STATUS OF VEGETABLE CULTIVATION IN SANGRUR DISTRICT OF PUNJAB

Thesis

Submitted to the Punjab Agricultural University
in partial fulfilment of the requirements
for the degree of

MASTER OF SCIENCE
in
EXTENSION EDUCATION
(Minor Subject: Agronomy)

By

Amandeep Singh
(L-2016-A-32-M)

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LUDHIANA – 141 004

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CERTIFICATE I

This is to certify that the thesis entitled, **"Status of vegetable cultivation in Sangrur district of Punjab"** submitted for the degree of **M.Sc.** in the subject of **Extension Education** (Minor subject: **Agronomy**) of the Punjab Agricultural University, Ludhiana, is a bonafide research work carried out by **Amandeep Singh (L-2016-A-32-M)** under my supervision and that no part of this thesis has been submitted for any other degree.

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

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CERTIFICATE II

This is to certify that the thesis entitled, **"Status of vegetable cultivation in Sangrur district of Punjab"** submitted by **Amandeep Singh (L-2016-A-32-M)** to the Punjab Agricultural University, Ludhiana, in partial fulfillment of the requirements for the degree of **M.Sc.** in the subject of **Extension Education** (Minor subject: **Agronomy**) has been approved by the Student's Advisory Committee along with External Examiner after an oral examination on the same.

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ABSTRACT

The present study entitled "Status of vegetable cultivation in Sangrur district of Punjab" was conducted in Malerkotla block of Punjab. Four vegetables crops i.e. cauliflower, cucumber, okra and capsicum were selected for the present study. A sample of 120 vegetable growers was selected randomly keeping in view that at least 50 farmers were selected for each vegetable crop. The study intended to know the personal profile of vegetable growers, the status of vegetable cultivation and problems faced by the vegetable growers. Study revealed that 57.50 per cent of the respondents belonged to age group of 37-48 years and 28.34 per cent of respondents were educated up to matric level. It was revealed that 81.68 per cent of respondents had taken loan from commission agents. The major source of information regarding vegetable cultivation were pesticide dealers with mean score 2.67 followed by progressive farmers with mean score 1.38. Majority of the respondents i.e., 87.50 per cent had purchased the seed from private seed shop and cultivated non-recommended varieties of selected vegetable crops. It was inferred that majority of respondents sown these vegetable crops at more than recommended row to row spacing and less than recommended plant to plant spacing. It was found that respondents had not used the recommended dose of fertilizers and pesticides the selected vegetable crops and they had applied more number of sprays than recommended. Almost all the respondents i.e., 92.50 per cent sold their produce to the local market. It was found that 15.00 per cent of the respondents wanted to decrease area of vegetable cultivation in winter season whereas 7.50 per cent of the respondents wished to decrease the area in summer season due to their decreasing profits. Major problems faced by the respondents were fluctuations in market rates and non-remunerative prices. The other problems which were reported by the growers were high cost of inputs, high cost of labour, non availability of canal water and lack of technical knowledge about plant protection measures.

Key words: Constraints, Vegetable cultivation, Status, Adoption, Capsicum, Okra, Cucumber, Cauliflower.

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ਸਾਰ-ਅੰਸ਼

ਮੌਜੂਦਾ ਅਧਿਐਨ ''ਪੰਜਾਬ ਦੇ ਸੰਗਰੂਰ ਜ਼ਿਲ੍ਹੇ ਵਿੱਚ ਸਬਜ਼ੀ ਕਾਸ਼ਤ ਦੀ ਹਾਲਤ'' ਸਿਰਲੇਖ ਹੇਠ ਪੰਜਾਬ ਦੇ ਮਲੇਰਕੋਟਲਾ ਬਲਾਕ ਵਿੱਚ ਕੀਤਾ ਗਿਆ। ਜਿਸ ਵਿਚ ਚਾਰ ਸਬਜ਼ੀਆਂ ਫ਼ੁੱਲ ਗੋਭੀ, ਖੀਰਾ, ਭਿੰਡੀ ਅਤੇ ਸ਼ਿਮਲਾ ਮਿਰਚ ਨੂੰ ਅਧਿਐਨ ਲਈ ਚੁਣਿਆ ਗਿਆ। ਜਿਸ ਅਧਿਐਨ ਵਿੱਚ 120 ਸਬਜ਼ੀ ਉਤਪਾਦਕਾਂ ਦਾ ਸੈਂਪਲ ਇਸ ਹਿਸਾਬ ਨਾਲ ਲਿਆ ਗਿਆ ਕਿ ਹਰ ਫ਼ਸਲ ਲਈ ਘੱਟੋ-ਘੱਟ 50 ਕਿਸਾਨ ਚੁਣੇ ਜਾਣ। ਇਸ ਅਧਿਐਨ ਵਿਚ ਸਬਜ਼ੀ ਉਤਪਾਦਕਾਂ ਦੀ ਨਿੱਜੀ ਜਾਣਕਾਰੀ, ਸਬਜ਼ੀ ਕਾਸ਼ਤਕਾਰੀ ਦੀ ਹਾਲਤ ਅਤੇ ਮੁਸ਼ਕਿਲਾਂ ਦਾ ਪਤਾ ਲਗਾਇਆ ਗਿਆ। ਨਤੀਜੇ ਦਰਸਾਉਂਦੇ ਹਨ ਕਿ 57.50% ਸਬਜ਼ੀ ਕਾਸ਼ਤਕਾਰ 37-48 ਸਾਲ ਦੇ ਸਨ ਅਤੇ 28.34 ਕਾਸ਼ਤਕਾਰ ਦੱਸਵੀਂ ਤੱਕ ਪੜ੍ਹੇ ਹੋਏ ਸਨ। ਇਹ ਸਾਹਮਣੇ ਆਇਆ ਕਿ 81.68% ਕਾਸ਼ਤਕਾਰਾਂ ਨੇ ਆੜਤੀਆਂ ਕੋਲੋਂ ਕਰਜਾ ਲਿਆ ਹੋਇਆ ਸੀ। ਸਬਜ਼ੀ ਕਾਸ਼ਤ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦਾ ਪ੍ਰਮੁੱਖ ਸ੍ਰੋਤ ਕੀਟਨਾਸ਼ਕ ਦਵਾਈਆਂ ਦੇ ਡੀਲਰ ਸਨ ਜਿਸਦਾ ਔਸਤ ਸਕੋਰ 2.67 ਸੀ ਇਸ ਤੋਂ ਬਾਅਦ ਜਾਣਕਾਰੀ ਦਾ ਸ੍ਰੋਤ ਅਗਾਂਹਵਧੂ ਕਿਸਾਨ ਸਨ। 87.50% ਕਾਸ਼ਤਕਾਰ ਨਿੱਜੀ ਦੁਕਾਨਾਂ ਤੋਂ ਬੀਜ ਖਰੀਦਦੇ ਸਨ ਅਤੇ ਗ਼ੈਰ ਸਿਫਾਰਿਸ਼ੀ ਕਿਸ਼ਮਾਂ ਦੀ ਕਾਸ਼ਤ ਕਰਦੇ ਸਨ। ਇਹ ਪਾਇਆ ਗਿਆ ਜ਼ਿਆਦਾਤਰ ਕਾਸ਼ਤਕਾਰ ਇਹਨਾਂ ਸਬਜ਼ੀਆਂ ਨੂੰ ਸਿਫਾਰਸ਼ ਕੀਤੇ ਪੌਦੇ ਤੋਂ ਪੌਦੇ ਦੇ ਫਾਸਲੇ, ਸਿਆੜਾਂ ਦੇ ਫਾਸਲੇ ਤੋਂ ਵੱਧ ਤੇ ਬੀਜਦੇ ਸਨ। ਚੌਣਵੀਆਂ ਫ਼ਸਲਾਂ ਲਈ ਉਹ ਖਾਦਾਂ ਦੀ ਸਿਫਾਰਿਸ਼ ਕੀਤੀ ਮਾਤਰਾ ਨਹੀਂ ਵਰਤਦੇ ਸਨ ਅਤੇ ਪੈਸਟੀਸਾਇਡ ਦਾ ਛਿੜਕਾਅ ਸਿਫਾਰਿਸ਼ ਤੋਂ ਵਧੇਰੇ ਕਰਦੇ ਸਨ। ਕਰੀਬ ਸਾਰੇ ਕਾਸ਼ਤਕਾਰ (92.50%) ਆਪਣੀ ਉਪਜ ਸਥਾਨਕ ਮੰਡੀ ਵਿਚ ਵੇਚਦੇ ਸਨ। ਇਹ ਪਾਇਆ ਗਿਆ ਕਿ 15.00 ਕਿਸਾਨ ਸਬਜ਼ੀਆਂ ਹੇਠ ਰਕਬਾ ਘਟਾਉਣਾ ਚਾਹੁੰਦੇ ਸਨ ਜਦਕਿ 7.50% ਕਿਸਾਨ ਗਰਮੀਆਂ ਵਿਚ ਸਬਜ਼ੀਆਂ ਹੇਠ ਰਕਬਾ ਘਟਾਉਣਾ ਚਾਹੁੰਦੇ ਸਨ। ਸਭ ਤੋਂ ਵੱਡੀ ਮੁਸ਼ਕਿਲ ਸਬਜ਼ੀਆਂ ਦੇ ਭਾਅ ਵਿਚ ਉਤਾਰ ਚੜਾਅ ਅਤੇ ਘੱਟ ਮੁਨਾਫਾ ਸੀ। ਹੋਰਨਾਂ ਮੁਸ਼ਕਿਲਾਂ ਵਿਚ ਵੱਧ ਲਾਗਤ, ਮਹਿੰਗੀ ਮਜ਼ਦੂਰੀ, ਨਹਿਰੀ ਪਾਣੀ ਉਪਲਬਧ ਨਾ ਹੋਣਾ ਅਤੇ ਪੌਦਾ ਸੁਰੱਖਿਆ ਬਾਰੇ ਜਾਣਕਾਰੀ ਦੀ ਘਾਟ ਸੀ।

ਮੁੱਖ ਸ਼ਬਦ: ਮੁਸ਼ਕਿਲਾਂ, ਸਬਜ਼ੀ, ਕਾਸ਼ਤਕਾਰੀ, ਸ਼ਿਮਲਾ ਮਿਰਚ, ਭਿੰਡੀ, ਖੀਰਾ, ਫੁੱਲ ਗੋਭੀ, ਕੀਟਨਾਸ਼ਕ

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ਪ੍ਰਮੁੱਖ ਸਲਾਹਕਾਰ ਦੇ ਹਸਤਾਖਰ **ਵਿਦਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ**

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CHAPTER – I

INTRODUCTION

Vegetables are rich and less expensive source of fat, sugar, carbohydrates, proteins, vitamins and minerals. Vegetables provide numerous chemical substances that are required for human body for development, growth, reproduction and for maintenance of health. Vegetable cultivation has been firmly prescribed as methods for yield broadening and as a means of crop diversification in India. The diverse agro climatic conditions of India make it possible to grow the wide range of varieties of vegetables crops throughout the year. As many as 61 annuals, four perennial vegetable crops are commercially cultivated in India, and it declares to grow the more number of vegetable crops as compared to other countries of the world (Singh 1998). India is predominantly an agriculture-based country and agriculture is the backbone of Indian economy. Major part of the Indian population lives in villages, out of which 72.2 per cent is engaged in agriculture. Overall food grains production was 284.83 million tonnes in the country during year 2017-18 (Anonymous 2018a). Despite significant research breakthrough made in food production, malnutrition poses a big problem in the country, which is becoming difficult to alleviate. Moreover, self sufficiency is said to be achieved in the country only when every individual is secured of the balance diet.

Till 1960, the main attention of agriculture scientists and policy makers had been to attain the self-sufficiency in food grains. Thereafter, the attention has been diverted to improve the quality of food to overcome the problem of malnutrition. Rural people have little change in the food preference but there is significant change in the availability of relatively more and better-quality vegetables in the market. In the country like India where vegetable production is still inadequate and people have become quality conscious, it is necessary to grow more vegetables. These days vegetable cultivation has become highly commercialized, however there is still a wide gap between actual and potential productivity. Therefore, collective efforts have to be made by researchers, policy makers and extensionists to overcome these constraints. Modern research has proved their value in balancing meat and cereal foods. With the spread of knowledge about the nutritive value of vegetables, there has been a considerable change in food habits of the people in advanced countries and within urban areas in the country, which now form a substantial part of their diet, resulting in increased demand for vegetables. The consumption of vegetables in India, with a large vegetarian population, is surprisingly low. The diet of people is largely cereal based with meager intake of protective foods such as vegetable and fruits. The per capita availability of vegetables in India is 140gms/day/person, which is just the half of the recommended level of Indian Council of Medical Research (Rao 2010). Ours' being a vegetarian society, the role of vegetables in improving the dietary standards of the people becomes all the more vital.

Therefore, the uptake of vegetable needs to be augmented by a change in food habits. This will naturally call for substantial increase in our production of vegetables, through improvement in agro techniques and their subsequent delivery to the farmers. During 2017-18, India has produced 180.68 million tonnes of vegetables and major vegetable crops cultivated were Tomato (Solanum lycopersicum), Brinjal (Solanum melongena), Red chilli (Capsicum annuum) and Beans (Phaseolus vulgaris) having the major share in terms of quantity and area under cultivation (Anonymous 2018b).

Vegetable crops have played an essential role in nutritional and food security of growing population of our country and occupied a major role in the diversification of agriculture. Vegetables are the essential items in everyday meals as they contain all the required nutrients for a balanced diet. The vegetables also have medicinal and aesthetic value. As they are rich resource of vitamins, minerals and other nutrients, vegetables are very precious for adding the quality components to the food for the maintenance of good health. In human diet, vegetables have been strongly associated with improvement of gastro intestinal health, good vision, and reduced risk of heart disease, stroke, chronic diseases such as diabetes, and some forms of cancer. Some photo-chemicals of vegetables are strong antioxidants and which thought to reduce the risk of chronic disease by protecting against free radical damage, by modifying metabolic activation and detoxification of carcinogens, or even by influencing processes that alter the course of tumor cells. All the vegetables may offer protection to humans against chronic diseases. During the periods of floods and droughts, when available period for growing conventional crops are too short, short duration vegetables serve as useful contingency arrangement for food production. Vegetables are particularly important as they render the staple food more palatable and hence improve intake, increase digestion, and have a curative role. Some important minerals such as calcium and iron are often lacking in our diet. Calcium and iron deficiency may occur more frequently if the basic food consists mainly of cereals. In this regard several vegetables such as pepper, amaranthus, cabbage, and beans can play useful role since they are rich in calcium and iron.

During the past two decades, production of vegetables has been increased continuously (Nair and Barche 2014). India is the second largest producer of vegetables in the world, next to China. Area under vegetable cultivation in India is 25662 thousand hectare with production of 180.68 million tones and productivity of 13.7 million tonnes per hectare (Anonymous 2018c). To feed the present population of the India, there is the need to double the total production of vegetables. Productivity of vegetables in India is quiet low beside it is second largest producer of vegetable. This may be due to high labor requirement in vegetable cultivation, no minimum support price on vegetables poor quality of produce, glut in main season and high cost of seed. Hence, there is need to enhance the production and productivity

of vegetable crops through modified strategies to meet the appropriate quality of vegetables in diet. Olericulturist and extension specialist will have to do some efforts together to achieve the desired level of production potential (George and Singh 2006). Protected cultivation is one of the best technologies to enhance the production, quality and productivity of vegetable crops.

Vegetable cultivation has emerged as an important enterprise for the farming community and many farmers have adopted it as a main source of the family income. These crops also maintain soil fertility because these are not exhaustive in nature. The vegetables are being used in processing industry as they can be processed to form commercial products like sauces, pickles etc. Cultivation of certain vegetables like leguminous vegetables increases the fertility of the soil through their symbiotic relationship with certain nitrogen-fixing bacteria. Further, income of the farmers growing grain crops like wheat and paddy has fallen in recent years mainly due to agrarian crisis of stagnating productivity, falling income and growing indebtedness. Now, a stage has reached where further improvement in productivity seemed to be limited and hence leading to stagnation of the income of the farming community. Therefore, some sort of diversification with the vegetable farming is needed which can help in generating higher income of farming community. Farm economists are suggesting for diversification but due to non-availability of infrastructure, assured prices of wheat and paddy, ineffective price policy for other crops and economically unviable competing crops, the situation has become further aggravated for the farmers of the Punjab State. Thus, in order to improve incomes, provide gainful employment and save the natural resources from further degradation, diversification from grain crops to vegetables emerges as a major strategy for agricultural growth.

In Punjab, the monoculture of rice-wheat crop rotation has led to over exploitation of natural resources, depletion of soil fertility and higher susceptibility of crops to the attack of various insect pest and diseases. The state has observed a substantial change on cropping pattern in the post green revolution era with main focus on wheat-paddy crop rotation. During the last five years, the area under pulses, maize, oilseeds and other cereals etc has decreased and the area under wheat and paddy has increased. Exploitation of natural resources of state especially water and soil occurs due to monoculture of rice and wheat which also leads to loss of biodiversity. Crop intensification, better crop diversification and more income per unit area are also increased by vegetable cultivation. In the prevailing agricultural scenario of the state, Dr. Johl in his report had proposed transfer of one million hectare of land from paddy-wheat rotation to other less water consuming crops (Anonymous 2002d). However, the area under vegetable crops, rate of production and yield obtained of most of vegetables is low in majority of vegetable growing states of India including Punjab. During the year 2017-2018, the area

under vegetable crops in Punjab was 24.3 thousand hectares with production of 4.91 million tonnes, which is still not enough to meet the vegetables requirement for fast growing population and limited land resources (Anonymous 2018e). But the Punjab government's initiatives which were taken to encourage vegetable cultivation all over the state, have started bearing results. The initiatives in the form of developing vegetable growing clusters by encouraging farmers to form groups and by providing subsidy and marketing facilities besides providing guidance have attracted a significant number of farmers towards vegetable cultivation. These clusters will be set up in seven areas of Punjab i.e Amritsar, Jalandhar, Hoshiarpur, Ludhiana, Sangrur (Malerkotla), Patiala and Fatehgarh Sahib. Apart from promoting the concept of green-house cultivation of vegetables which is aimed at giving a boost to the bulk sale of vegetables at competitive prices to the consumers, the new initiative has helped growers in fetching more prices. These vegetable producers would be facilitated to get their produce exported in the international market besides they would be helped to access assured distant domestic marketing. In Punjab, Sangrur district has an important place in the production of vegetables. In order to know the existing situation of vegetable growing in particularly Sangrur district of Punjab, the present study entitled 'Status of vegetable cultivation in Sangrur district of Punjab has been undertaken with following specific objectives.

1.1 Objectives:

1. To know the socio personal characteristics of the vegetable growers of Sangrur district of Punjab.
2. To determine the present status of vegetable cultivation in Sangrur district of Punjab.
3. To identify the problems faced by vegetable growers in Sangrur district of Punjab

1.2 Significance of the study

The study will investigate the status of vegetable cultivation with respect to adoption of agronomic practices, plant protection measures and marketing practices of vegetable crops in Sangrur district of Punjab. Study will also document the problems of vegetables growers, which may help the research and development organization to reorient their future activities.

1.3 Limitations of the study

1.3.1 The findings of the study are based on the expressed opinions of the farmers. Although every effort was made to get accurate information, the possibility of the respondents giving some biased information cannot be completely ruled out.

1.3.2 The investigation was carried out only in the selected block.

1.3.3 Being a single student's project, it has all those limitations which are common in such cases i.e. small sample, shortage of time, money and other resources.

1.3.4 Problems of the vegetable's growers may change from time to time. The present study is based on the perceived opinion taken from vegetable growers at the time of data collection.

CHAPTER – II

REVIEW OF LITERATURE

The review of past research plays an important role in planning process. It provides base for preparing the research design of the study and conceptualizing different concepts here in this chapter. In this chapter, the review of relevant studies has been discussed in chronological order under the following sub headings:

2.1 Studies related to socio-personal profile of respondents

2.2 Studies related to status of vegetable cultivation

2.3 Studies related to problems faced by vegetable growers

2.1 Studies related to socio-personal profile of respondents

Dhammu (1991) conducted a study in Jalandhar district of Punjab state and reported that 52.85 percent of respondents were between 30 to 50 years of age, 34.39 percent were below 30 years and remaining 12.86 percent were over 50 years of age.

Hanchinal *et al* (1991) examined that land holding was significantly correlated with the adoption of cultivation practices of potato crop.

Taulho and Kumari (1991) revealed that extension contacts played significant role in vegetable production.

Kaur (1993) reported that half of the respondents in her study on training needs of vegetable growers in Ludhiana district had medium land holding. It was reported that most of the vegetable growers belonged to middle age group. It was also observed that vegetable growers Ludhiana district had medium level of mass media exposure.

Nahar (1993) reported that majority of the respondents of Ludhiana districts had low extension contacts.

Singh (1994) conducted a study on training needs of fruit growers in Sangrur district of Punjab and found that most of the respondents had small orchard. It was also observed that most of the fruit growers of Sangrur district had high school education and had low level of mass media exposure.

Sharma (1996) examined that less than 50 percent of respondents had low level of mass media exposure. It was also concluded that education of mango growers was positively correlated to adoption of practices for mango cultivation. It was reported that there is positive and significant relationship between extension contacts and adoption of selected recommended practices for mango cultivation by mango growers in Punjab.

Roy and Bandopadhyay (1996) made an assessment of degree to which of improved technology in jute can be predicted from selected socio-personal traits of farmers and found that mass media exposure is an important factor to determine the adoption.

Ingle *et al* (1997) studied socio-personal characteristics of mango and citrus growers and observed that education was positively correlated to orchard sustainability.

Singh (1998) conducted a study to know the extent and level of adoption of selected recommended packages of practices of potato cultivation by the farmers of Punjab and found that age, experience and risk bearing capacity were found positively and significantly co-related with extent of adoption.

Hakeem (1998) observed that most of the adopters of recommended practices for muskmelon cultivation had operational land holding of 8-15 acres. It was also found that 83 percent of respondents had low to medium level of extension contacts.

Gill (1998) studied adoption of recommended practices for toria crop and found that 60 percent of the respondents were in the age group of 36-54 years. It was found that 45 percent of the respondents were illiterate. It was also reported that 85 percent of respondents for adoption of recommended practices for toria crop in Amritsar had low extension contacts.

Singh and Pandey (2000) conducted a survey and reported that organic vegetable growers were younger than conventionally vegetable growers. It was also reported that majority of the respondents were in middle age category and organic vegetable growers were more educated than conventionally vegetables growers. It was also reported that organic vegetable growers were young, less experienced in farming and tend to operate in small farms.

Meera and Bahal (2001) revealed that mass media exposure had the most significant contribution to farmer's awareness about ill effect of pesticides. It was also assessed the socio-economic factors influencing farmers awareness and reported that education has significant contribution to farmers awareness. They interviewed 90 vegetable growers in Alipur (India) to assess the socio-economic on the environment and revealed that education, social participation and mass media exposure had the most significant contribution to farmers awareness.

Kaur (2002) conducted study on training needs vegetables seed producers and found that majority of the respondents were in middle age category and more than 50 percent of the respondents have educational level of primary to middle. It was also found that vegetable seed producers had low level of mass media exposure.

Sharma (2002) studied adoption of recommended practices for chilli cultivation and observed that about half of the respondents were of the age group between 50-62 years and half of the respondents were educated up to middle level. It was also observed that half of the respondents had operational land holding ranging from 3-12 acres. Study also revealed that one third of the respondents had no extension contacts and nearly one third of respondents had low level of mass media exposure.

Sharma (2002) conducted a study on adoption of cultural practices of okra crop by farmers of Pakhowal block (Ludhiana district) and found that of 78.66 percent of the farmers were in the category of illiterate to under matric and 48 percent farmers had low level of extension contacts. Study also revealed that less than 50 per cent of the respondents had low mass media exposure.

Sharma *et al* (2002) reported that education, income, mass media exposure were found to be significantly related with adoption level of respondents with regard to recommended cultivation practices of Kharif maize to enhance adoption.

A case study on pea cultivation was done by Josan (2002) in Nizampur Village of Amritsar, it was found that one third of the pea growers were matriculate. Study also revealed that 78-95 percent of farmers had operational land holding of 2-18 acres.

Khangura (2002) found that half of the pea growers of Ludhiana district had education level from 6^{th} to 10^{th} standard. It was also revealed that about half of the respondents had 6-25 acres of operational land holding and about half of the respondents had low level of mass media exposure.

Krishnamurthy *et al* (2006) reported that middle-aged of people are more enthusiastic, having risk bearing capacity, eager to learn and they are innovative in nature.

Bodake (2007) found non-significant relationship with awareness and adoption levels of biofertilizers in respect of age.

Sharma *et al* (2008) found that a majority of vegetable growers were medium achievement motivated. Half of the respondents were having personal achievement-oriented influence. Majority of vegetable growers were found poor in expressing their strength, anticipated action and anticipating vigilance. A well-designed training course can improve their level of achievement motivation.

Sonkar and Mishra (2015) had undertaken a study in Karanjakala block of Jaunpur district of Uttar Pradesh. Two hundred fourteen vegetable growers were randomly selected as respondents for the study. The findings revealed that the majority of the respondents were in 36 to 54 years age group, having education up to intermediate, from joint families, having large size family, large land holdings, agriculture as main occupation, from medium income group, and having 21 to 32 years of farming experience. Respondents' first choice of training was in the area of Pumpkin cultivation followed by Bottle Gourd (2nd rank), and Radish (3rd rank). Pumpkin cultivation and Bottle Gourd cultivation were most preferred vegetable for training. While, the training need preferences in main areas and sub areas of vegetable cultivation are different for each vegetable.

Dhillon *et al* (2010) conducted a study on vegetable cultivation so as to provide planners and extension personnel an insight into various aspects with regard to use of media, sources of information, input and marketing of produce. The data were collected personally, on a structured interview schedule from six agro-climatic zones of Punjab. The study revealed that majority of the vegetable growers were extensively using media for getting information regarding vegetable cultivation. They were procuring inputs from the local traders. The vegetables were marketed in raw form directly through the wholesale dealers in the nearest town/ city. With vegetable cultivation emerging as a major alternative preferred by farmers the extension personnel and the policy makers need to strengthen the mechanism for easy, timely and quality availability of technical, physical, monetary and marketing inputs.

Verma (2017) the study was conducted in six villages of Community Development Blocks, Haldwani, Ramnagar and Dhari in Nainital district of Uttarakhand. The study revealed that the personal cosmopolite sources, which are part of farming community, live with the farmers, being aware of farmers' problems, providing new technologies, and having close supervision, can play significant role for bringing agricultural development in the area.

2.2 Studies related to status of vegetable cultivation

Jayathilake and Bandara (1989) revealed that most of the farmers did not follow government recommendations in selecting pesticides for pest control. About 76.7 per cent of the farmers used stronger concentrations of insecticides that recommended to obtain pest-free vegetables. The majority of the farmers were not able to identify the pests that infested their crops.

Jathol (1991) conducted a survey on environmental awareness among the people of two villages of Hoshiarpur district. The results revealed that the irrigation facilities, timely supply of critical inputs, supply of packing material, storage facilities, transportation facilities and market intelligence.

Singh and Sikka (1992) revealed that there is vast scope to increase productivity of vegetable crops through proper use of available technology, assured irrigation and credit facilities. They further observed that return to vegetable growers could be improved if growers were provided with socio-economic variables were directly related to environmental awareness such as education, income and occupation increased.

Kaur (1993) examined that majority of the farmers (85.51%) of Ludhiana district have used recommended dose of fungicides and 75 percent did not follow recommend time of application of fungicides and almost all the farmers did not follow recommendation with regard to number of sprays and majority of farmers (68.75%) have not followed recommended spraying interval.

Bhatti and Singh (1993) examined that returns from vegetable growing although high in hilly areas, and could be much higher if the package of recommended practices is adopted. Increase in vegetable area on small and marginal farms will not only provide gainful employment for underutilized family labour but would also reduce income inequality among different sizes of farms.

Nahar (1993) revealed the majority of the farmers of Ludhiana district used over doze and more treatments than the recommended ones and they followed safety measures like storing insecticides in original containers.

Gandhi and Patel (1997) conducted a survey in Andhra Pradesh, Punjab and Gujarat and found that farmer's awareness about the impact of pesticides was limited to the immediate surroundings and did not extend much to the effect of pesticides on water, air and crop residues, use of alternative methods such as biological methods was practically nil.

Singh (1997) found that 75 percent of the cauliflower growers had sown the non-recommended varieties. Half of fungicides for seed treatment and most of them had used the recommended insecticides. For the control of weeds, majority of cauliflower growers had used the recommended weedicides.

Singh (1998) reported that half of the potato cultivators of Punjab were not aware about the application of recommended fertilizers, exact dose and time of weedicides and fungicides.

Hakeem (1998) studied the adoption of recommended practices for muskmelon cultivation in Punjab and observed majority of respondents (83.4%) had used higher dose of insecticides.

Singh (1998) studied extent and level of adoption of selected recommended package of practices of potato cultivation and found that majority of respondents had low risk bearing capacity.

Kurstjens and Weide (2000) studied status of vegetable growers with respect to adoption of cultivation and mechanization solution for labour problem during weed control in Netherlands. It was observed that due to increase in organic vegetable farming and prohibition of several herbicides, manual weed control will become more important.

Chahal (1999) collected various vegetables from farmers field when they were ready for transportation to the market and examined that farmers were not adhering to the recommendation of Punjab Agricultural University and were using these insecticides at their own level as insecticidal contamination prevailed on vegetables.

Lichtenberg and Zimmerman (1999) investigated the effects of information from different sources on farmer's attitude regarding the effects of pesticides and other agricultural

chemicals on environmental quality using in three mid-Atlantic state in USA revealed that farmers are more uniformly, suggested that the form community may be more polarized on environmental issues that the general public.

Singh (2000) found that peach growers of Amritsar district had lack of knowledge about peach cultivation practices.

Khangura (2002) pointed out that majority of the pea growers of Ludhiana district of Punjab applied insecticides and fungicides in high concentration.

Kaur (2002) reported that main reason of starting the vegetable seed production was more profit whereas diversification, more demand, interest to get experience was reported by 52.38, 41.85 and 23.80 percent of the respondents, respectively.

Josan (2002) in his case study of pea cultivation in Nizampur village of Amritsar, reported that the high price and easy marketing have been the main reasons for starting pea cultivation by 81.56 percent respondents. The other reasons which reported were easy manageable crop (80.26%), easy availability of labour (77.63%) favorable weather conditions (73.68%), availability of nearby market (63.16%).

Singh *et al* (2004) reported that the micro financing can do wonders to the rural poor living even in remote villages in improving their economic condition and promoting them from the clutches of the village money lenders.

Parit *et al* (2005) stated that tomato was profitable with output input ratio of more than one. Therefore, there is a need to bring more area under tomato cultivation, as it yields good returns to cultivators. Vegetable can play an important role in improving economic status of farmers, as they start yielding in short term.

Mahantesh and Singh (2009) studied on Farmers, Knowledge, perception and Instensity of Pesticide Use in Vegetable cultivation in Western Uttar Pradesh" that pesticides have substantially contributed for controlling of pests and increasing crop yields. But over the years there is growing concern about indiscriminate use of pesticides in agriculture. The result shows that on an average 41 per cent of the farmers were aware about pesticide hazards in vegetable cultivation. Most of the farmers (88 per cent) perceived that frequency of insects and disease infestation has increased over the past 10 years. It was also observed that farmers have not followed adequate safety measures regarding pesticide application. The high pesticide use cost was observed in vegetables especially in Tomato and Brinjal and most of the pesticides belonged to high and moderate risk chemicals. Increasing farmers' awareness of pesticide hazards to the environment and promotion of alternative pest management strategies such as use of bio-pesticides and IPM is essential for reducing adverse effect on environment.

Sidhu *et al* (2010) found that majority of the vegetable growers were extensively using media for getting information regarding vegetable cultivation. They were procuring inputs from the local traders. The vegetables were marketed in raw form directly through the wholesale dealers in the nearest town/ city. With vegetable cultivation emerging as a major alternative preferred by farmers the extension personnel and the policy makers need to strengthen the mechanism for easy, timely and quality availability of technical, physical, monetary and marketing inputs.

Singh *et al* (2010) carried out study in eight blocks of this district. Fifteen recommended practices included in the package of practices in vegetable cultivation were used for measuring this adoption. The findings of this study highlighted that about 85 percent of the vegetable growers had low or medium adoption of commercial cabbage cultivation practices meaning there by medium adopters were more energetic, knowledgeable, dynamic and having more interest in adopting modern vegetable technologies.

Gupta *et al* (2010) The study revealed that the knowledge level of respondents about the side effects of pesticides was low. It is evident from the study that the education and communication behavior of farmers are to be taken into consideration with full certainty in making sound strategies of development plan. If farmers become more aware of the judicious use of pesticides it will reduce the hazards related to injudicious pesticide use.

Daya Ram *et al* (2012) conducted a study on adoption level of IPM practices. Findings revealed that majority of the respondents had medium level of adoption of IPM practices while equal per cent of respondents (20%) had high and low level of adoption, respectively. With regard to cultural practices, majority of the farmers had adopted the practice of transplanting of recommended number of seedling per hill. As mechanical control measures, the use of bamboo-cage-cum-perchers to control pest in cole crops had adopted by 70 per cent farmers. In respect to biological control measures, use of neem products/neem-based pesticide was also noticed in case of 40 per cent farmers. Application of chemical control measures was insignificant among the farmers. Among the cultural, mechanical, biological and chemical measures of integrated pest management, respondents mainly followed cultural and mechanical methods for management pest of cabbage and cauliflower crops.

Masuku (2013) conducted a study to identify factors affecting productivity and profitability of vegetable production. It was found that the factors that significantly affected productivity of vegetable farmers were access to credit, selling price, fertiliser quantity, distance to market and gender of the farmer. For example, the selling price of carrot had a positive relationship with the productivity of vegetable farmers, suggesting that when the selling price of carrot increase by one unit, all else equal, the quantity of carrot produced

would increase by 0.417 kilogrammes. The determinants of profitability of vegetable production were level of education, land under vegetable production and type of marketing agency. For example, with an additional year of education, profit would increase by E0.304.

Swarnaka *et al (*2013) conducted a study in Indore Block of Indore District with 120 vegetable growers of 10 villages which were selected randomly and considered for study on the basis of larger area coverage. Maximum vegetable growers had low extent of adoption of the eco-friendly management practices followed by medium and high extent of adoption of the eco-friendly management practices respectively.

Ayinde *et al* (2015) examined the effect of resource use efficiency on poverty profile of VFHs in Ogun State, Nigeria. Results revealed that majority (76.3%) of VFH heads were male, 74.4% had formal education, 89.4% were married and 36.9% were artisans. The average age of the VFH heads was 47 years and the mean monthly income was ₦20,200.00. FGT index estimate gave poverty incidence as 0.26 while poverty depth and severity were 0.37 and 0.009 respectively. SFA revealed that farm size, labour and fertilizer increased output ($p<0.05$) while (land) rent ($p<0.05$), fertilizer and agrochemical prices ($p<0.01$) as well as wages ($p<0.01$) increased costs in vegetable production. Furthermore; age, education, household size and poverty status ($p<0.01$) as well as farming experience, sex and household size ($p<0.05$) were the factors that reduced efficiency of VFHs. The implication from the findings of this study is that poverty reduction among the farming households led to reduction in farm efficiency. Therefore, apart from providing efficiency enhancing factors to farmers, stakeholders should (as a priority) implement a re-orientation programme that will make VFHs regard vegetable farming as a (business) investment in the study area.

Saryam *et al* (2017) conducted study in Dhari block of Nainital district, Uttarakhand. Both primary and secondary data was collected for the study purpose. Four vegetables covering maximum area under vegetable cultivation was selected. On this basis, pea, cabbage, French bean and tomato are selected for the study. The costs in and returns from each vegetable crop is analysed and found that the returns per rupee invested from pea, cabbage, tomato, bean were 1.56, 1.25, 1.20 and 1.10 respectively. Thus, it is profitable for vegetable growers to adopt cultivation in the region.

Singh *et al* (2017) has undertaken a study in Jhalawar district of Rajasthan. The important interventions extended by KVK Jhalawar among farmers were vegetable varieties, time of sowing, plant protection measures, and fertilizer application. Findings of the study revealed that technological interventions extended by KVK have significantly empowered the vegetable growers technologically and economically. Higher extent of adoption of timely sowing, balanced fertilizer use and plant protection measures by the beneficiary respondents resulted in less cost of cultivation (Rs. 8,350/-)and higher net income (Rs.1,04,200/-) from vegetable cultivation than the non-beneficiary respondents.

Islam *et al* (2017) conducted a study to determine the attitude of farmers towards organic vegetable cultivation and explore the relationships between their selected characteristics with their attitude. Attitude was measured against 13 statements regarding organic vegetable cultivation following five-point Likert scale. To explore the relationship between the concerned variables correlation coefficient (r) was computed using SPSS. Descriptive statistics were used to describe the variables.

Kaur *et al* (2017) conducted a study to know the adoption status of various recommended sowing practices in protected cultivation of vegetables in six districts of Punjab viz., Amritsar, Gurdaspur, Sangrur, Moga, Jalandhar and Kapurthala. The results revealed that maximum number of respondents (64.37%) grown capsicum in protected structures followed by 58.62 per cent for cucumber and 21.84 per cent for tomato crop in the protected structures. Majority of growers preferred poly house for cultivation of these crops followed by net house. Neem cake, trichoderma and vermicompost were mostly used by respondents under protected structures. Study also revealed that majority of the respondents adopted soil testing practices to get the actual micronutrient status of soil, shallow soil ploughing and applied organic formulation before sowing of crops under protected structures. Majority of tomato growers followed soil solarization practices under protected structure to reduce the soil born infections. Majority of capsicum and tomato grower prepare their own nursery and used pretreated seed under protected structures. Majority of capsicum and tomato growers did not adopt recommended seed rate and sowing time practices. Majority of tomato growers did not adopt recommended spacing practices while adopt recommended transplanting time practices while in capsicum, maximum number of growers adopt recommended spacing practices and did not adopt recommended transplanting time practices. In case of cucumber, majority of respondents did not adopt recommended seed rate, spacing practices, used pretreated seed and adopt recommended sowing time practices. Therefore, regular awareness camps and training courses should be organized to train the farmers for successful cultivation of vegetable crops under protected structures and adoption of these technologies at large scale.

2.3 Studies related to problems faced by vegetable growers

Sharma and Sharma (1988) observed that high cost of weedicides, insecticides and fungicides, inadequate credit facilities, lack of marketing facilities, lack of technical guidance in the application of weedicides, insecticides and fungicides etc. were some of the main constraints in adoption of recommended practices for wheat cultivation.

Singh and Mathur (1988) found that lack of knowledge, lack of finance, high cost of inputs, lack of improved implements and costly labour were the main constraints responsible for the adoption gap in bajra cultivation technology.

Singh (1990) identified the main the problems in horticulture development in tribal areas of Bihar, i.e. non-availability of genuine planting materials and quality seeds, lack of technical know-how, lack of coordination among teaching, research and extension institutions, lack of availability of quality farm inputs, capital constraints, lack of irrigation, lack of marketing facilities and lack of processing industries and cold storage facilities.

Peacock and Norton (1990) conducted a study on organic vegetable crop protection in the UK concluded that about half of the growers lost more than 10 percent of their revenue to pests. Growers perceived their most serious pest problems to be weeds, slugs and birds were the next most important pests.

Vijayaragavan et al (1990) conducted a study on management in dryland agricluture and found that farmers of area do not face major problem of non-availability of fertilizer and pesticides but they faced the problem of availability of certified seed.

Bisen *et al* (1991) reported that high cost of fertilizers and insecticides, lack of credit facilities, non-availability of skilled labour and ignorance suitable dose and method of application of fertilizer as the main constraints in adoption of recommended paddy cultivation practices.

Lokhande and Wangikar (1991) conducted a study to find constraints in the adoption of selected scientific grape technologies reported that high costs, non-availabilities of fertilizer in time, non-availability of loans by the banks in time, more labour required, irregular supply of electricity and high costs were some of the technology with the high cost and risky nature were the main constraints in adoption of sugarcane technology.

Srivastava (1993) reported that the main reason for the low productivity of vegetable crops was the non-availability of quality tested high yielding seed.

Gautam (1994) studied that lack of knowledge about type, dose, method of application as the main constraints in control of pests and diseases of crops.

Somani and Lodha (1994) conducted a study on farmers problems in judicious use of fertilizers in Udaipur Valley and revealed that high cost of fertilizers was the most important problem followed by lack of irrigation facility, credit facility, low price of produce and non-availability of fertilizer.

Ghosh and Sarkar (1994) reported that the boron requirement is high for the growth and development of cole crops and its deficiency has been identified as a major problem particularly in cauliflower growing areas of Jharkhand, causing heavy losses due to browning of curds and hollowness of stem symptoms.

Singh (1994) conducted a study on training needs of fruit growers in Sangrur district of Punjab and recorded the problems of non-availability of cold storage, marketing of fruits,

lack of expert extension services. The minimum number of problems were reported in the area of plant protection measures related to various insects pests, diseases and birds.

Khurana and Sharma (1995) reported that major constraints pertaining to inputs and production aspects were non-availability of compost in time and in desired quantity, higher charcoal price, inadequate supply of spawn, irregular production, complex cultivation practices, difficult technologies for spawn production, lack of regular market and delayed payments.

Gill (1996) pointed out that lack of knowledge, financial problems, shortage of labour and inappropriate soil conditions were the main reasons responsible for non-adoption of recommendation in Litchi cultivation.

Gurung *et al* (1996) conducted study on production and marketing constraints to fresh fruits and vegetables in the western hills of Nepal and analyzed that the area lacks a physical and institutional infrastructure to support fruit and vegetable marketing, namely market places, stalls, transport network, price and market information, tele-communication facility and credit services. Malhotra (1996) found that mosjt6 of the respondents while growing vegetables face the problems of attack of yellow vein mosaic virus, less knowledge of proper dose, time and method of weedicide application, labour, picking, non-availability of varieties resistant to disease and low price during peak season.

Zhang et al (1996) found that serious problem of nitrate pollution of ground and drinking water in vegetable-producing areas as no fertilizer applied in large qualities and the percentage of applied nitrogen taken up by crops was more than 40 percent.

Sharma (1996) analyzed that lack of knowledge, financial problems, high cost of inputs, ignorance in the identification of insects, pests and diseases, lack of preservation and storage facilities as the main constraints encountered by mango growers of Punjab.

Chand (1997) found that unavailability and high cost of inputs, poor timeliness of arrival of inputs, poor quality of inputs, inadequate credit facility, complicated credit procedure are constraints to adoption of apple cultivation. Uncertainty of weather was the higher-ranking production (70%) constraint followed by lack of irrigation facilities (56.67%), high labour cost (55%) and small land holding (51.67%). The most important marketing constraints were road blockades at the time of transportation (50%) and unavailability of markets (48.33%) while lack of guidance regarding selection of appropriate cultivars (48.33%) and fertilizer application (43.33%) were the highest-ranking technical constraints.

Singh (1998) reported that poor quality spawn, irregular production in mushroom, untrained labour, not fixed price in market as were the main entrepreneurial problems faced by mushroom cultivars.

Gill (1998) while studying the adoption of recommended practices for toria crop in Amritsar district found that lack of knowledge, traditional attitude non-availability of improved varieties, high cost of fertilizers and insecticides were the main constraints leadi9ng to non-adoption of recommended practices.

Hakeem (1998) reported that high cost of seeds, non-availability of disease resistant varieties, lack of knowledge, weather problems, high cost of pesticides and no support price the main problems faced by muskmelon growers.

Ansari *et al* (1999) observed that level of trace and toxic elements like Copper, Cromium, Cadmium, Lead, Nickle and Zinc were high in vegetables grown in soil amended with industrial sludge.

Sharma and Khurana (2000) reported that non-availability of labour and lack of technical knowledge in application of measures and fertilizers were the main constraints faced in the applications of manures and fertilizers.

Kumar (2000) conducted study on beekeeping in Ludhiana district of Punjab and reported that the respondents faced problems of pesticidal spray in the field adjoining bee colonies, less price of product, lack of skilled labour in marketing and less price of produce.

Jha and Dubey (2001) the disease collar rot of lady's finger was reported as major disease of lady's finger (Singh et al 1988) and caused 20-30 per cent loss every year in most of the lady's finger growing23 areas of the country.

Bhople and Borker (2002) reported that the important constraints faced by the vegetable growers in adoption of bio-fertilizers were: scanty supply of bio-fertilizers and lack of knowledge about quantity and method of use of sticking agents during seed inoculation.

Nirmala *et al* (2002) reported that the inadequacies of irrigation water at the time of application of biofertilizers and inability to plan in advance were the major constraints in adoption of biofertilizers. The other constraints like lack of enforcement upon the technology, inability to remember the quantity and delayed land preparation were reported by 34.16, 40.00 and 30.00 per cent of the respondents respectively.

Sharma (2002) reported that main constraints faced by chilli growers were heavy price fluctuation, lack of knowledge of raising nursery, heavy infection of diseases, insects' pests, intrusive requirement of labour and low price.

Khangura (2002) observed that pea growers of Ludhiana district faced the problems of more fluctuation in the market regarding price of the peas, high costs of inputs, high costs of labour and lack of knowledge regarding recommended dose of pesticides.

Josan (2002) in his study on pea cultivation in Nizampur (Amritsar) found that no fixed price of pea (100%), lack of storage facilities (89.97%), sharp decline in yield (75%) as

the main problems which were faced by the pea growers.

Kaur (2002) concluded that marketing of the vegetables seeds was not sure and non-availability of skilled labour, attack of insect pest and diseases were the major problems faced by vegetable seed producers.

Sharma (2002) reported that scarcity of labour, high wages of labour, exploitation by the commission agents, lack of support price, high price of pesticides and fertilizers were the main constraints which faced by the okra growers.

Dudhate and Wangikar (2003) reported socio-economic factors as the major constraints in adoption of brinjal production technology. This was followed by technical and institutional factors with little variation in merit assigned by farmers.

Verma *et al* (2004) reported that both the quantitative and qualitative losses of extremely variable magnitudes occur at all stages in the post-harvest system from harvesting, through handling, storage and marketing to final delivering to the consumer. It is evident from the losses 28 that the overall losses varied up to 20 per cent in vegetables, viz., tomato, cabbage, cauliflower, and chilli. The maximum losses were observed at the retailer level for tomato, cabbage and cauliflower whereas for chilli it was at wholesale level. The more moisture content of tomato was responsible for maximum loss at storage followed by cauliflower and cabbage. The losses caused by sorting and storage operations were more in comparison to losses at transportation of produce.

Kishor *et al* (2006) revealed that inadequate storage and transportation facilities coupled with bad weather conditions positively and significantly influenced the post-harvest losses at the farm level. The establishment of small sized cold storage units in the production centers would help in reducing the storage losses in vegetables. In this direction the zero-energy cool chamber technology was being found to beneficial particularly for small and marginal farmers.

Samantaray *et al* (2009) conducted a study in two villages of Umerkote block in Nabarangpur district of Orissa, covering marginal, small and big farmers (30 from each category totaling 90 numbers) who were involved in vegetable cultivation. Investigation was made relating to constraints associated with vegetable cultivation i.e. social, organizational, technology transfer and economic constraints.

Singh *et al* (2011) found that in Jabalpur district of Madhya Pradesh. A majority of the farmers are reported to have high and medium level knowledge of improved technologies of tomato and cauliflower cultivation. However, only 17 per cent in Sihora and 35 per cent in Panager Blocks of Jabalpur district are reported to be high adopters of the improved technologies including weed management in Cauliflower. A majority of the farmers have

expressed that lack of control measures for weed, leaf curl in tomato, high cost of pesticide and fertilizer, lack of marketing, impure seeds and chemical, timely labour availability as the major reasons for non-adoption of improved technologies. A significant correlation between extension contact and knowledge and adoption of improved technology has been found. It is suggested that there is a need to strengthen communication methods like TV and radio by extending the duration of farm programs and providing specialized training to the growers. Research efforts should be strengthened to develop multiple disease, pest and weed-resistant varieties and direct supply of these varieties to farmers. It is observed that co-operative farming may solve the problem of small farmers in respect to post-harvest management and value-addition.

Basak and Pandit (2013) observed that the constraints faced by the farmers in commercial cultivation of vegetables and to explore relationship between the selected characteristics of the farmers and constraints faced by them. The highest portion (83.30%) of the respondents faced medium constraint. Based on constraint facing index (CEI), low price of vegetables during harvesting ranked first followed by lack of quality seed and high wages of labourer. Among the ten selected characteristics, level of education, family size, farm size, extension media contact, knowledge on vegetable production and cosmopoliteness showed significant negative correlation and family subsistence pressure showed significant positive correlation with farmers' constraints in commercial cultivation of vegetables. Stepwise multiple regressions showed that extension media contact, cosmopoliteness and knowledge on vegetable production had greater influence on farmers' constraints.

Chouhan *et al* (2013) observed that the constraints faced by farmers in getting agriculture technology information under Agriculture Technology Management Agency (ATMA). A study was undertaken in Western Rajasthan. The major constraints identified were 'Constraints in promotion of Agriculture and Allied fields', 'Marketing constraints', 'Ecological constraints', 'Socio-political constraints', and 'Technical constraints'. The results showed that 'Ground water level going down day by day, 'Lack of proper communication about marketing facility', 'Erratic rainfall hinders the acceptance of new varieties', ' Interferences by anti-social elements in allocation of demonstration due to political reason','Lack of technology about post harvesting technology' were found to be the highest faced constraints by the respondents. The least constraints identified under these categories were ' Short supply of electricity for irrigation', 'Low price just after harvesting', 'Poor performance of technologies in drought condition discourage the farmers', 'Dominance of general caste in getting benefits under ATMA programme', 'Lack of technical knowledge about animal rearing' respectively. The finding of the study indicate that it is imperative to call for attention from government, policy makers, and planners to design effective policy/

strategy that would ensure to measures overcome the constraints faced by the farmers in reaping the benefits of ATMA.

Biswas and Jamir (2015) found that farmers the study highlighted that unavailability of quality planting material of fruits and seeds of HYVs of vegetables, lesser availability of bio-pesticides and bio-fertilizers, lack of knowledge about seed treatment, lack of knowledge regarding major pests and diseases identification and their management, continuous adoption of traditional practices for growing vegetables, lack of interest among rural youth, difficulty in selling small amount of surplus of produce, lack of knowledge regarding preservation and processing of surplus produce.

Roy and Paul (2015) revealed that the factors of marketing, the constraints in production and marketing and thereby suggests suitable policy options for improvement of vegetable marketing in West Bengal. Principal component analysis was undertaken to extract the factors governing vegetable marketing and Garrett ranking technique was followed to prioritize the vegetable marketing constraints encountered. The major factors governing vegetable marketing in the state emerged in course of the study were- ICT, financial and physical infrastructure, market regulation and surveillance and production environment. Among the constraints faced in vegetable marketing in the state, the predominant ones were- inadequate storage infrastructure, frequent price fluctuation, credit related issues, lower access to market information and low producers' share in consumers' rupee. The government agencies need to redefine their roles in agriculture marketing particularly in vegetables for better and efficient marketing of vegetables in West Bengal.

Pinthukas (2015) conducted a study to explore farmers' practice and constraints in organic vegetable farming as well as to identify farmers' perception and their adaptability to move to or improve their organic vegetable farming. The study revealed that a number of farmers in three study areas had previous experience in organic vegetable production, organic vegetable farming practice, i.e., land preparation, vegetable seed, types of crop, planting method, soil nutrient management, pest management, weed management and harvesting. The disadvantages or constraints in small-farmer adoption of organic agriculture include: debt and income, bio-physical and knowledge constraints. The multiple regression analysis results indicated that age, education level, household labor, farm income and extension visit significantly contributed to farmers' perception on organic vegetable production. Moreover, education level, experience, natural water and farmers' networks or membership significantly contributed to farmers' adaptation on organic vegetable production.

Roy *et al* (2017) conducting a survey of horticultural and marketing experts in which major problematic areas in agribusiness of vegetable crops were considered. According to 72 per cent respondent's inadequacy of infrastructure and cold storage facilities (Rank-1) is

among the most problematic areas where intervention should be a priority. The other problematic areas are lengthy marketing channel and unorganized marketing system (Rank-2), inadequate contract farming in vegetables (Rank-3), inadequate small-scale production of quality processed vegetable items (Rank-4), and instability in vegetable price leads to food price inflation (Rank-5) etc. Addressing all the problems at one time is difficult. This study throws some light on the policy makers and research managers to identify the way in which future agribusiness R&D should be directed in vegetable sector.

CHAPTER – III

MATERIALS AND METHODS

Materials and methods are basis for conducting any research problem and it helps in determine the worth of any research. Well documented methodology works as fire lamp for the researcher to complete the research work successfully. Material and method are very important part of research work because it determines the beneficial effects of the research problem. Keeping this in mind, review of literature related to present investigation was studied and suitable methodology was developed for present investigation and has been described in this chapter under the following headings:

3.1 Locale of study

3.2 Selection of respondents

3.3 Selection of variables

3.4 Operational definitions

3.5 Construction of research instrument

3.6 Pretesting of the research instrument

3.7 Collection of data

3.8 Analysis of data

3.1 Locale of study

The study was conducted in Sangrur district of Punjab. Sangrur distrct has eight blocks viz. Dhuri, Bhawanigrh, Lahragaga, Malerkotla, Sherpur, Sunam, Sangrur, Andana. Malerkotla block of this district has maximum area under vegetable cultivation in the district and known as the vegetable hub of the state. Therefore, the Malerkotla block of Sangrur district was selected for this study purpose.

3.2 Selection of vegetable crops

Four vegetable crops i.e. cauliflower, cucumber, okra and capsicum has been selected for the present study. Selection of crops was done on the basis of expert opinion considering area under cultivation and economic value of the crops in the block.

3.3 Selection of respondents

A list of villages having maximum area under vegetable cultivation of this district was obtained from the Department of Horticulture of Sangrur, Punjab. A list of vegetable growers of all the selected villages having minimum one acre of land under vegetable cultivation was prepared. From the total number of vegetable growers, a sample of 120 vegetable growers was selected randomly, keeping in view that at least 50 farmers were cultivating each selected vegetable crop.

3.4 Selection of the variables

The variables for the present study were selected after reviewing the related research studies and thorough discussion with the members of advisory committee. The variables selected were as following under two main heads:

3.4.1 Independent variables

3.4.1.1 Age

3.4.1.2 Gender

3.4.1.3 Education

3.4.1.4 Family size

3.4.1.5 Operational land holding

3.4.1.6 Farming experience

3.4.1.7 Subsidiary occupation

3.4.1.8 Total annual income

3.4.1.9 Source of farm information

3.4.1.10 Mass media exposure

3.4.1.11 Extension contacts

3.4.1.12 Risk bearing capacity

3.4.2 Dependent variables

3.4.2.1 Adoption status

3.4.2.2 Problems

3.5 Operational definitions

3.5.1 Age

It referred to the chronological age of the farmers in terms of completed years of life at the time of data collection. Three categories of respondents were prepared by using range method i.e. 24-36years, 37-48 years and 49-60 years.

3.5.2 Gender

It referred to the gender of respondents and categorized into male or female.

3.5.3 Educational level

It referred to the level of formal school education of the respondents in terms of number of years completed successfully. The respondents were categorized into six categories i.e. illiterate, primary, middle, matric, senior secondary and graduation.

3.5.4 Family size

It referred to the number of members in the family of respondents. One score was

assigned to each member of the family member. However, based upon the data the following categories were formed:

Category	Range (number of members)
Small	Up to 5
Large	More than 5

3.5.5 Operational land holding

It referred to the total area of cultivated land by the respondent. It was computed as area owned and area leased in but excluding area leased out. The land holdings were categorized in various categories as recommended in statistical abstract of Punjab.

Category	Range (acres)
Marginal	Up to 2.5
Small	2.5-5.0
Semi medium	5.0-10.0
Medium	10.0-25.0
Large	>25.0

3.5.6 Farming experience

It referred to the farming experience of the respondents it is expressed in number of years. Five categories of respondents were prepared by using range method i.e. 5-10 years, 11-15 years, 16-20 years and more than 20 years.

3.5.7 Subsidiary occupation

It referred to the subsidiary occupation of the respondents. Based upon data it was categorized into dairy, goat rearing and poultry.

3.5.8 Total annual income

It referred to the total annual income of the respondent's family including all agricultural and non-agricultural subsidiary enterprises and returns from the total land holding of the respondent. The total annual incomes of the respondents were categorized into three main categories i.e 3-6 lakhs, 7-10 lakhs and 11-14 lakhs.

3.5.9 Source of farm information

It referred to the frequency of contacts made with different extension agencies for seeking farm information related to vegetable cultivation like experts from department of horticulture, department of agriculture, KVKs, progressive farmers, officials' cooperative societies, and pesticides dealers. It was studied on three-point continuum such as Always, Sometimes, and Never and score of 3, 2, 1 were awarded, respectively.

3.5.10 Mass media exposure

It referred to the frequency of usage of different media viz television, farm literature and social media etc by the respondent to gain or improve knowledge regarding vegetable cultivation.

3.5.11 Extension activities

It referred to the frequency of participation of respondents in different extension activities viz. PAU *Kisan Melas* including Regional *Melas* at Patiala, demonstrations, training camps, seminars, district level camps to gain or improve knowledge about vegetable cultivation.

3.5.12 Risk bearing capacity

It referred to the degree, which an individual is oriented towards risk and uncertainty and had courage to face the complications emerging time to time while adopting vegetable cultivation. Modified scale of Supe and Singh (1976) on three point continuum such as Agree, Undecided and Disagree was used with score of 3, 2 and 1. respectively. Based on this criterion the respondents were classified as follow:

Risk bearing capacity	**Score**
Low	15-17
Medium	18-20
High	21-23

3.5.13 Adoption Status

It was referred to the prevailing position of vegetable cultivation. It was measured with respect to aspects such as area under vegetable crops, source of seed, varieties grown, time of sowing, source of irrigation, intercropping, pesticides used, number of pesticides sprays, marketing channels used etc.

3.5.14 Problems

It referred to the obstacles faced by the respondents in vegetable cultivation. These problems were studied with the help of structured as well as open ended question.

3.6 Constructions of research instrument

The data was collected with the help of interview schedule, which was prepared and finalized in consultation with the members of advisory committee and by consulting relevant literature for the collection of data and it consisted of following parts:

Part 1

It dealt with information regarding the socio-personal characteristics of selected farmers. It dealt with age, education, gender, family size, operational land, risk bearing capacity, farming experience, mass media exposure, extension activities etc

Part 2

This part was including the statement regarding status of vegetable growers such as area under vegetable crops, source of seed, varieties grown, time of sowing, source of irrigation, intercropping, insecticides used, number of pesticides sprays, marketing channel used, etc.

Part 3

It dealt with studying the problems faced by vegetable producers related to technical, inputs, management, production, marketing, transportation, storage of vegetable, etc. In this regard, various statements were prepared and response of vegetable growers was taken in yes or no form i.e. whether the farmers face the problem or not.

3.7 Pre-testing of research instrument

The interview schedule was pre-tested by selecting 20 non-sampled vegetable growers from Ludhaina district. The changes, suggestions and observations as a result of pre-testing were incorporated in the interview schedule after discussing with the advisory committee members. Content validity of instrument was ensured by taking the opinion of scientists from department of vegetable science.

3.8 Collection of data

The data were collected by personally interviewing the vegetable growers with the help of structured interview schedule. For the purpose of the study, data were collected from 120 respondents of selected district, by explaining them purpose of the research before data collection. Proper precautions were taken to ensure unbiased response of the respondents by providing them necessary instructions.

3.9 Statistical analysis of data

The responses of the respondents were transferred on an excel sheet and were then tabulated and analysed with the help of appropriate statistical tools such as frequencies, percentage, mean score and range method.

CHAPTER – IV

RESULTS AND DISCUSSION

Results are the information obtained and outcome of research conducted, with well defined objectives. The expressions of the results are of utmost importance in reporting any research. In this Chapter, the results presented in three sections and discussed according to the objectives. Each section gives a detailed account of findings of the study and present analytical view of results by the discussing its various dimensions. The results have been presented under the following sub-heads:

4.1 Socio personal characteristics of the respondents

4.2 Status of vegetable cultivation in Sangrur district of Punjab

4.3 Problems faced by vegetable growers in Sangrur district of Punjab

4.1 Socio personal characteristics of the respondents

4.1.1 Age and gender

Age is an important personal variable as it influences the attitude and values of an individual to a great extent. The data presented in the table 4.1 revealed that majority (57.50%) of the respondents belonged to age group 37 to 48 years (Fig 4.1). It was found that 22.50 per cent of the respondents belonged to category 24 to 36 years of age and 20.00 per cent of the respondents belonged to category 49-60 years of age. Kaur (2004) and Singh (2011) also reported that majority vegetable growers belonged to middle age group. It can be concluded that maximum number of the respondents belonged to middle age group i.e. 37-48 years. In this study, all the respondents were male.

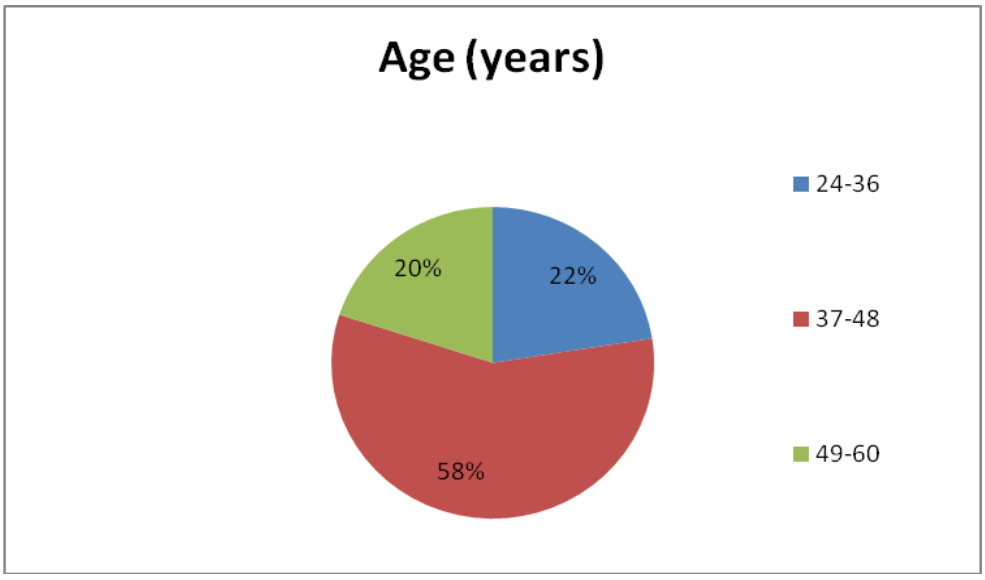

Fig. 4.1: Distribution of the respondents on the basis of age

4.1.2 Educational level

Results in the table 4.1 show that majority (28.34%) of the respondents were educated up to matric level followed by 25.83 per cent of the respondents who were illiterate (Fig 4.2). It was found that only 18.33 per cent of the respondents were educated upto senior secondary level. Similar results were also reported by Sharma (2002).

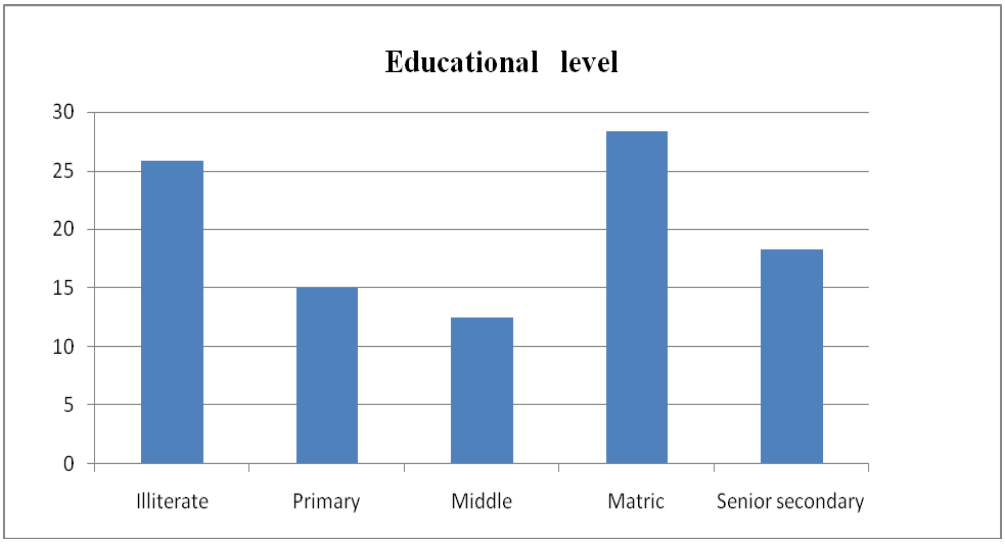

Fig. 4.2: Distribution of the respondents on the basis of education

4.1.3 Family size

Family size refers to total members in the family i.e., male, female and children. The findings revealed that in the table 4.1 that more than half of the respondents (69.16%) belonged to family of five or less than five members whereas 30.84 per cent of the respondents belonged to a family of larger size having more than five members.

Table 4.1: Distribution of respondents according to their socio personal characteristics

(n=120)

S. No.	Socio personal Characteristics	Category	Frequency	Percentage
1.	Age (years)	24-36	27	22.50
		37-48	69	57.50
		49-60	24	20.00
2.	Gender	Male	120	100.00
3.	Educational level	Illiterate	31	25.83
		Primary	18	15.00
		Middle	15	12.50
		Matric	34	28.34
		Senior secondary	22	18.33

S. No.	Socio personal Characteristics	Category	Frequency	Percentage
4.	Family size	Upto 5 members	83	69.16
		More than 5 members	37	30.84
5.	Area at the beginning of vegetable cultivation (acre)	0.5-1.0	73	60.84
		1-2	26	21.66
		>2	21	17.50
6.	Land owned (acre)	<2.5	53	44.16
		2.5-5	33	36.66
		5-10	16	13.33
		>10	4	3.33
7.	Land leased in (acre)	<2.5	51	42.50
		2.5-5	19	15.83
		5-10	8	6.66
		>10	2	1.66
8.	Operational land holding (acres)	<2.5	33	27.50
		2.5-5	55	45.83
		5-10	25	20.83
		>10	7	5.84
9.	Total land under vegetable cultivation (acre)	<2.5	48	40.00
		2.5-5	51	42.50
		5-10	21	17.50
10.	Vegetable farming experience(years)	5-10	26	21.66
		11-15	39	32.50
		16-20	36	30.00
		>20	19	15.84
11.	Subsidiary occupation	Dairy	19	15.83
		Goat rearing	80	66.66
		Poultry	5	4.16

S. No.	Socio personal Characteristics	Category	Frequency	Percentage
12.	Total annual income (lakh)	3-6	69	57.50
		7-10	29	24.16
		11-14	22	18.34
13.	Source of credit	Commission agent	98	81.68
		Fellow farmers	6	5.00
		Relatives	5	4.16
		Banks	11	9.16

4.1.4 Area at the beginning of the vegetable cultivation

Data reveal in the table 4.1 that at the beginning more than half (60.84 %) of the respondents cultivated the vegetable crops on 0.5-1.0-acre area and 21.66% of the respondents cultivated the vegetable crops on 1.0-2.0 acres of area. Only 17.50% of the respondents cultivated the vegetable crops on more than two acres of area.

4.1.5 Land owned and land leased in

Results in table 4.1 show that majority (80.82 %) of the vegetable growers were small and marginal farmers owning less than five acres of land, whereas 13.33 per cent of the respondents owned 6.0 to 10.0 acres of land (Fig. 4.3). Very few i.e. 3.33 per cent of the respondents owned more than 10 acres of land. It is revealed from the data in the table 4.1 that little less than half (42.50%) of the respondents took 1-5 acres of land on lease followed by 6.66% of the respondents leased 6-10 acres of land. Only 1.66% of the respondents leased more than 10 acres of the land.

4.1.6 Operational land holding and area under vegetable cultivation (acres)

Operational land holding represents the total cultivated land of respondents. The data show in the table 4.1 that 45.83 per cent respondents had 2.5-5.0 acres operational land holdings while 27.50 per cent of respondents had less than 2.5 acres of land and about 20.83 per cent of respondents had 5-10 acres of land and only 5.84 per cent of respondents had more than 10 acres of land (Fig. 4.3). Similar results were reported by Josan (2002). Data presented in the table 4.1 show that 40 per cent of the respondents had cultivated vegetable crops on area of less 2.5 acres while 42.5 percent of them cultivated on an area of 2.5-5.0 acres and 17.50 per cent of the respondents covered an area of 5-10 acres under vegetable cultivation.

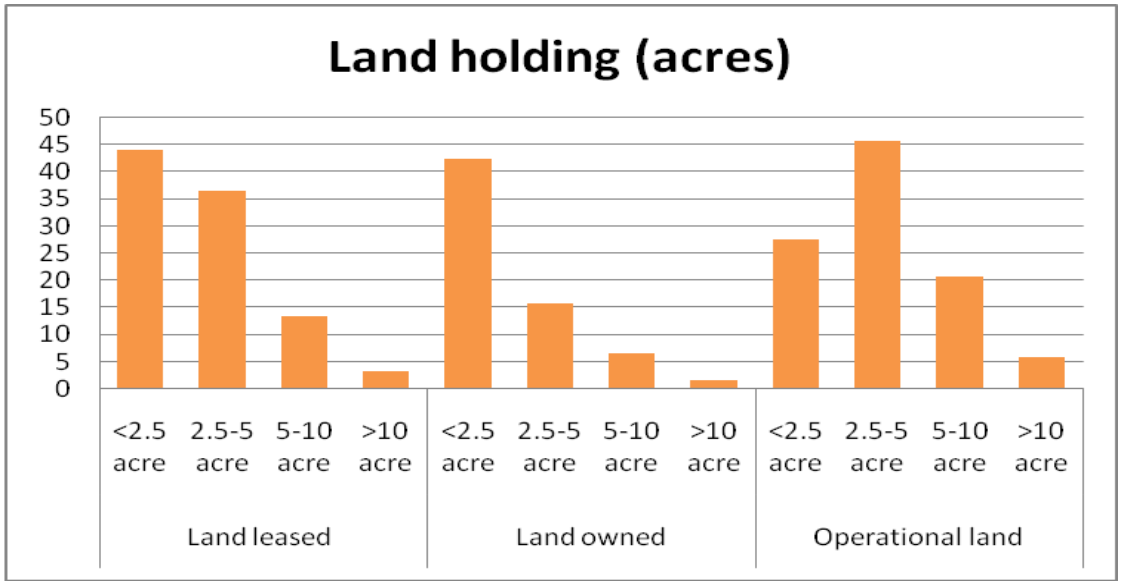

Fig. 4.3: Distribution of the respondents on the basis land holding (acres)

4.1.7 Vegetable farming experience

Data indicate in table 4.1 that 32.50 per cent of the respondents had 11-15 years of experience in vegetable cultivation whereas 30.00 per cent of respondents had 16-20 years of experience in vegetable cultivation while 21.66 per cent of respondents had 5-10 years of experience in vegetable cultivation and 15.84 per cent of respondents had 20 and more years of experience in vegetable cultivation. Sonkar and Mishra (2015) also reported that majority of vegetable growers had 21 -32 years of experience. It can be concluded that maximum number of vegetable growers started vegetable cultivation about 15-20 years ago.

4.1.8 Subsidiary occupation

The data reveal in the table 4.1 that majority of the respondents (66.66%) had adopted subsidiary occupation of goat farming. It might be due to the fact that majority of surrounding population of selected district belongs to muslim community and goat meat is preferred by them. So goat rearing also a profitable occupation. While 15.83 per cent of the respondents had dairy farming as a subsidiary occupation and only 4.16 percent of the respondents adopted poultry farming.

4.1.9 Total annual income

The data indicate in the table 4.1 that little more than half i.e. 57.50 per cent of the respondents had annual income from 3-6 lakh and 24.16 per cent of the respondents had annual income from 7-10 lakh. Remaining 18.34 per cent of the respondents had annual income from 11-14 lakh.

4.1.10 Source of credit

The data reveal in the table 4.1 that majority of the respondents i.e. (81.68%) had taken loan from commission agents as commission agent provide loan with very less interest

for one year but with the condition selling their vegetables produce through them. While 9.16 per cent of the respondents took loan from banks. About five per cent of respondents had taken loan from fellow farmers and about 4.16 per cent from relatives.

4.1.11 Crops grown in winter season

The data given in the table 4.2 reveal that majority of the respondents i.e., 77.50 per cent had grown cauliflower followed by wheat i.e., 29.16 per cent during winter season. It was also reveal that 64.16 and 62.50 per cent of the respondents had grown cucumber and capsicum respectively. Remaining little less than one third (26.67%) of the respondents had grown onion during winter season.

Table 4.2: Distribution of respondents according to crops grown by them during winter season

(n=120)

S. No.	Crops	Frequency*	Percentage
1.	Wheat	35	29.16
2.	Cauliflower	93	77.50
3.	Onion	32	26.67
4.	Capsicum	75	62.50
5.	Cucumber	77	64.16

***Multiple response**

4.1.12 Crops grown in summer season

The data given in table 4.3 inferred that majority of the respondents i.e., 70.00 per cent had grown okra during summer season. It was also reveal that 65.83 per cent of the respondents had grown rice. Remaining 24.16 per cent of the respondents had grown tomato during summer season.

Table 4.3: Distribution of respondents according to crops grown by them during summer season

(n=120)

S. No.	Crops	Frequency*	Percentage
1.	Rice	79	65.83
2.	Okra	84	70.00
3.	Tomato	29	24.16

***Multiple response**

4.1.13 Extension contacts

Extension contacts of the farmers were studied on the basis of number of contacts with different extension personnel for getting information regarding vegetable cultivation.

The data given in table 4.4 reveal that the major source of information regarding vegetable cultivation was pesticide dealers with mean score 2.67 followed by progressive farmers with mean score 1.38. Further it can be observed from data in table 4.4 that PAU/KVK scientists, Official cooperative societies, ADOs and HDOs was less preferred source of information regarding vegetable cultivation.

Table 4.4: Distribution of vegetable growers according to their sources of seeking information

(n=120)

Source	Always f (%)	Sometimes f (%)	Never f (%)	Mean Score
HDOs	1(0.83)	28(23.34)	91(75.83)	1.01
ADOs	0	12(10.00)	108(90.00)	1.10
PAU/KVK/FASC scientists	6(5.00)	8(6.67)	106(88.33)	1.17
Progressive farmers	17(14.16)	11(9.16)	92(76.68)	1.38
Officials of cooperative societies	0	17(14.16)	103(85.84)	1.14
Pesticides dealers	89(74.16)	22(18.33)	9(7.50)	2.67

4.1.14 Mass media exposure

Mass media exposure was measured by analyzing respondent's behavior in terms of reading farm literature, viewing television programme and using internet sources. It is clear from the table 4.5 that 7.50 per cent of the respondents viewed *Sada Sohna Punjab*

Table 4.5: Distribution of respondents according to their mass media exposure

(n=120)

Source	Category	f *	%
Farm telecast	*Mera Pind, Mere Khet*	6	5.00
	DD Kisan	7	5.83
	Sada Sohna Punjab	9	7.50
Farm literature	*Changi Kheti*	7	5.83
	Newspapers	18	15.00
	Modern kheti	9	7.50
	Kheti dunia	7	5.83
Social media	*Kheti Sandesh*	13	10.83
	Internet Browsing for agriculture	18	15.00
	Whatsapp	43	35.83
	Facebook	22	18.33
	YouTube	16	13.33

***Multiple response**

here as 5.83 per cent of the respondents watched *DD Kisan* channel and 5.00 per cent of the respondents watched *Mera Pind Mere Khet*. It was also found that 15.00 percent of the

respondents read the daily newspaper as a farm literature followed *Modern kheti* i.e., 7.50 per cent. It was found that 35.83 per cent of the respondents were using Whatsapp, while 18.33 per cent of respondents were used Facebook and 13.33 per cent of respondents have used. You tube as a social media. Thus, it can be concluded that higher number of respondents were using whatsapp, facebook, newspaper and internet browsing for vegetable cultivation. Use of social media was reported more among the farmers because they perceive social media as a quick source of information and farmers can get advice as well as information regarding new technology at their home. The result are in line with Sharma (2002), whereas Khangura (2002) observed that majority of vegetable growers had low level of mass media exposure.

4.1.15 Participation in extension activities

Extension activities play an important role in adoption of new technology by end users. It was pertinent from the data in table 4.6 that 18.33 per cent of the respondents participated in PAU *Kisan mela* including regional *mela* at Patiala while 16.66 per cent respondents had participated in demonstrations. The data in table 4.6 further showed that 15.00 and 12.50 per cent of the respondents had participated in training camps and seminars, respectively. Remaining 10.83 per cent of the respondents had participated in district level camps.

Table 4.6: Distribution of respondents according to their participation in extension activities

(n=120)

Extension activity	Frequency*	Percentage
Training camps	18	15.00
Demonstrations	20	16.66
PAU *Kisan melas including regional mela at Patiala*	22	18.33
Seminars	15	12.50
District level camps	13	10.83

***Multiple response**

Table 4.1.16: Risk bearing capacity

The data in Table 4.7 represents that majority of the respondents i.e. 56.66 per cent had medium (18-20) level of risk bearing capacity. One-fourth (23.33%) of respondents, one-fifth (20.00%) of these respondents had low (15-17) and high (21-23) level of risk bearing capacity.

Table 4.7 Distribution of respondents according to their risk bearing capacity

Sr. No.	Risk bearing capacity (Scores)	Frequency	Percentage
1	Low (15–17)	31	25.83
2	Medium (18–20)	61	50.83
3	High (21–23)	28	23.33

4.2 Status of vegetable cultivation in Sangrur district of Punjab.

4.2.1 Source of seed and nursery

The data presented in table 4.8 reveal that majority of the respondents i.e., 87.50 per cent had purchased the seed from private seed shop. About 55.83 per cent of the respondents used own seed/ nursery. Only 16.66 and 12.50 per cent of the respondents had purchased seed from PAU Ludhiana and state department of horticulture, Punjab, respectively (Fig. 4.4). It might be due to the reason that private seed shopkeepers had close relations with the farmers as discussed earlier in 4.4 and seed companies were selling the seed through them. Due to high cost of vegetables seed, private seed companies developed strong extension network in this area. Moreover many of these farmers have availed the loan from these shopkeepers cum commission agents and are liable to purchase farm inputs from them.

Table 4.8: Distribution of respondents according to source of seed and nursery for vegetable cultivation

(n=120)

S. No.	Source	Frequency*	Percentage
1.	PAU, Ludhiana	20	16.66
2.	State Department of Horticulture, Punjab	15	12.50
3.	Private seed shops	105	87.50
4.	Use own seed/nursery	67	55.83

***Multiple response**

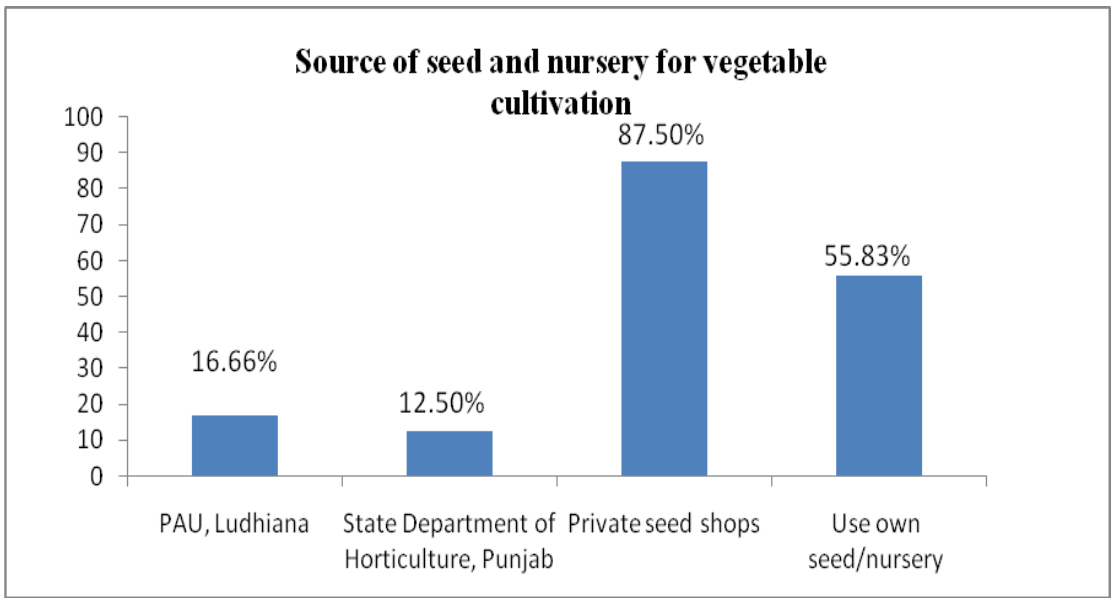

Fig.4.4: Distribution of the respondents on the basis of source of seed and nursery for vegetable cultivation

4.2.2 Different vegetable techniques

The data in table 4.9 shows that majority of the respondents i.e., 79.16 per cent adopted low tunnel technology followed by 66.66 per cent of the respondents had used bed/ ridge planting. It was also found that 41.66 per cent of the respondents had used relay-cropping. About 33.33 per cent of the respondents had adopted relay cropping e.g. cucumber in capsicum. In this relay cropping, cucumber crop is harvested in March and the residue is to be left in the field. The residual materials help the farmers as a mulching material in capsicum crop. This help to reduce the temperature during fruiting phase of capsicum. Examples of intercropping were cauliflower-coriander and capsicum-onion.

Table 4.9: Distribution of respondents according to adoption of different vegetable cultivation techniques at their field

(n=120)

S. No.	Source	Frequency*	Percentage
1.	Low tunnel	95	79.16
2.	Bed/Ridge planting	80	66.66
3.	Inter-cropping	40	33.33
4.	Relay-cropping	50	41.66

***Multiple response**

4.2.3 Cultivation practices in cucumber crops

The data given in table 4.10 reveal that all the respondents were cultivating un-recommended varieties of cucumber. It was found that more than half of the respondents i.e. 54.54 per cent had cultivated Rajani variety of cucumber followed by Laxami (29.87%), whereas Padmini variety was cultivated by 15.59 per cent of the respondents. All these varieties are not recommended by Punjab Agricultural University, Ludhiana (PAU, 2018). According to farmers, they are adopting these un-recommended hybrids mainly due to their high yield as compared to recommended variety. However, farmers also reported higher incidence of insect-pests and diseases on these varieties. Majority of the respondents i.e., 77.92 per cent cultivated cucumber crop on 1-2 acres of land and 19.49 per cent of the respondents cultivated cucumber crop on 3-4 acres of land. It was also found that majority of the respondents i.e., 81.81 per cent sown their cucumber crop during the months of November- December followed by 10.38 percent of the respondents sown the cucumber crop before November and only 7.81 per cent of the respondents sown the cucumber crop after December. All the respondents planted cucumber on beds and majority of the respondents (85.72 %) used less than recommended seed rate (Dwivedi *et al*, 2011). Only 14.28 per cent of the respondents used recommended seed rate.

Table 4.10: Distribution of respondents according to various cultivation practices in cucumber crop.

(n=77)

S. No.	Aspects	Categories	Frequency	Percentage
1.	Varieties	Laxami*	23	29.87
		Rajani*	42	54.54
		Padmini*	12	15.59
2.	Area(acres)	1-2	60	77.92
		3-4	15	19.49
		>4	2	2.59
3.	Time of sowing	Before Nov	8	10.38
		Nov-Dec	63	81.81
		After Dec	6	7.81
4.	Method of sowing	Bed planting	77	100
5.	Seed rate	Less than recommended	66	85.72
		Recommended (1000g/acre)	11	14.28
6.	Spacing (Row-Row)	Less than recommended	6	7.79
		Recommended	5	6.49
		More than recommended	66	85.72
7.	Spacing (Plant -Pant)	Less than recommended	64	83.12
		Recommended	7	9.09
		More than recommended	6	7.79
8.	Yield(q/acre)	More than average yield	50	64.93
		Less than average yield	27	35.07

***Non-recommended by PAU**

To know whether the respondents were maintaining the recommended spacing, respondents were also asked about spacing between the plants and rows. The findings of the study revealed that majority (85.72%) of them sown the crop at more than recommended row to row spacing. Similarly, majority (83.12%) of them sown the crop at less than recommended plant to plant spacing. During discussion farmers told that they kept wider row to row spacing than recommended because they need more space for different intercultural operation. The data showed that majority of the respondents (64.93 %) had obtained the higher average yield (>180q/acre) because farmers used local hybrid varieties and these variety were high yielding as compared to recommended variety. However, nearly one third (35.07%) of the respondents had obtained the lower average yield (<180q/acre).

4.2.4 Cultivation practices in Capsicum crops

The data given in table 4.11 reveal that Indra was the most popular variety of capsicum and was adopted by 57.34 per cent of the respondents while 42.66 per cent of respondents cultivated Aisha variety. These varieties are not recommended by PAU (PAU, 2018). Majority of the respondents i.e., 74.66 per cent cultivated capsicum crop on 1-2 acres of land and 22.68 per cent of the respondents cultivated capsicum crop on 3-4 acres of land, while 1.66 per cent of the respondents cultivated capsicum crop on more than four acres of land. It was also found that majority of the respondents i.e., 66.66 per cent were sown their capsicum crop during mid-November- mid December followed by 20 percent of the respondents sown the capsicum crop during January- February and only 13.34 per cent of the respondents sown the capsicum crop after February. All the respondents cultivated capsicum crop on bed planting. Majority of the respondents (80%) used lesser seed than recommended. Only 20 per cent of the respondents used recommended seed rate.the average seed rate adoptd by the respondents was 111.8g against the recommended seed rate of 200g. Similar results were also reported by Kaur *et al* (2017) that majority of capsicum and tomato growers had not adopted recommended seed rate and sowing time practices.

Table 4.11: Distribution of respondents according to various cultivation practices in Capsicum crop.

(n=75)

S. No.	Aspects	Categories	Frequency	Percentage
1	Varieties	Indra*	43	57.34
		Aisha*	32	42.66
2.	Area (acres)	1-2	56	74.66
		3-4	17	22.68
		>4	2	1.66
3.	Time of sowing	Nov – Dec	50	66.66
		Jan- Feb	15	20.00
		After Feb	10	13.34
4.	Method of sowing	Bed planting	75	100
5.	Seed rate	Less than recommended	60	80.00
		Recommended (200 g/acre)	15	20.00
6.	Spacing (Row-Row)	Less than recommended	4	5.34
		Recommended	11	14.66
		More than recommended	60	80.00
7.	Spacing (Plant-Plant)	Less than recommended	67	89.33
		Recommended	4	5.34
		More than recommended	4	5.33
8.	Yield (quintals)	More than average yield	46	61.34
		Less than average yield	29	38.66

***Non-recommended by PAU**

The findings of the study reveal that 14.66 per cent of the respondents sown the crop at recommended row to row spacing and 5.34 per cent of respondents sown the crop at less than recommended row to row spacing while majority (80.00%) of them sown the crop at more than recommended row to row spacing. Moreover, 5.34 per cent of respondents sown the crop at recommended plant to plant spacing and 5.33 per cent respondents sown the crop at more than recommended plant to plant spacing while majority (89.33%) of them sown the crop at less than recommended plant to plant spacing. The data showed that majority of the respondents (61.34 %) had attain the higher average yield (>120q/acre) because farmers used local hybrid varieties and these varieties were high yielding as compared to recommended variety. Nearly one third (38.66%) of the respondents had attain the lower average yield (<120q/acre).

4.2.5 Cultivation practices in okra crops

The data given in table 4.12 reveal that more than half of the respondents (59.52 %) cultivated VNR999 variety of okra followed by SV8999 (29.77%) whereas Jyoti was cultivated by remaining 10.71 per cent of the respondents. These varieties are not recommended by PAU, Ludhiana (PAU,2018). According to farmers, they are adopting these non-recommended varieties mainly due to their high yield (Upadhyay *et al* 2014). Majority of the respondents (63.09%) cultivated okra crop on 1-2 acres of land and (33.33%) of the respondents cultivated okra crop on 3-4 acres of land while 3.57 per cent of the respondents cultivated okra crop on more than 4 acres of land. It was also found that most of the respondents i.e., 54.76 per cent were sown their okra crop during the months of February-March followed by 28.57 percent of the respondents sown the okra crop before February and only 16.67 per cent of the respondents sown the okra crop after March. All the respondents cultivated okra crop on bed and ridge planting. Majority of the respondents (53.57%) used seed less than recommended. Only (35.71%) of the respondents used recommended seed rate whereas 10.72 per cent of the respondents used more than recommended seed rate. Results are in line with the study of Kaur *et al* (2017).

To know whether the respondents were maintaining the recommended spacing, respondents were asked about spacing between the plants and rows. The findings of the study found that 33.33 per cent of the respondents sown the crop at recommended row to row spacing while majority (60.72%) of them sown the crop at more than recommended row to row spacing. Moreover, 26.19 per cent of respondents sown the crop at recommended plant to plant spacing while majority (67.85%) of them sown the crop at less than recommended plant to plant spacing. During discussion farmers told that they kept wider row to row spacing than recommended because they need more space for different intercultural operations. The data showed that majority of the respondents (73.81%) had attain the higher average yield

(>170q/acre) because farmers used local hybrid varieties and these variety were high yielding as compared to recommended variety. Nearly one third (26.19%) of the respondents had attain the lower average yield (<170q/acre).

Table 4.12: Distribution of respondents according to various cultivation practices in Okra crop

(n=84)

S. No.	Aspects	Categories	Frequency	Percentage
1.	Varieties	SV8999*	25	29.77
		VNR999*	50	59.52
		Jyoti*	9	10.71
2.	Area(acres)	1-2	53	63.09
		3-4	28	33.33
		>4	3	3.58
3.	Time of sowing	Before Feb	24	28.57
		Feb- March	46	54.76
		After March	14	16.67
4.	Method of sowing	Bed panting	84	100
5.	Seed rate	Less than recommended	45	53.57
		Recommended (10 kg/acre)	30	35.71
		More than recommended	9	10.72
6.	Spacing (Row-Row)	Less than recommended	5	5.95
		Recommended (45cm)	28	33.33
		More than recommended	51	60.72
7.	Spacing (Plant-Plant)	Less than recommended	57	67.85
		Recommended (15cm)	22	26.19
		More than recommended	5	5.96
8.	Yield(q/acre)	More than average yield	62	73.81
		Less than average yield	22	26.19

***Non-recommended by PAU**

4.2.6 Cultivation practices in Cauliflower crops

The data given in table 4.13 reveal that more than half of the respondents (58.06%) cultivated Kavita variety of cauliflower followed by Katki (38.70%) whereas Maghari was cultivated by remaining 3.24 per cent of the respondents. These all varieties are not recommended by PAU (PAU, 2018). However, they have also realized that there was higher incidence of insect-pests and diseases on the early grown varieties during June-August. Majority of the respondents (61.29%) cultivated cauliflower crop on 1-2 acres of land and 34.40 per cent of the respondents cultivated cauliflower crop on 3-4 acres of land while 4.31 per cent of the respondents cultivated cauliflower crop on more than four acres of land. Majority of the respondents (63.44%) were sown their cauliflower crop at the time of August-September followed by 20.43 percent of the respondents sown the cauliflower crop before August and only 16.13 per cent of the respondents sown the cauliflower crop after September.

All the respondents cultivated cauliflower crop on bed and ridge planting. Majority of the respondents (86.02%) used lesser seed than recommended. Only 13.97 per cent of the respondents used recommended seed.

To know whether the respondents were maintaining the recommended spacing, respondents were asked about spacing between the plants and rows. The findings of the study revealed that 13.98 per cent of the respondents sown the crop at recommended row to row spacing while majority (86.02%) of them sown the crop at more than recommended row to row spacing. Moreover, 13.98 per cent of respondents sown the crop at recommended plant to plant spacing while majority (86.02%) of them sown the crop at less than recommended plant to plant spacing. The data showed that majority of the respondents (77.42%) had attain the higher average yield (>150q/acre) because farmers used local hybrid varieties and these variety were high yielding as compared to recommended variety. Remaining 22.58 per cent of the respondents had attain the lower average yield (<150q/acre).

Table 4.13: Distribution of respondents according to various cultivation practices in Cauliflower crop

(n=93)

S. No.	Aspects	Categories	Frequency	Percentage
1.	Varieties	Kavita*	54	58.06
		Katki*	36	38.70
		Maghari*	3	3.24
2.	Area(acres)	1-2	57	61.29
		3-4	32	34.40
		>4	4	4.31
3.	Time of sowing	Before Aug	19	20.43
		Aug- Sept	59	63.44
		After Sept	15	16.13
4.	Method of sowing	Bed panting	93	100
5.	Seed rate	Less than recommended	80	86.02
		Recommended (250g/acre)	13	13.98
6.	Spacing (Row-Row)	Recommended	13	13.98
		More than recommended	80	86.02
7.	Spacing (Plant-Plant)	Less than recommended	80	86.02
		Recommended	13	13.97
8.	Yield(q/acre)	More than average yield	72	77.42
		Less than average yield	21	22.58

***Non-recommended by PAU**

4.2.7 Fertilizer and Irrigation application in Cucumber crop

The data given in table 4.14 reveal that majority of the respondents i.e., 54.55 per cent applied 10-12 irrigations and more than one third (35.06%) of the respondents applied more than 12 irrigations to cucumber crop. It was also found that only 27.27 per cent of the respondents adopted recommended dose of urea fertilizer (90 kg/acre) whereas 46.75 per cent used more than recommended dose of urea fertilizer for meeting nitrogen requirement of the crop.the average dose of urea fertilizer applied in cucumber crop was 87.01kg/acre which is less than the recommended dose of 90 kg/acre. It might be due to the reason that these varieties are not recommended by PAU, hence these farmers also apply fertilizer dose as per advice of private companies representatives. During discussion, the farmers also clarified that if they apply more nitrogen (Urea) then the occurrence of blight/ downy mildew will be more. So, they tend to use lesser amount of nitrogen fertilizer in cucumber crop. It was also found that only 11.68 per cent of the respondents adopted recommended dose of DAP and as high as 80.51 per cent of the respondents applied more than recommended dose of DAP fertilizer i.e. 45kg/acre. Use of higher doses of DAP might be due to their perception that hybrids are high yielding and require more productive growth which can be achieved only by applying excess doses of phosphate fertilizers. Findings also reveal that more than half (55.84%) of the respondents adopted recommended dose of potash fertilizer (MOP).

Table 4.14: Distribution of respondents according to fertilizer and irrigation application in cucumber crop

(n=77)

S. No.	Aspects	Categories	Frequency	Percentage
1.	Irrigation	<10	8	10.39
		10-12	42	54.55
		>12	27	35.06
2.	Urea (kg)	Less than recommended	20	25.97
		Recommended (90kg/acre)	21	27.27
		More than Recommended	36	46.75
3.	DAP (kg)	Less than recommended	6	7.79
		Recommended (45kg/acre)	9	11.68
		More than recommended	62	80.51
4.	MOP (kg)	Less than recommended	10	12.98
		Recommended (35kg/acre)	43	55.84
		More than Recommended	24	31.17

4.2.8 Fertilizer and Irrigation application in Capsicum crop

The data given in table 4.15 reveal that majority of the respondents i.e., 66.66 per cent applied 12-15 irrigations and more than one third (33.34%) of the respondents had applied more than 15 irrigations to capsicum crop. It was also found that 42.66 per cent of the respondents adopted recommended dose of nitrogen fertilizer (Urea), while 30.66 per cent of them applied less than recommended dose of urea. Remaining i.e., 26.66 per cent of the respondents had used more than recommended dose of Urea. It is clear from table 4.15 that majority of the respondents (64%) used higher than recommended doses of DAP fertilizer (55kg/acre). however 28.00 per cent of the respondents adopted recommended doses of DAP fertilizer. Use of un-recommended practices may be due to the fact that as hybrids are high yielding and they require more productive growth which can be achieved by applying more DAP. Similarly use of higher doses of potash fertilizer (MOP) in capsicum crop was also reported in the study and it was found that 65.33 per cent of the respondents used more than recommended doses of muriate of potash (MOP) fertilizer.

Table 4.15: Distribution of respondents according to fertilizer and irrigation application in Capsicum crop

(n=75)

S. No.	Aspects	Categories	Frequency	Percentage
1.	Irrigation	<12	13	17.33
		12-15	47	66.66
		>15	15	33.34
2.	Urea (kg)	Less than recommended	23	30.66
		Recommended (110kg/acre)	32	42.66
		More than recommended	20	26.66
3.	DAP (kg)	Less than recommended	6	8.00
		Recommended (55kg/acre)	21	28.00
		More than recommended	48	64.00
4.	MOP (kg)	Less than recommended	10	13.33
		Recommended (20kg/acre)	16	21.33
		More than recommended	49	65.33

4.2.9 Fertilizer and Irrigation application in Okra crop

The data given in table 4.16 reveal that majority of the respondents i.e., 63.09 per cent applied more than 12 irrigations and 28.58 per cent of the respondents applied 10-12 irrigations to okra crop. Only 17.85 per cent of the respondents adopted recommended dose of

urea while 71.42 per cent respondents applied more than recommended doses of Urea. PAU has not recommended the use of DAP and potash fertilizer in okra crop, however it is evident from table 4.16 that respondents were applying these both fertilizers in okra crop. Majority (67.85%) of the respondents applied more than 50kg of DAP fertilizer in an acre, whereas on contrary MOP was used less than 50 kg/acre by most (57.14%) of the respondents.

Table 4.16: Distribution of respondents according to fertilizer and irrigation application in Okra crop

(n=84)

S. No.	Aspects	Categories	Frequency	Percentage
1.	Irrigation	<10	7	8.33
		10-12	24	28.58
		>12	53	63.09
2.	Urea (kg)	Less than recommended	9	10.71
		Recommended (80 kg/acre)	15	17.85
		More than recommended	60	71.42
3.	DAP (kg)	<50	7	8.33
		50	20	23.80
		>50	57	67.85
4.	MOP (kg)	<50	48	57.14
		50	21	25.00
		>50	15	17.86

4.2.10 Fertilizer and Irrigation application in Cauliflower crop

The data given in table 4.17 reveal that more than half of the respondents i.e., 56.99 per cent applied more than 12 irrigations and 43.01 per cent of the respondents applied 8-12 irrigations. It was also found that 44.08 per cent of the respondents adopted recommended dose of urea fertilizer (110kg/acre) and nearly equal number (45.16%) of respondents applied less than recommended dose of Urea. Use of lesser dose urea might be due to the reason that majority of these farmers also has used farm yard manure and poultry manure on their fields. On contrary, DAP fertilizer was used by the farmers in much higher quantity (71.21kg/acre) than recommended (55kg/acre) as 58.07 per cent of the respondents applied more than recommended dosages. It might be due to the perception of the farmers that local varieties demand more DAP. It was found that 26.89 per cent used recommended dose of muriate of potash followed by 39.78 per cent of the respondents had used more than recommended dose of muriate of potash (MOP).

Table 4.17: Distribution of respondents according to fertilizer and irrigation application in Cauliflower crop

(n=93)

S. No.	Aspects	Categories	Frequency	Percentage
1.	Irrigation	8-12	53	56.99
		>12	40	43.01
2.	Urea (kg)	Less than recommended	42	45.16
		Recommended (110 kg/acre)	41	44.08
		More than recommended	10	10.75
3.	DAP (kg)	Less than recommended	14	15.05
		Recommended (55kg/acre)	25	26.88
		More than recommended	54	58.07
4.	MOP (kg)	Less than recommended	31	33.33
		Recommended (40kg/acre)	25	26.89
		More than recommended	37	39.78

4.2.11 Plant protection measures adopted by the respondents

Cauliflower

The data shown in Table 4.18 reveal that majority of the respondents i.e., 70.96 per cent sprayed their cauliflower crop 3-8 times whereas 18.28 per cent of the respondents sprayed their crop 9-14 times (Fig. 4.5). As many as 10.76 per cent of the respondents sprayed the cauliflower as high as 15-20 times.

Cucumber

The data reveal that more than one third of the respondents i.e., 37.66 per cent sprayed their cucumber crop 11-17 times. As many as 36.37 per cent of the respondents sprayed their crop as high as 18-24 times. Nearly one third (25.97%) per cent of the respondents sprayed their cucumber crop 4-10 times. Respondents used more number of pesticides due to increase the yield and quality of the crop. Farmers grow high yielding varieties that are locally available due to their high yielding character but they attract more insect pest e.g. angular leaf spot and cucumber beetle thus they need more pesticides (Fig. 4.5). Same results are reported by Mahantesh and Singh (2009) that the high pesticide use was observed in vegetables especially in tomato and brinjal and most of the pesticides belonged to high and moderate risk chemicals.

Table 4.18: Distribution of respondents according to number of pesticide application in selected vegetable crops

Vegetables	Number of application	Frequency	Percentage
Cauliflower(n=93)	3-8	66	70.96
	9-14	17	18.28
	15-20	10	10.76
Cucumber(n=77)	4-10	20	25.97
	11-17	29	37.66
	18-24	28	36.37
Capsicum(n=75)	5-11	24	32.00
	12-18	32	42.66
	19-25	19	25.34
Okra(n=84)	5-11	20	23.82
	12-18	50	59.52
	19-25	14	16.66

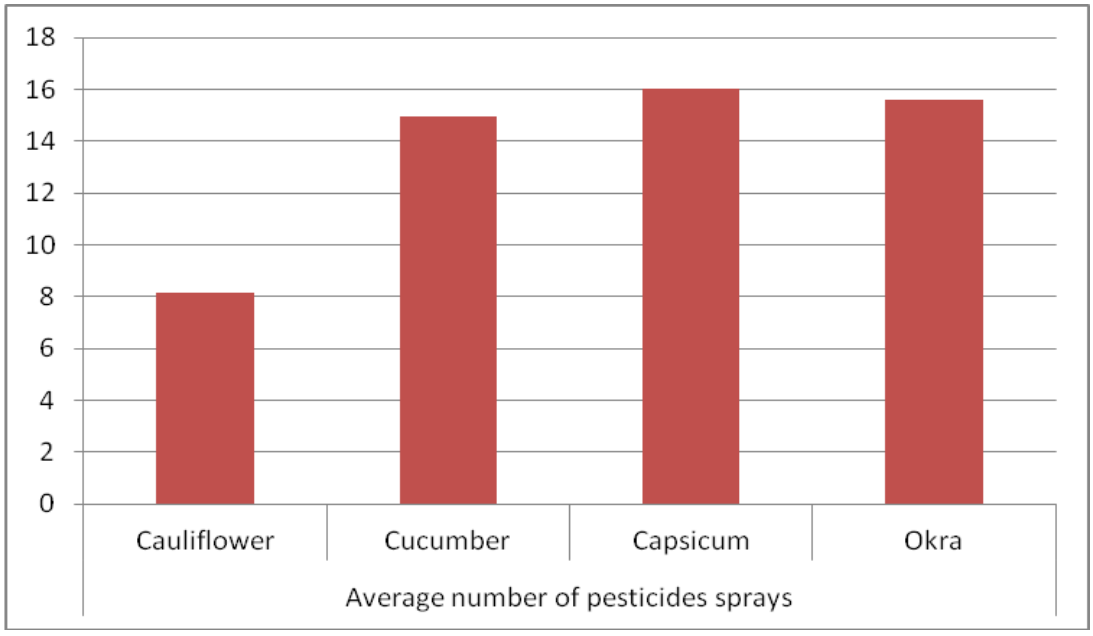

Fig. 4.5: Distribution of the respondents on the basis of average number of pesticides sprays in selected vegetable crops crops

Capsicum

The data shown in Table 4.18 reveal that majority of the respondents i.e., 42.66 per cent sprayed their crop 12-18 times whereas more than one third i.e., 32.00 per cent of the respondents sprayed their capsicum crop 5-11 times. It was also observed that 25.34 per cent

of the respondents sprayed their crop 19-25 times. It can be concluded that majority of the farmers apply large number of pesticides in capsicum because most of the varieties adopted by them were non-recommended and might attract more insect pest and diseases. Thus, they need more pesticide application due to high population of insect pests (Fig. 4.5). Same results are reported by Mahantesh and Singh (2009) that the high pesticide use was observed in vegetables especially in tomato and brinjal and most of the pesticides belonged to high and moderate risk chemicals.

Okra

The data reveal that more than half of the respondents i.e., 59.52 per cent sprayed their crop 12-18 times whereas 23.82 per cent of the respondents sprayed their crop 5-11 times. As many as 16.66 per cent of the respondents sprayed their okra crop as high as 19-25 times. It can be concluded that majority of the farmers apply large number of pesticides in okra because most of the research area was mainly surrounded by vegetable growers (Fig. 4.5). Thus, they need more pesticide application due to high population of insect pest.

4.2.12 In selected vegetable crops pesticides used by the respondents

Cauliflower

Table 4.19 shows that majority of the respondents i.e. 72.04 per cent used chlorantraniliprole as pesticide on cauliflower crop, with average number of sprays of 4.62 and 31.49 ml as average dose for each application. Second highest number of respondents i.e. 46.23 per cent used flubendiamide, with average number of sprays of 4.48 and 56.27 ml as average dose. Out of the four pesticides used in cauliflower kudrat and Spinosad had acquired third and fourth position, respectively. Kudrat was sprayed by 43.01 per cent of respondents with average number of sprays of 4.4 and average dose was 215 ml. Similarly, Spinosad was used by 18.27 per cent of respondents with average number of sprays of 4.5 and average dose was taken as 226.47 ml.

Cucumber

Data in table 4.19 show that second crop taken under study i.e. cucumber was sprayed with seven different pesticide out of which mancozeb was used by 77.92 percent of respondents placing this pesticide at top in the list in terms of number of respondents using different pesticides. Average number of sprays for mancozeb was noted as 6.6 with average dose of 226.66 ml for each application. Another pesticide i.e. is thiamethoxan was used by 45.45 per cent of respondents with average number of sprays of 5.88 and 268.57 ml as average dose. Fipronil was used by 44.15 per cent of respondents with average number of sprays of 6.14 and 111.47 ml as average spray dose. Other pesticides used in cucumber by respondents were chlorathalonil/metaloxyl-M, azoxystrobin, streptocycline and Spinosad accordingly.

Capsicum

Capsicum was also taken under survey for pesticide spray and the data of which is shown in table 4.19 Total number of six pesticide were used in this crop by respondents in different combinations. Mancozeb was used by highest number of respondents i.e. 65.33 per

Table 4.19: Distribution of respondents according to various pesticides applied by them in selected vegetable crops

Vegetables	Chemical used	*f (%)	Av no. of sprays	Av dose(ml)
Cauliflower (n=93)	Flubendiamide	43(46.23)	4.48(2-8)	56.27(50-80)
	Chlorantraniliprole	67(72.04)	4.62(2-8)	31.49(30-35)
	Spinosad	17(18.27)	4.5(2-10)	226.47(200-250)
	Kudrat	40(43.01)	4.4(3-10)	215(200-250)
Cucumber (n=77)	Fipronil	34(44.15)	6.14(3-9)	111.47(100-200)
	Thiamethoxam	35(45.45)	5.88(3-8)	268.57(200-300)
	Streptocycline	12(15.58)	6.5(5-8)	120(100-150)
	Mancozeb	60(77.92)	6.6(5-8)	226.66(200-250)
	Azoxystrobin	15(19.48)	5.93(5-9)	413.33(400-500)
	Spinosad	10(12.98)	4.8(3-7)	240(200-250)
	Chlorathalonil/ Metaloxyl-M	18(23.37)	7.05(5-8)	355.55(250-400)
Capsicum (n=75)	Flubendiamide	41(54.66)	5.70(4-8)	110.48(100-150)
	Mancozeb	49(65.33)	5.14(4-9)	220.40(200-250)
	Ametoctradin/Dimethomorph	43(57.33)	5.27(4-12)	269.76(200-300)
	Fipronil	31(41.33)	6.16(4-9)	200(150-250)
	Carbendazim	16(21.33)	5.5(4-7)	203.12(200-250) 203.12
	Kudrat	39(52.00)	5.43(4-8)	208.97(200-250)
Okra (n=84)	Flubendiamide	46(54.76)	6.58(4-8)	52.60(50-60)
	Chlorantraniliprole	54(64.28)	7.07(4-9)	31.66(30-45)
	Imdacloprid	28(33.33)	6.82(4-9)	102.5(100-150)
	Triazophos	16(19.04)	5.87(4-9)	221.87(200-250)
	Azoxystrobin	27(32.14)	5.70(4-9)	396.29(300-500)
	Chlorathalonil/ Metaloxyl-M	25(29.76)	4.76(3-8)	366(250-400)
	Kudrat	15(17.85)	4.33(4-5)	214.28(200-250)

***Multiple response**

cent with average number of sprays of 5.14 and 220.40 ml was taken as average dose for each application. Ametoctradin/ Dimethomorph was used by 57.33 per cent of respondents with 5.27 as average number of sprays and 269.76 ml of average dose. After these two pesticides flubendiamide was used by third majority of respondents i.e. 54.66 per cent. Average number sprays were taken as 5.70 in flubendiamide with 110.48 ml as average dose for each application. Other pesticides that were used on capsicum were kudrat, fipronil and carbendazim, accordingly.

Okra

Data further depict in table 4.19 also shows the different pesticides used in okra crop. A total number of seven pesticides were used in different combination for spraying. Chlorantraniliprole was used by majority of the respondents i.e. 64.28 per cent of them with 7.07 as average number of sprays and 31.66 ml was used as average dose per application. Flubendiamide was used by 54.76 per cent of respondents for spraying with 6.58 as average number of sprays and 52.60 ml as average dose. The third majority of respondents i.e. 33.33 per cent used Imadacloprid for spraying in okra with 6.82 as average number of sprays and 102.5 ml as average dose for each application. Other pesticides used by respondents were Azoxystrobin, Chlorathalonil/Metaloxy-M, Triazophos and Kudrat, accordingly.

4.2.13 Labour used for harvesting and observing waiting Period

It was pertinent from the table 4.20 that majority i.e., 73.34 per cent of the respondents used labour for harvesting which was belonged to category 2 to 4man days, whereas 26.66 per cent of the respondents used labour belong to category 5-8man days. It was also found that nearly half i.e., 47.50 per cent of the respondents harvested after 2 days of spraying pesticides followed by 21.66 per cent of the respondents were harvested 3 days after spraying. It was retrieved that 19.16 per cent and 11.68 per cent of the respondents were harvested after one and four days of spraying respectively.

Table 4.20: Distribution of respondents according to labour used for harvesting and observing waiting period after spray of pesticides

(n=120)

S. No.	Aspects	Categories	Frequency	Percentage
1.	Labour used for harvesting (man/days)	2-4	88	73.34
		5-8	32	26.66
2.	Waiting period (days)	1	23	19.16
		2	57	47.50
		3	26	21.66
		4	14	11.68

4.2.14 Marketing aspects

The data indicate from the table 4.21 that almost all the respondents i.e., 99.16 per cent sold their agricultural produce to commission agent. Only 3.33 per cent of the respondents sold their produce to direct marketing channel. Almost all the respondents i.e., 92.50 per cent sold to the local market (10-20km of distance) because they were taking loan from commission agents without interest so that's why they tend to sell their produce in local market. Remaining 7.50 per cent of the respondents preferred to more than 20 km of distance marketing. It was showed that more than half (58.33%) of the respondents pay 2-5 percent of market fee whereas 41.66 per cent of the respondents pay 5-10 percent of market fee.

Table 4.21: Distribution of respondents according to different marketing aspects

(n=120)

Aspects	Categories	Frequency*	Percentage
Marketing channels	Commission agent	119	99.16
	Direct	4	3.33
Place	Local	111	92.50
	Distance	9	7.50
Distance (km)	10-20	111	92.50
	>20	9	7.50
Market fee (percent)	1-2	0	0
	2-5	70	58.33
	5-10	50	41.66

***Multiple response**

4.2.15 Post harvest operations

It was indicate from the table 4.22 that all the respondents performed post harvesting operations like Cleaning, Drying, Sorting, Grading and Packing at their own to enhance market ability of their produce.

Table 4.22: Distribution of respondents according to post harvest operations

(n=120)

Operations	Frequency*	Percentage
Cleaning	120	100
Drying	120	100
Sorting	120	100
Grading	120	100
Packing	120	100

***Multiple response**

4.2.16 Prospects of vegetable cultivation

The data given in Table 4.23 revealed that few i.e., 3.33 per cent of the respondents wished to increase area of vegetable cultivation during summer season whereas 2.50 per cent of the respondents wanted to increase area during in winter season. The data also indicated that 15.00 per cent of the respondents wanted to decrease area of vegetable cultivation in winter season whereas 7.50 per cent of the respondents wished to decrease the area in summer season due to their decreasing profits. It may be due to fact that majority of the farmers were having small land holdings and performing vegetable cultivation on rented land. Thus, it might be difficult for them to manage all the monitory requirements from small profit.

Table 4.23: Distribution of respondents according to prospects of vegetable cultivation in Sangrur district of Punjab

(n=120)

S. No.	Vegetable cultivation	Categories	Frequency	Percentage
1.	Increase area of vegetable cultivation	Summer	4	3.33
		Winter	3	2.50
2.	Decrease area of vegetable cultivation	Summer	9	7.50
		Winter	18	15.00

4.3 Problems faced by vegetable growers in Sangrur district of Punjab

4.3.1 Problems faced by vegetable growers

In general, the vegetable growers were facing some problems related to input, finance, marketing, technical and many other problems. The investigators have found the following problems which have been reported by the vegetable growers.

4.3.2 Seed related problems

It was clear from the table 4.24 that majority of the respondents i.e., 84.15 per cent faced the problem of costly seed followed and nearly one third (25.83%) of the respondents faced problem of poor quality of seed. Remaining 12.50 per cent of the respondents faced untimely availability of seed.

4.3.3 Problems regarding pesticides during purchase of them

The data reveal that almost all the respondents i.e., 92.50 per cent faced the problem

of high cost of pesticides and 40.25 per cent of the respondents faced the problem of lack of information about recommended pesticides. Remaining 20.85 per cent and 2.50 per cent of the respondents faced the problems of poor quality of pesticides and non-availability of recommended chemicals, respectively. The results are in line with Khangura (2002) observed that pea growers of Ludhiana district faced the problems of more fluctuation in the market regarding price of the peas, high costs of inputs, high costs of labour and lack of knowledge regarding recommended dose of pesticides.

4.3.4 Problems during spraying of pesticides

It was found that majority of the respondents i.e., 87.50 per cent faced the difficulty of non-availability of skilled manpower. The results are in line with Kumar (2000) reported that the respondents faced problems of pesticidal spray in the field adjoining bee colonies, less price of product, lack of skilled labour in marketing etc.

4.3.5 Irrigation related problems

It was clear from the table 4.24 that 40.83 per cent of the respondents faced the difficulty of non- availability of canal water. It was also found that 5.85 per cent and 5.00 per cent of the respondents faced the problem of poor quality and less availability of irrigation water, respectively. Similar results were also reported by Nirmala *et al* (2002) that the inadequacies of irrigation water at the time of application of biofertilizers and inability to plan in advance were the major constraints in adoption of biofertilizers.

4.3.6 Problem related picking of vegetables

The data reveal that almost all the respondents i.e., 95.85 per cent faced the problem of high cost labour whereas 17.50 per cent of the respondents faced the problem of non-availability of labour. Similar results were reported by Basak *et al* (2013) that low price of vegetables during harvesting and high wages of labourer.

4.3.7 Marketing related problem

The data indicate that almost all the respondents i.e., 98.13 per cent faced the problem of fluctuating market rates of produce whereas 82.50 per cent of the respondents faced the difficulty in seasonal glut in the market. It was also found that 75.00 per cent of the respondents faced the problem of non-remunerative prices. Remaining 19.16 per cent, 17.50 per cent and 9.16 per cent of the respondents faced the problem of exploitation by middleman, non- availability of marketing information and late payment of the produce respectively. The results are in line with Roy (2015) as it revealed that the factors of marketing, the constraints in production and marketing and thereby suggests suitable policy options for improvement of vegetable marketing.

Table 4.24: Distribution of respondents according to problems faced by vegetable growers

(n=120)

S. No.	Cultivation problems	Frequency	Percentage
A. Seed related problems			
1.	Poor quality of seed	31	25.83
2.	Untimely availability	15	12.50
3.	High cost	101	84.16
B. Problems regarding pesticides during purchase of them			
1.	Non-availability of recommended chemicals	3	2.50
2.	Lack of information	49	40.85
3.	Poor quality	25	20.85
4.	High cost	111	92.50
C. Problems during spraying of pesticides			
1.	Non-availability of skilled manpower	105	87.50
D. Irrigation related problems			
1.	Less availability of water	6	5.00
2.	Non-availability of canal water	49	40.83
3.	Poor quality of irrigation water	7	5.85
E. Problem related picking of vegetables			
1.	Non-availability of labour	21	17.50
2.	High cost of labour	115	95.85
F. Marketing related problems			
1.	Non-availability of marketing information	21	17.50
2.	Fluctuating market rates of produce	118	98.13
3.	Late payment of produce	11	9.16
4.	Exploitation by middlemen	23	19.16
5.	Seasonal glut in the market	99	82.50
6.	Non-Remunerative price	90	75.00
G. Weather related problems			
1.	High temperature at germination	105	87.50
2.	Erratic rainfall	117	97.50
H. Other problems faced in vegetable cultivation			
1.	Electricity problems	11	9.16
2.	Labour intensive	21	17.50
3.	Costly inputs	12	10.00
4.	Inadequate storage facilities	106	88.33

***Multiple response**

4.3.8 Weather related problems

It was clear from the table 4.24 that almost all the respondents i.e., 97.50 per cent faced difficulty in erratic rainfall followed by 87.50 per cent faced high temperature problem at the time of germination. Similar results were found by Kishor *et al* (2006) as it revealed that inadequate storage and transportation facilities coupled with bad weather conditions positively and significantly influenced the post-harvest losses at the farm level.

4.3.9 Other problems faced in vegetable cultivation

The data reveal that majority of the respondents i.e., 88.33 per cent faced the difficulty of inadequate storage facilities. It was also found that 17.50 per cent, 10.00 per cent, 9.16 per cent of the respondents faced the problem of intensive labour, inputs were costly and electricity problems respectively. Similar results were also found by Verma *et al* (2004).

CHAPTER – V

SUMMARY

India makes it possible to grow the wide range of varieties of vegetables crops throughout the year. As many as 61 annuals, four perennial vegetable crops are commercially cultivated in India, and it declares to grow the more number of vegetable crops as compared to other countries of the world (Singh 1998). India is predominantly an agriculture-based country and agriculture is the backbone of Indian economy. Major part of the Indian population lives in villages, out of which 72.2 per cent is engaged in agriculture. Overall food grains production was 284.83 million tonnes in the country during year 2017-18 (Anonymous 2018a). During the past two decades, production of vegetables has been increased continuously (Nair and Barche 2014). India is the second largest producer of vegetables in the world, next to China. Area under vegetable cultivation in India is 25662 thousand hectare with production of 180.68 million tones and productivity of 13.7 million tonnes per hectare (Anonymous 2018c). Despite significant research breakthrough made in food production, malnutrition poses a big problem in the country, which is becoming difficult to alleviate. Moreover, self- sufficiency is said to be achieved in the country only when every individual is secured of the balance diet. In Punjab, the monoculture of rice-wheat crop rotation has led to over exploitation of natural resources, depletion of soil fertility and higher susceptibility of crops to the attack of various insect pest and diseases. The state has observed a substantial change on cropping pattern in the post green revolution era with main focus on wheat-paddy crop rotation. During the last five years, the area under pulses, maize, oilseeds and other cereals etc has decreased and the area under wheat and paddy has increased. These days vegetable cultivation has become highly commercialized, however there is still a wide gap between actual and potential productivity. Therefore, collective efforts have to be made by researchers, policy makers and extensionists to overcome these constraints. Modern research has proved their value in balancing meat and cereal foods. With the spread of knowledge about the nutritive value of vegetables, there has been a considerable change in food habits of the people in advanced countries and within urban areas in the country, which now form a substantial part of their diet, resulting in increased demand for vegetables. The consumption of vegetables in India, with a large vegetarian population, is surprisingly low. The diet of our people is largely cereal based with meager intake of protective foods such as vegetable and fruits. Vegetable crops have played an essential role in nutritional and food security of growing population of our country and occupied a major role in the diversification of agriculture. Vegetables are the essential items in everyday meals as they contain all the required nutrients for a balanced diet. The vegetables also have medicinal and aesthetic value. As they are rich resource of vitamins, minerals and other nutrients, vegetables are very

precious for adding the quality components to the food for the maintenance of good health. In human diet, vegetables have been strongly associated with improvement of gastro intestinal health, good vision, and reduced risk of heart disease, stroke, chronic diseases such as diabetes, and some forms of cancer. Some photo-chemicals of vegetables are strong antioxidants and which thought to reduce the risk of chronic disease by protecting against free radical damage, by modifying metabolic activation and detoxification of carcinogens, or even by influencing processes that alter the course of tumor cells. In Punjab, Sangrur district has an important place in the production of vegetables. In order to know the existing situation of vegetable growing in particularly Sangrur district of Punjab, the present study entitled 'Status of vegetable cultivation in Sangrur district of Punjab has been undertaken with following specific objectives.

- To know the socio personal characteristics of the vegetable growers of Sangrur district of Punjab.
- To determine the present status of vegetable cultivation in Sangrur district of Punjab.
- To identify the problems faced by vegetable growers in Sangrur district of Punjab

The study was conducted in Malerkotla block as this block has maximum area under vegetable cultivation in Sangrur district. Four vegetables crops i.e. cauliflower, cucumber, okra and capsicum were selected for the present study on the basis of expert opinion considering area under cultivation and economic value of the crops in the block. A list of vegetable growers having minimum one acre area under vegetable cultivation was obtained from the officials of Department of Horticulture. From the list, a sample of at least 120 vegetable growers has been selected randomly keeping in view that at least 50 farmers were cultivating each selected vegetable crop. An interview schedule was developed to collect the data regarding vegetable cultivation. The variables included in the study were age, gender, education, family size, area at the beginning of the vegetable cultivation, land owned, land leased in, operational land holding, Total land under vegetable cultivation , vegetable farming experience, subsidiary occupation, total annual income, source of credit, mass media exposure , extension contacts, present status of vegetable cultivation and problems faced by the farmers. After consulting relevant literature and discussions with the members of advisory committee interview schedule were prepared for the collection of data from the farmers and finalized in consultation with the members of the advisory committee. Schedule was pre-tested on 20 non-sampled farmers. After pre-testing, required modifications were made in the interview schedule according to the responses and with the opinion of the advisory committee members. The data was collected by personally interviewing the respondents. The data were analyzed with the help of appropriate statistical tools such as frequencies, percentage and range method.

The findings revealed that majority of farmers were aged between 37-48 years and nearly half of the respondents were small farmers. Majority of farmers were engaged in goat rearing subsidiary occupation. Pesticides dealers and progressive farmers of their area were important source of farm information. Very less number of respondents were viewed TV telecast or read farm literature for seeking information. However a good number of respondents were using social media for this purpose. Majority of respondents were found to be using private seeds or their own seeds or nursery for vegetable cultivation at their farm. Among the different vegetable cultivation techniques, low tunnel cultivation of vegetables crops was found to be most popular. Cucumber crop was mostly cultivated on 1-2 acres of land and planted at the recommended time during November and December. In case of capsicum, Indra was the most popular variety among the respondents however this crop was planted earlier than recommended time using lesser seed rate than the recommended. Okra farmers were using lesser seed rate and with wider spacing. It was found that majority of farmers used urea, DAP and MOP in cucumber crop between 0-50 kg/acre.

Majority of farmers used urea and DAP in between 51-100 kg/acre for capsicum crop. It was found majority of farmers used urea for cauliflower crop in between 51 to 150 kg /acre. Farmers sprayed their cauliflower crop 3 to 20 times however majority of them has sprayed 3 to 8 times on this crop. In case of cucumber, total numbers of sprays were ranged from 4 to 24 and in capsicum the range varied from 5 to 25 and in case of okra the total number of sprays ranged from 5 to 25. Majority of respondents observed a waiting period of 2 days after spraying their crops. Majority of the respondents marketed their produce in local market through commission agents. All the respondents were found to be using different post harvest operations like cleaning, drying, grading and packing however none of the respondents practiced leveling for market of their produce. It was found that 22.50 % respondents wish to decrease area under vegetable cultivation**.** Majority of the farmers faced the problems like high cost of seed and pesticides, non availability of canal water, fluctuating market rates of produce, weather problems and in adequate storage facility.

Suggestions based on findings

- In Malerkotla block farmers have not adopted poly house or net house technology. However farmers can adopt this technology to produce off season crop and increase their income.
- It was found that large number of respondents was applying non-recommended pesticides for vegetable cultivation. Different extension activities can be conducted to educate them to use recommended pesticides for vegetable cultivation.

- Farmers should be motivated to sell their produce in distant markets to fetch higher price.
- Canal water should be made available to the farmers of Malerkotla block.

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ANNEXURE

DEPARTMENT OF EXTENSION EDUCATION

PUNJAB AGRICULTURAL UNIVERSITY, LUDHIANA

PART 1: Socio-personal characteristics of vegetable growers of Sangrur District.

1. Name: _____
2. Village: _____
3. Age (Years): _____
4. Gender Male [ ] Female [ ]
5. Educational level: _____
6. Family type: Nuclear [ ] Joint [ ]
7. Family members: _____
8. Operational Land holding (in acres):
    - Land Owned : _____acres
    - Land Leased in : _____acres
    - Land Leased out : _____ acres
9. Land under vegetable cultivation: _____ acres
10. Farming experience: _____ yrs.
11. Subsidiary occupation (if any)
    - Business
    - Private service
    - Government service
    - Dairy , Poultry, Beekeeping, Mushroom Cultivation
    - Any other (Please specify)
12. Income (Per annum):
    - Field crops: _____
    - From vegetables:_____
    - Subsidiary enterprise:_____
    - Any other: _____

13. Give the detail of cropping pattern followed by you?

Winter	**Crops**	**Acres**	**Varieties**	**Yield/acre**
	1.			
	2.			
	3.			
	4.			
Summer	**Crops**	**Acres**	**Varieties**	**Yield/acre**
	1.			
	2.			
	3.			
	4.			
Offseason	**Crops**	**Acres**	**Varieties**	**Yield/acre**
	1.			
	2.			
	3.			
	4.			

14. Extension contacts:

How often did you contact any of the following for seeking advice regarding the vegetable cultivation?

Sr. No.	**Source**	**Always**	**Sometimes**	**Never**
1.	ADOs			
2.	HDOs			
3.	PAU/ KVK/FASC scientist			
4.	Progressive farmers			
5.	Officials of cooperative societies			
6.	Pesticides Dealers			
7.	Any other (Please specify)			

15. Mass media exposure:

How often do you read, listen or view the following sources for getting information about vegetable cultivation?

Sr. No.	Source	Always	Sometimes	Never
1.	Farm broadcast			
	a. *Kheti Bari*			
	b. *Unnat Kheti*			
	c. Dehati Programme			
	d. Sada Shona Punjab			
	e. Any other(Please specify)			
2.	Farm telecast			
	a. *Mera Pind, Mere Khet*			
	b. DD Kisan			
	c. Any other (Please specify)			
3.	Farm literature			
	a. *Changi Kheti*			
	b. Kheti Sandesh			
	c. Progressive Farming			
	d. Newspapers			
	e. Any other (Please specify)			
4.	Social media			
	a. PAU Website			
	b. Farmer Portal			
	c. Internet Browsing			
	d. Whatsapp			
	e. Facebook			
	f. Youtube			
	g. Any other (Please specify)			
5.	Any other (please specify			

16. How many times did you have participated in the following extension activities to seek information regarding the vegetable cultivation in the last year?

Sr. No.	Source	No of times	Place
1.	Farmers meetings in the village		
2.	*Kisan melas*		
3.	Demonstrations		
4.	Exhibitions		
5.	Training camps		
6.	Training courses		
7.	Educational tours		
8.	Seminars		
9.	Campaigns		
10.	District level camps		
11.	Any other (Please specify)		

17. Social participation

Are you members of any organizations?

Sr. No.	Organization	Participation No of times/Year
1.	*PAU Kisan Club*	
2.	Farmer Advisory Committee , ATMA	
3.	Farmer's club of village/ Self help group (SHG)	
4.	Seed Producer Nursery Growers Association (SAPNA)	
5.	Vegetable Growers Committee of PAU	
6.	PAU Organic Farming Club	
7.	Punjab Young Farmer Association(PNKS)	
8.	Any other (Please specify)	

18. Risk bearing capacity (scale developed by Supe and Singh, 1976)

Please give your response to each of the following statements in terms of Agree (A), Undecided (UD) or Disagree (DA).

Sr. No.	Statements	Agree	Undecided	Disagree
1	Knowing that the chances of success are high, one should take risk			
2	I will continue production of vegetables even if it is risky			
3	One should take decision of starting new venture by keeping in view the past experience			
4	In order to excel, it is necessary to take risk			
5	A farmer who is willing to take greater risk than the average usually does better financially			
6	When it comes to chance, I would go safe than feel sorry			
7	In risky situation, one learns a great about the new practice			
8	Financially sound farmers can go vegetable cultivation			

PART 2: **Status of vegetable cultivation in Sangrur District.**

1. Please specify the year in which you have started vegetables cultivation _____ year and on how much area_____?
2. Have you get your soil and water tested for vegetable cultivation? Yes/No
    - If yes, when _____
    - What is the status of soil and water at your farm_____
    - If no, give reason_____
3. From which source do you purchase the vegetables seed?
    - PAU, Ludhaina
    - State Department of Horticulture, Punjab
    - State Department of Agriculture, Punjab
    - Private seed shops
    - Nursery growers
    - Directly from private companies
    - From other sources (Please specify)

4. Which of the following vegetable techniques you have adopted at your farm?

Techniques	Yes/No	**Area(acres)**
Net house		
Poly house		
Low tunnel		
Bed/Ridge planting		
Inter-cropping		
Relay-cropping		
Trellis system		

5. Please specify the reasons that why you have started vegetable cultivation on commercial basis.
    - For getting more profit _____
    - Due to more demand of vegetables_____
    - To bring diversification in agriculture_____
    - Own interest for getting experience_____
    - Easy access to market_____
    - Regular cash payment_____
    - Any other (please specify)_____
6. Do you grow nursery of vegetables at your own field? Yes/No
    - If yes, name of the crops
    - If no, from where do you purchase
    - Also give reasons

7. Please give the following information regarding the vegetable cultivation at your farm.

Vegetable crops	**Varieties grown**	**Area**	**Time of Sowing**	**Method of Sowing**	**Seed Rate**	**Spacing**	**Yield**
1.**Cucumber**	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.
2.**Capsicum**	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.
3.**Okra**	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.
4.**Cauliflower**	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.	1. 2. 3.

8. Please provide the following information regarding vegetable cultivation.

S. No.	Vegetable crop	No of irrigation	Fertilizer/ Acre			
			N	P	K	Any other
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						

9. Please give the detail of chemicals used in Cauliflower

S. No.	Chemical name	No of application	Dose
1.			
2.			
3.			

10. Please give the detail of chemical used in Cucumber crop

S. No.	Chemical name	No of application	Dose
1.			
2.			
3.			

11. Please give the detail of chemical used in Capsicum crop

S. No.	Chemical name	No of application	Dose
1.			
2.			
3.			

12. Please give the detail of chemical used in Okra crop

S. No.	Chemical name	No of application	Dose
1.			
2.			
3.			

13. Do you harvest vegetables yourself? Yes/No

- If no, how much labour is required for harvesting_____?

14. How much time do you observe between spray and picking of vegetables _____days?

15. Which of following marketing channel of vegetables do you follow? (Please give details)

- Retailer
- Whole seller
- Middlemen
- Self

16. If you sell the produce in the market than give the detail of the market?

- Name of market
- Distance of the market
- Any market fee
- Any commission paid to middle man

17. Have you adopted any processing technique for vegetables? Yes/No

If yes, then what type of operations do you follow to value addition?

- Cleaning
- Drying
- Sorting
- Grading
- Packing
- Labeling

18. Give the details of labour employed by you at your field?

S. No.	Operations	Yourself/Labour	Man days employed
1.	Field preparations		
2.	Sowing		
3.	Fertilizers		
4.	Intercultural operations		
5.	Irrigation		
6.	Chemical spray		
7.	Harvesting		
8.	Packaging		
9.	Marketing		

19. Have you availed any subsidy for vegetable cultivation? If yes, then_____

- Source of information about subsidy_____

- Name of the Department from where you have availed the subsidy_____
- Purpose of subsidy_____
- Amount of subsidy_____
- Year in which subsidy was availed _____
- If no give reasons_____

20. Do you want to increase or decrease area under vegetable cultivation or discontinue. Please give the following information in this regard.

a)	Want to increase area : Yes/No	If Yes, then how much area increase under which crop? Summer vegetables Winter vegetables Off season vegetables	If no, give reason _____ _____ _____
b)	Want to decrease area. Yes/No	If Yes, then how much area decrease under which crop? Summer vegetables Winter vegetables Off season vegetables	If no, give reason _____ _____ _____
c)	If you discontinue than why? Yes/NO	If yes than which season crop? Summer vegetables Winter vegetables Off season vegetables	If no, give reasons _____ _____ _____

PART 3: Problems faced by vegetable growers in Sangrur District.

1. Please explain what type of problems do you face in vegetable cultivation?

   _____

   _____

   _____

2. Are you satisfied with the present vegetable cultivation? Yes / No

   If No, please mention the reasons and alternatives, if any.

   Reason (please tick)

   - Difficulty in marketing
   - Inadequate price
   - Intensive labour
   - Uncertainty in weather
   - Costly inputs

- Non availability of inputs
- Non availability of credit
- Inadequate storage facilities
- Delayed payment
- Any other (please specify)

3. What problems did you face in getting the seeds of vegetable?
    - Non-availability of recommended variety
    - Poor quality of seed
    - Untimely availability
    - High cost
    - Any other (please specify)
4. What problems did you face in timely sowing of vegetables?
    - Less/More rain
    - Non availability of irrigation water
    - Non availability of seed drill
    - Non availability of labour
    - Non availability of seed
    - Any other (please specify)
5. Have you faced any problem regarding weed control? Yes/No
    - If yes (Please Specify) _____
6. Have you faced any problem for the control of any insect-pest/disease in vegetables? Yes/no
    - If yes (please specify) _____
7. What type of problems do you face in procuring the recommended chemicals (pesticides/insecticides) and using their recommended doses/acre?
    - Non availability of recommended chemicals
    - Lack of information
    - Poor quality of chemicals
    - High cost
    - Any other(please specify)
8. What problems did you face during spraying the chemicals?
    - Non availability of sprayer/implements
    - Non-availability of recommended chemical
    - Non-availability of Skilled manpower
    - Any other(please specify)

9. Have you faced any problem during irrigation of vegetables crop?
    - Less availability of water
    - Non-availability of canal water
    - Poor quality of irrigation water
    - Any other(please specify)
10. What type of problems did you face during picking of vegetables crop?
    - Non-availability of labour
    - High cost of labour
    - Any other(please specify)
11. Please tick the following which type of marketing problems do you face?
    - Non availability of near market
    - Non availability of marketing information
    - Fluctuating market rates of produce
    - Late payment of produce
    - Exploitation by middleman
    - No fixed price
    - Seasonal glut in the market
12. What type of weather parameter affects you mostly during vegetables cultivation?
    - High temperature at germination
    - Heavy / less rainfall
    - Any other(please specify)
13. Did you get any compensation from government in case of any crop damage/failure?

    For what _____ Have much? _____
14. Give suggestions to overcome the problems mentioned above.

    _____

VITA

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