**96559.42** (77.24)	**105390.4** (78.32)	**97362.62** (77.47)
Cost C2 = (Cost B2+ Imputed value of family labour)	**117532.2** (96.37)	**119903.2** (95.92)	**128734.2** (95.66)	**120706.4** (96.05)
Value of management input(10 % of cost C2)	4427.73 (3.63)	5102.21 (4.08)	5837.02 (4.34)	4968.14 (3.95)
C3 = (Cost C2+ Value of management input(10% of cost C2)	**121959.94** (100.00)	**125005.38** (100.00)	**134571.18** (100.00)	**125674.51** (100.00)

Figure in parentheses are percentage to cost C_3

The per hectare cost of pea cultivation was analysed and is presented in Table 4.17. The cost of cultivation of pea was Rs.121959.94, Rs.125005.38, Rs.134571.18 and Rs.125674.51 for marginal, small, medium and overall farm category basis. Table 4.17 shows that the major share in total cost of cultivation was contributed by human labour 33.59 per cent, followed by seed 8.84 per cent, FYM 8.61 per cent, ploughing 4.33 per cent, plant protection 3.65 per cent and fertilizers 3.15 per cent. Among the different categories of farm, the per cent expenditure to the total cost was found all most similar.

4.4 COST AND RETURNS

4.4.1 Cost and return in tomato

Per quintal cost of tomato production was calculated and is presented in Table 4.18. The overall cost of production per quintal came out to be 490.05 and it varied between 479.77 to 494.76 for different farm categories. Yield of tomato was found to be 256.82, 266.39 and 270.92 quintals per hectare for marginal, small and medium farms, respectively. The total cost of cultivation was highest for the medium farm category Rs.130936.00 followed by small Rs.127805.20 and marginal farm category Rs.127063.30. The overall net returns were Rs.144266.00.

Table 4.18: Cost and return in tomato

(Rs/ha)

	Marginal	**Small**	**Medium**	**Overall**
Total Cost of cultivation	127063.30	127805.20	130936.00	129036.00
Yield(Quintal per hectare)	256.82	266.39	270.92	263.31
Gross Returns	274795.00	265856.00	284464.00	273302.00
Net Returns	147732.00	138051.00	153530.00	144266.00
Cost of production Per Quintal	494.76	479.77	483.29	490.05

4.4.2 Cost and return in cauliflower

The cost of cauliflower production was analysed and presented in Table 4.19. The per hectare cost of cultivation was found to be Rs.104001.00, Rs.103277.00 and Rs.110101.00 for marginal, small and medium farm, respectively. Yield of cauliflower was found to be highest for the medium farm category 250.00 followed by small 241.58 and marginal farm category 234.00. Overall, it turned out to be 240.11. The overall net returns were Rs.125021.00. The cost of production per quintal was found to be Rs.444.45, Rs.427.51 and Rs.440.41 respectively. At an overall level, it was found to be Rs.437.17

Table 4.19: Cost and return in cauliflower

(Rs/ha)

	Marginal	Small	Medium	Overall
Total Cost of cultivation	104001.00	103277.00	110101.00	104969.00
Yield(Quintal per hectare)	234.00	241.58	250.00	240.11
Gross Returns	229320.00	230713.00	230000.00	229990.00
Net Returns	125319.00	127436.00	119899.00	125021.00
Cost of production Per Quintal	444.45	427.51	440.41	437.17

4.4.3 Cost and return in pea

The cost of pea production was analysed and presented in Table 4.20. The per hectare cost of cultivation was found to be highest for the medium farm category Rs.134571.18 and lowest for the marginal farm category Rs.121959.94. Overall, it turned out to be Rs.125674.51. Yield of pea was found to be 65.00, 67.08 and 70.00 quintals per hectare for marginal, small and medium farm categories. The overall net returns were Rs.112361.43. The cost of production per quintal was found to be highest for medium farm category Rs.1922.45 and lowest for the marginal farm category Rs.1876.31. At an overall level it was found to be Rs.1881.35.

Table 4.20: Cost and return in pea

(Rs/ha)

	Marginal	Small	Medium	Overall
Total Cost of cultivation	121959.94	125005.38	134571.18	125674.51
Yield(Quintal per hectare)	65.00	67.080	70.00	66.80
Gross Returns	233025.00	238936.10	246750.00	238035.90
Net Returns	111065.06	113930.76	112178.82	112361.43
Cost of production Per Quintal	1876.31	1863.53	1922.45	1881.35

4.5 PROFITABILITY MEASURES

The main objective of any programme for the cultivation of crops is to increase the productivity of the land, to meet the basic needs of the rural population, to establish opportunities for jobs in general and to promote socio-economic prosperity. Careful analysis is necessary to assess the feasibility of a programme, its income and job impact. Financial institutions are keen to make loans available for new projects providing information on profitability measures and available known risk. The results of the profitability measures of vegetable cultivation in the study area has been calculated based on 2019-20 prices.

The economic viability of raising vegetable cultivation was evaluated with the help of different appraisal methods, viz., Farm Business Income, Farm Labour Income, Net farm Income, Farm Investment Income and Output-Input ratios. These formulae provide the sound base for information to decision makers, whether to invest or not to invest. The profitability measures were worked out on per hectare basis for better comparison among the different farm categories for three vegetable crops and presented in the Tables 4.21 to 4.23.

4.5.1 Profitability measurement in tomato.

The table 4.21 revealed that the gross return from tomato in case of marginal, small and medium farm categories was Rs.274795, Rs.265856 and Rs.284464 per hectare respectively. Farm business income varied between Rs.201123 to Rs.214095. Family labour income varied between Rs.171507 to Rs.182617 among different farm categories and Rs.178012 at overall category basis. Farm investment income was found to be Rs.191446,Rs.180274, Rs.193822 and Rs.187629 in case of marginal, small, medium and at overall farm category. The output – input ratio was found to be highest in case of medium farms 2.17 and lowest for small farms 2.08. It was 2.12 at an overall basis.

Table 4.21: Farm profitability in tomato crop on different farm categories

	Marginal	Small	Medium	Overall
Yield(Quintals)	256.82	266.39	270.92	263.31
Gross Return	274795	265856	284464	273302
Farm Business Income	214095	201123	212717	208837
Family Labour Income	182617	171507	185461	178012
Net Farm Income	147732	138051	153529	144266
Farm Investment Income	191446	180274	193822	187629
Output input ratio	2.16	2.08	2.17	2.12

4.5.2 Profitability analysis in cauliflower

The table 4.22 present the profitability analysis in cauliflower crop. The table revealed that the gross return from cauliflower in case of marginal, small and medium farm categories was Rs.229320, Rs.230713 and Rs.230000 respectively. Family labour income varied between Rs.131282 to Rs.140397 with Rs.138503 at an overall basis. Farm business income varied between Rs.162986 to Rs.171875 among different farm categories and Rs.169328 at overall category basis. Farm investment income was found to be Rs.161388, Rs.161529, Rs.156360 and Rs.160427 in case of marginal, small, medium and overall farm category. The output – input ratio was 2.20 in marginal, 2.23 in small, 2.09 in medium and 2.19 on overall farm basis.

Table 4.22: Farm profitability in cauliflower crop on different farm categories

	Marginal	Small	Medium	Overall
Yield(Quintals)	234	241.58	250	240.11
Gross Return	229320	230713	230000	229990
Farm Business Income	171875	169893	162986	169328
Family Labour Income	140397	140278	131282	138503
Net Farm Income	125319	127436	119899	125021
Farm Investment Income	161388	161529	156360	160427
Output input ratio	2.20	2.23	2.09	2.19

4.5.3 Profitability analysis in pea

Analysed data on profitability measures of pea crop is presented in Table 4.23. The table revealed that the gross return from pea in case of marginal, small and medium farm categories was Rs.233025, Rs.238936.1 and Rs.246750 respectively. Maximum farm business income and was earned in marginal farm category Rs.171779.4. Family labour income varied between Rs.138056.53 to Rs.141656.95 among different farm categories and Rs.140347.14 at overall category basis. Farm investment income was found to be Rs.146970.90, Rs.148648.80, Rs.149720.40 and Rs.148154.50 in case of marginal, small, medium and overall farm category. The output – input ratio was found to be 1.91 in marginal, 1.91 in small, 1.83 in medium and 1.89 on overall farm categories basis.

Table 4.23: Farm profitability in pea crop on different farm categories

	Marginal	Small	Medium	Overall
Yield(Quintals)	65	67.08	70	66.8
Gross Return	233025	238936.1	246750	238035.9
Farm Business Income	171779.4	171272.8	169761.1	171172.1
Family Labour Income	140301.36	141656.95	138056.53	140347.14
Net Farm Income	111065.06	113930.76	112178.82	112361.43
Farm Investment Income	146970.9	148648.8	149720.4	148154.5
Output input ratio	1.91	1.91	1.83	1.89

4.6 PRODUCTION FUNCTION ANALYSIS:

One of the main objectives of a production unit is to co-ordinate and utilizes resources or factors of production in such a manner that together they yield the maximum net returns. The cost and return analysis does not put sufficient light on the efficiency of resource allocation. It just depicts the general idea about the different factors of production or inputs used in the cultivation and production. In order to explain the contribution of individual input in the total output, production function analysis is helpful to evaluate the efficiency of various inputs used by the farmers. The elasticity of inputs used in the production of vegetables has been worked out by fitting Cobb-Douglas production function. The analysis was carried out at overall basis as there was no significant difference was observed among various categories of farm.

4.6.1 Cobb – Douglas production function in tomato

The estimated Cobb-Douglas production function is presented in Table 4.24. The production function analysis shows that in case of tomato, 88 per cent of variation in output was explained by the variables under study respectively.

Table 4.24: Estimated Cob- Douglas production function in tomato

	Coefficient	Standard Error	P-value
Intercept	54.95	(0.49)	0.00
Seed	0.03	(0.06)	0.61
FYM	-0.04	(0.10)	0.67
Labour	0.29**	(0.12)	0.02
Plant Protection	0.93*	(0.11)	0.00
Fertilizer	-0.02	(0.10)	0.87
$\sum b_i$	1.22**		

*** and ** significant at 1 and 5 per cent level respectively**
Figures in parentheses are standard error.
R^2 = 0.88 , F=80.62*, Adjusted R^2 =0.87

The sum of elasticity coefficients in case of tomato is greater than unity (Σb_i = 1.22) which is statistically significant and shows increasing returns to scale which means that the output increases in a greater proportion than the increase in input. The plant protection and labour were found statistically significant at 1 and 5 per cent respectively.

4.6.2 Resource use efficiency and elasticity of production in tomato

Resource use efficiency indicates whether a particular input is used efficiently or not as dictated by its economically optimum level. If a particular input is used up to that level where its marginal factor cost equal to the value of associated marginal products, then the resource use is said to be efficient. If the efficiency ratio is less than one it indicates that the resource is being over utilized and if ratio is more than one, the resource is being under-utilized.

It is observed from the Table 4.25 that the ratio of MVP to MFC represented by value of r in case of plant protection and labour was greater than unity which means these are under-utilized and an increase in their usage would increase the production. Values of fertilizer, seed and FYM were less than unity, which means these are over utilized and a reduction in their usage would lead to the maximization of profits in the sampled households.

Table 4.25: Estimated resource use efficiency and elasticity of production in tomato

	Coefficient	APP	MPP	Py	MVP	MFC	r
Seed	0.03	1.70	0.06	1000.00	55.72	275.00	0.20
FYM	-0.04	1.61	-0.07	1000.00	-71.63	150.00	-0.48
Labour	0.29	1.26	0.37	1000.00	368.22	350.00	1.05
Plant Protection	0.93	2.26	2.10	1000.00	2095.52	250.00	8.38
Fertilizer	-0.02	1.88	-0.03	1000.00	-30.83	525.15	-0.06

4.6.3 Cobb – Douglas production function in cauliflower

Table 4.26: Estimated Cob- Douglas production function in cauliflower

	Coefficient	**Standard Error**	**P-value**
Intercept	120	(0.07)	0.25
Seed	0.11*	(0.04)	0.01
FYM	0.10*	(0.04)	0.01
Labour	1.11*	(0.05)	0.00
Fertilizer	0.24*	(0.07)	0.00
Plant Protection	0.03	(0.03)	0.26
$\sum b_i$	1.56*		

*** significant at 1 per cent level respectively**
Figures in parentheses are standard error.
R^2=0.99, F=1332.99*, Adjusted R^2=0.99

The sum of elasticity coefficients in case of cauliflower is greater than unity (Σb_i = 1.56) which is statistically significant and shows increasing returns to scale which means that the output increases in a greater proportion than the increase in input. Seed, FYM, fertilizer and labour were found to be statistically significant at 1 per cent level of significance.

4.6.4 Resource use efficiency and elasticity of production in cauliflower

Table 4.27: Estimated resource use efficiency and elasticity of production in cauliflower

	Coefficient	APP	MPP	Py	MVP	MFC	r
Seed	0.11	1.68	0.18	1200.00	215.20	200.00	1.08
FYM	0.10	1.65	0.16	1200.00	190.85	150.00	1.27
Labour	1.11	1.56	1.73	1200.00	2072.81	350.00	5.92
Fertilizer	0.24	1.82	0.44	1200.00	528.17	525.15	1.01
Plant Protection	0.03	1.96	0.06	1200.00	75.01	250.00	0.30

It is observed from the Table 4.27 that the ratio of MVP to MFC represented by value of r in case of seed, FYM, fertilizers and labour was greater than unity which shows under-utilization of these and increasing their use would increase the production. Value of plant protection on the other hand was less than unity which shows its over-utilization and a reduction in their use would lead to maximization of profits.

4.6.5 Cobb – Douglas production function in pea

Table 4.28: Estimated Cob- Douglas production function in pea

	Coefficient	**Standard Error**	**P-value**
Intercept	4.27	(1.42)	0.66
Seed	-0.07	(0.13)	0.61
FYM	0.02*	(0.01)	0.00
Labour	0.90*	(0.36)	0.01
Fertilizer	-0.07	(0.13)	0.61
Plant Protection	0.39**	(0.18)	0.04
$\sum b_i$	1.31*		

*** and ** significant at 1 and 5 per cent level respectively**
Figures in parentheses are standard error.
R^2=0.81, F=11.46*, Adjusted R^2=0.77

The sum of elasticity coefficients in case of cauliflower is greater than unity (Σb_i = 1.31), which is statistically significant and shows increasing returns to scale which means that the output increases in a greater proportion than the increase in input. FYM and labour were found to be significant at 1 per cent level whereas, plant protection was found to be significant at 5 per cent level.

4.6.6 Resource use efficiency and elasticity of production in pea

It is observed from the Table 4.29 that the ratio of MVP to MFC represented by value of r in case of plant protection chemicals and labour was greater than unity which means these are under-utilized and an increase in the use of these would increase the production. Values for fertilizer, seed and FYM were less than unity, which means these were over utilized and a reduction in their use would lead to the maximization of profits in the sampled households.

Table 4.29: Estimated resource use efficiency and elasticity of production in pea

	Coefficient	APP	MPP	Py	MVP	MFC	r
Seed	-0.07	1.50	-0.10	4885.26	-488.54	200.00	-2.44
FYM	0.02	1.53	0.03	4885.26	129.89	150.00	0.87
Labour	0.90	1.19	1.07	4885.26	5245.21	350.00	14.99
Fertilizer	-0.07	1.75	-0.12	4885.26	-572.25	525.15	-1.09
Plant Protection	0.39	2.10	0.82	4885.26	4017.05	250.00	16.07

4.7 MARKETING SYSTEM OF VEGETABLES

Marketing of the produce is the final and crucial step in any agricultural production operation, which makes it necessary to ensure that the marketing mechanism has proper channels through which the farmers produce reaches to the end consumer. This will allow the farmer to obtain adequate returns and even more to encourage him to increase his output through which he cannot only achieve self-sufficiency but also to meet the supplies of vegetables as the demand of the people is shifting towards high value nutritive crops. A proper marketing system will thus, help the farmer to obtain surplus which in turn may encourage him to expand his business through the purchase of improved machinery and implements as well as provide financial support to transport his produce to distant an larger markets where his produce can fetch better prices in comparison to the local market.

The marketing system's efficiency becomes a pre-requisite for improving crop cultivation. An effective marketing system provides the farmer with sufficient details on the time and location for the selling of his produce. An efficient marketing system will provide them with the knowledge of the prevailing prices in the different markets that will prevent them from undergoing distress sales.

Various marketing operations are performed by the vegetable growers for the marketing of their produce. These operations include picking, assembling, grading, packaging and transportation etc. The details of these functions with regard to the study area are as under.

A) Picking:

Vegetables are generally picked at the stage of maturity when they attain desirable size, colour, texture, and maturity. The survey conducted in the area indicated that all the vegetable crops did not attain their maturity at the same time, thus picking needed to be done in stages. Picking of vegetables was done by the growers manually. The number of picking in particular vegetables was not specified and defined. The average no of pickings done by farmers was observed to be 3-4 in case of pea and 8-10 in case of tomato.

B) Assembling

There is no definite system of assembling for the harvested produce in the area. The vegetables just after picking were kept in a heap in the specified place like sheds in the fields or in the room of the house for further operations such as grading and packing.

C) Grading

Grading is a process of sorting out the harvested produce into different lots in such a manner that produce within each lot has uniform characteristics like shape, size and colour. The growers sell their graded produce to fetch good and higher prices in the market.

D) Packaging

Packaging is an important part of marketing. The packing of vegetables need a greater care because of their perishable and fragile nature. If these are not packed carefully then their quality is likely to deteriorate. After the vegetables were assembled and graded, the vegetables like pea and cauliflower were generally packed in gunny bags, whereas tomatoes were packed in crates.

E) Transportation

Due to their high perishability, most of the vegetables require immediate marketing after their harvest in order to avoid spoilage. Therefore, transportation plays an important role in marketing of these vegetables. The study showed that the vegetables were carried by labours to the road head and then transported through pick up van's to their nearest markets.

4.7.1 Identification of marketing agencies

(A) Producer

One of the significant market functionaries performing different roles in vegetable marketing is the producer himself. He undertakes the harvesting, assembly, cleaning, and arranges the product packaging.

(B) Local trader

A local trader works as an intermediary between the grower and the wholesaler. The main purpose of the local trader is to collect produce from the farmer and then sell this produce to the wholesaler.

(C) Wholesalers

Wholesalers are those intermediaries that specialise in multiple marketing functions, such as purchasing, selling, storage, etc. They purchase the produce directly from farmers or from village traders or from other wholesalers in large quantities. The wholesaler sells to retailers or other wholesalers, but does not sell to the ultimate consumer.

(D) Retailer

Retailers are the market functionaries who buy products from wholesalers and sell them in limited quantities to the ultimate consumers. Retailers are the market middlemen in the selling process that are closest to the ultimate consumers.

4.7.2 MARKETING CHANNELS AND MARGINS

Marketing channels are considered the routes or the path through which a commodity or product finds its way from producer to the ultimate consumers. The size and length of the channel depends upon the nature of the produce and the distance between producer and consumer. Due to the existence of various agencies working between the producer and consumer, there are different marketing channels for the same commodity. The different

agencies involved in marketing of vegetables are traders, retailers and wholesalers. Following marketing channels were observed in Kullu in marketing of vegetables.

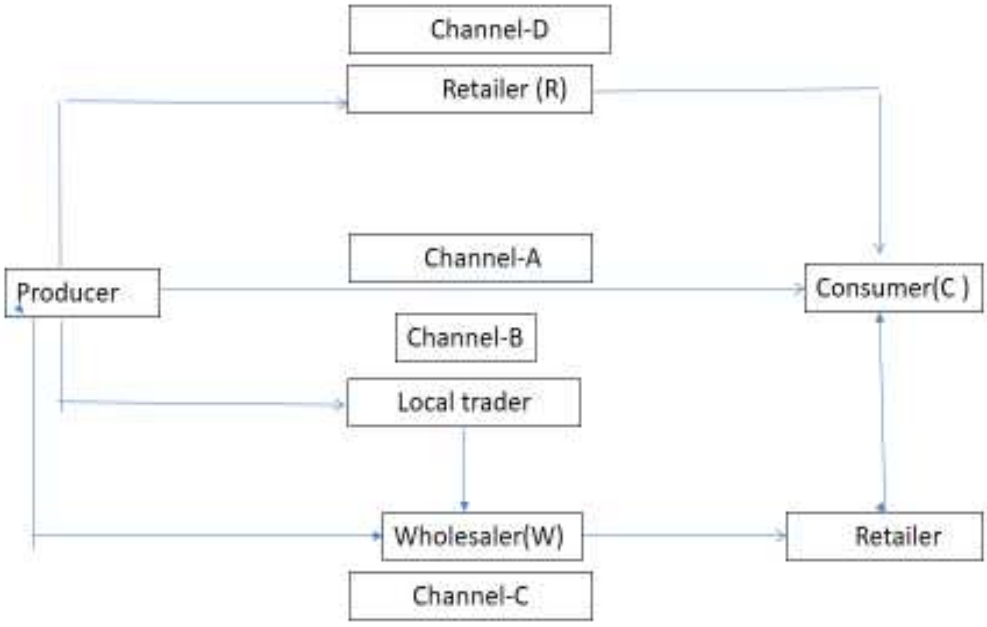
CHANNEL –A: Producer - Consumer

CHANNEL – B: Producer -Trader- Wholesaler -Retailer - Consumer

CHANNEL – C: Producer -Wholesaler - Retailer - Consumer

CHANNEL –D: Producer- Retailer-Consumer

Fig 3: Pictorial representation of marketing channels of vegetables



4.7.3 Quantity of tomato marketed through various channels

Table 4.30: Quantity of tomato marketed

Marketing channels	Marketing intermediaries	Marginal	Small	Medium	Overall
Channel –A	Producer--Consumer	4.82	3.25	2.67	3.79
Channel –B	Producer--Wholesaler--Retailer—Consumer	59.29	58.65	54.35	58.06
Channel- C	Producer--Local trader--wholesaler---Retailer---Consumer	30.17	31.03	36.12	31.69
Channel –D	Producer---Retailer---Consumer	5.72	7.07	6.86	6.47

Fig 4: Pictorial representation of quantity of tomato marketed.

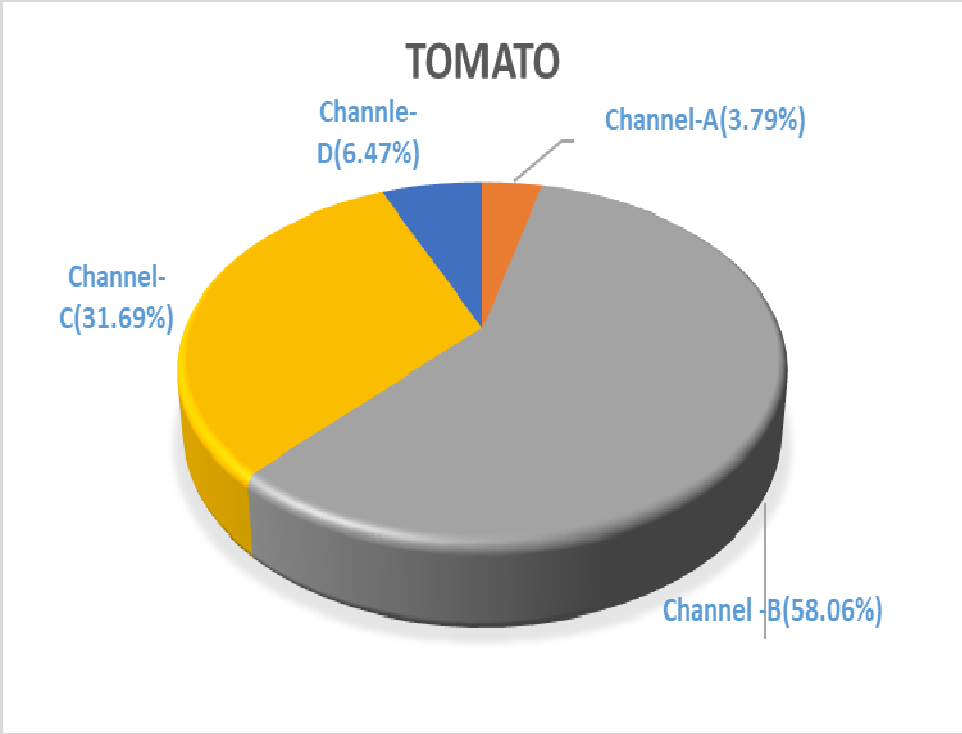


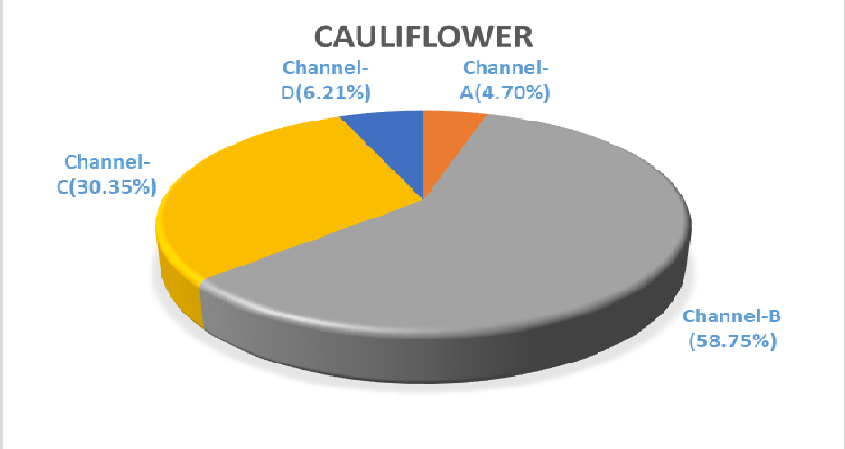
Table 4.30 depicts the data related to quantity of tomato marketed through different marketing channels. It was found that the maximum quantity of tomato was marketed through Channel-B (58.06%) on an overall basis. It also shows that the Channel –A and Channel -B were maximum used by marginal farmers, whereas Channel-C was used maximum by medium farmers and Channel-D by the small farmers.

4.7.4 Quantity of cauliflower marketed through various channels

Table 4.31: Quantity of cauliflower marketed

Marketing channels	Marketing intermediaries	Marginal	Small	Medium	Overall
Channel –A	Producer--Consumer	5.23	4.65	3.67	4.70
Channel –B	Producer--Wholesaler--Retailer—Consumer	57.56	60.1	58.65	58.75
Channel- C	Producer--Local trader-- wholesaler---Retailer---Consumer	31.72	28.8	30.45	30.35
Channel –D	Producer---Retailer---Consumer	5.49	6.45	7.23	6.21

Fig 5: Pictorial representation of quantity of cauliflower marketed



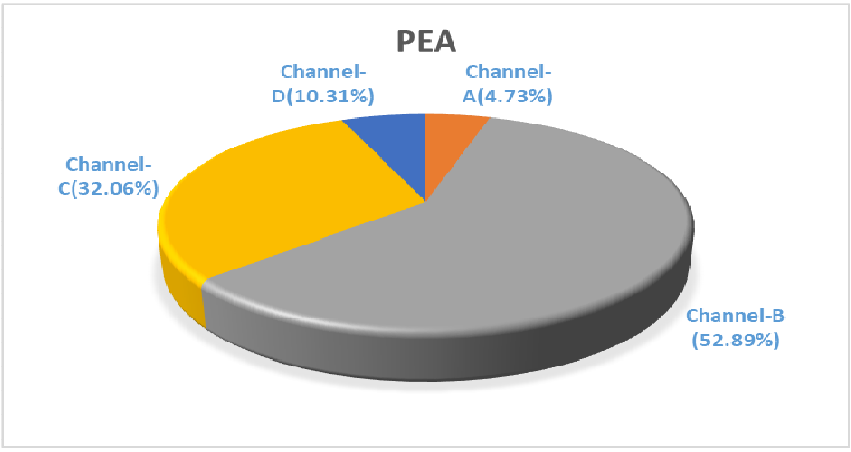
The table above shows that Channel –B was the most preferred channel for marketing of cauliflower (58.75%) on an overall basis. Channel-A and Channel-C were mostly preferred by marginal farmers, whereas Channel-B by small farmers and Channel-D by the medium farmers.

4.7.5 Quantity of pea marketed through various channels

Table 4.32: Quantity of pea marketed

Marketing channels	Marketing intermediaries	Marginal	Small	Medium	Overall
Channel –A	Producer--Consumer	5.27	4.65	3.78	4.73
Channel –B	Producer--Wholesaler--Retailer—Consumer	52.21	54.2	51.81	52.89
Channel- C	Producer--Local trader-- wholesaler---Retailer---Consumer	31.28	30.77	36.17	32.06
Channel –D	Producer---Retailer---Consumer	11.24	10.38	8.24	10.31

Fig 6: Pictorial representation of quantity of pea marketed.



The table above shows that Channel –B was the most preferred channel for marketing of pea (52.89%) on an overall basis. Channel-A and Channel-D were mostly preferred by the marginal farmers, whereas Channel-B was preferred by small and Channel-C by the medium farmers respectively.

4.7.6:

Table 4.33. Marketing cost and margin of different functionaries in the different marketing channel of tomato

(Rupees per quintal)

Sr. No.	Particulars	A	B	C	D
I.	**Marketing cost incurred by producers**				
	Net price received by farmer	1905.00	781.00	1004.00	1448.58
	Marketing cost	70.00	90.00	85.00	84.06
	Farmer's selling price	1975.00	871.00	1089.00	1532.64
III.	**Marketing cost incurred by Trader**				
	Gross price paid by Trader		871.00		
	Marketing cost		17.42		
	Trader Margin		120.00		
	Trader Selling price		1008.42		
IV.	**Marketing cost incurred by Wholesaler**				
	Gross price paid by Wholesaler		1061.00	1089.00	
	Marketing cost		264.38	283.12	
	Wholesaler margin		170.00	140.00	
	Wholesaler Selling price		1495.38	1512.12	
V	**Marketing cost incurred by Retailer**				
	Gross price paid by Retailer		1495.38	1512.12	1532.64
	Marketing cost		181.40	182.74	184.38
	Retailer Margin		160.00	180.00	210.00
	Retailer Selling price		1836.78	1874.86	1927.02
VI	Consumer purchase price	1975.00	1836.78	1874.86	1927.02

I) Marketing cost incurred by the producer:

The producer sold the produce either to the consumer as in Channel-A or to other market functionaries as seen in rest of the channels. The total marketing cost incurred in Channel–A was Rs.70 as the produce was directly sold to the consumer. The marketing cost for Channel-B was Rs.90 where the produce was sold to the wholesaler. For Channel-C and D, the marketing cost incurred was Rs.85 and Rs.84.06 respectively. The marketing costs in Channel-C and Channel-D was less than channel-B as the transportation cost was more in the latter. The marketing cost in the study includes the packaging material cost, local transportation etc.

II) Marketing cost incurred by the trader:

Local trader was found in channels B. The total marketing cost incurred by local trader was Rs.17.42 in Channel B. The major components of these marketing cost were found to be the commission charges and the mandi. The local trader further sold the produce to the wholesaler.

III) Marketing cost incurred by the wholesaler:

The wholesaler were found in two channels *i.e* Channel-B and C. In case of Channel-B and Channel–C the marketing cost incurred by wholesaler was found to be Rs.264.38 and Rs.283.12 respectively out of which commission charges, mandi fee, room rent (storage charges) and transportation constituted the important components of marketing cost. In Channel-B the wholesaler procured the produce through the local trader whereas in Channel-C, it was procured directly from the consumer. But in both the channels the produce was sold to the retailer.

IV) Marketing cost incurred by the retailer:

The retailer appeared in channels Channel B, C and D. The retailer was the only market functionary apart from the producer who was selling the produce directly to the consumer. The total cost incurred by retailer in Channel-B, Channel-C and Channel–D was Rs.181.40, Rs.182.74 and Rs.184.38 per quintal respectively. The retailer margin for Channel B, C and D was Rs.160, Rs.180 and Rs.210 per quintal.

4.7.7 Price spread of tomato among different marketing channels

Table 4.34: Price spread of tomato among the different marketing channels

Particulars				
	A	**B**	**C**	**D**
Producer price (Rs.)	1905.00	781.00	1004.00	1448.58
Consumer's price (Rs.)	1975.00	1836.78	1874.86	1927.02
Gross marketing margin(GMM) (Rs)	70.00	1055.78	870.86	478.44
Marketing cost (Rs.)	70.00	553.20	550.86	268.44
Marketing margin (Rs.)	0.00	450.00	320.00	210.00
Gross marketing margin (%)	3.54	57.48	46.45	24.83
Net marketing cost (%)	3.54	30.12	29.38	13.93
Net marketing margin (%)	0.00	24.50	17.07	10.90
Producer's shares	96.46	42.52	53.55	75.17
Marketing efficiency	27.21	0.78	1.15	3.03

The table above shows that the producer's price varies between Rs.781.00 to Rs.1905 among different channels. The gross marketing margin was highest in case of Channel-B (57.48%) followed by (46.45%) in Channel-C, (24.83%) in Channel-D and (3.54%) in Channel-A respectively. The net marketing margins varied between 0.00 to 24.50 per cent and the net marketing costs lies between 3.54 to 30.12 per cent for different marketing channels.

Channel-A was found to be the most efficient channel according to the Acharya method. The marketing cost and marketing margin were found to be least in Channel-D when compared to all the other channels.

4.7.8:

Table 4.35 Marketing cost and margin of different functionaries in the different marketing channel of cauliflower

Sr. No.	Particulars	A	B	C	D
I.	**Marketing cost incurred by producers**				
	Net price received by farmer	1957.97	1066.95	1121.00	1566.77
	Marketing cost	56.00	63.05	73.00	60.23
	Farmer's selling price	2013.97	1130.00	1194.00	1627.00
III.	**Marketing cost incurred by Trader**				
	Gross price paid by Trader		1130.00		
	Marketing cost		22.60		
	Trader Margin		110.00		
	Trader Selling price		1262.60		
IV.	**Marketing cost incurred by Wholesaler**				
	Gross price paid by Wholesaler		1262.60	1194.00	
	Marketing cost		271.78	266.29	
	Wholesaler margin		125.00	140.00	
	Wholesaler Selling price		1659.38	1600.29	
V	**Marketing cost incurred by Retailer**				
	Gross price paid by Retailer		1659.38	1600.29	1627.00
	Marketing cost		195.75	191.02	193.16
	Retailer Margin		160.00	175.00	190.00
	Retailer Selling price		2015.13	1966.31	2010.16
VI	Consumer purchase price	2013.97	2015.13	1966.31	2010.16

I) Marketing cost incurred by the producer:

The total marketing cost incurred in Channel–A was Rs.56 as the produce was directly sold to the consumer. The marketing cost for Channel-B was Rs.63.05 where the produce was sold to the wholesaler. The marketing cost incurred for Channel- C and D was Rs.73.00 and Rs.60.23. The marketing cost in the study includes the packaging material cost, local transportation etc.

II) Marketing cost incurred by the trader:

Local trader was found in channels B. The total marketing cost incurred by local trader was Rs.22.60 in Channel. The major components of these marketing cost were found to be the commission charges and the mandi. The local trader further sold the produce to the wholesaler.

III) Marketing cost incurred by the wholesaler:

The wholesalers were found in two channels *i.e* Channel-B and C. In case of Channel-B and Channel–C the marketing cost incurred by wholesaler was found to be Rs.271.78 and Rs.266.29 respectively out of which commission charges, mandi fee, room rent (storage charges) and transportation constituted the important components of marketing cost. In Channel-B the wholesaler procured the produce through the local trader whereas in Channel-C, it was procured directly from the consumer. But in both the channels the produce was sold to the retailer.

IV) Marketing cost incurred by the retailer:

The retailer appeared in Channels B, C and D. The total cost incurred by retailer in Channel-B, Channel-C and Channel–D was Rs.195.75, Rs.191.02 and Rs.193.16 per quintal respectively. The retailer margin for Channel B, C and D was Rs.160, Rs.175 and Rs.190 per quintal.

4.7.5 Price spread of cauliflower among different marketing channels

Table 4.36: Price spread of cauliflower among the different marketing channels

Particulars	A	B	C	D
Producer price (Rs.)	1957.97	1066.95	1121.00	1566.77
Consumer's price (Rs.)	2013.97	2015.13	1966.31	2010.16
Gross marketing margin(GMM) (Rs)	56.00	948.18	845.31	443.39
Marketing cost (Rs.)	56.00	553.18	530.31	253.39
Market margin (Rs.)	0.00	395.00	315.00	190.00
Gross marketing margin (%)	2.78	47.05	42.99	22.06
Net marketing cost (%)	2.78	27.45	26.97	12.61
Net Marketing margin (%)	0.00	19.60	16.02	9.45
Producer's shares	97.22	52.95	57.01	77.94
Marketing efficiency	34.96	1.33	1.33	3.35

The table above shows that the producer's price varies between Rs.1066.95 to Rs.1566.77 among different channels. The gross marketing margin was highest in case of Channel-B (47.05%) followed by (42.99%) in Channel-C, (22.06%) in Channel- D and (2.78%) in Channel-A respectively. The net marketing margins varied between 0.00 to 19.60 per cent and the net marketing costs lies between 2.78 to 27.45 per cent for different marketing channels.

Channel-A was found to be the most efficient channel according to the Acharya method as the producer's price was highest for this channel (Rs.1957.97) The marketing cost and marketing margin were found to be least in Channel-D when compared to other channels.

4.7.5:

Table 4.37 Marketing cost and margin of different functionaries in the different marketing channel of pea.

Sr. No.	Particulars	A	B	C	D
I.	**Marketing cost incurred by producers**				
	Net price received by farmer	4821.21	4164.98	4136.88	4368.76
	Marketing cost	38.00	47.45	53.00	48.00
	Farmer's selling price	4859.21	4212.43	4189.88	4416.76
III.	**Marketing cost incurred by Trader**				
	Gross price paid by Trader		4212.43		
	Marketing cost		84.25		
	Trader Margin		95.00		
	Trader Selling price		4391.68		
IV.	**Marketing cost incurred by Wholesaler**				
	Gross price paid by Wholesaler		4391.68	4189.88	
	Marketing cost		522.10	501.69	
	Wholesaler margin		120.00	140.00	
	Wholesaler Selling price		5033.78	4831.57	
V	**Marketing cost incurred by Retailer**				
	Gross price paid by Retailer		5033.78	4831.57	4416.76
	Marketing cost		465.70	449.53	416.34
	Retailer Margin		150.00	170.00	200.00
	Retailer Selling price		5649.49	5451.10	5033.10
VI	Consumer purchase price	4859.21	5649.49	5451.10	5033.10

I) Marketing cost incurred by the producer:

The total marketing cost incurred in Channel–A was Rs.38.00 as the produce was directly sold to the consumer. The marketing cost for Channel-B was Rs.47.45 where the produce was sold to the wholesaler. The marketing cost incurred for Channel- C and D was Rs.53.00 and Rs.48.00. The marketing cost in the study includes the packaging material cost, local transportation etc.

II) Marketing cost incurred by the trader:

Local trader was found in channels B. The total marketing cost incurred by local trader was Rs.84.25. The major components of these marketing cost were found to be the commission charges and the mandi. The local trader further sold the produce to the wholesaler.

III) Marketing cost incurred by the wholesaler:

The wholesalers were found in two channels *i.e* Channel-B and C. In case of Channel-B and Channel–C the marketing cost incurred by wholesaler was found to be Rs.522.10 and Rs.501.69 respectively out of which commission charges, mandi fee, room rent (storage charges) and transportation constituted the important components of marketing cost. In Channel-B the wholesaler procured the produce through the local trader whereas in Channel-C, it was procured directly from the consumer. But in both the channels the produce was sold to the retailer.

IV) Marketing cost incurred by the retailer:

The retailer appeared in Channel B, C and D. The total cost incurred by retailer in Channel-B, Channel-C and Channel–D was Rs.465.70, Rs.449.53 and Rs.416.34 per quintal respectively. The retailer margin for Channel B, C and D was Rs.150, Rs.170 and Rs.200 per quintal.

4.7. Price spread of pea among different marketing channels

The table below shows that the producer's price varies between Rs.4136.88 to Rs.4821.21 among different channels. The gross marketing margin was highest in case of Channel-B (26.28%) followed by (24.11%) in Channel-C, (13.20%) in Channel-D and (0.78%) in Channel-A respectively. The net marketing margins varied between 0.00 to 6.46 per cent and the net marketing costs lies between 0.78 to 19.82 per cent for different marketing channels.

Table 4.38 represents the price spread of pea

Particulars	A	B	C	D
Producer price (Rs.)	4821.21	4164.98	4136.88	4368.76
Consumer's price (Rs.)	4859.21	5649.49	5451.10	5033.10
Gross marketing margin(GMM) (Rs)	38.00	1484.51	1314.22	664.34
Marketing cost (Rs.)	38.00	1119.51	1004.22	464.34
Marketing margin (Rs.)	0.00	365.00	310.00	200.00
Gross marketing margin (%)	0.78	26.28	24.11	13.20
Net marketing cost (%)	0.78	19.82	18.42	9.23
Net marketing margin (%)	0.00	6.46	5.69	3.97
Producer's shares	99.22	73.72	75.89	86.80
Marketing efficiency	126.87	2.81	3.15	6.57

Channel-A was found to be the most efficient channel according to the Acharya method as the producer's price was highest for this channel (Rs.4821.21) The marketing cost and marketing margin were found to be least in Channel-D when compared to other channels.

4.8 PROBLEMS FACED IN THE PRODUCTION AND MARKETING OF VEGETABLES

The problems faced by the vegetable growers in the field of production and marketing were analysed and are categorized in two sub groups viz., production related problems and marketing related problems. The multiple responses of the sampled vegetable growers regarding different production and marketing problems are discussed in Table 4.39 and Table 4.40.

4.8.1 Production related problems

Various problems faced by the farmer while undergoing the production process includes incidence of insect and pest, shortage of labour, non-availability of skilled labour, proper supply of inputs such as chemical fertilizers, financial aid and social problems like inadequate training facilities and extension services. In order to run the production process smoothly, identification and understanding of these problems is very important so as to give appropriate solutions in order to overcome these.

Table 4.39 depicts that majority of the respondents in medium category (66%) were facing the problem of high wage rates and (92%) of the respondents in the marginal category were facing the problem on non- availability of labour at peak operation time. The problem of high chemical prices was faced maximum by respondents of small category (43.48%) and that of insects and diseases by medium category (66.67%). Non-availability of financial institutes was problematic maximum in the case of marginal category (76%).

Table 4.39: Production problems faced by vegetable growers.

Particulars	**Marginal**	**Small**	**Medium**	**Overall**	**Chi-square**
No. of farmers	25	23	12	60	
Skilled labour					
Shortage of skilled labour	64.00	78.26	66.67	57.96	3.61
Higher wage rate	16.00	43.48	66.67	36.67	31.29*
Non- availability at peak operation time	92.00	82.61	50.00	80.00	13.33*
Chemical fertilizers					
High price of chemical	24.00	43.48	41.67	35.00	6.418*
Problems of insects and diseases	40.00	52.17	66.67	50.00	6.90*
Desired brand not available	64.00	60.87	66.67	63.33	0.27
Non-availability of insecticides/fungicide	80.00	78.26	75.00	78.33	0.17
Financial problems					
Non- availability of financial institutes in village	76.00	52.17	33.33	58.33	17.36*
Low repayment capacity	20.00	34.78	33.33	28.33	4.56
High interest rate and cumbersome procedure of banks	36.00	52.17	41.67	43.33	3.11
Institutional problem					
Inadequate training facilities	32.00	43.48	33.33	36.67	2.18
Lack of extension facilities	12.00	21.74	16.67	16.67	2.83
Lack of knowledge of package of practices	60.00	52.17	58.33	56.67	0.60
Social problems					
Lack of interest in farming of family members	40.00	56.52	50.00	48.33	2.84
Inadequate cultivable land	88.00	86.96	83.33	86.67	0.14

***significant at 5 percent level.**

4.9.2 Marketing related problems:

Marketing problems also need to be taken into consideration as these are often neglected. These include poor transportation facilities leading to produce's quality deterioration, lack of proper dissemination of market information to the farmers and lack of storage facilities in case when the farmer is getting low prices for his produce. Table 4.40 depicts the marketing problems faced by the vegetable growers in the study area.

Table 4.40: Marketing problems faced by the vegetable growers.

Marketing problems					
Particulars	**Marginal**	**Small**	**Medium**	**Overall**	**Chi-square**
Grading and Packing					
Shortage of skilled labour	64	78.26	66.67	70.00	1.65
High wage rates	72	60.87	41.67	61.67	8.30*
Non-availability at peak operation time	56	82.61	58.33	66.67	6.63*
Packing material					
Shortage of packing material	48	56.52	66.67	55	3.14
High prices	68	69.57	50	65	3.88
Storage facility					
No storage facility	40	52.17	33.33	43.33	4.42
Inadequate storage facility	48	43.48	33.33	43.33	2.78
Transportation					
Lack of vehicles	40	34.78	16.67	33.33	10.11*
Vehicles not available in time	48	56.52	50	51.67	0.77
High transport charges	56	60.87	66.67	60	0.95
Market Intelligence					
Late information	32	43.48	41.67	38.33	1.96
Inadequate information	32	65.22	58.33	50.00	11.92*
Limited to market only	56	56.52	66.67	58.33	1.24
Non remunerative price for the produce	40	52.17	50	46.67	1.79
Delayed payment	60	52.17	33.33	51.67	7.95*

***significant at 5 percent level.**

The table shows that the major marketing problem faced by the farmer was inadequate market information which was maximum in case of small category (65.22%). Other marketing problems faced were non-availability of skilled labour at peak operation time, high wage rates, lack of vehicles for timely transport and delay in payments.

In order to see whether the problems identified by the vegetable growers are farm category specific or independent of the farm category, chi-square test is used. Among the production problems, high wage rate, non-availability at peak operation time, high prices of chemicals, problems of insect and diseases and non-availability of financial institutes in village were found to be statistically significant which means these problems are more prominent in one of the farm category. As far as marketing problems are concerned, high wage rate, non-availability at peak operation time, lack of vehicle, inadequate market information and delay in payments were found statistically significant indicating that these problems were faced by one of the farm category among different farm categories.

Chapter-5

SUMMARY AND CONCLUSIONS

Vegetable crops are important constituents of Indian agriculture and are grown in an area of 10,463 thousand hectares with an annual production of 1,87,474 thousand MT (NHB 2018-2019).Vegetables with shorter duration and higher productivity have resulted in greater economic returns to farmers over the last two decades .

Agriculture is the main occupation of the people of Himachal Pradesh. Earlier the economy of our state was fruit based but in the era of crop diversification, vegetable cultivation in Himachal Pradesh in general has gained significant importance on account of favourable agro-climatic conditions for growing quality vegetables. The total area under vegetable cultivation in the state is 8,576 thousand hectares with a total production of 1743.31 thousand MT in the year 2017-2018 (Anonymous, 2018).

The area under vegetable production in Kullu district is 6500 hectares and the total production is 141854 MT (HP Agriculture Department) with an average productivity of 200 quintals per hectares. The important commercial vegetables grown in Kullu district are tomato (*Solanum lycopersicum*), cauliflower (*Brassica oleracea var. botrytis*) and pea (*Pisum sativum*). The present study entitled "Economic analysis of production and marketing of major vegetable crops in Kullu valley of Himachal Pradesh" was conducted with the following objectives:

1. To study the socio-economic conditions of vegetable growers.
2. To analyse the cost of cultivation of major vegetables.
3. To study the resource use efficiency in vegetable cultivation.
   To analyse the market structure and problem associated in production and marketing of vegetables.

The major findings of the study are given below:

- The area with respect to vegetables in India and Himachal Pradesh is increasing with compound annual growth rate of 2.29 and 1.29 per cent respectively during 2011-12 to 2018-19. Similar trends have been seen on production i.e. 2.63 per cent and 2.65 per annum during the same period.

- Socio-economic indicator revealed that majority households in the study area were having joint families (58.33%). The average family size varied between 5.25 members per family in case of marginal to 7.25 members per family in medium farmers.
- The overall literacy rate was worked out to be 78.44 per cent but the literacy index was low (2.4) indicating below average quality of education.
- Agriculture is the main occupation in the study area as 64.09 per cent of people were engaged in agriculture followed by private services 13.64 per cent, own business 7.95 per cent, government services 7.27 per cent, wage labourers 4.32 per cent and rural artisans 2.73 per cent.
- The average size of land holding was found 1.12 hectares out of which 81.58 per cent was cultivated area and 47.51 per cent was under field crops at and overall farm category level.
- Cropping intensity was found highest in case of marginal farm (173.58%) followed by small farm (156.00%) and medium (150.66%) respectively. At overall level it was found to be 157.14 per cent, which indicated that there is a scope to improve farm management for better returns.
- The main crops grown in the kharif season were maize, tomato, capsicum and beans and that in rabi season were pea, cauliflower and wheat. The most dominating vegetable in the kharif season was tomato and cauliflower and pea in the rabi season.
- The major share of livestock was attributed by cattle, followed by goat and sheep. At overall farm categories, the average number of livestock per household was found to be 2.89.
- The per hectare cost of cultivation of tomato varied from Rs.127063.30 in marginal farm to Rs.130936.00 in medium farm category. The major share in total cost was of human labour i.e. 29.28 per cent, whereas the share of FYM, seed, field operation, fertilizers and plant protection accounted to 27.49 per cent of the total cost.
- The cost of cultivation per hectare for cauliflower was highest in medium farm category Rs.110101.00 followed by marginal Rs.104001.00 and Rs.103277.00 in small farm category. The share of human labour towards total cost of production was 21.30 per cent, followed by FYM, seedling, fertilizers, plant protection and bullock labour.

- The cost of cultivation of pea was found to be highest in medium farms and lowest in the marginal farms. In this case also, the share of human labour was highest, followed by FYM and fertilizer, cost of seed, field preparation and plant protection.
- Medium farmers earned highest net income by cultivating tomato crop. Small farmers earned highest net income by growing cauliflower and peas.
- The highest output-input ratio was 2.17 in case of medium farmers cultivating tomato whereas, it was 2.3 for cauliflower and 1.91 in case of pea for small farmers.
- The Cobb-Douglas production function for analysis indicated that the labour and plant protection had significant impact on output of tomato, whereas seed, labour, FYM and fertilizer significantly contributed towards cauliflower production. In case of pea, role of FYM, human labour and plant protection played a significant role in increasing the production.
- The efficiency ratios for the significant variables indicated that the farmers were not using the resources judiciously. The reason for this maybe lack of awareness and knowledge. Therefore, it is suggested that the farmers should be trained for judicious use of resources.
- Four marketing channels were prevalent in the study area for the marketing of vegetables viz., Channel-A (Producer- Consumer), Channel-B (Producer -Trader-Wholesaler -Retailer - Consumer), Channel-C (Producer -Wholesaler - Retailer - Consumer) and Channel-D (Producer-Retailer-Consumer).
- More than 50 per cent of the growers marketed their produce through Channel-B in case of crops under study.
- The share of producer in consumer price was 75.17 per cent for tomato, 77.94 per cent for cauliflower and 86.80 per cent for pea respectively.
- The major problems faced by the growers in production of vegetables were non-availability of labours during the peak period, non-availability of timely financial help, high prices of plant protection material, problems of insects and diseases and high wage rates.
- In the field of marketing, majority of farmers reported problems of non- availability of labours during the peak period, high wage rate, delayed payments, lack of market intelligence and problem of transportation.

Suggestions:

- The study brightened many problems of the vegetable growers in the area for production and marketing activities of vegetable crops. These problems can be solved by technology and post -harvest management.
- Supply of critical inputs at farmer's door.
- Training in modern production technology and post-harvest management.
- Reinforcing the marketing infrastructure: increasing the number of markets, constructing rural godowns and cold chambers.
- Timely management of transport.
- Strengthening of market intelligence system and establishment of eNam.

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APPENDIX I

Cost of cultivation of tomato in the study area

(Rupees per farm)

	Marginal	Small	Medium	Overall
Cost A1				
Ploughing (Bullock labour / Tiller / Tractor)	656.78 (3.72)	804.86 (3.83)	846.64 (3.62)	741.2 (3.74)
Seed	1256.59 (7.12)	1447.51 (6.89)	1463.41 (6.26)	1355.56 (6.83)
FYM	1647.56 (9.34)	1951.22 (9.29)	2093.5 (8.95)	1829.27 (9.22)
Fertilizers	606.52 (3.44)	786.96 (3.75)	836.69 (3.58)	710.46 (3.58)
Plant protection	598.08 (3.39)	744 (3.54)	803.2 (3.43)	684.98 (3.45)
Hired Labour	1992.44 (11.29)	2729.06 (12.99)	3281.25 (14.03)	2485.47 (12.53)
Miscellaneous (Staking material, irrigation charges etc.)	879.03 (4.98)	1076.42 (5.12)	1113.52 (4.76)	988.05 (4.98)
Interest on working capital	155.92 (0.88)	194.78 (0.93)	213.11 (0.91)	179.56 (0.91)
Land Revenue	4.38 (0.02)	5 (0.02)	5 (0.02)	4.69 (0.02)
Depreciation	644.74 (3.65)	617.56 (2.94)	823.22 (3.52)	690.57 (3.48)
COST A1	8442.02 (47.85)	10357.4 (49.3)	11479.6 (49.09)	9669.8 (48.74)
Interest on fixed capital	1047.7 (5.94)	1565.5 (7.45)	3063.41 (13.1)	1604.71 (8.09)
Cost B1	9489.73 (53.79)	11922.9 (56.75)	14542.9 (62.18)	11274.5 (56.83)
Rental value of owned land	3268.13 (18.53)	3735.01 (17.78)	3735.01 (15.97)	3501.56 (17.65)
Cost C1	12757.9 (72.32)	15657.9 (74.52)	18278 (78.15)	14776.1 (74.48)
Imputed value of family labour	3170.8 (17.97)	3335.76 (15.88)	3023.28 (12.93)	3181.19 (16.04)
Cost C2	12660.5 (71.76)	15258.6 (72.62)	17566.2 (75.11)	14455.7 (72.87)
Cost C2	15928.7	18993.6	21301.2	17957.3
Value of management input(10 % of cost C2)	1713.08 (9.71)	2017.15 (9.6)	2085.71 (8.92)	1880.76 (9.48)
Cost C3	17641.7 (100.00)	21010.8 (100.00)	23386.8 (100.00)	19838 (100.00)

Figure in parentheses are percentage to cost C_3

APPENDIX II

Cost of cultivation of cauliflower in the study area

(Rupees per farm)

	Marginal	**Small**	**Medium**	**Overall**
COST A1				
Ploughing (Bullock labour / Tiller / Tractor)	717.09	1111.22	1183.03	936.6
	(4.64)	(4.96)	(4.89)	(4.81)
Seed	1454.3	2070.4	2145.72	1793.65
	(9.42)	(9.23)	(8.87)	(9.21)
FYM	1667.97	2639.26	2625.86	2173.82
	(10.8)	(11.77)	(10.86)	(11.16)
Fertilizers	787.5	1171.03	1161.02	987.5
	(5.1)	(5.22)	(4.8)	(5.07)
Plant protection	775.5	1163.4	1192	984.57
	(5.02)	(5.19)	(4.93)	(5.06)
Miscellaneous	450	682.5	700	575.25
	(2.91)	(3.04)	(2.9)	(2.95)
Hired Labour	1940.6	3013.48	3252.54	2545.9
	(12.57)	(13.44)	(13.45)	(13.07)
Interest on working capital	68.19	103.7	107.28	87.48
	(0.44)	(0.46)	(0.44)	(0.45)
Land Revenue	4.69	6.56	6.25	5.63
	(0.03)	(0.03)	(0.03)	(0.03)
Depreciation	690.79	810.54	1029.02	828.68
	(4.47)	(3.61)	(4.26)	(4.26)
Cost A1	8556.62	12772.1	13402.7	10919.1
	(55.41)	(56.95)	(55.43)	(56.07)
Interest on fixed capital	1122.53	2054.72	3829.26	1925.64
	(7.27)	(9.16)	(15.84)	(9.89)
Cost B1	9679.15	14826.8	17232	12844.7
	(62.68)	(66.11)	(71.27)	(65.96)
Rental value of owned land	3501.57	4902.2	4668.76	4201.88
	(22.67)	(21.86)	(19.31)	(21.58)
Cost B2	13180.7	19729	21900.7	17046.6
	(85.35)	(87.97)	(90.58)	(87.54)
Imputed value of family labour	1573.13	1756.54	1325.28	1602.26
	(10.19)	(7.83)	(5.48)	(8.23)
Cost C1	11252.3	16583.3	18557.3	14447
	(72.87)	(73.95)	(76.75)	(74.19)
Cost C2	14753.9	21485.5	23226.1	18648.9
	(95.54)	(95.81)	(96.07)	(95.77)
Value of management input(10 % of cost C2)	688.69	940.26	951.37	824.54
	(4.46)	(4.19)	(3.93)	(4.23)
Cost C3	15442.5	22425.8	24177.4	19473.4
	(100.00)	(100.00)	(100.00)	(100.00)

Figure in parentheses are percentage to cost C_3

APPENDIX III

Cost of cultivation of pea in the study area

(Rupees per farm)

Particulars	Marginal	Small	Medium	Overall
Cost A1				
Ploughing (Bullock labour / Tiller / Tractor)	842.2 (4.32)	987.71 (4.39)	1202.8 (4.26)	979.6 (4.33)
Seed	1624 (8.32)	2044.57 (9.09)	2657.81 (9.4)	2000.62 (8.84)
FYM	1440 (7.38)	2034.78 (9.04)	2871.09 (10.16)	1947.19 (8.61)
Fertilizers	575 (2.95)	737.36 (3.28)	940.63 (3.33)	713.44 (3.15)
Plant protection	680 (3.48)	842.4 (3.74)	1075.2 (3.8)	825.9894 (3.65)
Miscellaneous (Staking material, irrigation charges etc.)	886.86 (4.54)	1077.68 (4.79)	1318.35 (4.67)	1054.83 (4.66)
Hired Labour	2765.37 (14.17)	3524.86 (15.67)	4713.01 (16.68)	3455.41 (15.27)
Interest on working capital	179.94 (0.92)	229.67 (1.02)	301.74 (1.07)	224.12 (0.99)
Land Revenue	5 (0.03)	5.625 (0.02)	6.5625 (0.02)	5.625 (0.02)
Depreciation	800.92 (4.1)	694.75 (3.09)	1080.48 (3.82)	828.68 (3.66)
Cost A1	9799.29 (52.28)	12179.41 (55.78)	16167.67 (59.07)	12035.49 (55.09)
Interest on fixed capital	1301.49 (6.67)	1128.97 (5.02)	1755.77 (6.21)	1346.61 (5.95)
Cost B1	11100.78 (56.89)	13308.38 (59.15)	17923.44 (63.42)	13382.11 (59.16)
Rental value of owned land	3735 (19.14)	4201.88 (18.67)	4902.19 (17.35)	4201.88 (18.57)
Cost B2	14835.78	17510.25	22825.63	17583.98
	(76.03)	(77.82)	(80.77)	(77.73)
Imputed value of family labour	3969.37	4072.32	4208.54	4143.16
	(127.13)	(18.1)	(24808.57)	(18.32)
Cost C1	15070.15 (77.23)	17380.7 (77.24)	22131.99 (78.32)	17525.27 (77.47)
Cost C2	18805.15 (96.37)	21582.57 (95.92)	27034.17 (95.66)	21727.15 (96.05)
Value of management input(10 % of cost C2)	708.44 (3.63)	918.4 (4.08)	1225.77 (4.34)	894.27 (3.95)
Cost C3	19513.59 (100.00)	22500.97 (100.00)	28259.95 (100.00)	22621.41 (100.00)

Figure in parentheses are percentage to cost C_3

APPENDIX IV

DR YS PARMAR UNIVERSITY OF HORTICULTURE AND FORESTRY, NAUNI, SOLAN
DEPARTMENT OF SOCIAL SCIENCE

Economic analysis of production and marketing of major vegetable crops in Kullu valley of Himachal Pradesh

Household Schedule for the study

1) Distance of important office/facilities from the village…….

Office/facilities	Distance (km)	Office/facilities	Distance(km)	Office/facilities	Distance (km)
Post office		Primary /Middle school		BDO	
Bank		Sr. Secondary school		Co-operative society	
Market		Veterinary Dispensary		District Headquarters	
Road		KVK		Others	

KVK=KrishiVigyan Kendra, BDO= Block Development Office

2) General information

i) Name of the Respondent: ii) Age:

iii) Sex: iv) Economic status: APL/BPL

v) Village: vi) Panchayat:

vii) Block: viii) District:

ix) Family type: Joint/ Nuclear

x) No of family members: Male Female Children

Sr.no	Relationship with head	Age	Education I/P/M/H/D/S/NS	Occupation	
				Particulars	Income (Rs.)
1					
2					
3					
4					
5					
6					

DOB- Date of Birth, I-Illiterate, P- Primary, M- Middle, H-High /Sr.Secondary, D- Degree and above, S- School going, NS- Non school going.

3) Land utilization pattern (bigha or ha)

Sr. no.	Particulars of land	Area		
		IR	UIR	TOTAL
1	Total land holding(owned)			
2	Cultivated area Field crop			
3	Orchard area			
4	Area under Forest tree			
5	Ghasnis /pastures land/barren land			
6	Fallow land			
7	Leased-in land			
8	Leased –out land			
10	Land put to non-agriculture use			
11	Others			
12	Total holding			

IR-IRRIGATED UIR- UNIRRIGATED

3) Inventory of buildings

Sr. no	Particulars	Kucha		Pukka	
		No. & Year of construction	Cost(Rs.)	No. & Year of construction	Cost(Rs.)
1	Residential house				
2	Cattle shed				
3	Store house				
4	Other(speciy)				

5) Source of irrigation

Source	Natural spring	Kuhl	Lift irrigation	Tanks	Rain water harvesting	Otherspecify
Private owned						
Govt. Owned						
Community owned						
Adequacy of source						

6) Inventory of irrigation structures

Sr.no	Source of irrigation	Type of construction	Year of construction	Cost of construction
1	Kuhl			
2	Tank			
3	Lift			
4	Pipe line			
5	Drip irrigation			
6	Sprinkles			
7	Any other			

7) Inventory of implements and machinery

Sr. no	Implements	Number	Year of purchase	Purchase price	Present value	Expected remaining life(no. of yrs)
A	**Major implements:**					
1	Traditional plough					
2	Foot sprayer					
3	Power sprayer					
B	**Minor implements**					
4	Spade(khurpi)					
5	Sickle					
6	Pickaxe(gainti)					
7	Pruning scissors					
8	Axe					
9	Grafting knives					
10	Basket kiltas					
11	Plastic crates					

8) Cropping pattern and production details(Bigha)

Crop	Area (bigha)/no. of plants		Production (Qtls)		Home consumed	Marketed	
	IR	UIR	IR	UIR		Qty	value
Kharif							
Maize							
Tomato							
Potatoes							
Capsicum							
Beans							
Rabi							
Wheat							
Cauliflower							
Pea							
Fruits							
Apple							
Apricot							
Pear							
Forest							

9) Livestock inventory

Sr. no	Particulars	Number			Milk yield/day (lts)	Year of purchase	Present value (Rs.)
		No	Crossbred	local			
1	Cattle i) Milch ii)Dry						
2	Sheep						
3	Goat						
4	Others						

10) Record of animal products & utilization

Type of product	Use		
	Home consumed quantity	Sold	
		Qty	Value
Milk			
Wool			
Meat			
Others			

11 (a). COST OF CULTIVATION OF VEGETABLE CROP
Name of the crop……..
Area ……..

Material cost				
Sr. no	**Particulars**	**Quantity**	**Rate**	**Value**
1	Seeds			
2	Seedling			
3	FYM			
4	Fertilizers			
	i)			
	ii)			
	iii)			
5	Plant protection chemicals			
	i)			
	ii)			
	iii)			
6	Staking material			

Operation			Labour cost (MD)		Wage rate/charges	Total amount
			Owned labour	Hired labour		
Ploughing and furrowing						
Seed/Seedling sowing						
FYM application						
Fertilizers	Quantity of doze Kg/g	No of spray(if any)				
i)						
ii)						
iii)						
Pesticide application	Quantity of doze Kg/g	No of spray(if any)				
i)						
ii)						
iii)						
Insecticide application						
i)						
ii)						
Irrigation i) ii) iii)						
Weeding i) ii) iii)						
Staking						
Harvesting						
i)						
ii)						
iii)						

11 (b). COST OF CULTIVATION OF VEGETABLE CROP
Name of the crop……..
Area ……..

Material cost				
Sr.no	**Particulars**	**Quantity**	**Rate**	**Value**
1	Seeds			
2	Seedling			
3	FYM			
4	Fertilizers			
	i)			
	ii)			
	iii)			
5	Plant protection chemicals			
	i)			
	ii)			
	iii)			
6	Staking material			

Operation			Labour cost (MD)		Wage rate/charges	Total amount
			Owned labour	Hired labour		
Ploughing and furrowing						
Seed/Seedling sowing						
FYM application						
Fertilizers	Quantity of doze Kg/g	No of spray(if any)				
i)						
ii)						
iii)						
Pesticide application	Quantity of doze Kg/g	No of spray(if any)				
i)						
ii)						
iii)						
Insecticide application						
i)						
ii)						
iii)						
Irrigation i) ii) iii)						
Weeding i) ii) iii)						
Staking						
Harvesting						
i)						
ii)						

11 (c). COST OF CULTIVATION OF VEGETABLE CROP

Name of the crop……..

Area ……..

Material cost				
Sr.no	**Particulars**	**Quantity**	**Rate**	**Value**
1	Seeds			
2	Seedling			
3	FYM			
4	Fertilizers			
	i)			
	ii)			
	iii)			
5	Plant protection chemicals			
	i)			
	ii)			

	iii)			
6	Staking material			

Operation			Labour cost (MD)		Wage rate/charges	Total amount
			Owned labour	Hired labour		
Ploughing and furrowing						
Seed/Seedling sowing						
FYM application						
Fertilizers	Quantity of doze Kg/g	No of spray(if any)				
i)						
ii)						
iii)						
Pesticide application	Quantity of doze Kg/g	No of spray(if any)				
i)						
ii)						
iii)						
Insecticide application						
i)						
ii)						
iii)						
Irrigation i) ii) iii)						
Weeding i) ii) iii)						
Staking						
Harvesting						
i)						
ii)						

12) (a) Marketing channel of crops

Mode of transportation: i)Human back ii) Mules/Ponies
iii)Bus iv)trucks/campers v)others

Marketing channels		Name of crop and quantity					
		Crop	Quantity	Crop	Quantity	Crop	Quantity
1	Producer-----Consumer						
2	Producer-----R-----C						
3	Producer-----Local trader---W---R---C						
4	Producer-----W---R----C						

Name of the crop……

Particular	Family labour Days/hr		Hired labour Days/hr		Machinery /vehicles (charges/qtl)	Material cost/service charge		
	M	F	M	F		Qty	Rate (Rs/qtl)	Value (Rs.)
1.Assembling & Grading								
2.Packing cost								
i)Boxes								
ii)Gunny bags								
iii)Labelling								
iv)Others								
3.Transpotation								
i)Field to road head								
ii)Road head to distance market								
iii)Loading/unloading								
iv)Others(specify)								
4.Storage								
1.Other charges								
i)Market fee								
ii)commission fee								

12) (b) Marketing channel of crops
Name of the crop ……

Particular	Family labour Days/hr		Hired labour Days/hr		Machinery /vehicles (charges/qtl)	Material cost/service charge		
	M	F	M	F		Qty	Rate(Rs/qtl)	Value(Rs.)
1.Assembling and grading								
2.Packing cost								
i)Boxes								
ii)Gunny bags								
iii)Labelling								
iv)Others								
3.Transpotation								
i)Field to road head								
ii)Road head to distance market								
iii)Loading/unloading								
iv)Others(specify)								
4.Storage								
1.Other charges								
i)Market fee								
ii)commission fee								

12) (c) Marketing channel of crops
Name of the crop……

Particular	Family labour Days/hr		Hired labour Days/hr		Machinery /vehicles (charges/qtl)	Material cost/service charge		
	M	F	M	F		Qty	Rate (Rs/qtl)	Value (Rs.)
1.Assembling and grading								
2.Packing cost								
i)Boxes								
ii)Gunny bags								
iii)Labeling								
iv)Others								
3.Transpotation								
i)Field to road head								
ii)Road head to distance market								
iii)Loading/unloading								
iv)Others(specify)								
4.Storage								
1.Other charges								
i)Market fee								
ii)commission fee								

14) Problems faced by farmers

a) Problems related to production

	Problems/ constraints	Severity					Suggestion
A	**Skilled labour**	**VH**	**H**	**M**	**L**	**Nil**	
	Shortage of skilled labour						
	Higher wage rates						
	Non-availability at peak operation time						
B	**Chemical fertilizer**						
	Desired brand not available						
	Non- availability of insecticides/fungicides						
	High prices of chemicals						
	Problem of insect and disease						
C	**Financial problems**						
	Non-availability of financial institutions in village						
	Low repayment capacity						
	High interest rate and cumbersome procedure of banks						
D	**Institutional problems**						
	Inadequate training facilities						
	Lack of extension facilities						
	Lack of knowledge of package of practices						
E	**Social problems**						
	Lack of interest in farming of family members						
	Inadequate land						

b) Problems at various stages of marketing

	Problems faced by farmers	Severity					Suggestion
A	**Grading and packing**	**VH**	**H**	**M**	**L**	**Nil**	
	Shortage of skilled labour						
	High wage rates						
	Non-availability at peak operation time						
B	**Packing material**						
	Shortage of packing material						
	High prices						
C	**Storage facility**						
	No storage facility						
	Inadequate storage facility						
D	**Transportation**						
	Lack of vehicles						
	Vehicles not available in time						
	High transport charges						
E	**Market intelligence**						
	Late information						
	Inadequate information						
	Limited to market only						
	Non remunerative price for the produce						
	Delayed payment						
	Any other						

NOTE: VH- Very high, H- High, M- Medium, L- low

Local Trader's schedule

Name Age of respondent Education

Quantity handled:

Sr. no	Particulars	Pea	Cabbage	Beans
1	Quantity handled			
2	Average purchase price(Rs.)			
3	Source of supply			
4	Distance of source of supply(km)			
5	Commission charged (Rs.)			
6	Storage (Qtls)			
7	Market fee			
8	Loading /unloading			
	To whom sell your produce			
A	Consumer			
B	Secondary Wholesaler			
C	Retailer			
D	Local trader			
9	Transportation			
10	Taxes			
11	License			
12	Union charges			
13	Telephone charges			
14	Cost of gunny bags			
15	Miscellaneous			
16	Total cost			
	Sale price			

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Title of Thesis	**:**	**"Economic Analysis of production and marketing of major vegetable crops in Kullu valley of Himachal Pradesh"**
Name of the Student	**:**	Ishita Mandla
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ABSTRACT

The present study entitled **"Economic Analysis of production and marketing of major vegetable crops in Kullu valley of Himachal Pradesh"** was carried out in Kullu and Naggar blocks of district Kullu on the basis of highest area under vegetable cultivation. The multi-stage random sampling procedure was adopted to select the respondents. Compound annual growth rate was used to analyse the trend in vegetable cultivation and various cost concepts were used in order to calculate the benefits realized from vegetable cultivation. The results of the study indicate that about 64.09 per cent of the surveyed people were engaged in agriculture. The major vegetable crops grown were tomato, cauliflower and pea. The cropping intensity in the study area was in the range of 150.66 to 173.58 which indicates that there is a scope to improve farm management for better returns. The overall cost of cultivation was worked out for three major crops and it was found highest in tomato (Rs.129036.00/ha) followed by pea (Rs.125674.51/ha) and then cauliflower (Rs.104969.00/ha).The net returns were found highest in tomato (Rs.144266.00), despite the high cost incurred in its cultivation, followed by cauliflower (Rs.125021.00) and pea (Rs.112361.43). The Cob-Douglas production function determines the efficiency of each resource used and it showed that labour and plant protection had significant impact on tomato production whereas seed, FYM, labour and fertilizer had significant impact on cauliflower production. In case of pea, FYM, labour and plant protection had significant impact on the pea production. The efficiency ratios for the significant variables in all the vegetables were greater than unity. It is thus concluded from the analysis that the vegetable growers in the study area were not using the resources efficiently. Four main marketing channels were found prevalent in the study area for marketing of vegetables. Among these channels, channel-B consisting of Producer- wholesaler- retailer- consumer was found to be the most preferred channel as more than 50 per cent of the produce was disposed off through this channel. Problems like non-availability of labour at operation time, high wage rates, high transportation charges, limited market information and lack of storage facility were the major production and marketing problems reported by the farmers in the study area.

Signature of the Major Advisor **Signature of the Student**

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