IDENTIFICATION AND PRIORITIZATION OF COMPETENCIES POSSESSED BY FRUIT GARDEN OWNERS IN DISTRICT FAISALABAD, PAKISTAN

BY

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ALHAMD-U-LILLAH

It is Done

Thousands of Blessings of ***ALLAH*** upon

Holy Prophet Muhammad (S.A.W.)

With out whose guidance we are nothing

O'ALLAH, Bestow, the special mercy on ***Sayyedina Muhammad (Sallallaho Allaihe Waalahe Wassalum)*** and his family such blessings that may relieve us of all anxieties and calamities may satisfy all our needs and may clean us of all evils.

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ABSTRACT

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The purpose of this study was to identify and prioritize the competencies possessed by fruit garden owners in district Faisalabad, Pakistan.

The target population consisted of all the (1993) Fruit Growing farmers of district Faisalabad. A stratified random sample of three hundred and seventeen fruit growing farmers was selected. The data were collected through personal interviews on a research instrument having five sections. A five point response likert scale was used to assess the levels of competencies possessed by fruit growers. The finding indicated that awareness regarding the sources of information of the respondents perceive that they possess various categories from very high ($\overline{X}$=3.43) level regarding frequency of availability and high ($\overline{X}$=3.57) level of correctness regarding university of Agriculture Faisalabad as a source of information but this source was available only to 4.4 percent of the respondents. The field Assistant were available to 87.00 percent of the respondents with low availability level ($\overline{X}$=2.58) and low ($\overline{X}$=2.13) level of correctness of information. While telephone had low ($\overline{X}$= 1.37) level of availability and very low ($\overline{X}$= 0.94) level of correctness was used by the respondents as a source of information..

Majority of the respondent (97.00) percent reported the major problem of proper training regarding fruit growing practices were not available to them with medium ($\overline{X}$= 2.40) level of severity.

The findings of the study indicated that fruit growers had possessed from low level to an average level of competence in most of the competencies, whereas all of the competencies were perceived as highly important for fruit production, protection and marketing. The

mango growers had low ($\overline{X}$= 2.7, 2.48, 2.5 and 2.13) level of knowledge, skill, attitude and adoption concerning mango growing practices, citrus growers had ($\overline{X}$= 2.7, 2.49, 2.52 and 2.2) level, guava growers had low ($\overline{X}$=2.72, 2.46, 2.59 and 2.15) level and date growers had low to medium ($\overline{X}$= 2.78, 2.46, 2.63 and 2.24) level of knowledge, skill, attitude and adoption concerning fruit growing practices such as preparation of field, system layout for transplanting of nursery plants in the field up to harvesting and marketing of fruits. The fruit growers had low to medium level of knowledge, skill, attitude and adoption regarding fruit growing practices which indicate a need to train farmers regarding these practices.

A greater (29.97, 26.49 and 17.35 percent) of the respondents reported that months of January, February and September are the appropriate time and majority (50.78 and37.22 percent) of the respondents reported that one week to two week time duration for the conduction of training courses and majority (54.89) percent) of the respondents reported that University of Agriculture Faisalabad is the ideal place for the training of fruit growers in the identified technical competencies.

The Chi- square values for association between age groups, education level, tenancy status, size of land holding and knowledge level, skill, attitude, adoption level was highly significant which showed highly significant positive relationship between the age group, education level, tenancy status, size of land holding of respondents and knowledge, skill, attitude and adoption level of recommended practices concerning mango citrus, guava and date production, protection and marketing.

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CHAPTER I

INTRODUCTION

Fruits are known to be the prime source of food for human beings and the fruit gardening can play a significant role in the economic development of any country. In Pakistan, agro-climatic environment is suitable for the cultivation of various types of fruits. Ahmed *et al* (1993) calculated the cost of production of fruit and major crops. They reported that the cultivation of fruits resulted in more income per hectare than major crops. The use of land for fruits instead of crops is an economic advantage to the country. A comparative analysis of the area and production of fruit plants and major crops in the Punjab province and Pakistan is given in Table 1.

Table-1 Area and production of major crops and fruit plants

Crops	Punjab		Pakistan	
	Area (000 ha)	**Production (000 tons)**	**Area (000 ha)**	**Production (000 tons)**
All fruits	400.9	4562.2	853.4	7178.7
Wheat	6402.0	15607.0	8549.8	20958.8
Rice	1723.5	3286.0	2515.4	5563.4
Maize	534.5	2694.0	1051.7	3604.0
Sugarcane	827.2	40306.0	1241.3	63920.0
Cotton	2424.8	9062.0	3054.3	11655.1

Source: Pakistan Statistical Year Book 2009 Govt. of Pakistan

It can be judged from the figures presented in **Table 1** that there is a great room for promoting the fruit gardening in the Punjab and Pakistan. The area under fruit crops is very less as compared to the area under major crops. The fruit cultivation should be encouraged where the fruit yield is a comparative advantage over other major crops. The information concerning the average yield of fruits obtained by fruit growers and the potential yields of those fruit plants obtained at research stations is given in Table 2.

Table-2 Average and potential yield of major fruits in Pakistan

Fruits	Average yield* (tons/ha)	Potential Yield (tons/ha)	Yield gap
Mango	10.24	20	
Citrus	9.98	40 m ton/ha	
Guava	8.92		
Dates	5.70		

*Sources: * Pakistan Statistical Year book, 2007-08 Shahid,2006*

Table 2 depicts the actual yield of fruit crops produced at the farmers' field which are considerably less than the potential yield of these fruit crops. One of the major factors causing this huge yield gap is the unawareness of fruit growers to modern production technology. This deficiency on the part of the fruit growers can be overcome by comprehensive training and extension of modern fruit production techniques.

In the developed countries, people get their important nutrients for the development of the body from the expensive diets such as meat, milk, butter and eggs. But these items are out of the reach of an ordinary man in Pakistan. It is needed that the area and production of fruits, intercropped with vegetables, must be increased which are cheap alternative sources of these nutrients and the public needs to be educated to think of fruits as a staple and important food rather than as a luxury.

Khan & Khan. (1994) stated that for the rapidly growing world population a continuously increasing supply of basic food stuff is needed. In Pakistan, where the rate of population increase is one of the biggest in the world, i.e. 2.1% (Govt. of Pakistan, 2003), food supply is inadequate, the situation is more alarming. It is, therefore, essential to give serious consideration to the problem of food supply in Pakistan to avoid a worse situation in the years ahead. With the increase in population, the pressure of population on the land increases and average holdings become smaller and smaller. An intensive type of agriculture such as the growing of fruits should be encouraged. By growing fruits we can

get easily more income than other major crops because the fruit crops yield more and their rate of return is higher than major crops. But this can only be achieved by educating the farmers regarding modern agricultural technology. Awolola (1995) pointed out that education relates positively and significantly with farmers motivational orientation to farm work. By getting more and more knowledge, farmers can earn a lot of foreign exchange by growing fruits and exporting to other countries of the world. Abbas (2008) concluded that there is significant positive relationship between the education level and the adoption of the recommended practices by the respondents. So the farmers which had high education level were more adopters of recommended practices than the farmers with low level of education.

The health giving characteristics of some of the fruits had been rather widely accepted and recognized. Fruits contain mineral salts, which make them useful in preventing constipation. Lime juice is used to prevent scurvy diseases. Citrus and Jaman are good for diabetes. Similarly flowers and fruits are the symbol of health beauty, happiness, prosperity and friendship.

Fruits are the prime source of food for humans on the earth. Man has kept the fruit in his diet to provide variety, taste, interest and aesthetic appeal and to meet certain essential nutritional requirements. Ascorbic acid (vitamin C), for example, is the most important nutrient, because man is unable to synthesize it. Vitamin C is abundantly found in citrus and guava. Furthermore some fruits can be important supplementary sources of carbohydrates, minerals and proteins.

Fruit plants not only provide fruits but are also a source of attraction to mankind. Fruit gardens have beautiful scenic views and they commensurate the aesthetic value of

human being. People feel enlightened and fresh while visiting fruit gardens especially when the fruit plant is at flowering and fruiting stage. Therefore, the fruit gardens are also a source of recreation for human being. Fruit gardens add beauty to the fields when they are planted by using appropriate recommended designs and play an important role in moderating the microclimate of the area.

Fruit plants protect the area and its dwellers from extremes of weather and can shield it from stormy winds, which can otherwise damage the crops. Fruit trees filter and purify the air from dust and provide shade and protection against ultraviolet radiation. They also increase the fertility of the soil.

Keeping in view the present status of fruit production in comparison with crops it can be stated that the fruits are of more importance; economically more beneficial; profitable when grown by farmers according to the recommendations of the experts.

The field staff of the Department of Agriculture (Extension), Govt. of the Punjab like the similar other departments of the province is responsible for the dissemination of agricultural technology to the farmers but the fruit growers have little access to agricultural information. Okorley et al. (2005) stated that the major step to achieve is to help farmers acquire the necessary competencies through relevant and appropriate training after training need assessment. Brown at al. (2005) reported that he conducted series of interviews to identify industry training need of farmers. Training materials were developed and tested with mango, vegetables and other marketing groups. The training has been based on developing comparative advantages in marketing by using integrated supply networks to minimize supply chains and build relationship to create and value adding in existing chains.

Partap & Partap. (2001) Reported that most of the fruit growers and institutions in

the region of Hindu Kush- Himalayan have very low knowledge which decreased the quality and production of fruits and vegetables. Alkire et al., (1992) pointed out that relevant, reliable and useful information is needed to the garden owners to promote agricultural change. Memon (1989) also stated that farmers recognized the need for economic competence related to farming business. They were not competent enough to make their farming business more productive.

Kadian (1999) conducted a study to examine the level of knowledge of farmers regarding recommended fruit growing practices; growers' attitude to fruit cultivation; and adoption of innovations. According to him marginal farmers were poor accepters of innovations. One of the reasons for poor adoption/acceptance was the low level of knowledge and skill of farmers in growing and managing fruit plants/gardens. Thus still, there remains a gap between the available knowledge and knowledge required to clearly identify the levels of competencies possessed by fruit plant growers so that training programs/extension campaigns may be planned for them to equip them with the knowledge and skills required to be competent enough in growing and managing good fruit gardens.

This research work is an essential part of the long research continuum that allows the farmers to come ever stewards of their land and resources to increase their fruit production by getting more and more knowledge after the implications of research findings. It will help produce quality fruits in abundance and at afford able price. The finding of the research will enable the fruit growers to get accurate and important information about what could be useful and dangerous for them. Further more, this research will be a useful reference for the regulatory agencies for decision making on scientific knowledge which has been the prime mission of the research. This study is, therefore, planned to identify and

prioritize competencies possessed by fruit garden owners in district Faisalabad, Pakistan.

1.1 Objectives

1.1.1 General objectives

1. To identify and prioritize competencies possessed by fruit garden owners in District Faisalabad, Pakistan.

1.1.2 Specific objectives

To achieve the general objectives following specific Objectives are formulated:

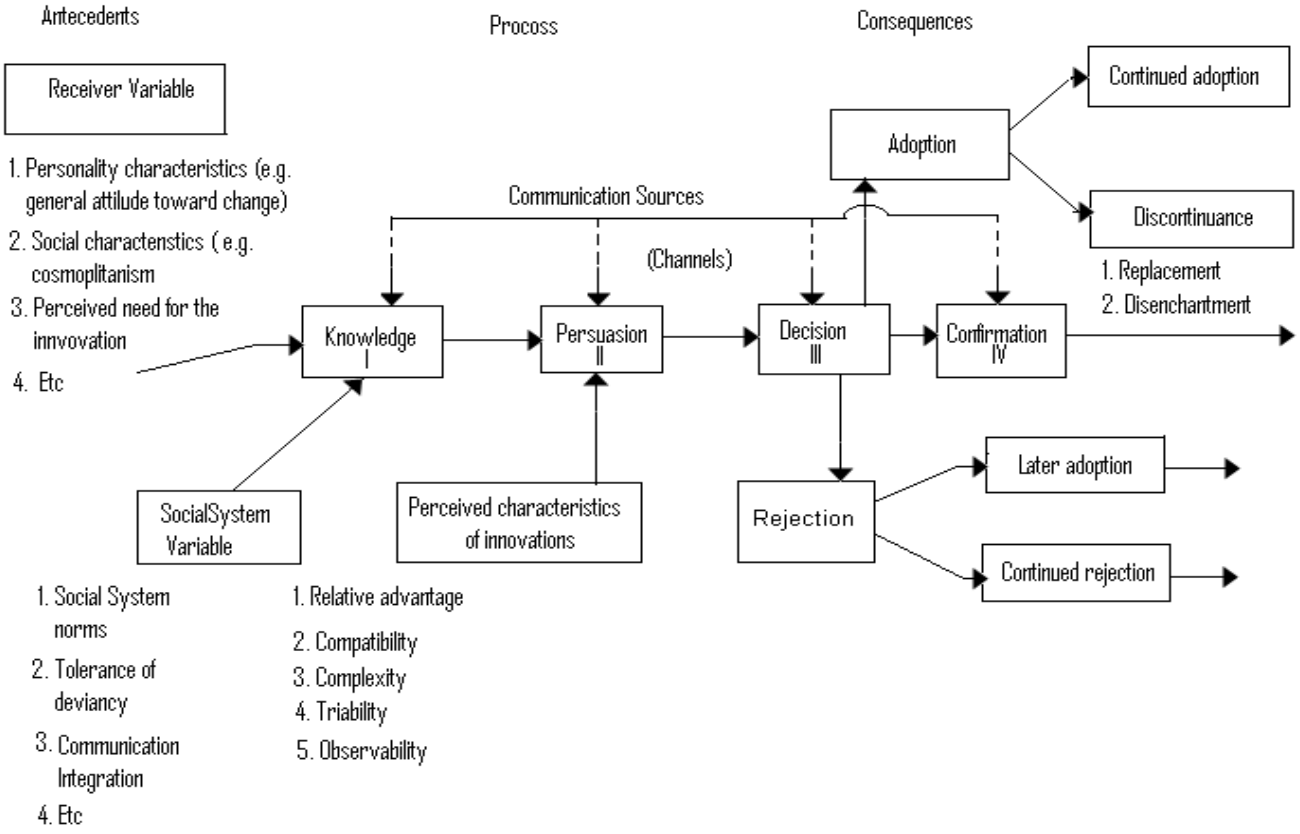
1. To identify the sources of information of fruit growers.
2. To analyze the problems faced by fruit growers.
3. To determine the levels of technical competencies possessed by the fruit growers.
4. To determine the rank order of the technical competencies in which the fruit growers need training.
5. To suggest feasible measures for the improvement of fruit growers competence in fruit production, storage and marketing.

1.2 Theoretical frame work

The modern agriculture has been undergoing revolutionary changes in the form of innovations in various fields. Diffusion is defined as the process through which an information is disseminated through a number of channels over time among the members of a social system. An innovation is also defined as an idea, practice, or object that is perceived to be new by an individual or other unit of adoption. Communication is a

process by which individuals create and share information among them selves in order to reach a mutual under standing (Roger 1995). Diffusion research was started as early as 1903 by the French sociologist Gabriel. Who plotted the diffusion curve. Tards. In 1903 defined that S- shaped curve is of current importance because most innovations have an S-shaped rate of adoption (Roger, 1995).

Figure 1



Diffusion of innovation model, given by Rogers (1995) Provides basic steps of diffusion process i.e 1. Knowledge, 2. Persuasion, 3. Decision, 4. Confirmation

It has been argued that receivers (personality characteristics, social characteristics, Perceived need etc.) influence these above steps and effective communication channels are inevitable for the successful adoption of innovation (figure =1). The adoption and diffusion

of innovation (modern techniques) are associated with a number of factors related to innovation like relative advantages, compatibility, triability and observability (Rogers, 1983). Knowledge, skill and attitude of fruit growers affect their adoption behavior and influence the diffusion process. So, if we want to make the farmers equipped with modern recommended techniques then it seems indispensable to assess their training needs particularly in the sophisticated and modern perspective Iftikhar, (2009). Training based on identified needs is the accessory of adoption and diffusion processes among the farming community. There would be more chances of adoption and diffusion where the training needs are assessed and on the basis of empirical evidences farmers are trained in a suitable manner. In this way the rate of adoption and diffusion may be accelerated by identifying the weaker training sides where they have more need of Training.

1.3 Limitations of the Study

1. This study was required to be conducted at province level but owing to the shortage of resources and time at the disposal of the researcher, it will be limited to the fruit growers in district Faisalabad only.
2. This study is limited to the technical competency only.
3. This study is also limited to four types of major fruits. These are mango, citrus, guava and date.

1.4 Assumptions

1. The fruit growers will be willing to provide the needed information.
2. The population of the study is a normal one.

1.5 Definition of Terms

Some keywords and terms used in this study are defined as follows:.

1. **Arhti:**

Local commission agents in the market.

2. **The Department of Agriculture (Ext):**

The Extension Wing of the Department of Agriculture under the Ministry of Agriculture, Forestry and Livestock, Punjab, Pakistan.

3. **EDO**

The term EDO means Executive District Officer. He/ she works at District level. He/she is responsible for looking after the affairs of different departments, i.e., agriculture, livestock, fisheries etc.

4- **DOAE**

The term DOAE means District Officer of Agriculture, who is seated at district level.

5. **DDOAE:**

The term DDOAE means **D**eputy **D**istrict **O**fficer **A**griculture (**E**xtension).He is seated at Tehsil level.

6. **Agricultural officer (AO)**

He is the employee of the Department of Agriculture (Extension) who conducts Extension work and supervises the Field Assistants in the field. He is seated at markaz level.

7. Field Assistant (FA)

Field assistants are the front line agricultural extention agents who work at the union council level and assists AOs in conducting extension work in the field. They have two years training in agriculture after matriculation.

8. Competency

The ability (skill, knowledge and attitude) to effectively perform a task

9. Fruit farmer

A cultivator who grows fruit crops at his farm.

10. Orchard:

Garden or the area where the fruits are grown.

11. Tehsil:

A subset of a district

12. Union Council

A subset of a tehsil

13. Commission Agent

A commission agent is an important functionary in the distribution channel of agricultural produce at the market level. Usually the commission agent acts as selling agent on behalf of the producer or the preharvest contractor.

14. Preharvest Contractor

The preharvest contractor purchased orchards at the sufficient time before

maturity; they had to bear all such losses taking place on standing fruit trees in addition to those occurring during the actual distribution of fruit such as picking, packing and transportation losses.

CHAPTER 2

REVIEW OF LITERATURE

The importance of review of literature cannot be overemphasized for any type of research problem as it highlights the findings of the related studies in relevance to the problem under study. It eliminates the possibility of un-necessary duplication of effort and provides a better understanding to make the research study objective and purposeful. The present research effort on a topic 'An Assessment of Technical Competencies Possessed by Fruit Garden Owners in Gardening Technology' is not a new one and, there has already been research done on the said topic. Therefore, studies having direct relevance to this research topics are being reviewed. This chapter with the review of literature related to assessment of technical competencies possessed by fruit garden owners in gardening technology, and studies related to teachers of vocational institutes of agribusiness.

2.1 STUDIES RELATED TO THE ASSESSMENT OF TECHNICAL COMPETENCIES POSSESSED BY GARDEN OWNERS (FARMERS) IN GARDENING TECHNOLOGY.

Importance of review of literature lies in the fact that it provides background knowledge and further orientation to the problem to be studied and also eliminate the possibility of unnecessary duplication of efforts. In addition valuable information on research techniques may be gained from reports of previous research. Very little research has been conducted on this topic in Pakistan. However, some of the studies relevant to this research are reviewed as under.

Haq (1965) noted that 10-15 percent of the annual production of fruit, i.e. 7 million maunds valued at Rs. 105 millions, went waste from the trees to the table. It was also found that about 4 percent of the production was lost due to faulty collections, mechanical

damages, picking up immature fruits and improper packing, while 2.5 percent was lost owing to defective methods of transport and careless handling. The system of transport in refrigerated vans was practically absent. About 6 percent of the produce he found spoiled as a result of improper storage of all stages.

Gott *et al.* (1981) examined the perceptions of local school administrators pertaining to educational competencies needed by vocational agriculture instructors in the area of adult/young farmer education. A questionnaire consisting of 209 competency statements was administered to the following sample population: 20 percent of the superintendents and principles administering vocational agriculture in Missouri; 20 percent of all Missouri vocational agriculture instructors; and all Missouri area vocational-technical school Directors, Teacher educators and State Supervisors. The response rate for the sample was 89 percent. Included among the areas covered in the questionnaire were the following: programme planning, development, and education; instructional planning, execution, evaluation, and management; guidance, school community relationships; professional role and development; adult/young farmer education; agricultural machines; and teaching agricultural management. After analyzing all collected data, researchers concluded that teachers, principles and superintendents placed less emphasis on adult/young farmer education than did teachers educators and state supervisors. They also noted a lack of support for adult/young farmer education in the leadership of local secondary school systems, Finally, the opinion of teachers tended to represent the views of local school administrators rather than those of state supervisors and teacher educators.

Mohayidin (1984) stated that farmers' decisions are invariably taken under conditions of uncertainty. His study was aimed at reviewing the expected accounting profit model and to compare how well it explains farmers' decision on cropping pattern selection with two other models, the negative exponential utility and the market-based profit model. The study employs data on small holders in Malaysian districts: Muar and Perak Tengah.

Cheema and Malhi (1986) concluded the varieties of mango with delicious taste, high market value and less susceptible to the attack of insect/pests and diseases, are more popular and widely grown. On the other hand, the varieties which are more susceptible and with low market value are rarely grown.

Protasov *et al.* (1986) wrote a book giving information on the biology of pests and characteristics of diseases of potato and the main fruit and vegetable crops grown by farmers in their personal plots, as well as on the agro-technical, chemical and biological control of these pests and diseases. A section is included on the phonological phases of development of fruit and berry crops, as well as a calendar of control measures and a list of recommended preparations, together with their times and rates of applications and maximum number of applications.

Ahmad (1987) concluded that radio proved to be the main source of information in educating the farmers about the recommended agricultural practices for wheat, sugarcane and cotton crops. Field Assistants and wall slogans were found to be the second major sources of information responsible for creating awareness among the farming community about modern farming technology. However, a few of his study respondents got information from neighbors, television, forefathers, exhibitions, demonstration plots and printed material.

Martin and Omer (1987) reported young farmers were neglected for the provision of educational activities. The main purpose of this study was to determine and analyze the selected factors associated with awareness and participation of members of IYFEA in agricultural extension education programmes. A secondary purpose of the study was to determine perceptions held by members of IYFEA regarding agricultural education programmes offered by the Cooperative Extension Service. They reported that

1. About 30 Percent of the respondents first heard of the Cooperative Extension Service, through mass media, 26.47 Percent from family members and 24.51 Percent from friends/neighbors.

2. The majority (82.23 Percent) of the respondents indicated that they had participated in meetings sponsored by the Cooperative Extension Service. Only 10 Percent of them have never participated in meetings sponsored by the Cooperative Extension Services.

3. Seventy percent of the respondents indicated that they were satisfied or very satisfied with services/information provided by extension service. Only 8 respondents (7.84 Percent) of the respondents reported that they were dissatisfied with the services/information provided by the extension service, and 18 respondents (17.64 Percent) indicated that they had no opinion.

   The respondents seemed to have a fairly high level of awareness of the Cooperative Extension Service. They also seemed to have a fairly high level of satisfaction with the services/information provided by the Cooperative Extension Service.

   The respondents placed a very high priority rating on educational programmes on marketing, production records, and production management. The respondents also indicated that the highest rated methods of communication included local community meetings, newspaper articles, and country meetings.

   Because most of the significant differences in the ratings of the importance of the program planning, programme areas and extension methods were attributed to the differences of sex and age. It is compulsory that when planning and conducting educational programmes for members of IYFEA. These factors must be considered.

   The methods of Local meetings, county meetings, and newspaper articles should be used in planning educational programmes for young farmers.

Anwar (1988) conducted a study to determine the extent of adoption of improved citrus fruit growing practices by growers in Tehsil Phalia District Gujrat. The general objective of this study was to determine the extent of adoption of improved gardening practices by the citrus growers. The specific objectives were:

1. To determine the awareness of the respondents regarding the citrus growing practices.
2. To find out the extent of adoption of improved citrus growing practices.
3. To identify the problems encountered by the respondents in the adoption of improved citrus cultivation technology.
4. To know the opinion of citrus growers for increasing citrus area and citrus production in the country.

Five out of 55 Union Councils were selected randomly and 3 villages from each Union Council and ten farmers from each village were selected randomly for the collection of data. Thus, the sample consisted of 150 farmers. The data collected were analyzed statistically and tabulated. One hundred percent of the respondents were aware of the recommended time of transplanting of citrus fruit nursery, system of lay out, 20% pit size, number of irrigations were adopted by 35.33%, where as 72.90% of the respondents were aware of pruning and only 8.67% were adopted pruning practices. Twenty two percent of them were aware of recommended picking method of citrus fruit and only 10% of them were adopted.

Kibriaul (1988) made a survey of the conditions of forests, farmers' knowledge and experience of tree growing, their preferences and perceptions, and obstacles to planting in 7 districts that form a cross-section of Bangladesh's agro-ecological zones. The information was collected by interviews with 50 household heads in each of 7 villages. The survey revealed that almost every homestead contains a combination of different tree species, a bamboo grove, and shrubs. Farmers generally prefer to grow fruit trees because they are multipurpose and can also provide fuel, fodder and timber. Bangladesh farmers are aware of values of trees and want to plant more. The major constraints preventing this are a lack of quality seedlings, fencing materials, financial support, and extension services. It is suggested that a homestead forestry programme be set up to strengthen existing extension

services and provide desired seedlings and other support to farmers.

Asif. J. (1989) reported that a significant majority of the growers ignorant the grading method after culling and further reported that packing recommendations were not followed by a fairly large section of the respondents

Memon (1989) conducted a study in Hyderabad District, Sindh, Pakistan to identify the economic competencies needed and possessed by the farmers. The study was presented as a Ph.D. dissertation at the Iowa State University in Ames, Iowa, USA. The specific objectives of the study were:

1. To identify selected characteristics of farmers and Agricultural officers in Hyderabad District, Sindh, Pakistan.
2. To determine the degree to which economic competencies were needed and possessed by the farmers.
3. To compare the perceptions of the farmers and Agricultural Officers regarding the degree of competence needed and the degree of competence possessed by the farmers.
4. To compare the degree of competence needed and the degree of competence possessed when farmers were grouped by selected demographic factors.

A descriptive research methodology was used in this study. The target population consisted of farmers and Agricultural Officers in Hyderabad district, Sindh, Pakistan. The sample consisted of 100 randomly selected farmers (three of them did not agree to participate in the study) and 26 Agricultural Officers in the district. The instruments used in this study consisted of two sections. section I was concerned about the biographical data, whereas Section II contained 37 competency statements. A 1-5 point response scale was used to access the degree of competence needed and the degree of competence possessed by the farmers. A "1" indicated do not know, "2" indicated little competency needed or

possessed, "3" indicated moderate competency needed or possessed, "4" indicated high competency needed or possessed, and "5" indicated very high competency needed or possessed. The instrument was tested for reliability. The alpha coefficient for the instrument on competency possessed as perceived by farmers was 0.95. The data were collected through personal interviews. It was found that a very high majority (83.5 percent) of farmers were married. Slightly over one-fourth (26.8 percent) of the farmers were illiterate whereas only 12.4 percent of farmers had attended a college. The mean years of farming experience was 18.22 and the mean size of the farm family was 4.8. Most (80.8 percent) of the Agricultural Officers held the M.S. degree. Only 15 percent had received in-service training related to their extension work. The mean experience of Agricultural Officers was approximately 13 years. Regarding the economic competencies needed by the farmers it was concluded that farmers recognized the need for economic competence related to farming business. All of the competencies had a mean score above 3.75 on a 1-5 point scale of competence needed by farmers whereas all of the competencies had a mean score less than 3.00 on a 1-5 point scale of competencies possessed by farmers. It was concluded that a gap existed between economic competencies needed by farmers. Farmers possessed a low level of economic competence whereas they needed a high level of economic competence as identified by themselves and Agricultural Officers. It was further concluded that there was a need for the farmers to improve their economic competencies as a means to improve their farming productivity. A significant difference was found between the perceptions held by the farmers and those of Agricultural Officers for only four competencies needed by the farmers and for six competencies possessed by the farmers. No significant difference was observed between the overall means of these two categories of respondents regarding the economic competencies needed and possessed by the farmers. Significant differences were also observed for several competencies possessed by farmers when they were grouped by educational level or by tenancy status. At the end it was recommended by Memon that research should be initiated to investigate the effectiveness

of extension in meeting the needs of farmers.

Mohy-ud-Din (1989) reported that a number of pesticides such as Diptrex, Nogas Folidol, Dimecron, Metasystox, etc. were used for controlling the fruitfully of mango. Their use created other pest problems such as out break of scale insects because elimination of their natural enemies. Regarding the transfer of technology for the control of insect/pests and diseases of mango fruit, field days, workshops and brochures were distributed among the farmer and extension workers by Pakistan Agricultural Research Council, Islamabad. He further reported that when 3-4 hoeing up to 15 cm, were done from October to December to expose the eggs of mango mealy bug to predators, it resulted in mortality of eggs as compared to orchard where hoeing was not done.

Pfenninger and Koblet (1989) described a brief account of the history of the association and of Swiss viticulture since 1864, and the upswing in Swiss wine production since 1961. Developments in acreage, quality and prices and in training are reviewed. The general economic position of the sector, advertising and other activities of the association and the future outlook for Swiss wines are discussed. The second article looks in more detail at the associations' advisory services.

Van de Wart and Van de Wart (1989) subjected nursery trees of apple cultivar Karmijn de Sonnaville on M.9 rootstocks under simulated conditions to light, moderate or severe hail damage, each treatment being applied in July, August or September. Damage varied from leaf injury only to broken shoots and severely damaged leaves and wood. Differences in subsequent differences in yields/tree, assessed 2 and 3 years after planting out,were not significant. The incidence of canker (*Nectria gallingena*), however, was greater to trees which has received severe hail damage in the nursery in September.

Haraikawa (1990) analyzed behavior of Japanese farmers using an empirical and simple LP model to demonstrate that their behavior is optimum and rational. Kokota Cho, located in the south-eastern part of Ibaraki prefecture and a well-known greenhouse melon-producing area, was selected for study. The farmers from Hokota- Cho cultivate early

maturing and new melon varieties which they sell at a high price. A parametric LP model (simple and empirical) was applied to analyze the rationality of farmers' behavior. It was demonstrated that farmers are able to maximize their profit provided that price changes according to the changes in the product life cycle (PLC) in the greenhouse melon market. For example, when the price of the no-net/late melon variety decreased to 79.7% of that of the no-net/semi-early melon variety, the LP optimum solution showed that the farmers discontinue cultivation of the late type and adopt the semi-early type. In another case, when the price of the no-net/semi-early melon variety (NNE) decreased to 66.0% of that of the net/late (NL) variety, the LP optimum solution showed that the farmers should cultivate the NNE and NL over 5.4% and 10.7% of their cultivated upland area, respectively. The farmers' behavior thus corresponded to the LP optimum solution. However, they were faced with serious technical problems: they had to use new chemicals such as Chloropicrin (soil disinfectant) to prevent the occurrence of diseases associated with continuous cropping of melon. Also, they were compelled to improve crop management and quality control, because the quality of melon affects the price in the case of the early and new varieties. It is considered that they will be able to solve these problems by using their own experience and common sense.

Joshi *et al.* (1990) presented the results of a survey which was aimed at monitoring and assessing the performance of the kitchen garden programmes, in the Pakhrib as Agricultural Center's local target area, in Nepal. The programme is focused on women and is characterized by an extension-type structure which provides technical services and inputs to participants. This study made comparisons between participants and non-participant farmers in terms of vegetable cultivation before and after the project was implemented. Aspects such as the number of farmers growing different vegetables, area allocated to each vegetable, amounts of produce sold and earnings are taken into account. In addition to evaluation of its success, the programmes origins and evolutions are also studied, analyzing the impact of its services on labour-allocation and decision-making activities of male and

female farmers. During surveys, factors like participants' relationships with their households, market assess ability and types of work by gender need to be evaluated among others. Sociological factors, such hierarchical structure of the family are important in determining who the decision-maker is and, in turn, affect the patterns and rate of production. Finally the need for training while introducing new varieties of vegetables and modern inputs is stressed.

Hussain (1991) conducted a study to identify the extent to which the mango grower had adopted the plant protection measures one end and to explore the non adoption constraints on the other in Tehsil Muzafar Garh. The objectives of his study were:

1. To determine the extent of awareness of mango growers about insect pests and diseases.
2. To determine the degree of awareness and adoption of improved plant protection measures.
3. To find out difficulties faced by the mango growers in the adoption of plant protection measures and formed suggestions for their solution.

Tehsil Muzafar Garh consists of 31 Union Councils, out of which two were selected randomly for this study. Thereafter 15 mango growers commanding mango orchards 0.45 hectare (one acre) and were drawn at random from each Union Council. Total respondents were 150. The data collected were analyzed by using chi-square tests and percentages.

About 98.66 percent of the respondents were aware of mango hopper, mango fruit fly, mango mealy bug while 74.0 percent of the respondents were aware of termites. Anthracnose, mango malformation and dieback diseases were known to most of the respondents, and minority of the respondents were aware of the powdery mildew of mango, sooty mold and root rot. Twenty eight percent of the respondents had applied the recommended number of sprays and 6.0 percent above the recommended number of sprays

for the control of insect/pests and diseases of mango. Only 27.97 percent of the respondents reported total control with the chemicals applied.

The respondents benefited from all the available resources of information. However, friends and neighbors (98.0 percent), Agri. extension Department (96 percent) and radio (90 percent) were the most popular sources of information among the respondents. The major difficulties in the way of adopting recommended P.P.M of mango, as reported by the respondents, were high cost of chemicals and spraying machinery, adulteration in chemicals, non-availability of spraying machinery on hire basis, non-cooperation of agricultural extension field staff, lack of manual labour, lack of finance and carelessness.

Joshi and Reeve (1991) stated that a long-standing issue in education for farmers in Australia is that of the relevance of formal courses to the practical world of running a farm. This is a function of several factors, not least of which is the apparent differences in the perspectives of farmers and those responsible for providing the training. The processes outlined in the report are aimed at improving the relevance to farmers of training programmes in farm management. The study sought to determine in detail the knowledge, skills and attitudes (competencies) required by farmers in the effective management of the financial aspects of their farm business. A full set of competency profiles are presented for five farming types (sheep and wool, beef cattle, broad care cropping, sub-tropical horticulture, and small area farming) in New South Wales. The application of these profiles to curriculum development is then discussed with particular reference to the Home Study Programs in Farm Management and Farm Office Management offered by Continuing Education, CB Alexander Agricultural College Tecal, New South Wales. However, the discussion is presented in such a way to facilitate the application of the results to other courses in other locations.

Robin (1991) identified and described current development dynamics for using the lowlands of rice growing systems for fruit crops, as being introduced into the farming

systems of Muslim ethnic groups in the Tombali region of Guinea-Bissau. The analysis shows the diversity of farming systems within the same agrarian society, and how different land management techniques yield different development problems. He also identifies the direction for development in the future, focusing particularly on the creation of village interest groups to further local agricultural development.

Alkire *et al.* (1992) conducted a study to find out the sole sources of information available to farmers. Farmers learns also from experience, from other farmers (probably the better farmers), and from seed and chemical dealers, which are more or less informal sources. They acquire information also from radio and television agricultural broadcasts. An objective of this research was to determine the importance of these diverse sources in creating knowledge of newer technologies among farmers, and in the actual adoption of new agricultural inputs. The main objectives of the analysis were:

1. To examine the relationships between access to information sources, farmer knowledge and input adoption.
2. To examine how farmers' resource status, location, education level and age affect their adoption behavior.
3. To determine the relative importance of information sources, farmers' knowledge, and the influence of their resource base, location, age, and education in the adoption of new technologies.

The data were collected from a randomly selected sample of farmers in Lakki Marwat Tehsil, North West Frontier Province (NWFP), Pakistan. The population for this study consisted of all farmers who owned land in Lakki Marwat and were directly involved in farming. Twenty of the 53 villages in the Tehsil were randomly selected for the survey. Between 85 and 100 farmers were identified in each village, with the assistance of village leaders; 15 farmers were selected and interviewed from each village, again using random

sampling procedures. Altogether, 13 percent of the villages in the Tehsil were included in the sampling frame, and 17 percent of the population in sampled villages were interviewed.

A key element in the transformation of agriculture is the dissemination of new knowledge and information to farmers. Information reduces farmers' uncertainty about decisions and thus facilitates their adoption of new technology and cultural practices. Given the apparent weaknesses of the extension systems, one should not automatically assume that it is the only, or best, source of agricultural information. After all, farmers are in contact with other potential sources of information, including other farmers, the media, and input supply dealers.

Farmers may play some role in diffusing information but they do not appear to be as effective as the channels of information which serve to link farmers directly, and extension appear to be equally highly correlated with knowledge, at least in a broad sense. Farmers may be younger and better educated and thus, more respective to, aware of, and capable of searching for new information.

Shah (1992) conducted a study to find out the extent of adoption of the citrus growing practices by the growers in Tahsil Karor Distt. Layyah. Out of 12 Union Councils in Layyah, five were selected randomly. Two villages from each Union Council and citrus growers from each village were drawn having total number of 150 respondents. Chi-square and percentages were applied as statistical techniques for analysis of data.

All the respondents were aware of spring transplanting of nursery and 74% were adopted, 68.67% were aware of the moon soon transplanting and 31.34% were adopted. It as revealed that 100, 15.34 and 0.67% of the respondents were aware of the square rectangular, hexagonal and quincunx layout systems, respectively, and 91% of them were adopted square system of planting citrus plants.

It was found that 91.34, 84.67, 68.67, 64.63, 62.00 and 56.67% were aware of the number of irrigations and interval during various seasons i.e., February-March at flowering, November-January 15 July to end of July. April to 15 July and September-October,

respectively. It was observed that only 35.34, 6.0, 2.67 and 1.34% of the respondents were aware of and reported serious damage caused by citrus wither tip, gummosis, citrus trestiza and crown rot, respectively.

Niazi (1993) concluded that samara behisht (chounsa) , tukhmi , langra, hyder shah wala, dusehri and totapari were found to be more popular among the mango growers. Square system of layout was adopted by an over whelming majority of 98 percent of the respondents, mango pit farming, 34-40 feet plant to plant distance, irrigational interval throughout the year and recommended dozes of nitrogen, potash, phosphorous and farmyard manure were adopted by overwhelming majority of the respondents.

Qazi *et al.* (1993) conducted a study. The primary objective of this study was to examine the association between the adoption of new farm practices and such characteristics as age, education and size of land holdings of the sugarcane growers. A multistage sampling technique was employed for the selection of the sample. Out of 8 villages in Union Council No. 109/SB, Tehsil and Distt. Sargodha, four villages were randomly selected at the first stage. At the second stage 30 sugarcane growers were taken randomly from each selected village. Thus, the total sample comprised of 120 sugarcane growers. Relevant information was collected using a pre tested interviewing schedule. Chi-square test was used to test the significance of the data. The results and conclusions of the study were:

1. There was no difference between the adopters and no-adopter of recommended varieties of sugarcane in regard to their age.
2. There was no difference between the adopters and non-adopters of chemical fertilizers in regard to their age.
3. There was no difference between the adopters and non-adopters of pesticides in regard to their age.
4. There was no difference between the adopters and non-adopters of recommended

varieties of sugarcane in regard to their education.

5. There was no difference between the adopters and non-adopters of chemical fertilizer in regard to their education.
6. There was no difference between the adopters and non-adopters of pesticides in regard to their education.
7. The adopters and non-adopters of recommended varieties of sugarcane differed significantly in regard to their land holdings.
8. The adopters and non-adopters of pesticides differed significantly in regard to their land holdings.

Hussain *et al.* (1994) conducted research on the impact of the training and visit (T & V) extension system in the irrigated Punjab of Pakistan. He tested three models and analyzed using limited dependent variable regressions: the impact of T & V on the number of extension contacts with farmer's knowledge of wheat technology. He concluded that The & V had increased the quantity but not the quality of the extension contact and it also has increased farmers' knowledge and adoption of recommended practices for wheat production.

Awolola (1995) considering the importance of education in motivating farmers' orientation to farming, hypothesized that those farmers who have once or two types of education may have been exposed and acquired new skills, knowledge and attitude (which is defined as a state of readiness to be motivated to act certain goal). The study was conducted in five villages in Zaria LGA of Kaduna State. Purposive sampling method was used to choose 210 respondents with different types of education. Findings of the study indicated that education relates positively and significantly with farmers' motivational orientation to farm work. Furthermore, the findings revealed significant differences between the effects of adult, and farm institute and primary and farm institutional types on farmers' motivational orientation to farm work.

Based upon the findings of the study it was suggested that the education and economic planners in the country need to reconstruct the structure and design the type of curriculum that will respond to the needs of the farmer and his society. Most of our people living in rural areas are illiterate and have farming as their major occupation. Since agricultural production involves a lot of technical concepts which most farmers do not understand, special adult education/extension education should be developed for the training of farmers so as to ensure their positive participation in their occupation. Clearly, farmers must participate through learning and using new skills and understandings. This is where adult education/extension comes in. Finally primary adult and farm institute education planners, therefore, need to consider not only linkages at the top levels of national planning and policy-making, but also processes of curriculum innovation and experimentation and how to protect and disseminate such innovation locally.

Khan and Mahmood (1996) concluded that Pakistan has considerable potential to get benefit from export of fruit for which developed countries have promised to reduce tariffs by 40-50%.

Sharma (1998) stated that respondent from200 farmers in three selected Districts of the India Punjab State revealed that adoption of recommended technology for need control in mango orchards was very poor. The use of weed as fodder, high cost of herbicide, lack of technical guidance and lack of time were identified as major constraints in the adoption of recommended practices for the control of weed and fruit drop in mango orchards. He further stated that the weed control in mango orchard in Indian Punjab State farmers respondents faced the major constraints in adoption of weedicide were lack of technical guidance and lack of time. Therefore, it was suggested that extension scientists should promote awareness through organization of short term training programmes, distribution of scientist literature and maintenance of regular contact with mango growers.

Desai *et al*., (1999) reported in his study the constraints faced by mango growers in the adoption of drip irrigation system in juna garh of India. The data was collected from

175 mango growers from 24 villages. The most important economic constraint faced by the growers was high prices of spare parts, heavy initial expenses for installation of drip irrigation system and lack of capital for covering entire area under drip irrigation.

Kadian (1999) concluded a study in Kangra district, Himachal Pradesh, India [n=40] growers, to examine the level of Knowledge of recommended fruit cultivation practices, growers attitudes to fruit cultivations, and adoption of innovations. It was concludes that marginal farmers were poor acceptors of innovations because of lake of sources. Knowledge score was highest for use of fungicides and pesticides (58.53 %) and lowest for use of herbicides (43.86%) age, education and extension contact were found to be significantly correlated with adoption and knowledge level.

Puri – Sg ; Ghodki – BV (1999) Found that 52 percent of the respondents were in the high knowledge category, while 37 and 11 percent were in the medium and low knowledge categories, respectively. Out of 15 selected practices recommended for M. zapota cultivation, 9 were known to all respondents and 6 were known to 65-91 percent of respondents. Growers were least knowledge able in the use of plant protection measures 65 percent manures and fertilizers 74 percent and the Atul harvester 77 percent. It is suggested that organized training and demonstrations should be conducted to improve the knowledge of growers in Maharashtra.

Mohammad (2001) reported that the order of training needs as perceived by mango growers were plant protection measures (98%), pruning and its training (74%) manuring (57%), land preparation (17%) , selection of verities (13%), irrigation (13%) , and planting technique (10%). The most of the respondents preferred two days (43%) during in their own village, (90%), skill oriented training (70%) will nature of peripatetic training (82%). The result of another survey conducted at Hosur and Bargur blocks of Dharmpuri District from grape growers revealed that the perceived training needs of the growers were ranked plant protection (95%), manures and manuring (80%), training and pruning (65%), while erecting pandal, preparation of fields, irrigation, selection of variety, preparation of

planting material ranged from (12-15%). Farmers further reported that the training to be offered should be before crop season (78%) having duration of one day (63%), in their own village (82%) and for the developing skills (50%) in the field condition (52%). For the assessment of training needs of farm women in Integrated Farming system he reported that more than (75%) of the respondents women expressed their desire for training in various enterprises like farm forestry, horticulture, bee-keeping and fish farming etc.

Partap & Partap. (2001) reported that in apple inadequate crop pollination declined apple production. A few growers in Himachal Pradesh and Sichuan were aware of and are trying to solve this problem using different approaches, Like the use of honey bees but the majority of the growers and institutions in the Hindu Kush Himalayan region have little knowledge about this crucial factor that is why the production and quality of apples and other fruits and vegetables decreased.

Butt (2002) Reported that one- third of the respondents were found to be having a high level of awareness. While 43.20 percent of the respondents had medium level. About one fourth of the respondents were having low level of awareness of short massage telecast on TV by Govt.of Punjab.

Level of adoption of majority (58.40%) was medium ranging from 12-15 messages. Whereas 22.40 % of the respondents got low level of adoption. Only 19.20 % of the respondents had high level of adoption of the short agricultural message telecast be Govt. agencies.

Ramzan (2003) reported that mostly about 34.7% of the respondents gain the technical assistance from dealer whereas few number of respondent gain information from other sources. A majority of respondent 70% have no response about the procedure of pest scouting whereas only 38.3%, 2.7% of the respondents were aware of these techniques about 20% of the respondent has partially informed about the mechanism of pest scouting, whereas 80% of respondent were not aware of this technique. Large majority of respondent 58% have no awareness of calibration skill.

Yasin . (2003) calculated the relationship between age group of respondents, education level, size of land holding and adoption of pesticide spray to the citrus fruit plants and found that the relationship between age group and adoption of spray of pesticide was negative . It is clear from the results that the farmers of age group 22-44 were more adopters (57%) than elders. Similarly a strong positive relationship was found between education level of citrus fruit growers and adoption of citrus pesticide spray. It means that farmers with higher education level were better adopters of practices. The relationship between size of land holding and pesticide spray to the citrus fruit plants was week which indicates that size of land holding did not affect the pesticide spray to the citrus gardens in the study area.

Abid (2004) Studied on low productivity of mango orchards; its cause and possible remedies concluded that the training needs of mango growers in different areas were required such as malformation, insect pest and diseases.

Mc Cubbin (2007) in a study of strengths and weaknesses of date palm production and marketing indicated that the production is mainly dependent on the selection of a suitable variety of mango fruit , climatic conditions, adoption of recommended production technologies etc.

Abbas (2008) pointed out that there existed a highly significant relationship between educational level of the respondents and their adoption level of recommended production technology of the date palm. It may imply that the farmers with higher level of education were more likely to adopt the recommended practices than those having little or no education. He further reported that 38.2, 25.6 and 37.2 percent of the respondents had adopted the chemicals for the control of insect/pests like Bifenthrin, Phostoxin and Metasystox etc.

Ahmad (2008) reported that plant protection (weeds, diseases, insects etc.) cultural practices, nursery raising , harvest and post harvest technology were ranked 1^{st}, 2^{nd}, 3^{rd} and fourth respectively. There mean values fell between medium and high categories but tending more towards high category.

Ingram, J. (2008) reported the knowledge of growers about the soil and its

management in England. He reported that while farmers are technically informed, they can often lack the in- depth scientific knowledge required to implement more complex practices suck as using nutrient value of manures. They also noted that, most of the farmers have good knowledge of their own soils, there tacit knowledge of soil management can be weak note ably in relation to cultivation. The paper further concludes that growers knowledge about soil and its sustainable management is well developed there are some other areas, where their knowledge should be significantly enhanced and further research and a policy response.

Iftikhar (2009) reported in his study that most conspicuous factors/constraints revealed by the respondents regarding low quality yield were lack of technical knowledge/training (41.8 percent), non availability of inputs (30.8 percent) and lack of interest (26.7 percent) reported by the farmers.

Iqbal (2009) identified a number of problems but intensity varied from low to very high. Timely unavailability of fertilizers, high prices of inputs and expensive labour for nursery transplantation were perceived to be the top most problems and fell under high category with mean values 0f 4.8, 4.3 and 4.2 respectively. While lack of finance and shortage of labour during transplantation to be high mean values of 4.0 and 3.7 respectively.

Iqbal et. al. (2009) reported that citrus growers lack in knowledge and did not know how to manage their citrus crop. The reason for low yield included poor agronomic practices. There are also no linkages between researchers and growers. Growers did not know the new citrus production technology such as irrigation, fertilization, pruning and treatment of diseases.

Rahman et al (2009) conducted study in Bangladesh on fruit diversity related household characteristics and reported that (63.75) percent of the respondents pointed out the non availability of good seed and seedlings and 85.00 percent of the respondents reported high prices of seedlings. The relationship between age, education of the respondents and fruit diversity was calculated. There was no relationship between age of the respondents and fruit diversity in their gardens. The relationship between education of respondents and fruit diversity was positive significant. The growers had higher education were more capable of growing various kinds of fruits in their gardens.

Khan (2010) reported in his study the role of electronic media that TV was at the top most having 1330 score value for the accuracy, relevance, feasible and useful information dissemination media. He also reported that highly negative relationship was observed with age and farming experience.

Nosheen (2010) concluded from her study that the farmers trusted more in information gained by local farmers followed by relatives, friends, television and radio. She also reported that the difficulties in overcoming the problems is due to the larger difference in education levels of respondents.

Shahbaz.et al. (2010) reported that in the study area majority of the respondents were small farmers. They grow wheat, maize and rice crops. There were no defective Agri. Ext. system for the dissemination of Agricultural technologies to the farmers. Growers only used time old traditional technology of crops and fruits production. Farmers obtained very low yields. There knowledge level was very low. These small farmers did not know how to get bank loans offered by banks to the farmers.

2.2 STUDIES RELATED TO TECHNICAL COMPETENCIES POSSESSED BY AGRICULTURAL TEACHERS

It appears to be necessary for a teacher to know about his subject of specialization and the method of teaching to his students to make the process of teaching and learning effective. Transfer of technology regarding agricultural crops is very necessary to increase the per acre yield of major crops. So the teacher must be competent. Enough literature is available for assessing and evaluating the technical competencies of Agri. business teachers. These studies were reviewed to learn about their methodology used for assessing their competencies and the method of their data collection from the respondents. .Some of the related studies are reviewed as under.

McGhee and Cheek (1987) conducted a study with a purpose to assess the level of mastery of the students enrolled in the Fundamentals of Agribusiness and Natural Resources Occupations Programs in Florida Schools. After the analysis of data it was concluded that 34 (44.7%) of the competencies were taught by 50-75% of the teachers. Twenty competencies (26.3%) were included in the programs of 25-50% and only three (4%) of the 76 competencies were taught by 0-25% of the teacher respondents.

A major part 70% of the fundamental competencies were taught by 50% of the teacher respondents. All of the competencies in the leadership content areas were taught by 75% or more of the teachers. However, only 2 of the 16 (12.5%) competencies in the agricultural mechanics content area were taught by 75% or more of the teachers.

Because such a small percentage of competencies related to agricultural mechanics are being taught by a majority of teachers and the students performance is very poor, emphasis should be given to strengthening the development of fundamental competencies, in service education activities to develop the agricultural mechanics skills of teachers and increased attention at the pre-service level, emphasize should be given on the role and need for instruction in agricultural mechanics in the programme of vocational agriculture.

(Martin and Sajilan, 1989) identified the teaching competencies perceived to be important to Malaysian extension personnel in teaching adult farmers.

It was concluded that all 53 competency statements were perceived as being at least moderately important to the respondents. Sixteen competencies statement were found has highly important.

Nazri and Barrick (1990) conducted a study to compare the professional knowledge competency of agricultural teachers with or without pre-service teacher preparation. It

2.3 SYNTHESIS OF THE LITERATURE REVIEWED

A number of studies has been conducted on farmers knowledge and experience regarding fruit growing, their preferences and perceptions, obstacles and field problems etc. The competencies in which fruit farmers need training has also been discussed by various authors. In most of the studies the competencies addressed in which fruit farmers need training were plant protection measures, system layout, plant to plant distance, fertilizer application, irrigations, pruning and marketing.

Various researchers have discussed competencies possessed by Extension field staff and teachers but no systematic and comprehensive study is found on the competencies of fruit farmers in Pakistan. The present study was therefore planned to fill the knowledge gap and to identify and prioritize the competencies possessed by fruit garden owners in district Faisalabad, Pakistan.

CHAPTER 3

METHODOLOGY

3.1 Research Design

This study used a descriptive research design. It was designed to identify and prioritize the competencies possessed by fruit garden owners in district Faisalabad, Pakistan. Fruit farmers are those who grow fruit crops at their farms.

3.2 Population

The population of this study consisted of fruit growing farmers (who grow any of the fruit mango, citrus, guava, and date) of District Faisalabad in the Punjab province, Pakistan.

Total area of the District is 1443,703 acres. Out of which 196,084 acres are cultivated area. The District has a population of about 5.4 millions (Govt. of Pakistan, 1998). It has five Tehsils, Faisalabad, Jaranwala, Sammundri, Tandilianwala and Chak Jhumra Tehsil. According to Agriculture Extension Departments' survey total nineteen hundred and ninety three (1993) fruit growing farmers are in District Faisalabad.

3.3 Sample

The required sample was calculated by using “Table for determining Sample Size from a given Population” developed by Fitzgibbon, and Morris, (1987).

A stratified random sample of fruit growing farmers was selected from each Tehsil.

From the total population 317 respondents were selected as sample of the study. From each Tehsil these were as under:

Tensile	Population	Sample Size
Faisalabad	496	80
Jaranwala	562	90
Sammundri	722	112
Tandilianwala	99	16
Chakjumra	114	19
Total	1993	317

3.4 Instrumentation

The researcher arranged several meetings with the academic staff of the Department of Agricultural Extension, University of Agriculture, Faisalabad and the members of supervisory committee to develop a structured interview schedule based on the review of relevant literature, personal insights of the researcher and qualitative field interviews especially the focus group interviews. The instrument was later discussed with the Horticultural staff of Agricultural Extension Department of District Faisalabad Govt. of Punjab. Then a meeting was arranged with ten prominent literate fruit growing farmers of the area who were part of the population but not that of sample to discuss the questions and items included in the instrument. In designing the instrument, the objectives of the study were kept in view. The instrument comprised X111 sections. Section”I” contained eleven points related to biographical information. The other sections comprised information related to study objectives. Section "II" consisted of information related to sources of information fruit farmers used for growing of fruit crops and contained five statements. Five point likert scales were used to assess the level of availability and correctness of the sources of information. Six and seven numbers were also on the scale, six number NA

means not applicable and NR means no response .Section "III" consisted thirteen statements regarding fruit farmer's problems which they are being faced during fruit production, protection and marketing of selected fruit plants. Section 1V, V, VI and VII contained information regarding (Mango, Citrus, Guava and Dates) plant production, protection and marketing after transplanting nursery. These practices started from the preparation of field to all other agronomic practices up to harvesting and marketing of fruits. Section XIII contained four statements related to the suggestions required to improve the knowledge level of fruit growers. Five point likert scale was used to assess the knowledge, skill, attitude and adoption level of fruit growers and six and seven number showed, not applicable and no response of the respondents. The scale used to know these levels was defined as:

1 = VL = very low

2 = L = low

3 = M = average

4 = H = high

5 = VH = very high

6 = NA = not applicable

7 = NR = no response

The instrument was reviewed by the members of supervisory committee of the researcher. Once all the needed suggestions and recommendations were considered, the instrument was field tested for validity and reliability.

3.4.1 Validity of the Instrument

For the purpose of field testing and assessing the validity and appropriateness of the instrument according to the local conditions and requirements in Faisalabad district, Pakistan, a panel of experts in the field of fruit production and Agricultural Extension was requested to provide their suggestions and comments. The members in the panel included one Associate professor, three Assistant professors, one lecturer at the Division of Education and Extension, two Associate professors from the department of Horticulture University of Agriculture Faisalabad, one Horticultural officer from Agricultural Extension Department who is working in District Sargodha and three Horticultural officers working especially in the project of rehabilitation of fruit gardens at Faisalabad district, Agricultural Extension department Govt. of Punjab were also included in the panel. A group of fruit growing literate farmers from the field participated in the discussion session. A copy of the instrument along with a brief description of the research was provided to each member two days before they were requested to discuss it. All the members were requested to judge the appropriateness of each competency statement according to their view of requirement. They were further requested to suggest any changes, additions or deletions to any statement of fruit plant production, protection, and marketing based on the relevance of each statement to the needs and expected response of the different categories of the respondents in Faisalabad district. The panel judging the validity of the instrument was given a detailed presentation of the study methodology and objectives. The panel suggested for the deletion and addition of some statements related to objectives of the study. In section, IV (plant protection measures section) the panel suggested that the symptoms of diseases must be added against the diseases for diagnosing the real diseases

and application of insecticides/pesticides/fungicides to assess the real knowledge level of the fruit growing farmers for this study. The additions and deletions made were in all the sections of the instrument.

3.4.2 Reliability of the Instrument

Generally two types of reliability are reported for instruments similar to the one used in this study, namely the coefficient of stability and the coefficient of internal consistency which is commonly called as Cronbach‘s Alpha. Cronbach’s Alpha needs a computer to be calculated. Researcher made the task possible by using Intel Pentium 5 computer with an application specifically designed for this purpose i.e. Statistical Package for Social Sciences (SPSS). In order to test the reliability of the instrument, twenty- five respondents were selected from an area adjacent to the study area where the farmers were growing fruit crops. The researcher with the help of two agricultural officers from the department of Agricultural Extension Faisalabad Govt. of the Punjab interviewed twenty five respondents in Faisalabad district for determining the reliability of the instrument. The researcher calculated the Cronbach's Coefficient Alpha for the whole instrument using the computer program Statistical Package for Social Sciences (SPSS). The Cronbach's coefficient alpha was calculated from the responses of twenty- five respondents who were not members of the selected sample. These respondents were personally interviewed by using the interview schedule. All of the data related to those 25 respondents were entered in the SPSS package and use the command to calculate the reliability coefficient. The Cronbach's coefficient alpha values for statements related to different sections ranged from 0.84 to 0.94.

3.5 Data Collection

For the collection of data, personal interviews were conducted. The instrument prepared for this purpose was named (interview schedule). Before the data collection the researcher had a detailed discussion with the agricultural officers of each Tehsil separately and trained the agricultural officers and their field assistants for the collection of data. Two days before the collection of the data, the field assistants visited the fruit farmers and discussed with them the data collection and the availability of the fruit farmer, the time and the day. Then the researcher along with the respective field assistant personally reached at the farm of the farmer at the said time and day then the field assistant go away and personally collected data from the fruit farmer. All the respondents were interviewed at their fruit farms. All the respondents were informed that the information collected from them will be kept confidential. Majority of the respondents participated in the study were happy with their own willingness. Not only did they participate but most of them expressed best wishes for the interviewing team.

3.6 Difficulties Faced in the Data Collection and Study

The researcher had to face a number of difficulties during data collection.

(1) For the collection of lists of fruit growing farmers from the Department of Agricultural Extension, Government of the Punjab the researcher had to visit many times because the concerned staff was not available at the time of first visit.

(2) For the collection of data from the fruit farmers the researcher visited the offices of the Agricultural Officers of all the Tehsils of Faisalabad District to engage field assistants with him so that the researcher might easily reach the farm of the fruit farmer and save time. There are 15 Agricultural Officers in District Faisalabad the

researcher had to visit each agricultural officers 3-4 times.

(3) Some-times, due to emergent duties, the field assistants were changed due to senior officer's visit to the field so the researcher came back with out collection of data and wasted time.

(4) Some of the fruit farmers were not available during the first visit. Thus, the researcher had to pay many visits in such cases. In many cases, the researcher had to visit two times as most of the time they were busy in purchasing inputs and repair of implements from the market.

(5) Most of the fruit farmers were suspicious about the data collection. Therefore a lot of time was spent on introductory discussions to remove their suspicious.

(6) For the collection of data from fruit farmers of district Faisalabad, the researcher used his own motor cycle to visiting the respondent's farmers in far flung villages. There were kacha roads. Many times the motor cycle got punctured and there was none of the auto repair shops in some of the remote areas.

(7) During rains, the researcher collected data from respondent farmers on foot so that a lot of time had wasted to reach the fruit farm.

(8) There were three to four villages in each union council and in each union council four to six fruit farmers were present so that total area of the union council had to be visited to reach each fruit farmer.

(9) Many times the researcher came back from the field in the late evening especially in case of the villages which were far away from his residence; he had to keep with him one person for safety.

(10) While interviewing big farmers, the researcher had to devote relatively more time as

they were always very busy all the time and tried to post- pone the interview.

(11) The researcher was so much busy with his studies during the data collection that he could not spare time especially for his two children which were then the students of important classes of Matric and F.Sc. (pre medical).

(12) For the collection of related review of literature the researcher visited many times the libraries in different cities.

(13) The researcher got admission to doctoral programe of studies on December 1996, during the study periods especially for the completion of theory course work the researcher studied late hours during nights and due to hard work the eye sight of the research worker effected and got checked from the doctor who advised him to use glasses for his distance and near vision.

3.7 Data Analysis

After a tiring activity of more than six months, data were collected from Faisalabad District related to all the categories of research study. The filled in research instruments were brought to the researchers office, where Pentium-IV computer facility was available. Before feeding the data, the researcher with the technical help of senior members of supervising committee coded all the statements of interview schedule carefully and after the span of two months he was successful in feeding the whole data by using application specifically designed for the analysis of data i.e. SPSS (Statistical Package for Social Sciences). The data related to biographical information of the respondents from each of the category were analyzed using rank orders, percentages, standard deviations and numbers.

The chi-square was calculated to find out the relationship between two variables.

CHAPTER 4

RESULTS AND DISCUSSION

The main objective of this research project was identification and prioritization of competencies possessed by fruit garden owners in District Faisalabad, Pakistan. In this chapter an effort has been made to tabulate, analyzes, discuss and interpret the data regarding the competencies of fruit growers concerning knowledge, skill, attitude and adoption levels for growing of selected fruit plants. These practices are from preparation of field, system layout, fertilizer application, plant protection measures, irrigations to marketing of fruits. The data collected from respondents regarding their sources of information they used for growing of fruit crops have been analyzed and discussed. In this chapter data regarding fruit farmer's problems which they are being faced during fruit production, protection and marketing of selected fruit plants were analyzed. The severity of the fruit farmer's problems were discussed. The biographical information regarding age, education, tenure ship, size of garden was also discussed and find out weather these influence the knowledge, skill, attitude and adoption level of respondents for fruit production, protection and marketing.

Tehsil wise distribution of the respondents is given in Table 3.

Table 3. Tehsil wise distribution of respondents

Tehsil	no.	Percent
Faisalabad	80	25.3
Tandilian wala	16	5.0
Samundri	112	35.3
Jaranwala	90	28.4
Chak Jhumra	19	6.0
Total	317	100.0

The data provided in Table 3 indicate that (35.3 percent) of the sample fruit growers belonged to Tehsil Samundri followed by respondents (28.4 percent) belonged to Tehsil

Jaranwala and (25.3 percent) from Faisalabad while only (6.0 percent) of the respondents belonged to Tehsil chak Jhumra and (5.00 percent) of the respondents belongs to Tandalianwala Tehsil respectively according to their population size.

The next table presents information regarding age level of the respondents.

Age level

It is generally observed that age factor mostly count in maturity, but we cannot mention with surety that its effects will always be significant. A number of studies pertaining to the adoption of fruit growing practices have proved age as a significant factor which affect the knowledge, skill, attitude and adoption level of the growers. In some occasions, the lower age may be more effective but it effect on other occasions. It was therefore, considered necessary to collect data about the age of the respondents. The data regarding the age level of the respondents are shown in the next table.

Table 4. Distribution of respondents according to age group

Age (years)	No of respondents	Percent
Up to 30 years	14	4.4
31 to 45 years	72	22.7
Above 45 years	231	72.9
Total	317	100.0

Tables 4 indicate that majority (72.9 percent) of the respondents fell in the age category above 45 years of age. While (22.7 percent) of the fruit growers were with in the age category of 31 to 45 years of age. The lowest (4.4 percent) of the respondents were with in the age limits of up to 30 years of age. On an average majority of the respondents were old farmers exceed the age limits.

Shah, (1992) concluded that an over whelming majority (83.33) percent of the respondent was mature enough and experience farmers. Hassan (1989) concluded that majority of the respondents were middle aged and old ones.

The next table presents information regarding education level of the respondents.

Education

Education is defined as desire able change in human behavior, by gaining knowledge, wisdom, experience, other desirable qualities of mind character and general and technical competencies. This is an important factor in the adoption of improved agricultural practices (Ahmad, 1975). Data regarding education levels of the respondents are shown in the table given below.

Table 5. Distribution of respondents according to their education level

Education level	n	%
Illiterate	24	7.6
Up to Primary (5^{th} grade)	22	6.9
Primary to Matric (10^{th} grade	75	23.7
Above Matric (above 10^{th} grade)	137	43.2
Any other diploma	59	18.6
Total	317	100.0

The data given in table 5 indicate that only (7.6 percent) of the respondents were illiterate. There were only (6.9 percent) of the respondents those only attended a primary schooling. Whereas (23.7 percent) of the respondents who had education level primary to matric. There were (43.2 percent) of the respondents which were above matric. Table further indicated that (18.6 percent) of the respondents had diploma or degree. The data in this table are also in line with the study of (Shah, 1992) and (Hussain, 1992) who reported that most of the farmers were literate and contradict Iftikhar (2009) that most of the respondents are illitrate. Gott (1981) reported that teachers, principals, and superintendents placed less emphasis on adult/young farmer education than did teachers educators and state supervisors. Marten (1987) reported that young farmers were not serious in their education which was especially designed for them in making farm management decisions.

The next table presents information regarding the size of land holding of respondents.

Size of land holding

It was assumed that the size of land holding related to the knowledge, skill, attitude and adoption of modern fruit growing practices. Respondents with large land holding could take risk and had more contacts with others. It was therefore, considers necessary to collect information about the size of land holding of the respondents. The data regarding the size of land holding are shown in the table given below.

Table 6: Distribution of respondents according to their size of holding

Land holding	No of respondents	Percent
Up to 12 acres	174	54.9
13 to 25 acres	38	12.0
Above 25 acres	105	33.1
Total	317	100.0

Table 6 reveal, that comparatively higher percentage (54.9 percent) of the respondents were commanding up to 12 acres of land followed by (33.1 percent) of the respondents having above 25 acres of land. While only (12.00 percent) of the respondents occupied 13 to 25 acres of land respectively. The results of the study are also in consonance with those of Butt (2002) and Iqbal (2008) that a large majority of the respondents was small farmers possessing up to 12.5 acres of land.

The next table presents information regarding type of tenure of the respondents.

Type of tenure

Type of tenure followed by a farmer also determines the knowledge, skill, attitude and adoption level of the fruit growing practices of the growers. According to the findings of Ahmad (1988) it showed significantly positive relationship with the adoption of improved agricultural practices. But Rauf (1986) concluded that it had no effect. The data regarding the type of tenure of the respondents are shown in the Table given below;

Table 7. Distribution of respondents according to tenancy status

Tenancy status	n	%
Owner cultivator	263	83.0
Owner-cum-tenant	15	4.7
Tenant	32	10.1
Lessee	7	2.2
Total	317	100.0

The data given in Table 7 clearly indicate that a fairly large majority of the respondents 83.0 percent were owner cultivators while 10 .1 percent of the respondents were tenants and only (4.7percent) and (2.2 percent) of the respondents were owner-cum tenants and cultivating land on lessee.. The results of this study were also in line with the study of Butt. (2002) that a fairly large majority of the fruit growers were owner cultivators.

The next table presents information regarding size of garden of the respondents.

Garden size

The size of fruit orchard some times positively affects the behavior of the growers regarding their knowledge, skill, attitude and adoption. We also know that no one from the owner of small orchard can take risk in the adoption of modern techniques of fruit growing practices due to his meager economic resources. However growers with large size orchards can be expected to do so. Keeping this fact in view fruit growers were asked the size of fruit garden they possessed. The data regarding the size of fruit garden of the fruit growers are shown in the table given below.

Table 8. Distribution of respondents according to garden size

Garden Size	No of respondents	Percent
Up to 3 acres	128	40.4
4 to 6 acres	88	27.8
Above 6 acres	101	31.8
Total	317	100.0

Table 8 reveals that (40.4 percent) of the respondents were commanding up to 3 acres of land under fruit orchards followed by (31.8 percent) of the respondents having garden size above 6 acres of land under garden while (27.8 percent) of the respondents possessed 4 to 6 acres of garden respectively.

The next table presents information regarding type of selected fruit plants planted in the filed of the respondents.

Table 9: Distribution of respondents according to type of fruit plants (out of 317)

Fruit plant (out of 317)	n	%	Area (acres)					
			Up to 3 acres		3 to 6 acres		Above 6 acres	
			n	%	n	%	n	%
Mango	131	41.3	100	76.3	19	14.5	12	9.2
Citrus	189	59.6	99	52.4	28	14.8	62	32.8
Guava	112	35.3	96	85.7	13	11.6	3	2.7
Dates	35	11.0	30	85.7	1	2.9	4	11.4

The data given in Table 9 indicate that (59.6) percent of the respondents were growing citrus fruit at their farms while (41.3) percent of the respondents were growing mango fruits at their farms while (35.3) percent and (11.0) percent of the respondents were growing guava and date fruits at their farms respectively. The data further show that some of the farmers are growing more than one type of fruit plants.

The next table presents information regarding sources of information of respondents.

Sources of information

Research knowledge generated at fruit research stations, in the universities and in the books is of little value unless it reaches to its end users the fruit growers. This knowledge needs to be disseminated effectively among the fruit growers. A number of Govt. and private agencies are disseminating the Agricultural technologies to the farmers. Awareness of the fruit growers about these agencies towards the achievement of the desired goals and objective and the frequency of availability and correctness of the information the fruit growers got from the different information sources are discussed in this Table. The

distribution of respondents according to their sources of information is shown in the table given below.

Table 10 Distribution of respondents according to sources of information (n = 317)

Source	n	%	Frequency of availability		Correctness	
			$\bar{X}$	SD	$\bar{X}$	SD
FA	278	87.7	2.58	0.68	2.13	0.65
AO	321	72.2	2.30	.066	2.48	0.66
Friends	255	80.4	2.13	0.49	2.05	0.47
Relatives	255	60.4	2.08	0.37	1.98	0.46
DDOA	152	48.0	1.80	0.69	2.47	0.69
Local Leaders	135	74.1	1.90	0.53	1.81	0.45
Zarat Nama	106	73.4	2.08	0.44	2.14	0.35
Zarii Daigest	90	28.4	1.94	0.68	1.88	0.75
Leaf let	99	31.2	1.91	0.62	1.36	0.62
TV	68	21.5	1.59	.0.63	1.41	0.50
Radio	87	27.4	1.68	0.56	1.08	0.50
Telephone	99	31.2	1.37	0.64	0.94	0.45
UAF staff	14	4.4	3.43	0.50	3.57	0.46

$\bar{X}$ = Mean. SD = Standard Deviation

Scale: 1 = very low, 2 = low, 3 = medium, 4 = high, 5 = very high

The data given in Table 10 reveal that the fruit growers had high ($\bar{X}$=3.43, SD=0.5) level for the availability of information and also had high ($\bar{X}$=3.57, SD=0.46) level for its correct ness from University of Agricultural Faisalabad, Where as the fruit growers had low ($\bar{X}$= 1.37, SD= 0.64) level for the availability of agricultural information and had low ($\bar{X}$=0.94, SD=0.45) level of correctness of telephone source. The data further show that the University of Agriculture Faisalabad had available to only 4.4 percent of the respondents and its information is correct. Similarly the telephone used by the respondents for getting information from different sources of information provide them not so much

accurate information and its Availability is also low and a few farmers use this source of information. Data show that majority of the respondents reported Extension field staff (FA and AO) friends and local leaders are their major sources of information. Nosheen (2010) reported in his study that the farmers trusted more in information gained by local farmers followed by relatives, friends. Television and radio. Khan (2010) reported that TV was at the top most having 1330 score value for the accuracy, relevance, feasible and useful information dissemination media. Zarat Nama, Zarii Digest are available to (73.4 and 28.4 percent) of the respondents and provide them information having correctness value (2.14 and 1.88). Hanif, (1992) reported that relatives/ friends/ neighbors and radio were the main information sources as reported by majority (65 and 56 percent) of the respondents, whereas, less than 20 percent of the respondents in each case had received information from television, Agricultural Extension field staff and printed material. Haq (2009) reported that majority (96.9 and 98.6 percent) of the respondent farmers knew their respective Agricultural Officers and Field Assistants and are their major sources of information. The findings of the study of Ahmad (1987) contradicted the findings of this study reported that radio proved to be the main source of information in educating the farmers about the recommended agricultural practices.

The next table presents information regarding fruit farmers' problem

Fruit farmer's problems

The area and production of fruit plants are very low in Punjab and especially in Pakistan. There are many problems which fruit growers are being faced. Some of the problems were more crucial and affected the yield and quality of fruit gardens. The data concerning the problems of fruit growers and the extent of there severity is shown in the table given below.

Table 11. Distribution of fruit farmers according to their problems (n = 317)

Fruit farmer's problems	Percentage	No	Extent of severity	
			$\bar{X}$	SD
Extra irrigation water is not available for fruit plants	94.0	298	3.89	1.13
Proper training regarding fruit growing practice are nor arranged	97.0	310	3.11	1.11
Lock of timely information regarding fruit production	93.6	297	3.08	0.95

Good quality insecticides and pesticides are not available in the markets at proper rates	91.16	289	2.40	0.86
Fertilizer is not available at proper time	80.44	255	2.13	0.88
Seedlings of good variety fruit plants are not available in the markets	95.26	302	1.76	0.84
Losses form wild animals	65.62	208	2.44	0.72
Shortage of technical labour	83.28	264	1.83	0.97
Import and export facilities are not available	47.94	152	2.66	1.15
Credit facility is not available	32.80	104	1.86	0.70
Defective marketing system	21.76	69	2.46	0.81
Non available of farm machinery	3.78	12	3.00	1.04
Ground water quality deterioration	3.78	12	3.00	1.04

$\bar{X}$ = Mean. SD = Standard Deviation
Scale: 1 = very low, 2 = low, 3 = medium, 4 = high, 5 = very high

It can be concluded from the data given in Table 11 that the fruit growers faced many problems the extent of severity had high ($\bar{X}$ =3.89 SD=1.13) level for shortage of irrigation water and the extent of severity had medium ($\bar{X}$=3.11 SD=1.11) level regarding proper training of fruit growers for fruit growing are not arranged. The data show that the problem had medium ($\bar{X}$=3.08 SD =0.95) level for lack of timely information regarding fruit production technology. Data further show that fruit growers had low ($\bar{X}$= 1.76 SD=0.84) level of severity regarding "seedling of good quality fruit plants are not available". The data further indicate that the most crucial problem was non availability of extra irrigation water for fruit plants, "proper training regarding fruit growing practices was not available" and lack of timely information regarding fruit production technology. It can be concluded from the data that fruit growers need training regarding fruit production technology and timely information must be provided to them for fruit production. Data further show that University of Agriculture Faisalabad provided correct information to a few fruit growers it should develop short courses for the training of all the fruit growers of District Faisalabad regarding fruit growing practices. Hussain (1992) reported that major

difficulties being faced by the respondents in order of their seriousness were defective marketing system, high cost of inputs, lack of finance, non availability of insecticides/ pesticides, lack of technical knowledge, adulteration in pesticides, lack of plant protection machinery and non cooperation of Agriculture Department. Iqbal (2009) reported that for rice crop timely unavailability of fertilizers, high prices of inputs and expensive labour for nursery transplantation were perceived to be the top most problems and fell under high category with mean values of 4.8, 4.3 and 4.2 respectively.

The next table presents information regarding competencies of fruit growers concerning preparation of field for transplantation of selected fruit plants in the field.

Preparation of fields

According to the recommendations of the Department of Agriculture (Extension and Adaptive Research) Govt. of the Punjab the soil required for fruit production should be sandy loam to loam. The depth of the soil profile should be at least 6 feet deep. Compact structure, hard, stony and salt affected soils should be avoided. The ph of soil 6.5 is better for citrus cultivation but it can be grown on soils having more than 7.00 ph values. The soil required for guava and date cultivation is sandy or sandy loam. Selected field should be deeply ploughed four to six times followed by harrowing to root out the perennial weeds and heavy clods along with planking. This is followed by proper leveling of land and a gentle slope is provided in one direction to facilitate irrigation as well as drainage of excess water during rains. By doing such practices root penetration becomes easier for better growth of fruit plants. Preparation of field is very necessary for weed control and for improvement of soil fertility. It makes pit forming easy. The data concerning respondents' knowledge, skill, attitude and adoption level regarding preparation of field for selected fruits nursery plants are shown in the table given below.

Table 12 Means and standard deviations of respondents' knowledge, skill, attitude and adoption level regarding preparation of field for transplantation of selected fruit nursery plants.

Plant	Number of respondents n	Knowledge		Skill		Attitude		Adoption	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Mango	131	2.92	0.64	2.22	0.87	2.94	0.68	2.13	0.88

Citrus	189	3.11	0.38	2.53	0.32	2.95	0.46	2.20	0.56
Guava	112	3.25	0.59	2.57	0.90	3.02	0.69	1.81	0.88
Dates	35	2.71	0.79	2.06	0.72	2.66	0.80	1.89	0.83

Scale: 1=very low, 2= low, 3= medium (average), 4= high, 5= very high

$\bar{X}$ = mean, SD = standard deviation

It can be concluded from the data given in Table 12 that guava growers had medium ($\bar{X}$=3.25) level of knowledge regarding preparation of field for transplantation of nursery plants; while the date growers had low ($\bar{X}$=2.71) level of knowledge regarding field preparation practices. Similarly guava growers had medium ($\bar{X}$ =2.57) level of skill regarding field preparation practices and date growers had low ($\bar{X}$ = 2.06) level of skill concerning field preparation practices. Among the four selected fruit plants the respondents knowledge regarding the land preparation practice for guava plant was highest where as their knowledge regarding the land preparation practice for date was lowest. The data further showed that guava growers had medium ($\bar{X}$=3.02) level of attitude and date growers had low ($\bar{X}$=2.66) level of attitude regarding field preparation practices. The level of adoption practices was low ($\bar{X}$=2.20) by the citrus growers and that of guava growers ($\bar{X}$=1.81). Thus the fruit growers had low to medium level of knowledge, skill, attitude and adoption which indicate a need to train farmers regarding field preparation practices. Data further indicate that guava growers had better knowledge, skill and attitude level than other fruit growers had. The mean level of adoption was highest in case of citrus growers as compared to the mean level of adoption of land preparation practices for mango, dates, and guava plants. To know the reason for this difference, the researcher conducted a qualitative interview of key informants and reached to the conclusion that the better adoption in citrus fruit was due to the high return in citrus fruit as compared to other fruits. The reason for overall low rate of adoption was due to high rate of diesel and tractor hiring charges. The findings of Abuzer (2003) were also in line with the results of this study indicating that adoption level of ploughing and planking was lower than awareness. Hussain et al. (1990) reported that by the adoption of recommended ploughing and planking practices yield can be increased significantly. The low to medium levels of knowledge, skill and attitude of field preparation practices indicate the growers low level of competence. Therefore the adoption level was also low.

The next table presents information regarding competencies of fruit growers concerning layout system for transplantation of selected fruit plants.

Layout system

According to the recommendations of the Department of Agriculture (Extension and Adaptive Research) govt. of the Punjab there are many systems of layout for transplantation of fruit nursery plants in the field like square, rectangular, quincunx hexagonal etc. Every system of layout has its merits and demerits. Proper layout system is necessary for fruit orchard. Fruits are planted in a north to south orientation for best exposure to the sun. Varying distances are used between the plants and rows. Fruit production is on the out canopy of the tree. Some growers plant fruit plants densely, proper pruning gives more outer canopy per hectare and more yield. Good layout system makes the different operations easy such as weed control, cultivation, aeration and harvesting of fruits. It results in proper humidity in the microclimate around the fruit, makes spray coverage easy, results in more healthy fruits, is also a source of attraction to mankind. Proper layout system has a beautiful scenic view and commensurate the aesthetic value of human being. People feel enlightened and fresh while visiting gardens of beautiful layout especially when the fruit plants are at flowering and fruiting stage. Proper garden designs are a source of recreation for human being and add beauty to the fields when they are planted by using appropriate recommended designs and play an important role in moderating the microclimate of the area. The data concerning respondents' knowledge, skill, attitude and adoption level regarding layout systems of selected fruits in the gardens are shown in the table given below.

Table 13. Means and standard deviations of respondents' knowledge, skills, attitude and adoption levels regarding system layout for transplantation of selected nursery plants.

Plant	Number of respondents	Knowledge		Skill		Attitude		Adoption	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Mango	131	3.01	0.55	2.04	0.85	2.57	0.97	2.60	0.81
Citrus	189	**2.85**	**0.39**	**2.30**	**0.30**	**2.35**	**0.69**	**2.73**	**0.26**
Guava	112	2.80	0.64	2.16	0.87	2.58	0.90	2.36	0.74

Dates	35	2.65	0.67	2.07	0.97	2.39	0.88	2.63	0.89

Scale: 1=very low, 2= low, 3= medium (average), 4= high, 5 = very high

$\overline{X}$= mean, SD= standard deviation

The data given in Table 13 indicate that mango growers had medium (average) ($\overline{X}$=3.01) level of knowledge regarding layout system; while the date growers had low ($\overline{X}$ = 2.65) level of knowledge for system layout for transplantation of nursery plants in the field. Citrus growers had ($\overline{X}$=2.30) low level of skill and mango growers had low ($\overline{X}$ = 2.04) level of skill for system layout; where as guava growers had low ($\overline{X}$=2.58) level of attitude and citrus growers had low ($\overline{X}$=2.35) level of attitude regarding system layout. The citrus growers had low ($\overline{X}$=2.73) level of adoption and guava growers had low ($\overline{X}$=2.36) level of adoption regarding system layout for transplantation of nursery plants. On an average the fruit growers had low to medium level of knowledge, skill, and attitude which indicate a need to train farmers regarding system lay out for transplantation of nursery plants. Data further show that citrus growers were better adopters of these practices because from citrus gardens growers gain more income than other fruits. The mango and citrus growers are more knowledge able skill full and better adopters than guava and date growers because mango and citrus fruits gave more income and are delicate; a little mistake in transplanting can destroy the plant.

Hussain (1992) reported the same results in the case of system layout for transplanting mango nursery plants in the field. The low to medium levels of knowledge, skills and attitude regarding system layout practices indicate the growers low level of competence. Therefore the adoption level is also low.

The next table consists of information regarding respondents' knowledge, skill, and attitude and adoption level regarding plant to plant distance for transplanting selected fruit plants in the field.

Proper Plant to plant distance

Proper plant to plant distance is very necessary with regard to get maximum yield of each variety of each fruit plants. Mangoes are planted at varying distances between trees and rows. In dried areas with out irrigation, wider spacing is necessary in order to decrease competition for the limited amount of irrigation water. According to the recommendations

of the Department of Agriculture (Extension and Adaptive Research) govt. of the Punjab the proper distance for mango plant transplanting are 25-40 feet according to the varieties and size of plants. The citrus and guava plants are planted at a distance of 20-25 feet row to row and line to line. The date plants are planted at a distance of 20-22 feet row to row and line to line distance is the same. Which is important for easily weed control, easy cultivation, spray, intercropping, optimum aeration, good light and proper sunshine The data concerning respondents' knowledge, skill , attitude and adoption level regarding plant to plant distance for transplanting in the field of selected fruit plants are shown in the table given below.

Table 14. Means and standard deviations of respondents' knowledge, skills, attitudes and adoption level regarding plant to plant distance for transplantation of selected fruit nursery plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.97	0.49	2.53	0.73	2.36	1.02	2.71	0.65
Citrus	189	2.94	0.29	2.94	0.29	2.87	0.44	2.76	0.24
Guava	112	2.77	0.55	2.22	0.81	2.69	0.69	2.31	0.58
Dates	35	2.85	0.36	1.87	0.85	2.60	0.70	2.60	0.49

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\overline{X}$= mean, SD= standard deviation

The data given in Table 14 depicts that mango and citrus growers had nearly same medium (average) ($\overline{X}$=2.97-2.94) level of knowledge where as guava growers had medium ($\overline{X}$=2.77) level of knowledge regarding plant to plant distance for transplantation of selected fruit plants. The citrus growers had medium (average) ($\overline{X}$=2.94) level of skill and date growers had low ($\overline{X}$=1.87) level of skill. The citrus growers had medium ($\overline{X}$=2.87) level of attitude and mango growers had low ($\overline{X}$=2.36) level of attitude regarding plant to plant distance for transplanting selected fruit nursery plants in the field. The citrus growers had medium ($\overline{X}$ = 2.76) level of adoption and guava growers had low ($\overline{X}$ =2.31) level of adoption regarding plant to plant distance for transplanting in the field. It means that on the average citrus growers had medium level of knowledge, skill and attitude ($\overline{X}$ = 2.94- 2.76) level which indicate that fruit growers are more interested in citrus gardening because of high returns in this fruit. Table further indicate that fruit growers had medium to low level of knowledge, skill, attitude and adoption level which indicate a need to train farmers

regarding these practices. Sharif (1990) also concluded that plant to plant distance was adopted by comparatively lesser number of respondents.

The next table depicts the information regarding the competencies of fruit growers for size of planting pit for transplantation of selected fruit nursery plants in the field.

Size of planting pit

The life span of selected fruit plants are above 30 years. So a certain size of pit is necessary for plant health, yield and plant life. The size of the pit depends upon the type of soil, species varieties of fruits. It should be larger in heavy soils smaller in sandy soils Malik, (1994). The data concerning respondents knowledge, skill, attitude and adoption level regarding the size of planting pit for transplanting selected fruit nursery plants are shown in the following table.

Table 15. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding size of planting pit for transplantation of selected fruit nursery plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.77	0.63	2.39	0.86	2.59	0.83	2.66	0.72
Citrus	189	2.90	0.17	2.57	0.12	2.87	0.16	2.74	0.23
Guava	112	2.90	0.31	2.61	0.69	2.90	0.31	2.61	0.49
Dates	35	2.56	0.51	2.32	0.48	2.37	0.66	2.56	0.51

Scale: 1=very low, 2= low, 3= medium, 4= high, 5 = very high

$\overline{X}$= mean, SD= standard deviation

The data given in Table 15 show that citrus and guava growers had medium (2.90, 2.90) level of knowledge and date growers had medium (X=2.56) level of knowledge regarding size of planting pit for transplantation of fruit nursery plants. Whereas the guava growers had low ($\overline{X}$=2.61) level and date grower had low ($\overline{X}$=2.32) level of skill regarding size of planting pit. While guava growers had low ($\overline{X}$ = 2.90) level of attitude and date growers had low ($\overline{X}$=2.37) level of attitude for transplanting nursery plants in the field. Whereas citrus growers had medium ($\overline{X}$ =2.74) Level of adoption and date growers had low ($\overline{X}$ =2.56) level of adoption regarding size of planting pit for transplanting of fruit nursery plants in the field. It means that fruit growers had low to medium level of knowledge, skill and attitude; which indicate a need to trained farmers regarding these practices. Shah (1992) suggested that (51.35) percent of the respondents were aware of the recommended

size of planting pit, while only 10 percent of them had adopted. The above findings are contrary to some extent to those of Sharif (1990) who concluded that 70.00 % of the respondents were aware of and had adopted recommended planting pit size for citrus fruit plants. Niazi (1993) showed the similar results to this study that only 40.00 percent of the respondents were aware of and only 26.67 percent of them had adopted the recommended pit size.

The data concerning respondents' knowledge, skill, attitude and adoption level regarding the competencies of fruit growers for filling of pits for transplantation of selected fruit nursery plants in the field are shown in the next table.

Filling of pits

Pits are dug. When the soil is taken out of the pit, the soil from the upper half is placed on one side, and that from the lower half on the other side. The pit is filled in after a month or so, care being taken that the top goes to the bottom, while the bottom soil comes to the top. Before filling in, a mixture of well decomposed compost, ash and chemical fertilizers are also mixed in the soil containing N, P, K. When the pit has been filled to the top level; some surplus soil is kept in reserve for leveling the pit if it gradually sinks afterwards. The digging and filling it with weathered soil is to provide conditions congenial to proper development of the young plant. The data concerning respondents' knowledge, skill, attitude and adoption level regarding filling of pits for selected fruit plants are shown in the table given below.

Table 16. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding filling of pits for transplantation of selected nursery fruit plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.90	1.07	2.84	1.03	2.90	1.07	2.15	1.10
Citrus	189	3.17	0.67	3.15	0.66	3.23	0.61	3.02	0.63
Guava	112	3.20	1.06	3.12	1.05	3.16	1.09	3.03	1.06
Dates	35	3.30	0.93	3.07	0.69	3.30	0.70	3.30	0.93

Scale: 1=very low, 2= low, 3= medium, 4= high, 5 = very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in table 16 that date growers had medium ($\overline{X}$=3.30) level and mango growers had ($\overline{X}$= 2.90) level of knowledge regarding filling of pits for transplantation of fruit nursery plants. The citrus growers had medium ($\overline{X}$=3.15)

level and mango growers had medium ($\overline{X}$=2.84) level of skill for filling of pits for transplantation of plants. The date growers had medium ($\overline{X}$=3.30) level and mango growers had medium ($\overline{X}$=2.90) level of attitude regarding filling of pit for transplantation of fruit nursery plants; whereas date growers had medium ($\overline{X}$=3.30) level of adoption and mango growers had ($\overline{X}$= 2.15) level of adoption practices regarding filling of pits with ingredients of fill for transplantation of selected fruit nursery plants in the field. Data indicate that date growers had maximum medium level of skill, attitude and adoption; this was because the date nursery plants are rare and expensive so the fruit growers plant it with more care. Abbas (2008) reported that adoption level of pit plantation practices was lower than the awareness. Data further show that fruit growers had medium (average) knowledge, skill, attitude and adoption level which indicates a need to trained farmers regarding filling of pits with ingredients of fill before transplanting fruit nursery plants in the field.

The next table presents information regarding competencies of fruit growers regarding fertilizer application less then five years of aged selected fruit plants after transplanting in the filed.

Fertilizer application

The selected fruit plants are perennial in nature as such are maintained on the same site for couple of years. Accordingly the nutrition of these trees should be done with due consideration to minimize the adverse effects. Our productive soils are generally alluvial in nature and due to continuous cropping since ages are deficient in nitrogen, phosphorous and potash which are the major nutrients which significantly affect the plant health, growth, its productivity, life duration in addition to quality of its fruit. Nitrogen being a component of amino acids chlorophyll promotes rapid vegetative growth imparts plants a healthy green colour. It increases protein content besides increasing fruit yields and quality of fruits. On the other hand, an excess of nitrogen leads to excessive succulent growth and susceptibility to pest and diseases attack. According to the recommendations of the department of agricultural (Extension and adaptive research) Govt. of the Punjab the requirement of nitrogen for all selected plants less than five years of age are 20-30 kgs. of farm yard manure and 1500 gram urea fertilizer per plant per year for mango plant. Citrus, guava and date plants 1 kilo gram urea per plant per year. Phosphorous plays a major role

in photosynthesis and other chemical physiological processes. It stimulates early growth and root formation, hastens maturity seed formation and contributes to the hardness of plants. Without phosphorous seed will be sterile and fruits not ripen. The requirement of phosphorous for less than five years of age selected fruit plants are 700 gram triple super phosphate per plant per year. Potassium is essential for a variety of processes, photosynthesis rates, fruit formation, winter hardiness and disease resistance. It actually regulates water absorption, the formation of carbohydrates and their accumulation in the plant potassium increases absorption capacity for water, improves quality, and induces tolerance to diseases, drought, frost and salinity. The requirement of potash for these plants are 600 gram per plant per year.

The data concerning respondents' knowledge, skill, attitude and adoption level regarding fertilizer application for less than five years of age are shown in the next table.

Table 17. Means and standard deviations of respondents' knowledge, skill, attitude and adoption level regarding fertilizer application less than five years of age plants after transplantation of selected fruit nursery plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.68	0.81	2.65	0.78	2.68	0.81	2.51	0.92
Citrus	189	2.81	0.48	2.72	0.54	2.84	0.47	2.67	0.62
Guava	112	3.00	0.69	2.86	0.77	3.00	0.63	2.70	0.91
Dates	35	2.78	1.04	2.56	0.95	2.78	1.09	2.67	1.16

Scale: 1=very low, 2= low, 3= medium (average), 4= high, 5 = very high

$\overline{X}$= mean, SD= standard deviation

It can be seen from the data given in Table 17 that guava growers had medium (average) ($\overline{X}$=3.00) level of knowledge and mango growers had low ($\overline{X}$=2.68) level of knowledge regarding fertilizer application less than five years of age plants. The guava growers had medium ($\overline{X}$=2.86) level of skill and date growers had low (2.56) level of skill regarding fertilizer application less than five years of age plants. Similarly guava growers had medium ($\overline{X}$=3.00) level of attitude and mango growers had low ($\overline{X}$=2.68) level of attitude regarding fertilizer application less than five years of age plants where as guava growers had low ($\overline{X}$=2.70) level of adoption and mango growers had low ($\overline{X}$= 2.51) level of adoption regarding fertilizer application for less than five years of age fruit plants. Data show that fruit growers had low to medium level of knowledge, skill, attitude and adoption

which indicate a need to train farmers regarding fertilizer application practices. Data further show that guava growers had more knowledge, skill, attitude and adoption regarding fertilizer application for less than five years of age plants. (Hassan ,1989) concluded that nitrogen , phosphorus and potash are major nutrients ,which significantly affect the plant health , growth , productivity and life duration in addition to quality of its fruit. Ramasubramanian and Manoharan (2003) reported that the preferred areas of training for mango growers were fertilizer management.

Cheema and malhi (1986) reported that timely application of fertilizer is very essential for mango production and further concluded that the incidence of powdery mildew of mango decreased with rising rates of N, P,K. Shah (1992) reported similar results to this study that 6.0 percent, 4.87 percent and 1.34 percent of the respondents were aware of the fertilizer application to plants aged 1-4, 5- 9, and above 9 years respectively and the adoption was very discouraging.

The next table presents information regarding competencies of fruit growers concerning fertilizer application from five to ten years of aged selected fruit plants in the field.

According to the recommendation of the Department of Agriculture (Extension and Adoptive Research) Govt. of the Punjab the requirement of fertilizer application for five to ten years of age mango, citrus and guava plants are 50 kgs. Farm yard manure and 2 kgs. urea, 1.5 kgs. DAP and I kgs. Potash per plant per year are recommended. For date fruit plants 40 kgs. Farm yard manure, 750 gram urea, 500 gram DAP and 500 gram potash per plant per year are recommended. The next table presents information regarding competencies of fruit growers concerning fertilizer application from five to ten years of aged selected fruit plants.

Table 18. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding fertilizer application five to ten years of aged plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Mango	131	2.75	0.80	2.71	0.76	2.75	0.80	2.60	0.91
Citrus	189	2.87	0.59	2.79	0.64	2.89	0.58	2.76	0.68
Guava	112	3.00	0.69	2.86	0.77	3.09	0.69	2.78	0.90
Dates	35	2.78	1.04	2.52	0.96	2.73	1.05	2.67	1.16

Scale: 1=very low, 2= low, 3= medium, 4= high, 5 = very high

$\bar{X}$= mean, SD= standard deviation

It is quite evident from the above Table 18 that guava growers had medium ($\overline{X}$=3.00) level of knowledge and mango growers had medium ($\overline{X}$= 2.75) level of knowledge, and guava growers had medium ($\overline{X}$=2.86)level of skill and date growers had low ($\overline{X}$ =2.52) level of skill regarding fertilizer application five to ten years of age plants. While guava growers had medium ($\overline{X}$ = 3.09) level and date growers had low ($\overline{X}$ =2.73) level of attitude regarding fertilizer application. The guava grower had medium ($\overline{X}$ =2.78) level of adoption and mango grower had low level ($\overline{X}$ =2.60) level of adoption regarding fertilizer application practices five to ten years of age plants. It means that growers had medium to low level of knowledge, skill and attitude which indicates that farmers need training regarding fertilizer application for plants aged five to ten years in the field. (Puri-sg and Ghodki-bv, 1999) also concluded in their study that sapota growers (74.0 percent) were least knowledge able in the use of manures and chemical fertilizers for sapota cultivation.

Niazi (1993) also indicated the similar results to this study that only 23.33 percent of the respondents applied the recommended doze of Farm yard manure to 1-10 years old plants. He further reported that phosphorous was applied by a negligible minority of the respondents and only 20 percent knew the recommended doze of phosphorous at the plant age of 1-8 years.

The next table depicts the information regarding the competencies of fruit growers concerning fertilizer application above 10 years of aged selected fruit plants in the field.

Fertilizer application above ten years of age mango plants are 100 kgs. farm yard manure 3 kgs. urea, 2 kgs DAP and 2 kgs potash for citrus plants, 80 kgs. farm yard manure, 2.5 kgs urea, 2 kgs. DAP and 1.5 kgs. potash and for guava plants 50 kgs. farm yard manure, 1 kgs. urea, 1 kgs. DAP and 1 kgs. potash per plant per year are required. For date plants 40 kgs. farm yard manure, 3 kgs urea, 1.5 kgs. DAP and 2 kgs potash per plant per year are required.

The next table presents information regarding competencies of fruit growers concerning fertilizer application above ten years of aged selected fruit plants are shown in the following table.

Table 19 Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding fertilizer application above ten years of old selected fruit plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Mango	131	2.82	0.80	2.76	0.78	2.81	0.80	2.70	0.92
Citrus	189	2.92	0.53	2.84	0.58	2.92	0.53	2.84	0.59
Guava	112	3.00	0.70	2.85	0.78	3.07	0.64	2.78	0.91
Dates	35	2.78	1.04	2.51	0.95	2.78	1.04	2.67	1.16

Scale: 1=very low, 2= low, 3= medium, 4= high, 5 = very high

$\bar{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 19 that guava growers had medium ($\bar{X}$=3.00) level of knowledge while the date growers had minimum medium ($\bar{X}$=2.78) level of knowledge regarding fertilizer application practices. Similarly guava growers had medium ($\bar{X}$ =2.85) level of skill and date growers had low ($\bar{X}$ = 2.51) level of skill concerning fertilizer application practices. Data further show that guava growers had medium ($\bar{X}$=3.07) level of attitude and date growers had low ($\bar{X}$=2.78) level of attitude regarding fertilizer application practices. While the level of adoption practices was medium ($\bar{X}$=2.84) by the citrus growers and that of date growers had low($\bar{X}$=2.67) level of adoption regarding fertilizer application practices above ten years of age plants. Thus the fruit growers had low to medium level of knowledge, skill and attitude which indicate a need to trained farmers regarding fertilizer application practices. Table further indicate that guava growers had better knowledge, skill and attitude level than other fruits and citrus growers had better adoption level for fertilizer application above ten years of age fruit plants.

The study of Niazi, (1993) regarding fertilizer application to different aged mango plants concluded that only 23.33 percent of the farmers were aware of recommended doze of fertilizer for above ten years of aged plants.

The next table depicts the information regarding the competencies of fruit growers for time of fertilizer application for fruit plants after transplantation of selected fruit plants in the field.

Time of fertilizer application

Optimum time for manuring of selected fruit plants are before flowering, after ploughing or hoeing the land under the canopy of the plant, earthing up to 1.5 feet around the trunk should be done. Then mix the organic and chemical fertilizers in the soil 1/2 nitrogen +all potash+ phosphorous followed by irrigation. The remaining dose should be used in similar manner before fruit formation. These mixed fertilizers are another way of enhancing the fertility of orchards which along with contribution of essential nutrients improves the physical properties of soil, i.e., structure, aeration, water holding capacity of the soil. The data concerning respondents' knowledge, skill, attitude and adoption level regarding time of fertilizer application for selected fruit plants are shown in the following table.

Table 20. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding time of fertilizer application after transplantation of selected nursery fruit plants.

Plant	N	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.18	0.62	2.13	0.56	2.17	0.56	2.04	0.61
Citrus	189	2.30	0.17	2.25	0.21	2.23	0.16	2.04	0.07
Guava	112	2.27	0.53	2.18	0.47	2.14	0.55	1.98	0.74
Dates	35	2.57	0.66	2.40	0.50	2.34	0.48	2.23	0.84

Scale: 1=very low, 2= low, 3= medium, 4= high, 5 = very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 20 that date growers had low ($\overline{X}$=2.57) level of knowledge while the mango growers had low ($\overline{X}$=2.18) level of knowledge regarding time of fertilizer application practices. Similarly date growers had low ($\overline{X}$ =2.34) level of attitude and guava growers had low ($\overline{X}$ = 2.14) level of attitude concerning time of fertilizer application practices.. Data further show that date growers had low ($\overline{X}$=2.23) level of adoption and mango and citrus growers had low ($\overline{X}$=2.04, 2.04) level of adoption regarding time of fertilizer application practices to fruit plants. Data further indicate that the fruit growers had low level of knowledge, skill, attitude and adoption which indicate a need to trained farmers regarding proper time of fertilizer application practices to the selected fruit plants. Abbas (2008) reported that a simple majority (57.00) had adopted the recommended time of fertilizer application.

Niazi (1993) concluded similar results as this study, reveals that half of the respondents knew the proper time of application of chemical fertilizers. Time of application of farm yard manure was known to only 20.00 percent of the respondents and only 16.66 percent of them had adopted farm yard manure at proper time.

According to the results of the study of Hussain (1992) 69-76 percent of the respondents were aware of the time of application of fertilizer to citrus plants and 43- 55 percent had adopted.

The next table depicts the information regarding the competencies of fruit growers regarding irrigation for selected fruit nursery plants in the field.

Irrigations

Fruit plants selected are perennial trees, their maximum root net work prevail in four feet depth. To this much depth, moisture should reach for proper transportation of water and available nutrients into the plant against gradient. However, the schedule of irrigation may be adjusted according to season, rainy days, stage of growth etc. Due to fast growth of trees, branches, leaves and fruits the water requirement increases. Therefore, in hot months of may and June irrigation must be applied weekly or after 10-12 days in summer. Avoid irrigation in rainy season and during flowering. Shallow irrigation should be done with reasonable intervals during cold nights. The data concerning respondents' knowledge, skill, attitude and adoption level regarding application of irrigation water in summer for selected fruit plants are shown in the table given below.

Table 21. Means and standard deviations of respondents' knowledge, skill, attitude and adoption level regarding application of irrigation water in summer after transplantation of selected nursery fruit plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Mango	131	2.53	0.72	2.49	0.68	2.34	0.86	1.98	0.83
Citrus	189	2.61	0.29	2.61	0.28	2.26	0.53	2.03	0.37
Guava	112	2.82	0.42	2.79	0.44	2.51	0.60	1.97	0.84
Dates	35	2.89	0.78	2.55	0.72	2.78	0.67	2.80	0.82

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\bar{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 21 that date growers had medium ($\overline{X}$=2.89) level of knowledge while the mango growers had low ($\overline{X}$=2.53) level of knowledge regarding irrigation in summer. Similarly guava growers had medium ($\overline{X}$ =2.79) level of skill regarding irrigation practices and mango growers had low ($\overline{X}$ = 2.49) level of skill concerning irrigation practices. Data further show that date growers had medium ($\overline{X}$=2.78) level of attitude and citrus growers had low ($\overline{X}$=2.26) level of attitude regarding irrigation practices. While the level of adoption practices was ($\overline{X}$=2.80) low by the date growers and that of guava growers had low ($\overline{X}$=1.97) level regarding irrigation in summer. Thus the fruit growers had low to medium level of knowledge, skill, attitude and adoption which indicate a need to trained farmers regarding irrigation practices in summer to selected fruit plants. Data further indicate that date growers had better knowledge, skill and attitude level than other fruit plants.

Shah, (1992) also reported that farmers had medium level of knowledge regarding irrigation to mango fruit plants. Hassan (1989) concluded in his study that awareness among the orchard growers pertain to recommended number of irrigations to be applied to the citrus plants during a year at 1-4 and 5-9 year stage was 38.33 and 46.67 percent respectively. While the adoption of recommended number of irrigations during the year at the 1-4 and 5-9 year plant age stages was 2.5 and 4.17 percent respectively. However it was relatively high, i. e. 21.67 percent at the above 9 years plant age level.

The next Table depicts the information regarding the competencies of selected fruit growers for application of irrigation water in winter.

Winter

Table 22. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding application of irrigation water in winter to selected fruit plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.72	0.65	2.63	0.68	2.51	0.81	2.33	0.89
Citrus	189	2.53	0.22	2.47	0.20	2.36	0.23	2.06	0.33
Guava	112	2.63	0.74	2.58	0.71	2.53	0.81	2.12	0.92
Dates	35	3.14	0.69	2.85	0.70	2.66	0.96	3.14	0.69

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 22 that date growers had medium (average) ($\overline{X}$=3.14) level of knowledge and citrus growers had low ($\overline{X}$=2.53) level of knowledge regarding irrigation in winter. Similarly date growers had medium ($\overline{X}$ =2.85) level of skill and citrus growers had low ($\overline{X}$ = 2.43) level of skill concerning irrigation practices in winter. Data further show that date growers had low ($\overline{X}$=2.66) level of attitude and citrus growers had low ($\overline{X}$=2.36) level of attitude regarding irrigation practices in winter. While the date growers had medium ($\overline{X}$=3.14) level of adoption and the citrus growers had ($\overline{X}$=2.06) level of adoption regarding irrigation in winter to selected fruit plants. Thus the fruit growers had low to medium level of knowledge, skill, attitude and adoption which indicate a need to trained farmers regarding application of irrigation water to selected fruit plants. Data further indicate that date growers had better knowledge, skill, attitude and adoption level than other fruits regarding application of irrigation water in winter to selected fruit plants.

Spring

Table 23. Means and standard deviations of respondents' knowledge, skills, attitude adoption level regarding application of irrigation water in spring after transplantation of selected nursery fruit plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.71	0.56	2.64	0.57	2.26	0.81	2.28	0.82
Citrus	189	2.66	0.18	2.66	0.18	2.45	0.17	2.38	0.28
Guava	112	2.57	0.50	2.53	0.51	2.52	0.51	2.19	0.56
Dates	35	2.77	0.69	2.75	0.73	2.80	0.68	2.80	0.68

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\overline{X}$= mean, SD= standard deviation

The data given in Table 23 indicate that date growers had low ($\overline{X}$=2.77) level of knowledge and guava growers had ($\overline{X}$=2.57) level of knowledge regarding irrigation practices in spring. Similarly date growers had low ($\overline{X}$ =2.75) level of skill and guava growers had low ($\overline{X}$ = 2.53) level of skill concerning irrigation practices. Data further show that date growers had low ($\overline{X}$=2.80.) level of attitude and mango growers had low ($\overline{X}$=2.26) level of attitude regarding irrigation in spring. While the adoption practices had low ($\overline{X}$=2.80) level by the date growers and that of guava growers was low ($\overline{X}$=2.19) level of adoption for irrigation in spring. Thus the fruit growers had low to medium level of knowledge, skill, attitude and adoption which indicate a need to trained farmers regarding irrigation in spring. Table further indicate that date growers had better knowledge, skill and attitude level than other fruits indicating th**at** date growers are better competent in irrigation practices.

The next table depicts information regarding application of irrigation water in autumn to selected fruit plants.

Autumn

Table 24. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding application of irrigation water in autumn to selected fruit plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.66	0.55	2.59	0.56	2.24	0.76	2.26	0.82
Citrus	189	2.56	0.23	2.55	0.24	2.43	0.32	2.10	0.35
Guava	112	2.39	0.56	2.37	0.55	2.36	0.68	2.17	0.53
Dates	35	2.89	0.76	2.75	0.61	2.60	0.73	2.89	0.76

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\overline{X}$= mean, SD= standard deviation

The data given in Table 24 concluded that date growers had medium ($\overline{X}$=2.89) level of knowledge and guava growers had low ($\overline{X}$=2.39) level of knowledge regarding irrigation in autumn. Similarly date growers had medium ($\overline{X}$ =2.75) level of skill and guava growers had low ($\overline{X}$ = 2.37) level of skill concerning irrigation practices in autumn season. Data further show that date growers had low ($\overline{X}$=2.60) level of attitude and mango growers had low ($\overline{X}$=2.24) level of attitude regarding irrigation practices in autumn. While the adoption practices was medium ($\overline{X}$=2.89) level by the date growers and that of citrus growers was low ($\overline{X}$=2.10) level of adoption. Thus the fruit growers had low to medium level of knowledge, skill, attitude and adoption. Data further indicate that date growers had better knowledge, skill and attitude level than other fruits and are more adopter of irrigation practices.

The next table depicts the information regarding the competencies of fruit growers for the application of irrigation method after transplantation of selected fruit nursery plants in the field.

Irrigation method

The efficient use of water is dependent on the most suitable method of irrigation. No more irrigation than is sufficient to wet the soil-mass occupied by the root system of the crop is to be applied at any one time, there should be no wastage by run-off from the area irrigated. This is only possible by the use of the correct method. The main factors governing the choice of method are 1= size, spacing, system of planting of the trees, 2 = size of the stream duration of the flow, 3= method of delivery (open ditch, flume, or underground pipe), 4= soil characteristics (5) topography, or slop of the field, (6) depth of water to be applied. With so many variables, that the method of application would have to be varied to suit a particular situation, which may be their some total of all these factors acting together. The selection of the proper method can, therefore, at best be only compromise. The different methods of irrigation fall into four general classes. The data concerning respondents' knowledge, skill, attitude and adoption level regarding irrigation method for selected fruit plants are shown in the table given below.

Table 25. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding irrigation method after transplantation of selected fruit nursery plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.82	0.57	2.77	0.52	2.03	0.93	2.10	0.98
Citrus	189	2.72	0.22	2.54	0.22	2.17	0.44	2.20	0.68
Guava	112	3.02	0.36	2.87	0.56	2.22	1.07	2.16	0.94
Dates	35	2.55	0.51	2.24	0.75	2.06	0.96	2.07	0.79

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 25 that guava growers had medium ($\overline{X}$=3.02) level of knowledge while the date growers had medium ($\overline{X}$=2.55) level of knowledge regarding application of irrigation method to selected fruit plants. Similarly guava growers had medium ($\overline{X}$ =2.87) level of skill and date growers had low ($\overline{X}$ = 2.24) level of skill concerning application of irrigation method. Data further show that guava

growers had low ($\overline{X}$=2.22) level of attitude and mango growers had low ($\overline{X}$=2.03) level of attitude regarding application of irrigation method. While the level of adoption practices was ($\overline{X}$=2.20) low by the citrus growers and that of date growers ($\overline{X}$=2.07). Thus the fruit growers had low to medium level of knowledge, skill, attitude and adoption. Which indicate a need to trained farmers regarding these practices. Data further indicate that guava growers had better knowledge, skill and attitude level than other fruits and citrus growers had better adoption level regarding irrigation method applied to selected fruit plants.

Desai et al;. (1999) reported that in Junagadh District of India the constraints faced by mango growers in the adoption of drip irrigation system was high prices of spare parts, heavy initial expenses for installation of drip irrigation system and lack of capital for covering entire area under drip irrigation system.

The next table depicts the information regarding the competencies of fruit growers regarding weed control after transplantation of selected fruit nursery plants in the field.

Weed control

Plowing is done at the time when the plants are not bearing fruits, then a second plowing is done at right angle to the first to control weeds where it can be easily completed in the gardens.

Herbicides are usually used in the rows to control weeds which compete for water nutrients. Mowing is commonly practiced every 8 to10 weeks. Hand hoeing is also practiced where labour costs are not expensive. Mulches of dead weeds and grass can be used to help keep down weeds and maintain soil moisture. The data concerning respondents' knowledge, skill, attitude and adoption level regarding weed control for selected fruit plants are shown in the table given below.

Table 26. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding weed control after transplantation of selected nursery fruit plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	3.12	0.97	2.92	1.06	3.09	1.03	2.93	1.24
Citrus	189	2.98	0.48	2.79	0.51	2.92	0.52	2.77	0.73
Guava	112	2.98	0.83	2.76	0.88	2.95	0.88	2.78	1.05
Dates	35	3.09	1.06	2.42	0.94	3.09	1.06	3.01	1.14

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 26 that mango growers had medium ($\overline{X}$=3.12) level of knowledge while the citrus and guava growers had each medium ($\overline{X}$=2.98) level of knowledge regarding weed control practices. Similarly mango growers had medium ($\overline{X}$ =2.92) level of skill and date growers had low (x=2.42) level of skill regarding weed control practices. Data show that mango and date and mango growers each had medium ($\overline{X}$ = 3.09) level of attitude and citrus growers had medium ($\overline{X}$=2.92) level of attitude regarding weed control practices. While the level of adoption practices was medium ($\overline{X}$=3.01) by the date growers and that of citrus growers was low ($\overline{X}$=2.77) level of adoption regarding weed control practices. Thus the fruit growers had medium level of knowledge, skill, attitude and adoption.

Mohy-ud-din (1989) reported that 3-4 hoeing up to 6 inches from October to December controlled the weeds and increased the mortality rate of eggs of mealy bug up to 90 percent as compared to the orchards where hoeing was not done.

The results of the study of Sharma (1998) are also in line with the results of this study stated that the weed control in mango orchard in Indian Punjab state farmers respondents faced the major constraints in adoption of weedicide was lack of technical guidance and lack of time.

Therefore it is suggested that Extension scientists should promote awareness through organization of short term training programmes, distribution of scientific literature and maintenance of regular contact with fruit growers.

The next table depicts the information regarding the competencies of fruit growers regarding recommended pruning method of selected fruit nursery plants in the field.

Recommended pruning method

Selected fruit plants require periodic pruning or shaping to enhance their beauty and to develop healthy and sturdy growth. The mango fruit plants are pruned after harvesting of fruits and some pruning may be done after winter season to winter killed branches. The date plant need more pruning than other fruit plants after harvesting of fruits and before pollination unwanted shoots must be pruned to make pollination easy. The guava and citrus fruit plants must be pruned when it is needed. The purpose of pruning a plant is to remove unwanted growth.

To remove broken, dead or winter killed branches and limbs.

To balance the top and root growth at the time of planting.

To remove all the diseased and insect pest attacked branches or part of the plant.

To repair branches or plant that has been seriously injured or broken by hail and storm.

To renovate old plants which have very poor quality of flowers and week foliage.

To maintain a desired size or form of the fruit plant.

To maintain the high quality of flowers and fruits.

The data concerning respondents' knowledge, skill, attitude and adoption level regarding recommended pruning method for selected fruit plants are shown in the table given below.

Table 27. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding recommended pruning method after transplantation of selected nursery fruit plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Mango	131	2.67	0.72	2.37	0.74	2.65	0.76	1.92	0.94
Citrus	189	2.56	0.28	2.22	0.19	2.53	0.31	1.92	0.35
Guava	112	2.47	0.67	2.11	0.69	2.49	0.60	1.67	0.73
Dates	35	3.00	0.97	2.38	0.95	2.92	1.05	2.74	0.99

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\bar{X}$= mean, SD= standard deviation

.It can be concluded from the data given in table 27 that the date growers had medium (average) (x=3.00) level of knowledge and guava growers had low (x=2.47) level of knowledge regarding pruning of selected fruit plants. The date growers had low (x= 2.38) level of skill and guava growers had low (x=2.11) level of skill regarding pruning of fruit plants. Similarly the date growers had medium (x=2.92) level of attitude and guava growers had low (x=2.49) level of attitude regarding pruning of fruit plants. Data further show that date growers had low (x=2.74) level of adoption and guava grower had low (x=1.67) level of adoption regarding pruning of fruit plants. The date growers had better knowledge, skill, attitude and adoption level than other fruits. Hassan (1989) stated that majority (75.83) percent of the respondents was aware of pruning practice but only (20.00) percent of them had adopted that practice. Siddiqui (1991) reported that pruning method was known to (85.00) percent of the respondents and (60) percent of them had adopted it accordingly.

Ramasubramanium and Manoharan (2003) reported that the areas of training which fruit growers need was pruning of mango fruit plants.

The next table depicts the information regarding the competencies of fruit growers for pollination of selected fruit plants in the field.

Pollination

Table. 28 Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding pollination of selected fruit plants.

Plant	N	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.55	0.75	2.13	0.83	2.52	0.75	1.62	0.85
Citrus	189	2.68	0.16	2.32	0.15	2.49	0.16	1.77	0.15
Guava	112	2.51	0.55	2.06	0.72	2.26	0.55	1.42	0.54
Dates	35	3.98	0.94	3.59	0.93	4.04	0.97	3.98	0.94

Scale: 1=very low, 2= low, 3= medium (average), 4= high, 5= very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 28 that date growers had high ($\overline{X}$=3.98) level of knowledge and the guava growers had medium ($\overline{X}$=2.51) level of knowledge regarding pollination of selected fruit plants. Similarly date growers had medium ($\overline{X}$ =3.59) level of skill and guava growers had low ($\overline{X}$ =2.06) level of skill concerning pollination practices. Data further show that date growers had high ($\overline{X}$=4.04) level of attitude and guava growers had low ($\overline{X}$=2.26) level of attitude regarding pollination practices. While the level of adoption practices was high ($\overline{X}$=3.98) by the date growers and that of guava growers was low ($\overline{X}$=1.42). Thus the fruit growers of mango, citrus and guava had low to medium level of knowledge, skill, attitude and adoption which indicate a need to trained farmers regarding pollination practices. Data further indicate that date growers had better and high knowledge, skill and attitude level than other fruit growers.

The next table depicts the information regarding the competencies of fruit growers for inter cropping in Kharief after transplantation of selected fruit nursery plants in the field.

Intercropping

In the early years when the fruit plants does not give any income it is necessary to grow some intercrops such as vegetables, leguminous crops those can also be secured some additional income in the inter spaces. Fruit plant orchards can also be better maintained by

growing either leguminous or cash crops as seasonal vegetables. Leguminous crops are more beneficial as, in addition to keeping down weeds, they enrich the soil by fixing the atmospheric nitrogen.

The data concerning respondents' knowledge, skill, attitude and adoption level regarding intercropping in kharief season in selected fruit plants are shown in the table given below.

Table 29. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding intercropping in kharief after transplantation of selected fruit plants.

Plant	N	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	**131**	**2.15**	**0.54**	**2.06**	**0.53**	**1.98**	**0.62**	**1.70**	**0.75**
Citrus	**189**	**2.07**	**0.22**	**2.02**	**0.22**	**1.79**	**0.27**	**1.59**	**0.09**
Guava	**112**	**2.02**	**0.50**	**1.94**	**0.51**	**1.87**	**0.50**	**1.51**	**0.70**
Dates	**35**	**2.18**	**0.39**	**2.07**	**0.26**	**1.82**	**0.39**	**1.39**	**0.72**

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 29 that date growers had low ($\overline{X}$=2.18) level of knowledge and the guava growers had low ($\overline{X}$=2.02) level of knowledge regarding intercropping in kharief season. Similarly date growers had low ($\overline{X}$ =2.07) level of skill and citrus growers had low ($\overline{X}$ = 2.02) level of skill concerning intercropping in kharief season. Data further show that mango growers had low ($\overline{X}$=1.98) level of attitude and citrus growers had low ($\overline{X}$=1.79) level of attitude regarding intercropping in kharief in selected fruit plants. While the level of adoption practices was ($\overline{X}$=1.59) low by the citrus growers and that of date growers was ($\overline{X}$=1.39) low. Thus the fruit growers had low level of knowledge, skill, attitude and adoption which indicate a need to trained farmers regarding intercropping of crops in kharief season in selected fruit plant' orchards.

The next table depicts the information regarding the competencies of fruit growers for intercropping of Rabi crops after transplantation of selected fruit nursery plants in the field.

Table 30. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding intercropping in Rabi season after transplantation of selected fruit nursery plants.

Plant	N	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.50	0.72	2.36	0.75	2.16	0.83	1.77	0.83
Citrus	189	2.43	0.32	2.41	0.31	1.86	0.20	1.86	0.35
Guava	112	2.39	0.55	2.21	0.55	1.93	0.71	1.96	0.76
Dates	35	2.43	0.50	2.16	0.37	1.98	0.60	2.00	0.93

Scale: 1=very low, 2= low, 3= medium, 4= high, 5 = very high
$\overline{X}$= mean, SD= standard deviation

The data given in Table 30 concluded that mango growers had low ($\overline{X}$=2.50) level of knowledge and the guava growers had minimum low ($\overline{X}$=2.39) level of knowledge regarding intercropping in Rabi season. The citrus growers had low ($\overline{X}$ =2.41) level of skill and date growers had low ($\overline{X}$ =2.16) level of skill concerning intercropping in rabi season. Data further show that mango growers had low ($\overline{X}$=2.16) level of attitude and citrus growers had low ($\overline{X}$=1.86) level of attitude regarding intercropping in Rabi in selected fruit plants. While the level of adoption practices was ($\overline{X}$=2.00) low by the date growers and that of mango growers was low ($\overline{X}$=1.77) level of adoption regarding intercropping in Rabi season in selected fruit plants. Thus the fruit growers had low level of knowledge, skill, attitude and adoption which indicate a need to trained farmers regarding intercropping in rabi season in selected fruit plants.

The next table depicts the information regarding the competencies of fruit growers regarding growing of different fruit varieties in the field.

Varieties

The varieties of selected fruit plants are beyond number. It is not necessary that a grower should plant all varieties which thrive well in his region. For commercial gardening one should select varieties which are regular bearers and find good price in market and are liked by a large section of consumers. A small mango grower should continue him self to minimum three varieties namely saroly, malda, dasury and sindhry. If he limits himself to one careful variety like saroli or sindhri, he can be sure of good financial return. A big commercial orchard should be planned in a manner that varieties continue to ripe throughout the season. Similarly citrus, guava and date growers has suggested to have 2 or

3 varieties of each seasonal group in an orchard of moderate size. The data concerning respondents' knowledge, skill, attitude and adoption level regarding growing of different selected fruit varieties in gardens are shown in the table given below.

Table 31 . Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding selected fruit varieties they cultivated in their orchards.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.72	0.76	2.55	0.79	2.11	0.99	1.74	1.01
Citrus	189	2.90	0.52	2.79	0.28	2.58	0.63	2.15	0.55
Guava	112	2.60	0.56	2.31	0.68	2.72	0.58	1.53	0.83
Dates	35	2.54	0.51	2.43	0.50	2.32	0.47	2.41	0.75

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\overline{X}$= Mean, SD = standard deviation

The data given in Table 31 show that citrus growers had medium (=2.90) level of knowledge and the date growers had minimum low ($\overline{X}$=2.54) level of knowledge regarding different fruit varieties. Similarly citrus growers had low ($\overline{X}$ =2.79) level of skill and guava growers had low ($\overline{X}$ = 2.31) level of skill concerning different fruit varieties of selected fruit plants. The data further show that guava growers had low ($\overline{X}$=2.72) level of attitude and mango growers had low ($\overline{X}$=2.11) level of attitude regarding selected fruit varieties. While the level of adoption practices was ($\overline{X}$=2.41) low by the date growers and that of guava growers was low ($\overline{X}$=1.53) regarding cultivation of different fruit varieties in fruit growers gardens. Thus the fruit growers had low to medium level of knowledge, skill, attitude and adoption which indicate a need to trained farmers regarding fruit varieties for cultivation.. Ortho (1985) reported that in India 30 cultivar of mango was being commercially grown. Hussain (1992) reported that among the recommended varieties of citrus fruit, kinnow and feutrals'early were known to about 72-89 percent of the respondents and 66-76 percent of them had adopted. Joshi (1990) reported that the need for training while introducing new varieties of vegetables and modern inputs is stressed. Cheema and Malhi (1986) concluded that the varieties of mango with delicious taste, high market value and less susceptible to the attack of insect/pests and diseases, are more popular and widely grown. On the other hand, the varieties which are more susceptible and with low markets value is rarely grown.

The next table depicts the information regarding diseases attacked to selected fruit nursery plants after transplantation in the field.

Plant protection measures

Selected fruit plants are subject to a number of diseases at all stages of their development, right from plants in the nursery to the fruits in storage or transit. Diseases in many cases are due to mismanagement and neglect of orchards; if the trees are properly attended to, and the orchard are well maintained, diseases may not occur. But concentrated measures of diseases control have to adopt to prevent or cure some of the more parasitic maladies. While most of the diseases can be cured or controlled by chemical spray or dusting, and can be cured by providing adequate protective covering of fungicides well in advance- well before the actual appearance of the diseases The data concerning respondents' knowledge, skill , attitude and adoption level regarding diseases of selected fruit plants are shown in the table given below.

Table 32. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding diseases attacked to selected fruit plants after transplantation in the field.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.61	0.70	2.36	0.80	2.58	0.72	1.38	0.65
Citrus	189	2.53	0.31	2.38	0.37	2.45	0.30	1.86	0.25
Guava	112	2.68	0.65	2.35	0.68	2.51	0.70	1.71	0.90
Dates	35	2.30	0.71	2.11	0.69	2.15	0.78	1.22	0.68

Scale: 1=very low, 2= low, 3= medium, 4= high, 5 = very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 32 that guava growers had low ($\overline{X}$=2.68) level of knowledge and the date growers had minimum low ($\overline{X}$=2.30) level of knowledge regarding diseases of selected fruit plants. The citrus growers had low ($\overline{X}$ =2.38) level of skill and date growers had low ($\overline{X}$ = 2.11) level of skill concerning diseases of fruit plants. Data further show that mango growers had low ($\overline{X}$=2.58) level of attitude and date growers had low ($\overline{X}$=2.15) level of attitude regarding diseases of selected fruit plants. While the level of adoption practices was ($\overline{X}$=1.86) low by the citrus growers and that of date growers low ($\overline{X}$=1.22) level. Thus the fruit growers had low level of knowledge, skill, attitude and adoption regarding diseases attacked to fruit plants which indicate a need to

trained farmers regarding diseases of selected fruit plants. Abid (2004) concluded that the training needs of mango growers in different areas were required such as insects pests and diseases.

The above results are some what similar to those of Hassan (1991) who reported that 99 % of the respondents were aware of anthracnose and mango mall formation, and 69.33 %, 42.66 %, and 38.00 % of the respondents were aware of dieback of mango, powdery mildew, sooty mould and mango root rot respectively.

The next table depicts the information regarding the competencies of fruit growers regarding insect/pests attacked to selected fruit plants and fruits in the field.

Insects/pests

Damage by insects/pests has always been, and will ever be, a problem to the orchardist. Insects attack trees, lower their vitality, the result is a crop of poor quality: the yield is also considerably reduced, the cost of production thus goes up. Moreover, because of the poor quality of the fruit, the gardener cannot easily, if at all, find a market for his produce. The selected fruit plants, from nursery stage up to maturity, have a number of insect enemies. Termites destroy the roots, particularly of young plants, and cause their death. It is not common to see a fully established mango grove being divested by stem- borers. Barks are damaged by certain caterpillars and by termites: twigs and shoots are affected by various scale insects and borers: leaves are defoliated by a variety of caterpillars, beetles and thrips: vital sap is sucked by a number of insects, while fruits are damaged by flies and piercing moths. In addition to these there are certain other creatures, such as mites, which cause malformation of inflorescences of vegetative shoots. Harmful birds and mammals may destroy the trees by building their nests on the branches, burrowing into the trunk, pecking at the fruits at all stages of their growth The data concerning respondents' knowledge, skill, attitude and adoption level regarding attack of insects/pests of selected fruit plants are shown in the following table.

Table 33. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding insect/pest attacked to selected fruit plants and fruits.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Mango	131	2.65	0.69	2.46	0.79	2.58	0.73	1.65	0.96
Citrus	189	2.34	0.22	2.24	0.27	2.34	0.22	1.70	0.25
Guava	112	2.68	0.65	2.35	0.68	2.51	0.70	1.71	0.90

Dates	35	2.30	0.71	2.11	0.69	2.15	0.78	1.22	0.68

Scale: 1=very low, 2= low, 3= medium, 4= high, 5= very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 33 that guava growers had low ($\overline{X}$=2.68) level of knowledge and the date growers had minimum low ($\overline{X}$=2.30) level of knowledge regarding insect/ pest attack to fruit plants. The mango growers had low ($\overline{X}$ =2.46) level of skill and date growers had low ($\overline{X}$ = 2.11) level of skill concerning insect/pest attack to selected fruit plants.. The data further show that mango growers had low ($\overline{X}$=2.58) level of attitude and date growers had low ($\overline{X}$=2.15) level of attitude regarding insect/ pest attacked to selected fruit plants. While the level of adoption practices was ($\overline{X}$=1.71) low by the guava growers and that of date growers had low (=1.22) level for insect/ pest attack to selected fruit plants.

Ramzan (2003) concluded the similar results that majority of the respondents 97 .0 percent) had no response about the procedure of pest scouting. Only 38.3 percent, 2.7 percent and 4 .0 percent of the respondents were aware of UML, LMU, AND MUL procedure of pest scouting respectively. A large majority (58.0) percent of the respondents have no awareness about the calibration skill for using of spray machine. He further concluded that farmer's knowledge level regarding insect/ pest of cotton crop is low and the extension services are required to be made more active for performing their job of creating awareness among the farmers. Mohy-ud-Din (1989) reported that a number of pesticides are used for controlling the fruit fly of mango fruit. Their uses created other pest problems such as out break of scale insects because elimination of their natural enemies.

Proper training is needed to the farmers for the use of insecticides/pesticides.

The next table depicts the information regarding the competencies of fruit growers for control measures of insect/ pest and diseases of selected fruit nursery plants and fruits in the field.

Control measures

Control measures play an important role in the checking of insect/pest and diseases. If the fruit growers cannot take any measurement to the insects/ pests and diseases, the loss may increases up to 50 percent. The data concerning respondents' knowledge, skill, attitude and

adoption level regarding control measures of insect/pest and diseases of selected fruit plants in the field are shown in the table given below.

Table 34. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding control measures of insect/ pest and diseases of selected fruit plants and fruits in the field.

Plant	n	Knowledge	Skill	Attitude	Adoption				
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.50	0.64	2.27	0.69	2.34	0.63	1.63	0.80
Citrus	189	2.48	0.11	2.16	0.17	2.37	0.14	1.69	0.27
Guava	112	2.65	0.64	2.08	0.77	2.55	0.66	1.69	0.84
Dates	35	2.31	0.70	2.09	0.60	2.20	0.66	1.46	0.71

Scale: 1=very low, 2= low, 3= medium, 4= high, 5 = very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 34 that guava growers had low ($\overline{X}$=2.65) level of knowledge and the date growers had minimum low ($\overline{X}$=2.31) level of knowledge regarding control measures of insect pest and diseases of selected fruit plants. The mango growers had low ($\overline{X}$ =2.27) level of skill and guava growers had low ($\overline{X}$ = 2.08) level of skill concerning control measures of insect/ pest and diseases. The data further show that guava growers had low ($\overline{X}$=2.55) level of attitude and date growers had low ($\overline{X}$=2.20) level of attitude regarding control measures of insect /pest and diseases. While the level of adoption practices was low ($\overline{X}$=1.69, 1.69) both by the citrus and guava growers and that of date growers was low ($\overline{X}$=1.46) by the date growers for control measures for control of insect/ pest and diseases. Thus the fruit growers had low level of knowledge, skill, attitude and adoption which indicate a need to trained farmers regarding control measures of insect/ pest and diseases of selected fruit plants. The results of study of Niazi (1993) reported that 70 percent of the respondents were aware of mango mealy bug, hopper, fruit fly and termites. However, only 30.00, 13.33 and 11.33 percent of the respondents were familiar with mango scale insects, mango borer, and mites.

The next table depicts the information regarding the competencies of fruit growers regarding harvesting practices for selected fruit nursery plants in the field.

Recommended harvesting practices

Harvesting is the first important operation in the process of marketing. This includes selection of a suitable method for harvesting; which may protect the fruits from injury,

also a proper assessment of the maturity of fruits to be picked. Correct judgment of maturity is essential both for picking the fruits for the market also for prolonging their keeping quality in cold storage.

After harvesting mango fruits are prepared for packing which consists of bringing it to a packing house where it is washed. In less sophisticated packing houses fruit is delivered to grading tables where it is selected and packed into cartoons, transferred into cooling rooms loaded into refrigerated trucks. It has been useful to treat fruits at 55 0c for three minutes to control anthracnose, the most serious post harvest disease of mango. Mangoes are packed in ventilated corrugated cartoons, referred to as flats or lugs. Some of the growers use polyethylene sleeves wrapped around each fruit for added protection the data concerning respondents' knowledge, skill, attitude and adoption level regarding recommended harvesting practices for selected fruit plants are shown in the following table.

Table 35. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding recommended harvesting practices for fruits from the selected fruits plants.

Plant	n	Knowledge		Skill		Attitude		Adoption	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Mango	131	2.87	0.59	2.62	0.71	2.77	0.61	2.05	0.90
Citrus	189	2.82	0.20	2.69	0.20	2.69	0.20	2.23	0.20
Guava	112	2.81	0.57	2.39	0.61	2.75	0.56	1.89	0.84
Dates	35	3.37	0.62	3.04	0.68	3.32	0.60	3.24	0.58

Scale: 1=very low, 2= low, 3= medium, 4= high, 5, = very high

$\overline{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 35 that date growers had medium ($\overline{X}$=3.37) level of knowledge and the guava growers had low ($\overline{X}$=2.81) level of knowledge regarding recommended harvesting practices for selected fruit plants. Similarly date growers had medium ($\overline{X}$ =3.04) level of skill and guava growers had low ($\overline{X}$ = 2.39) level of skill concerning recommended harvesting practices for selected fruit plants. Data further show that date growers had medium ($\overline{X}$=3.32) level of attitude and citrus growers had low ($\overline{X}$=2.69) level of attitude regarding recommended harvesting practices of selected fruit plants. While the level of adoption practices was medium ($\overline{X}$=3.24) by the date growers and that of guava growers was low ($\overline{X}$=1.89) level for recommended harvesting practices. Thus the date growers had medium level of knowledge, skill, attitude and adoption which

indicate that regarding recommended harvesting practices date growers are better than other fruit growers. Thus there is a need to train other fruit growers regarding recommended harvesting practices.

Asif (1989) reported that a significant majority of the growers ignored the grading method after culling, which according to Haq (1965) caused losses to the growers. This study also reported that packing recommendations were not followed by a fairly large section of the respondents which could bring them lesser income.

The next table depicts the information regarding the competencies of fruit growers regarding marketing of fruits after harvesting from the selected fruits plants in the field.

Marketing of Fruits

Marketing is one of the most important aspects of raising every commodity, because the ultimate purpose is to earn money.

Mango is the only fruit which is utilized in one form or another from the time the fruits are small green till they are fully ripe. The green fruit is used in the preparation of curries, pickles, preserves, and jellies. It is also used in dried form, the product thus prepared is known as amchoor. Cool and refreshing drinks are also made from it. Similarly, from the ripe mango, citrus and guava fruits a number of products are such as squash, marmalades, ice cream are prepared and sold to the market. Dates are also used in dried form and sold to other countries. Some of the farmers sold their fruits to the contractors, while a few of them tried self marketing but they did not get better benefits from their fruits. The data concerning respondents' knowledge, skill, attitude and adoption level regarding marketing of selected fruit plants are shown in the table given below.

Table 36. Means and standard deviations of respondents' knowledge, skills, attitude and adoption level regarding marketing of fruits after harvesting from the selected fruit plants.

Plants	n	Knowledge		Skill		Attitude		Adoption	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Mango	131	2.53	0.73	2.40	0.68	2.45	0.75	1.93	0.88
Citrus	189	2.55	0.24	2.25	0.38	2.38	0.28	2.03	0.43
Guava	112	2.59	0.58	2.29	0.69	2.37	0.70	2.16	0.86
Dates	35	2.46	0.76	2.25	0.74	2.31	0.67	2.24	1.18

Scale: 1=very low, 2= low, 3= medium, 4= high, 5 = very high

$\bar{X}$= mean, SD= standard deviation

It can be concluded from the data given in Table 36 that guava growers had low ($\overline{X}$=2.59) level of knowledge and the date growers had l0w ($\overline{X}$=2.46) level of knowledge regarding marketing practices. The mango growers had low ($\overline{X}$ =2.40) level of skill and date grower and citrus grower both had low ($\overline{X}$ = 2.25) level of skill concerning marketing practices. Data further show that mango growers had low ($\overline{X}$=2.45) level of attitude and date growers had low ($\overline{X}$=2.31) level of attitude regarding marketing practices. While the level of adoption practices was ($\overline{X}$=2.24) low by the date growers and that of citrus growers ($\overline{X}$=2.03). Thus the fruit growers had low level of knowledge, skill, attitude and adoption which indicate a need to trained farmers regarding marketing practices for fruits after harvesting from the selected fruit plants in the market. The above mentioned findings are in consonance with those of Hassan (1991) who reported that 61.33 percent of the respondents sold their mango fruit on contract bases followed by 21.33 and 17.34 percent of them who were practicing self marketing and self cum contract, respectively.

Pirzada (2003) stated that within horticultural sub- sector, mango cultivation and export, like citrus, has great potential. Mango verities such as Sindhri, Chaunsa, Fajri, Golden and begum paley, just to name few, were in great demand, especially in middle and far eastern countries. Khan and Mahmood (1996) showed that Pakistan has considerable potential to get benefits from export of leather made ups, spices cut flowers plants, tropical nuts and fruits where developed countries have promised to reduce tariffs by 40-50 percent.

The information regarding the rank orders of the technical competencies in which fruit growers need training is presented in tables 37-40.

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Table 37. Means, standard deviations and rank orders of the knowledge, skill and attitude levels of recommended practices concerning mango production, protection, and marketing.

Practices	Knowledge		Skill		Attitude		Combined (K+S+A)	
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	RO
Intercropping in Kharief season in mango gardens	2.15	0.54	2.06	0.53	1.98	0.62	2.06	1
Time of fertilizer application to mango plants	2.18	0.62	2.13	0.56	2.17	0.56	2.16	2
Intercropping in Rabi season in mango gardens	2.50	0.72	2.36	0.75	2.16	0.83	2.34	3
Control measures of insects/pests/diseases	2.50	0.64	2.27	0.69	2.34	0.63	2.37	4
Pollination in mango plants	2.55	0.75	2.13	0.83	2.52	0.75	2.40	5
Irrigation in Summer to mango gardens	2.53	0.72	2.49	0.68	2.34	0.86	2.45	6
Varieties of mango fruit	2.72	0.76	2.55	0.79	2.11	0.99	2.46	7
Marketing of mango fruits	2.53	0.73	2.40	0.68	2.45	0.75	2.46	8
Irrigation in Autumn to mango plants	2.66	0.55	2.59	0.56	2.24	0.76	2.50	9
Diseases of mango fruits and plants	2.61	0.70	2.36	0.80	2.58	0.72	2.52	10
Irrigation in Spring to mango plants	2.71	0.56	2.64	0.57	2.26	0.81	2.54	11
layout system of mango gardens	3.01	0.55	2.04	0.85	2.57	0.97	2.54	12
Irrigation method to mango gardens	2.82	0.57	2.77	0.52	2.03	0.93	2.54	12
Recommended pruning method of mango plants	2.67	0.72	2.37	0.74	2.65	0.76	2.56	14
Insects/pests attackedto mango fruits and plants	2.65	0.69	2.46	0.79	2.58	0.73	2.56	14
Size of planting pit	2.77	0.63	2.39	0.86	2.59	0.83	2.58	16
Proper Plant to plant distance	2.97	0.49	2.53	0.73	2.36	1.02	2.62	17
Irrigation in Winter to mango plants	2.72	0.65	2.63	0.68	2.51	0.81	2.62	17
Fertilizer application to less than five years of age plants	2.68	0.81	2.65	0.78	2.68	0.81	2.67	19
Preparation of field for mango gardens	2.92	0.64	2.22	0.87	2.94	0.68	2.69	20
Fertilizer application five to ten years of age plants	2.75	0.80	2.71	0.76	2.75	0.80	2.74	21
Recommended harvesting practices	2.87	0.59	2.62	0.71	2.77	0.61	2.75	22
Fertilizer application above ten years of age plants	2.82	0.80	2.76	0.78	2.81	0.80	2.80	23
Filling of pits	2.90	1.07	2.84	1.03	2.90	1.07	2.88	24
Weed control in mango gardens	3.12	0.97	2.92	1.06	3.09	1.03	3.04	25
Overall Mean	2.7		2.48		2.5		2.56	

Scale: 1 = very low, 2 = low, 3 = medium, 4 = high, 5 = very high
$\overline{X}$ = mean, SD = standard deviation
n= 131

The data collected from the mango growers regarding their competencies for the assessment of their training need concerning the knowledge, skill and attitude level of the growers was given in Table 37 concluded that the competencies were ranked according to their mean values considering that the lowest value as I and the highest value as 25. Therefore one is the competency in which the mango growers need maximum training, Thus the top five competencies in which mango growers need training were: (1) Intercropping in mango gardens in kharief season had mean score (x= 2.06), (2) time of fertilization application to mango fruit plants had mean score (x=2.16), (3) intercropping in Rabi season in mango orchards had mean score (x=2.34), (4) control measures of insects/ pests and diseases attacked to the mango fruit plants had mean score (x=2.37), and (5) pollination of mango fruit plants especially care at pollination time had mean score (x= 2.40). The competency statements needs less attention are ranked 20-25 had mean score comparatively higher needs a little bit less training. Therefore (25) weed control in mango orchards, mechanically, chemically or manually had comparatively high mean score of (x=3.04). The results of this study is similar to those of Ahmad, (2008) who reported that weed control in mango gardens had high mean score and fell between medium and high categories. The number (24) filling of pits with ingredients of fill for transplantation of fruit nursery plants in the field had mean score (x=2.88), (23) fertilizer application above ten years of aged mango fruit plants had mean score (x=2.80), (22) recommended harvesting practices of fruits from the mango fruit plants had mean score (x=2.75), (21) fertilizer application from five to ten years of aged mango fruit plants had mean score (x= 2.74) were ranked at the ends of all the competencies need comparatively less training for mango growers. Similarly from 20-10 competency statements which needed more training than 20-25 competency statements. Martin and Sajilan, 1989 identified the teaching competencies perceived to be important to Malaysian Extension personnel in teaching adult farmers concluded that all 53 competency statements were perceived as being at least moderately important and out of which sixteen competency statements were highly important in transferring new Agricultural technologies to the Malaysian farmers. He also recommended that a need assessment should be conducted in the Malaysian Extension system to the extent to which training in educational techniques and processes is necessary.

Table 38. Means, standard deviations and rank orders of the knowledge, skill and attitude levels of recommended practices concerning citrus production, protection and marketing.

Practices	Knowledge		Skill		Attitude		Combined (K+S+A)	
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	RO
Intercropping in Kharief season in citrus gardens	2.07	0.22	2.02	0.22	1.79	0.27	1.96	1
Intercropping in Rabi season in citrus gardens	2.43	0.32	2.41	0.31	1.86	0.20	2.23	2
Time of fertilizer application to citrus plants	2.30	0.17	2.25	0.21	2.23	0.16	2.26	3
Insecticides/pesticides for citrus fruits and plants	2.34	0.22	2.24	0.27	2.34	0.22	2.31	4
Control measures for diseases of citrus fruits and plants	2.48	0.11	2.16	0.17	2.37	0.14	2.34	5
Marketing of fruits	2.55	0.24	2.25	0.38	2.38	0.28	2.39	6
Recommended pruning method	2.56	0.28	2.22	0.19	2.53	0.31	2.44	7
Irrigation in Winter to citrus gardens	2.53	0.22	2.47	0.20	2.36	0.23	2.45	8
Insects/pests of citrus fruits and plants	2.53	0.31	2.38	0.37	2.45	0.30	2.45	9
Irrigation method of citrus gardens	2.72	0.22	2.54	0.22	2.17	0.44	2.48	10
Diseases of citrus fruit and plants	2.63	0.12	2.30	0.16	2.50	0.12	2.48	10
Irrigation in Summer to citrus gardens	2.61	0.29	2.61	0.28	2.26	0.53	2.49	12
Pollination of citrus plants	2.68	0.16	2.32	0.15	2.49	0.16	2.50	13
Layout system of citrus gardens	2.85	0.39	2.30	0.30	2.35	0.69	2.50	14
Irrigation in Autumn to citrus gardens	2.56	0.23	2.55	0.24	2.43	0.32	2.51	15
Irrigation in Spring to citrus gardens	2.66	0.18	2.66	0.18	2.45	0.17	2.59	16
Proper Plant to plant distance of citrus plants	2.94	0.29	2.32	0.13	2.87	0.44	2.71	17
Recommended harvesting practices of citrus fruits	2.82	0.20	2.69	0.20	2.69	0.20	2.73	18
Varieties of citrus fruit	2.90	0.52	2.79	0.28	2.58	0.63	2.76	19
Size of planting pit	2.90	0.17	2.57	0.12	2.87	0.16	2.78	20
Fertilizer application for Less than five years of age plants	2.81	0.48	2.72	0.54	2.84	0.47	2.79	21
Fertilizer application five to ten years of age plants	2.87	0.59	2.79	0.64	2.89	0.58	2.85	22
Preparation of field for citrus gardens	3.11	0.38	2.53	0.32	2.95	0.46	2.86	23
Fertilizer application above ten years of age plants	2.92	0.53	2.84	0.58	2.92	0.53	2.89	24
Weed control in citrus gardens	2.98	0.48	2.79	0.51	2.92	0.52	2.90	25
Filling of pits	3.17	0.67	3.15	0.66	3.23	0.61	3.18	26
Overall Mean	2.7		2.49		2.52		2.57	

Scale : 1 = very low, 2 = low, 3 = medium, 4 = high, 5 = very high

$\overline{X}$ = mean, SD = standard deviation

n= 189

The data collected from the citrus growers regarding their competencies for the assessment of their training need concerning the knowledge, skill and attitude level of the growers was given in Table 38 concluded that the competencies were ranked according to their mean values considering that the lowest value as I and the highest value as 26. Therefore one is the competency in which the citrus growers need maximum training, Thus the top five competencies in which citrus growers need maximum training were: (1) Intercropping in citrus gardens in Kharief season had mean score (x= 1.96), (2) intercropping in Rabi season in citrus orchards had mean score (x =2.23), (3) time of fertilizer application to citrus fruit plants had mean score (x=2.26), (4) control measures of insects/ pests attacked to citrus fruit plants with the use of insecticides and pesticides had mean score (x=2.31), (5) control measures for diseases attacked to citrus fruit plants had mean score (x=2.34). The competency statements need less attention are ranked at the end 26-22. (26) filling of pits with ingredients of fill for transplantations of nursery fruit plants in the field had mean score of (x= 3.18), (25) weed control in citrus orchards, mechanically, chemically or manually had comparatively high mean score of (x=2.90.), (24) fertilizer application above ten years of age plants had mean score (x= 2.89), (23) preparation of field for transplantation of citrus nursery plants in the field had mean score (x=2.86), (22) fertilizer application from five to ten years of aged citrus fruit plants (x=2.85) were ranked at the end with high mean score need a little bit less training to citrus growers as compared to first five competency statements. Similarly from 6-21 competency statements which need more training to citrus growers than 21 to 26 competency statements. Shah (1992) find out the extent of adoption of the citrus growing practices by the growers reported that only 35.34, 6.0, 2.07 and 1.34 percent of the respondents were aware of and reported serious damage caused by citrus wither tip, gummosis, citrus trestiza and crown rot respectively. Iqbal.S, (2009) reported that the low production in citrus fruit is due to the lack of technical knowledge by the citrus growers they did not know how to manage their citrus crop, which included poor agronomic practices.

Table 39. Means, standard deviations and rank orders of the knowledge, skill and attitude levels of recommended practices concerning guava production, protection and marketing.

Practices	Knowledge		Skill		Attitude		Combined (K+S+A)	
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	RO
Intercropping in Kharief in guava gardens	2.02	0.50	1.94	0.51	1.87	0.50	1.94	1
Intercropping in Rabi in guava gardens	2.39	0.55	2.21	0.55	1.93	0.71	2.18	2
Time of fertilizer application to guava plants	2.27	0.53	2.18	0.47	2.14	0.55	2.20	3
Pollination of guava plants	2.51	0.55	2.06	0.72	2.26	0.55	2.28	4
Recommended pruning method	2.47	0.67	2.11	0.69	2.49	0.60	2.36	5
Irrigation in Autumn to guava gardens	2.39	0.56	2.37	0.55	2.36	0.68	2.37	6
Marketing of fruits	2.59	0.58	2.29	0.69	2.37	0.70	2.42	7
Control measures of insect/pests and diseases of guava fruit and plants	2.65	0.64	2.08	0.77	2.55	0.66	2.43	8
System of layout of guava gardens	2.80	0.64	2.16	0.87	2.58	0.90	2.51	9
Insects/pests and diseases attacked to guava fruits and plants	2.68	0.65	2.35	0.68	2.51	0.70	2.51	9
Irrigation in Spring to guava gardens	2.57	0.50	2.53	0.51	2.52	0.51	2.54	11
Varieties of guava fruit	2.60	0.56	2.31	0.68	2.72	0.58	2.54	12
Proper Plant to plant distance of guava plants	2.77	0.55	2.22	0.81	2.69	0.69	2.56	13
Irrigation in Winter to guava gardens	2.63	0.74	2.58	0.71	2.53	0.81	2.58	14
Recommended harvesting practices	2.81	0.57	2.39	0.61	2.75	0.56	2.65	15
Irrigation method of guava gardens	3.02	0.36	2.87	0.56	2.22	1.07	2.70	16
Irrigation in Summer to guava gardens	2.82	0.42	2.79	0.44	2.51	0.60	2.71	17
Size of planting pit	2.90	0.31	2.61	0.69	2.90	0.31	2.80	18
Weed control in guava gardens	2.98	0.83	2.76	0.88	2.95	0.88	2.90	19
Preparation of field for guava gardens	3.25	0.59	2.57	0.90	3.02	0.69	2.95	20
Fertilizer application above ten years of age plants	3.00	0.70	2.85	0.78	3.07	0.64	2.97	21
Fertilizer application Less than five years of age plants	3.00	0.69	2.86	0.77	3.07	0.63	2.98	22
Fertilizer application five to ten years of age plants	3.00	0.69	2.86	0.77	3.09	0.69	2.98	23
Filling of pits	3.20	1.06	3.12	1.05	3.16	1.09	3.16	24
Overall Mean	2.72		2.46		2.59		2.59	

Scale : 1 = very low, 2 = low, 3 = medium, 4 = high, 5 = very high
$\overline{X}$ = mean, SD = standard deviation
n= 112

The data collected from the guava growers regarding their competencies for the assessment of their training need concerning the knowledge, skill and attitude level of the growers was given in Table 37 concluded that the competencies were ranked according to their mean values considering that the lowest value as I and the highest value as 24. Therefore one is the competency in which the guava growers need maximum training, Thus the top five competencies in which guava growers need training were: (1) Intercropping in guava gardens in Kharief season had mean score (x= 1.94), (2) inter cropping in Rabi season in guava gardens had mean score (x=2.18), (3) time of fertilizer application to guava fruit plants had mean score (x=2.20), (4) pollination of guava fruit plants had mean score (x=2.28) and (5) recommended pruning method of guava fruit plants especially care after pruning had mean score (x=2.36). Ingram, J. (2008) reported that while farmers are technically informed, they can often lack the in- depth scientific knowledge required to implement more complex practices suck as using nutrient value of manures. They also reveal that, while mostly farmers have good knowledge of their own soils, there tacit knowledge of soil management can be weak note ably in relation to cultivation. The paper further concludes that although farmers knowledge about soil and its sustainable management appears in general to be well developed there are some areas, which need to be significantly enhanced and as such require both a policy response and further research effort. Shahbaz et al (2010) reported in his study that in the study area of north west Pakistan no defective Agri. Extension system for the dissemination of Agricultural technology to the growers. They used time old agricultural technology of crops and fruits and obtained very low yields. There knowledge level was very low. The competency statements need less attention are ranked 20 to 24 had mean score comparatively higher needs a little bit less training for guava fruit growers, (24) filling of pits with ingredients of fill for transplantation of nursery fruit plants had comparatively high mean score (x=3.16), (23) fertilizer application from five to ten years of age plants in the field had mean score (x=2.98), (22) fertilizer application less than five years of aged guava fruit plants (x =2.98), (21) fertilizer application above ten years of aged guava fruit plants had mean score (x=2.97), (20) preparation of field for transplantation of guava nursery plants in the field had mean score (x=2.95) need training regarding guava transplanting. Similarly from 6-19 competency statements which needed more training than 20 to 24 competency statements for guava growers.

Table 40. Means, standard deviations and rank orders of the knowledge, skill and attitude levels of recommended practices concerning dates production, protection and marketing.

Practices	Knowledge		Skill		Attitude		Combined (K+S+A)	
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	RO
Intercropping in Kharief in date gardens	2.18	0.39	2.07	0.26	1.82	0.39	2.02	1
Insects/pests and diseases attacked to date fruits and plants	2.30	0.71	2.11	0.69	2.15	0.78	2.19	2
Intercropping in Rabi in date gardens	2.43	0.50	2.16	0.37	1.98	0.60	2.19	3
Control measures of insects/pests and diseases of date fruits and plants.	2.31	0.70	2.09	0.60	2.20	0.66	2.20	4
Irrigation method to date gardens	2.55	0.51	2.24	0.75	2.06	0.96	2.28	5
Marketing of fruits	2.46	0.76	2.25	0.74	2.31	0.67	2.34	6
System layout of date gardens	2.65	0.67	2.07	0.97	2.39	0.88	2.37	7
Size of planting pit	2.56	0.51	2.32	0.48	2.37	0.66	2.42	8
Varieties of date fruit	2.54	0.51	2.43	0.50	2.32	0.47	2.43	9
Time of fertilizer application to date plants	2.57	0.66	2.40	0.50	2.34	0.48	2.44	10
Proper Plant to plant distance	2.85	0.36	1.87	0.85	2.60	0.70	2.44	11
Preparation of field for date gardens	2.71	0.79	2.06	0.72	2.66	0.80	2.48	12
Fertilizer application five to ten years of age date plants	2.78	1.04	2.52	0.96	2.73	1.05	2.68	13
fertilizer application above ten years of age date plants	2.78	1.04	2.51	0.95	2.78	1.04	2.69	14
Fertilizer application for less than five years of age plants	2.78	1.04	2.56	0.95	2.78	1.09	2.71	15
Irrigation in Summer to date gardens	2.89	0.78	2.55	0.72	2.78	0.67	2.74	16
Irrigation in Autumn to date gardens	2.89	0.76	2.75	0.61	2.60	0.73	2.75	17
Recommended pruning method	3.00	0.97	2.38	0.95	2.92	1.05	2.77	18
Irrigation in Spring to date gardens	2.77	0.69	2.75	0.73	2.80	0.68	2.77	19
Weed control in date gardens	3.09	1.06	2.42	0.94	3.09	1.06	2.87	20
Irrigation in Winter to date gardens	3.14	0.69	2.85	0.70	2.66	0.96	2.88	21
Recommended harvesting practices	3.37	0.62	3.04	0.68	3.32	0.60	3.24	22
Filling of pits	3.30	0.93	3.07	0.69	3.50	0.70	3.29	23
Pollination of date plants	3.98	0.94	3.59	0.93	4.04	0.97	3.87	24
Overall Mean	2.78		2.46		2.63		2.62	

Scale: 1 = very low, 2 = low, 3 = medium, 4 = high, 5 = very high
$\overline{X}$ = mean, SD = standard deviation
n= 35

The data collected from the date growers regarding their competencies for the assessment of their training need concerning the knowledge, skill and attitude level of the growers was given in Table 40 concluded that the competencies were ranked according to their mean values considering that the lowest value as I and the highest value as 24. Therefore one is the competency in which the date growers need maximum training, Thus the top five competencies in which date growers need maximum training were: (1) Intercropping in date gardens in Kharief season had mean score (x =2.02), (2) insect pest and diseases attacked to the date fruit plants had mean score (x=2.19), (3) intercropping in Rabi season in date orchards had mean score (x=2.19), (4) control measures of insects/ pests and diseases attacked to the date fruit plants (x=2.20)and (5) application of irrigation method to date fruit plants had mean score (x= 2.28). The competency statements for which the date growers need less attention are ranked 20 to 24 at the end had mean score comparatively higher, (24) pollination of date fruit plants in orchards, had mean score (x=3.87), (23) filling of pits with ingredients of fill for transplantation of fruit nursery plants in the field had mean score (x=3.29), (22) recommended harvesting practices for fruits from the date fruit plants had mean score (x=3.24), (21) irrigation practices of date fruit plants in winter had mean score (x=2.88), (20) weed control in date fruit plants in the gardens had mean score (x= 2.87). Similarly from 6-19 competency statements which needed more training than 20 to 24 competency statements.. The results of this study is also similar to the study of Mc. Cubbin (2007) who reported that the production of date palm is mainly dependent by the selection of suitable variety and adoption of recommended production technology. Abbas (2008) indicated that 38.2, 25.6 and 37.2 percent of the respondents adopted the chemical control measures of date palm fruits by using chemicals of Bifenthrin (10EC), Phostoxin and Metasystox (25 EC) respectively.

The next table presents the information regarding the relationship between age groups and knowledge, skill, attitude and adoption level of recommended practices concerning mango production, protection and marketing.

Table 41: Responses (%)between age group and knowledge, skill, attitude and adoption levels of recommended practices concerning mango production, protection and marketing.

(1) Age group

(a) Knowledge level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	1 7.1% 0.76	13 92.9% 9.92	14 100 10.69
31-45 years	6 27.3% 4.58	7 31.8% 5.34	9 40.9% 6.87	22 100 16.79
Above 45 years	35 36.8% 26.72	34 35.8% 25.95	26 27.4% 19.85	95 100 72.52
Total	41 31.3%	42 32.1%	48 36.6%	131 100

Chi-square = 22.97**

(b) Skill level

Age group	Low	Medium	High	Total
Up to 30 years	1 7.1% 0.76	0 0.0% 0.00	13 92.9% 9.92	14 100 10.69
31-45 years	13 59.1% 9.92	4 18.2% 3.05	5 22.7% 3.82	22 100 16.79
Above 45 years	50 52.6% 38.17	33 34.7% 25.19	12 12.6% 9.16	95 100 72.52
Total	64 48.9%	37 28.2%	30 22.9%	131 100

Chi-square = 46.19**

(c) Attitude level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	1 7.1% 0.76	13 92.9% 9.92	14 100 10.69
31-45 years	0 0.0% 0.00	22 100.0% 16.79	0 0.0% 0.00	22 100 16.79
Above 45 years	28 29.5% 21.37	55 57.9% 41.98	12 12.6% 9.16	131 100 72.52
Total	28 21.4%	78 59.5%	25 19.1%	131 100

Chi-square = 69.36**

(d) Adoption level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	1 7.1% 0.76	13 92.9% 9.92	14 100 10.69
31-45 years	0 0.0% 0.00	17 77.3% 12.98	5 22.7% 3.82	22 100 16.79
Above 45 years	28 29.5% 21.37	49 51.6% 37.40	18 18.9% 13.74	131 100 72.52
Total	28 21.4%	67 51.1%	36 27.5%	131 100

Chi-square = 43.32**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 41 concluded that age group of up to 30 years of age 9.92 percent each had high knowledge, skill, attitude and adoption level and none of the respondents in this category had low level of knowledge where as mango growers of age group 31-45 years of age had high 6.87 percent level of knowledge 9.92 percent had low skill level, 16.79 percent had medium attitude level and 12.98 percent had medium adoption level where as above 45 years of age 26.72 and 38.17 percent had low knowledge and skill level and 41.98 and 37.40 percent of the growers had medium attitude and adoption level concerning mango production, protection and marketing practices. Khan (2010) conducted research on the role of electronic media in the dissemination of agricultural technologies among the farmers reported that highly negative

relationship was observed with age and farming experience. Data further showed that Chi-square values for all the contengency tables are, for knowledge 22.97 ($p< 0.01$), skill 46.19, attitude 69.36 and for adoption level 43.32 which showed that positive and highly significant relationship was found between age groups and knowledge, skill, attitude and adoption level of recommended practices concerning mango production protection and marketing.

The next table presents information regarding the relationship between education level and knowledge, skill, attitude and adoption level of recommended practices concerning mango production, protection and marketing.

Table 42: Responses (%) between education level and respondents knowledge, skill, attitude and adoption level of recommended practices concerning mango production, protection and marketing.

(a) Knowledge level

Education level	Low	Medium	High	Total
Illiterate	0 0.0% 0.00	7 100.0% 5.34	0 0.0% 0.00	7 100 5.34
Up to matric	14 37.8% 10.69	8 21.6% 6.11	15 40.6% 11.45	37 100 28.24
Above matric	20 28.6% 15.27	21 30.0% 16.03	29 41.4% 22.14	70 100 53.44
Any diploma	7 41.2% 5.34	6 35.3% 4.58	4 23.5% 3.05	17 100 12.98
Total	41 31.3%	42 32.1%	48 36.6%	131 100

Chi-square = 18.83**

(b) Skill level

Education level	Low	Medium	High	Total
Illiterate	0 0.0% 0.00	7 100.0% 5.34	0 0.0% 0.00	7 100 5.34
Up to matric	22 59.5% 16.79	8 21.6% 6.11	7 18.9% 5.34	37 100 28.24
Above matric	35 50.0% 26.72	12 17.1% 9.16	23 32.9% 17.56	70 100 53.44
Any diploma	7 41.2% 5.34	10 58.8% 7.63	0 0.0% 0.00	17 100 12.98
Total	64 48.9%	37 28.2%	30 22.9%	131

Chi-square = 35.30**

(c) Attitude level

Education level	Low	Medium	High	Total
Illiterate	0 0.0% 0.00	7 100.0% 5.34	0 0.0% 0.00	7 100 5.34
Up to matric	14 37.8% 10.69	16 43.2% 12.21	7 18.9% 5.34	37 100 28.24
Above matric	14 20.0% 10.69	38 54.3% 29.01	18 25.7% 13.74	70 100 53.44
Any diploma	0 0.0% 0.00	17 100.0% 12.98	0 0.0% 0.00	17 100 12.98
Total	28 21.4%	78 59.5%	25 19.1%	131 100

Chi-square = 24.65**

(d) Adoption level

Education level	Low	Medium	High	Total
Illiterate	0 0.0% 0.00	7 100.0% 5.34	0 0.0% 0.00	7 100 5.34
Up to matric	14 37.8% 10.69	16 43.2% 12.21	7 18.9% 5.34	37 100 28.24
Above matric	14 20.0% 10.69	27 38.6% 20.61	29 41.4% 22.14	70 100 53.44
Any diploma	0 0.0% 0.00	17 100.0% 12.98	0 0.0% 0.00	17 100 12.98
Total	28 21.4%	67 51.1%	36 27.5%	131 100

Chi-square = 36.24**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 42 showed that the illiterate respondents 5.34 percent had medium level of knowledge, skill, attitude and adoption level. Similarly up to matric had 11.45 percent high level of knowledge, 16.79 percent had low level of skill, 12.21 percent had medium level of attitude and adoption. Similarly up to matric 11.45 percent had high level of knowledge, 16.76 percent had low level of skill, 12.21 percent had medium level of attitude and adoption. while above matric 22.14 percent had high level of knowledge, 26.72 percent had low level of skill,

29.01 percent had medium level of attitude and 22.14 percent had high level of adoption. Where as diploma holders 5.34 percent had low level of knowledge, 7.63 percent had medium level of skill and 12.98 percent had medium level of attitude and adoption. Table further showed that Chi- square values between education levels of mango growers and knowledge 18.83 (p=<0.01, between education and skill level Chi- square value= 35.30, between attitude level Chi- square value=24.65 and between education levels and adoption level Chi-square vale= 36.24 (p=<0.01) showed highly significant positive relationship between education levels and knowledge level, skill level, attitude level and adoption level of recommended practices concerning mango production, protection and marketing.

The next table presents information regarding the relationship between tenancy status and knowledge, skill, attitude and adoption level of recommended practices concerning mango production, protection and marketing.

Table 43: Responses (%)between tenancy status and respondents knowledge, skill, attitude and adoption level of recommended practices concerning mango production, protection and marketing.

(3) Tenancy Status

(a) Knowledge level

Tenancy status	Low	Medium	High	Total
Owner	41	42	35	118
	34.7%	35.6%	29.7%	100
	31.30	32.06	26.72	90.08
Tenant	0	0	13	13
	0.0%	0.0%	100.0%	100
	0.00	0.00	9+.92	9.92
Total	41	42	48	131
	31.3%	32.1%	36.6%	100

Chi-square = 24.96**

(b) Skill level

Tenancy status	Low	Medium	High	Total
Owner	64	31	23	118
	54.2%	26.3%	19.5%	100
	48.85	23.66	17.56	90.08
Tenant	0	6	7	13
	0.0%	46.2%	53.8%	100
	0.00	4.58	5.34	9.92
Total	64	37	30	131
	48.9%	28.2%	22.9%	100

Chi-square = 14.72**

(c) Attitude level

Tenancy status	Low	Medium	High	Total
Owner	28	72	18	118
	23.7%	61.0%	15.3%	100
	21.37	54.96	13.74	90.08
Tenant	0	6	7	13
	0.0%	46.2%	53.8%	100
	0.00	4.58	5.34	9.92
Total	28	78	25	131
	21.4%	59.5%	19.1%	100

Chi-square = 12.66**

(d) Adoption level

Tenancy status	Low	Medium	High	Total
Owner	28	61	29	118
	23.7%	51.7%	24.6%	100
Tenant	0	6	7	13
	0.0%	46.2%	53.8%	100
Total	28	67	36	131
	21.4%	51.1%	27.5%	100

Chi-square = 6.81*

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 43 indicated that 32.08 percent of owner cultivators had medium level of knowledge, 48.86. percent had low level of skill, 54.96 percent had medium level of attitude and 46.56 percent had medium level of adoption. Where as tenants had 9.92 percent high level of knowledge, 5.34 percent had high level of skill, attitude and adoption level. Table further showed that Chi square values between tenancy status and knowledge level had 24.96 ($p< 0.01$) , between skill level had 14.72 ($p< 0.01$), between attitude level had 12.66 ($p< 0.01$) and between tenancy status and adoption level had 6.81($p< 0.01$) which indicated that highly significant relation ship was found between tenancy status and knowledge, skill and attitude level of

recommended practices where as significant relationship was found between tenancy status and adoption level of recommended practices concerning mango production, protection and marketing.

The next table presents information regarding relationship between size of land holding and knowledge, skill, attitude and adoption level of recommended practices concerning mango production, protection and marketing.

Table 44: Responses (%) between size of land holding and respondents knowledge, skill, attitude and adoption level of recommended practices concerning mango production, protection and marketing.

(4) Size of land holding

(a) Knowledge level

Land holding	Low	Medium	High	Total
Up to 12 acre	34 35.8% 25.95	28 29.5% 21.37	33 34.7% 25.19	96 100 72.52
13 to 25 acres	0 0.0% 0.00	8 47.1% 6.11	9 52.9% 6.87	17 100 12.98
Above 25 acres	7 36.8% 5.34	6 31.6% 4.58	6 31.6% 4.58	19 100 14.50
Total	41 31.3%	42 32.1%	48 36.6%	131 100

Chi-square = 8.97^{NS}

(b) Skill level

Land holding	Low	Medium	High	Total
Up to 12 acre	49 51.6% 37.40	27 28.4% 20.61	19 20.0% 14.50	95 100 72.52
13 to 25 acres	8 47.1% 6.11	4 23.5% 3.05	5 29.4% 3.82	17 100 12.98
Above 25 acres	7 36.8% 5.34	6 31.6% 4.58	6 31.6% 4.58	19 100 14.50
Total	64 48.9%	37 28.2%	30 22.9%	131 100

Chi-square = 2.22^{NS}

(c) Attitude level

Land holding	Low	Medium	High	Total
Up to 12 acre	28 29.5% 21.37	48 50.5% 36.64	19 20.0% 14.50	95 100 72.52
13 to 25 acres	0 0.0% 0.00	17 100.0% 9.92	0 0.0% 4.58	17 100 14.50
Above 25 acres	0 0.0% 0.00	13 68.4% 9.92	6 31.6% 4.58	19 100 14.58
Total	28 21.4%	78 59.5%	25 19.1%	131 100

Chi-square = 21.67**

(d) Adoption level

Land holding	Low	Medium	High	Total
Up to 12 acre	28 29.5% 21.37	42 44.2% 32.06	25 26.3% 19.08	95 100 72.52
13 to 25 acres	0 0.0% 0.00	12 70.6% 9.16	5 29.4% 3082	17 100 12.98
Above 25 acres	0 0.0% 0.00	13 68.4% 9.92	6 31.6% 4.58	19 100 14.50
Total	28 21.4%	67 51.1%	36 27.5%	131 100

Chi-square = 14.06**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 44 indicated that up to 12 acres of land holders 25.95 percent had low level of knowledge, 37.40 percent had low level of skill, 36.64 percent had medium level of attitude and 32.06 percent had medium level of adoption. Similarly 6.87 percent of 13-25 acres of land holders had high level of knowledge and 6.11 percent had low level of skill, 12.98 percent had medium level of attitude and 9.16 percent had medium level of adoption. While 5.34 percent of above 25 acres of land holders had low level of knowledge and skill, 9.92 percent had medium level of attitude and adoption. Where as none of the fruit growers had low level of attitude and adoption. Table further showed that the chi- square values 8.97 ($p< 0.01$) for

knowledge level is non significant, for skill level chi- square value 2.22($p<0.01$) non significant. It means that there was no relationship between size of land holding and knowledge and skill level of respondents. The chi-square value between size of land holding and attitude level was 21.67 ($p<0.01$) highly significant. For adoption level chi- square value 14.06 ($p<0.01$) highly significant. It means that there was highly significant relationship between attitude level and adoption level of respondents and size of land holding.

The next table presents information regarding the relationship between age group and knowledge, skill, attitude and adoption level of recommended practices concerning citrus production, protection and marketing.

Table: 45 Responses (%) between age group and respondents knowledge, skill, attitude and adoption level of recommended practices concerning citrus production, protection and marketing

(1) Age group

(a) Knowledge level

Age group	Low	Medium	High	Total
Up to 30 years	7 50.0% 3.70	1 7.1% 0.53	6 42.9% 3017	14 100 7.41
31-45 years	11 20.4% 5.82	15 27.8% 7.94	28 51.9% 14.81	54 100 28.57
Above 45 years	20 16.5% 10.58	46 38.0% 24.34	55 45.5% 29.10	121 100 64.02
Total	38 20.1%	62 32.8%	89 47.1%	189 100

Chi-square = 11.60**

(b) Skill level

Age group	Low	Medium	High	Total
Up to 30 years	7 50.0% 3.70	1 7.1 0.53	6 42.9% 3.17	14 100 7.41
31-45 years	15 27.8% 7.94	30 55.6% 15.87	9 16.7% 4.76	54 100 28.57
Above 45 years	28 23.1% 14.81	49 40.5% 25.93	44 36.4% 23.28	121 100 64.02
Total	50 26.5%	80 42.3%	59 31.2%	189 100

Chi-square = 15.19**

(c) Attitude level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	8 57.1% 4.23	6 42.9% 3.17	14 100 7.41
31-45 years	25 46.3% 13.23	6 11.1% 3.17	23 42.6% 12.17	54 100 28. 57
Above 45 years	43 35.5% 22.75	35 28.9% 18.52	43 35.5% 22.75	121 100 64.02
Total	68 36.0%	49 25.9%	72 38.1%	189 100

Chi-square =17.47**

(d) Adoption level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	8 57.1% 4.23	6 42.9% 3.17	14 100 7.41
31-45 years	15 27.8% 7.94	22 40.7% 11.64	17 31.5% 8.99	54 100 28.57
Above 45 years	19 15.7% 10.05	59 48.8% 31.22	43 35.5% 22.75	111 100 64.02
Total	34 18.0%	89 47.1%	66 34.9%	189 100

Chi-square = 7.059**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 45 concluded that age group of up to 30 years of age 3.70 percent each had low knowledge and skill level. 4.23 percent had medium level of attitude and adoption level and none of the respondents in this category had low level of attitude where as citrus growers of age group 31-45 years of age had high 14.81 percent level of knowledge 15.87 percent had medium skill level, 13.23 percent had low attitude level and 11.64 percent had medium adoption level where as above 45 years of age 29.10 had high level of knowledge , 25.93 percent had medium level of skill, 22.75 percent had high level of attitude and 31.22 percent had medium level of adoption. Data further showed that Chi- square values for knowledge 11.60 ($p< 0.01$) skill 15.19, attitude 69.36 and for adoption level 7.059 which showed that positive and highly

significant relationship was found between age groups and knowledge, skill, attitude and adoption level of recommended practices concerning citrus production protection and marketing. Yasin et al (2003) they reported in their study that the relationship between age group and adoption of pesticide spray is strongly negative. It is clear that farmers between age group of 22-40 adopted the pesticide spray for citrus fruit plants is more (57.6%0 than elders.

The next table presents information regarding the relationship between education level and knowledge, skill, attitude and adoption level of recommended practices concerning citrus production, protection and marketing.

Table 46 Responses (%) between education level and respondents knowledge, skill, attitude and adoption level of recommended practices concerning citrus production, protection and marketing

(2) Education level

(a) Knowledge level

Education level	Low	Medium	High	Total
Illiterate	1 33.3% 0.53	2 66.7% 1.06	0 0.0% 0.00	3 100 1.59
Up to matric	20 31.3% 10.58	25 39.1% 13.23	19 29.7% 10.05	64 100 33.86
Above matric	13 14.0% 6.88	25 26.9% 13.23	55 59.1% 29.10	93 100 49.21
Any diploma	4 13.8% 2.12	10 34.5% 5.29	15 51.7% 7.94	29 100 15.34
Total	38 20.1%	62 32.8%	89 47.1%	189 100

Chi-square = 17.89**

(b) Skill level

Education level	Low	Medium	High	Total
Illiterate	1 33.3% 0.53	2 66.7% 1.06	0 0.0% 0.00	3 100 1.59
Up to matric	14 21.9% 7.41	43 67.2% 22.75	7 10.9% 3.70	64 100 33.86
Above matric	29 31.2% 15.34	27 29.0% 14.29	37 39.8% 19.58	93 100 49.21
Any diploma	6 20.7% 3.17	8 27.6% 4.23	15 51.7% 7.94	29 100 15.34
Total	50 26.5%	80 42.3%	59 31.2%	189 100

Chi-square = 32.31**

(c) Attitude level

Education level	Low	Medium	High	Total
Illiterate	3 100.0% 1.59	0 0.0% 0.00	0 0.0% 0.00	3 100 1.59
Up to matric	28 43.8% 14.81	23 35.9% 12.17	13 20.3% 6.88	64 100 33.86
Above matric	31 33.3% 16.40	18 19.4% 9.52	44 47.3% 23.28	93 100 49.21
Any diploma	6 20.7% 3.17	8 27.6% 4.23	15 51.7% 7.94	29 100 15.34
Total	68 36.0%	49 25.9%	72 38.1%	189 100

Chi-square = 21.33**

(d) Adoption level

Education level	Low	Medium	High	Total
Illiterate	3 100.0% 1.59	0 0.0% 0.00	0 0.0% 0.00	3 100 1.59
Up to matric	17 26.6% 8.99	34 53.1% 17.99	13 20.3% 6. 88	64 100 33.86
Above matric	8 8.6% 4.23	47 50.5% 24.87	38 40.9% 20.11	93 100 49.21
Any diploma	6 20.7% 3.17	8 27.6% 4.23	15 51.7% 7.94	29 100 15.34
Total	34 18.0%	89 47.1%	66 34.9%	189 100

Chi-square = 31.23**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 46 showed that all the illiterate respondents 1.06 percent had medium level of knowledge, and skill, 1.59 percent had low level of attitude and adoption , similarly up to matric had 13.23 percent medium level of knowledge, 22.75 percent had medium level of skill, 14.81 percent had low level of attitude and 17.99 percent had medium adoption level, while

above matric 29.10 percent had high level of knowledge, 19.58 percent had high level of skill, 23.28 percent had high level of attitude and 24.87 percent had medium level of adoption. Where as diploma holders 47.09 percent had high level of knowledge and 7.94 percent had high level of skill, attitude and adoption concerning citrus production, protection and marketing practices.. Table further showed that Chi- square values between education levels of citrus growers and knowledge 17.89 ($p=<0.01$, between education and skill level Chi- square value= 32.31, between attitude level Chi- square value=21.33 and between education levels and adoption level Chi-square value= 31.23 ($p=<0.01$) showed highly significant positive relationship between education levels and knowledge level, skill level, attitude level and adoption level of recommended practices concerning citrus production, protection and marketing. Yasin. (2003) reported that a strongly positive relationship was found between education level and adoption of pesticide spray. It means that farmers with higher education were better adopters of pesticide spray to the citrus gardens.

The next table presents information regarding the relationship between tenancy status and knowledge, skill, attitude and adoption level of recommended practices concerning citrus production, protection and marketing.

Table 47 Responses (%) between tenancy status and respondents knowledge, skill, attitude and adoption level of recommended practices concerning citrus production, protection and marketing

(3) Tenancy Status

(a) Knowledge level

Tenancy status	Low	Medium	High	Total
Owner	17 11 8.99	59 39.1% 31.22	75 49.7% 39.68	151 100 79.89
Owner cum Tenant	1 9.1% 0.53	2 18.2% 1.06	8 72.7% 4.23	11 100 5.82
Tenant	20 74.1% 10.58	1 3.7% 0.53	6 22.2% 3.17	27 100 14.29
Total	38 20.1%	62 32.8%	89 47.1%	189 100

60.45**

(b) Skill level

Tenancy status	Low	Medium	High	Total
Owner	35 23.2% 18.52	64 42.4% 33.86	52 34.4% 27.51	151 100 79.89
Owner cum Tenant	1 9.1% 0.53	9 81.8% 4.76	1 9.1% 0.53	11 100 5.82
Tenant	14 51.9% 7.41	7 25.9% 3.70	6 22.2% 3.17	27 100 14.29
Total	50 26.5%	80 42.3%	59 31.2%	189 100

17.14**

(c) Attitude level

Tenancy status	Low	Medium	High	Total
Owner	58 38.4% 30.69	35 23.2% 18.52	58 38.4% 30.69	151 100 79.89
Owner cum Tenant	3 27.3% 1.59	0 0.0% 0.00	8 72.7% 4.23	11 100 4.82
Tenant	7 25.9% 3.70	14 51.9% 7.41	6 22.2% 3.17	27 100 14.29
Total	68 36.0%	49 25.9%	72 38.1%	189 100

Chi-square = 16.78**

(d) Adoption level

Tenancy status	Low	Medium	High	Total
Owner	24 15.9% 12.70	75 49.7% 39.68	52 34.4% 27.51	151 100 79.89
Owner cum Tenant	3 27.3% 1.59	0 0.0% 0.00	8 72.7% 4.23	11 100 5.82
Tenant	7 25.9% 3.70	14 51.9% 7.41	6 22.2% 3.17	27 100 14.29
Total	34 18.0%	89 47.1%	66 34.9%	189 100

Chi-square = 13.12*

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 47 indicated that 39.68 percent of owner cultivators had high level of knowledge, 33.86 percent had medium level of skill, 30.69 percent had high level of attitude and 39.68 percent had medium level of adoption. Whereas owner-tenants had 4.23 percent high level of knowledge, 4.76 percent had medium level of skill, 4.23 percent had high level of attitude and adoption level. Similarly tenants had 10.58 percent low level of knowledge, 7.41 percent had low level of skill, 7.41 percent had medium level of attitude and adoption level. Table further showed that Chi square values between tenancy status and knowledge level had 60.45 ($p< 0.01$) , between skill level had 17.14 ($p< 0.01$), between attitude level had 16.78 ($p< 0.01$) and between

tenancy status and adoption level had 13.12($p < 0.01$) which indicated that highly significant relationship was found between tenancy status and knowledge, skill and attitude level of recommended practices where as significant relationship was found between tenancy status and adoption level of recommended practices concerning citrus production, protection and marketing.

The next table presents information regarding the relationship between size of land holding and knowledge, skill, attitude and adoption level of recommended practices concerning citrus production, protection and marketing.

Table 48 Responses (%) between size of land holding and respondents knowledge, skill, attitude and adoption level of recommended practices concerning citrus production, protection and marketing

(4) Size of land holding

(a) Knowledge level

Land holding	Low	Medium	High	Total
Up to 12 acre	25 27.2% 13.23	32 34.8% 16.93	35 38.0% 18.52	92 100 48.68
13 to 25 acres	0 0.0% 0.00	15 68.2% 7.94	7 31.8% 3.70	22 100 11.64
Above 25 acres	13 17.3% 6.88	15 20.0% 7.94	47 62.7% 24.87	75 100 39.68
Total	38 20.1%	62 32.8%	89 47.1%	189 100

Chi-square = 25.80**

(b) Skill level

Land holding	Low	Medium	High	Total
Up to 12 acre	37 40.2% 19.58	36 39.1% 19.05	19 20.7% 10.05	92 100 48.68
13 to 25 acres	0 0.0% 0.00	22 100.0% 11.64	0 0.0% 0.00	22 100 11.64
Above 25 acres	13 17.3% 6.88	22 29.3% 11.64	40 53.3% 21.16	75 100 39.68
Total	50 26.5%	80 42.3%	59 31.2%	189 100

Chi-square = 57.18**

(c) Attitude level

Land holding	Low	Medium	High	Total
Up to 12 acre	48 52.2% 25.40	26 28.3% 13.76	18 19.6% 9.52	92 100 48.68
13 to 25 acres	7 31.8% 3.70	8 36.4% 4.23	7 31.8% 3.70	22 100 11.64
Above 25 acres	13 17.3% 6.88	15 20.0% 7.94	47 62.7% 24.87	75 100 39.68
Total	68 36.0%	49 25.9%	72 38.1%	189 100

Chi-square = 36.60**

(d) Adoption level

Land holding	Low	Medium	High	Total
Up to 12 acre	27 29.3% 14.29	53 57.6% 28.04	12 13.0% 6.35	92 100 48.68
13 to 25 acres	0 0.0% 0.00	15 68.2% 7.94	7 31.8% 3.70	22 100 11.64
Above 25 acres	7 9.3% 3.70	21 28.0% 11.11	47 62.7% 24.87	75 100 39.68
Total	34 18.0%	89 47.1%	66 34.9%	189 100

Chi-square = 52.93**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 48 indicated that up to 12 acres of land holders18.52 percent had high level of knowledge, 19.58 percent had low level of skill, 25.40 percent had low level of attitude and 28.04 percent had medium level of adoption. Similarly 7.94 percent of 13-25 acres of land holders had medium level of knowledge and 11.64 percent had medium level of skill and 4.23 percent had medium level of attitude and 7.94 percent had medium level of adoption. While 24.87 percent of above 25 acres of land holders had high level of knowledge, 21.16 percent had high level of skill, and 24.87 percent had high level of attitude and adoption. Where as none of the citrus fruit growers had low level of skill of 13-25 acres of land holders. Table further showed that the chi- square values 25.80 ($p< 0.01$) for knowledge level is highly significant, for

skill level chi- square value 57.17 ($p<0.01$) highly significant. It means that there was highly significant relationship between size of land holding and knowledge and skill level of respondents. The chi-square value between size of land holding and attitude level was 36.60 ($p<0.01$) significant. For adoption level chi- square value 52.93 ($p<0.01$) highly significant. It means that there was highly significant relationship between attitude level, adoption level of respondents and size of land holding.

The next table presents information regarding the relationship between age group and knowledge, skill, attitude and adoption level of recommended practices concerning guava production, protection and marketing.

Table 49 Responses (%) between age group and respondents knowledge, skill, attitude and adoption level of recommended practices concerning guava production, protection and marketing

(1) Age group

(a) Knowledge level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	0 0.0% 0.00	14 100.0% 12.50	14 100 12.50
31-45 years	7 30.4% 6.25	5 21.7% 4.46	11 47.8% 9.82	23 100 20.54
Above 45 years	0 0.0% 0.00	25 33.3% 22.32	50 66.7% 44.64	75 100 66.96
Total	7 6.3%	30 26.8%	75 67.0%	112 100

Chi-square = 35.80**

(b) Skill level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	7 50.0% 6.25	7 50.0% 6.25	14 100 12.50
31-45 years	7 30.4% 6.25	16 69.6% 14.29	0 0.0% 0.00	22 100 20.54
Above 45 years	8 10.7% 7.14	52 69.3% 46.43	15 20.0% 13.39	75 100 66.96
Total	15 13.4%	75 67.0%	22 19.6%	112 100

Chi-square = 19.06**

(c) Attitude level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	1 7.1% 0.89	13 92.9% 11.61	14 100 12.50
31-45 years	7 30.4% 6.25	13 56.5% 11.61	3 13.0% 2.68	23 100 20.54
Above 45 years	8 10.7% 7.14	34 45.3% 30.36	33 44.0% 29.46	75 100 66.96
Total	15 13.4%	48 42.9%	49 43.8%	112 100

Chi-square = 25.23**

(d) Adoption level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	1 7.1% 0.89	13 92.9% 11.61	14 100 12.50
31-45 years	12 52.2% 10,71	8 34.8% 7.14	3 13.0% 2.68	23 100 20.54
Above 45 years	9 12.0% 8.04	43 57.3% 38.39	23 30.7% 20.54	75 100 66.96
Total	21 18.8%	52 46.4%	39 34.8%	112 100

Chi-square = 42.44**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 49 concluded that age group of up to 30 years of age 12.50 percent had high knowledge, 6.25 percent had medium level of skill, 11.61 percent had high level of attitude and adoption level and none of the respondents in this category had low level of knowledge, skill, attitude and adoption level. where as guava growers of age group 31-45 years of age had high 9.82 percent level of knowledge, 14.29 percent had medium skill level, 11.61 percent had medium attitude level and 10.71 percent had low adoption level where as above 45 years of age 44.64 percent had high level of knowledge and 46.43 percent had medium level of skill and 30.36 percent had medium level of attitude and 38.39 percent of the growers had medium level of adoption. Data further showed that Chi- square values for knowledge 35.80 ($p< 0.01$) for skill

level 19.06, for attitude level 25.23 and for adoption level 42.44 which showed that positive and highly significant relationship was found between age groups and knowledge, skill, attitude and adoption level of recommended practices concerning guava production protection and marketing.

The next table presents information regarding the relationship between education level and knowledge, skill, attitude and adoption level of recommended practices concerning guava production, protection and marketing.

Table 50 Responses (%) between education level and respondents knowledge, skill, attitude and adoption level of recommended practices concerning guava production, protection and marketing.

(2) Education level

(a) Knowledge level

Education level	Low	Medium	High	Total
Illiterate	0 0.0% 0.00	1 8.3% 0.89	11 91.7% 9.82	12 100 10.71
Up to matric	0 0.0% 0.00	3 11.1% 2.68	24 88.9% 21.43	27 100 24.11
Above matric	0 0.0% 0.00	26 51.0% 23.21	25 49.0% 22.32	51 100 45.54
Any diploma	7 31.8% 6.25	0 0.0% 0.00	15 68.2% 13.39	22 100 19.64
Total	7 6.3%	30 26.8%	75 67.0%	112 100

Chi-square = 55.17**

(b) Skill level

Education level	Low	Medium	High	Total
Illiterate	1 8.3% 0.89	10 83.3% 8.93	1 8.3% 0.89	12 100 10.71
Up to matric	1 3.7% 0.89	24 88.9% 21.43	2 7.4% 1.79	27 100 24.11
Above matric	6 11.8% 5.36	32 62.7% 28.57	13 25.5% 11.61	45 100 45.54
Any diploma	7 31.8% 6.25	9 40.9% 8.04	6 27.3% 5.36	22 100 19.64
Total	15 13.4%	75 67.0%	22 19.6%	112 100

Chi-square = 16.96**

(c) Attitude level

Education level	Low	Medium	High	Total
Illiterate	1 8.3% 0.89	1 8.3% 0.89	10 83.3% 8.93	12 100 10.71
Up to matric	1 3.7% 0.89	18 66.7% 16.07	8 29.6% 7.14	27 100 24.11
Above matric	6 11.8% 5.36	29 56.9% 25.89	16 31.4% 14.29	51 100 45.54
Any diploma	7 31.8% 6.25	0 0.0% 0.00	15 68.2% 13.39	22 100 19.64
Total	15 13.4%	48 42.9%	49 43.8%	112 100

Chi-square = 36.79**

(d) Adoption level

Education level	Low	Medium	High	Total
Illiterate	1 8.3% 0.89	11 91.7% 9.82	0 0.0% 0.00	12 100 10.71
Up to matric	2 7.4% 1.79	17 63.0% 15.18	8 29.6% 7.14	27 100 24.11
Above matric	11 21.6% 9.82	24 47.1% 21.43	16 31.4% 14.29	51 100 45.54
Any diploma	7 31.8% 6.25	0 0.0% 0.00	15 68.2% 13.39	22 100 19.64
Total	21 18.8%	52 46.4%	39 34.8%	112 100

Chi-square = 33.46**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 50 showed that the illiterate respondents 9.82 percent had high level of knowledge, and 8.93 percent had medium level of skill, 8.93 percent had high level of attitude and 9.82 percent had medium level of adoption. similarly up to matric 21.43 percent had high level of knowledge, 21.43 percent had medium level of skill, 16.07 percent had medium level of attitude and 15.18 percent had medium adoption level, while above matric 23.21 percent had medium level of knowledge, 28.57 percent had medium level of skill, 25.89 percent had medium

level of attitude and 21.43 percent had medium level of adoption.. Similarly diploma holders 13.39 percent had high level of knowledge and 8.04 percent had medium level of skill and 13.39 percent had high level of attitude and adoption. Table further showed that Chi- square values between education levels of guava growers and knowledge 55.17 ($p=<0.01$, between education and skill level Chi- square value = 16.96, between attitude level Chi- square value=36.79 and between education levels and adoption level Chi-square value= 33.46 ($p=<0.01$) showed highly significant positive relationship between education and knowledge level, skill level, attitude level and adoption level of recommended practices concerning guava production, protection and marketing.

The next table presents information regarding the relationship between tenancy status and knowledge, skill, attitude and adoption level of recommended practices concerning guava production, protection and marketing.

Table 51: Responses (%) between tenancy status and respondents knowledge, skill, attitude and adoption level of recommended practices concerning guava production, protection and marketing.

(3) Tenancy Status

(a) Knowledge level

Tenancy status	Low	Medium	High	Total
Owner	7 7.6% 6.25	28 30.4% 25.00	57 62.0% 50.89	92 100 82.14
Owner cum Tenant	0	1	8	9
	0.0% 0.00	11.1% 0.89	88.9% 7.14	100 8.04
Tenant	0	1	10	11
Total	0.0% 0.00 7	9.1% 0.89 30	90.9% 8.93 75	100 9.82 112
	6.3%	26.8%	67.0%	100

Chi-square = 6.02^{NS}

(b) Skill level

Tenancy status	Low	Medium	High	Total
Owner	13 14.1% 11.61	67 72.8% 59.82	12 13.0% 10.71	112 100 82.14
Owner cum Tenant	1 11.1% 0.89	7 77.8% 6.25	1 11.1% 0.89	9 100 8.04
Tenant	1 9.1% 0.89	1 9.1% 0.89	9 81.8% 8.04	11 100 9.82
Total	15 13.4%	75 67.0%	22 19.6%	112 100

Chi-square = 30.38**

(c) Attitude level

Tenancy status	Low	Medium	High	Total
Owner	13 14.1% 11.61	39 42.4% 34.82	40 43.5% 35.71	92 100 82.14
Owner cum Tenant	1 11.1% 0.89	8 88.9% 7.14	0 0.0% 0.00	9 100 8.04
Tenant	1 9.1% 0.89	1 9.1% 0.89	9 81.8% 8.04	11 100 9.82
Total	15 13.4%	48 42.9%	49 43.8%	112 100

Chi-square = 15.19**

(d) Adoption level

Tenancy status	Low	Medium	High	Total
Owner	18 19.6% 16.07	44 47.8% 39.29	30 32.6% 26.79	82 100 82.14
Owner cum Tenant	1 11.1% 0.89	8 88.9% 7.14	0 0.0% 0.00	9 100 8.04
Tenant	2 18.2% 1.79	0 0.0% 0.00	9 81.8% 8.04	11 100 9.82
Total	21 18.8%	52 46.4%	39 34.8%	112 100

Chi-square = 19.20**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 51 indicated that 50.89 percent of owner cultivators had high level of knowledge , 59.82 percent had medium level of skill, 35.71 percent had high level of attitude and 39.29 percent had medium level of adoption. Where as owner-tenants had 7.14 percent high level of knowledge, 6.25 percent had medium level of skill, 7.14 percent had medium level of attitude and adoption level. Similarly tenants had 8.93 percent high level of knowledge, 8.04 percent had high level of skill, attitude and adoption level. Table further showed that Chi square values

between tenancy status and knowledge level had 6.02 ($p< 0.01$) non significant, between skill level had 30.38 ($p< 0.01$), between attitude level had 15.19 ($p< 0.01$) and between tenancy status and adoption level had 19.20 ($p< 0.01$) which indicated that highly significant relationship was found between tenancy status and skill , attitude and adoption level of recommended practices where as non significant relationship was found between tenancy status and knowledge level of recommended practices concerning guava production, protection and marketing.

The next table presents information regarding the relationship between size of land holding and knowledge, skill, attitude and adoption level of recommended practices concerning guava production, protection and marketing.

Table 52: Responses (%) between size of land holding and respondents knowledge, skill, attitude and adoption level of recommended practices concerning guava production, protection and marketing.

(4) Size of land holding

(a) Knowledge level

Land holding	Low	Medium	High	Total
Up to 12 acre	0 0.0% 0.00	16 30.8% 14.29	36 69.2% 32.14	52 100 46.43
13 to 25 acres	7 25.9% 6.25	5 18.5% 4.46	15 55.6% 13.39	27 100 24.11
Above 25 acres	0 0.0% 0.00	9 27.3% 8.04	24 72.7% 21.43	33 100 29.46
Total	7 6.3%	30 26.8%	75 67.0%	112 100

Chi-square = 23.77**

(b) Skill level

Land holding	Low	Medium	High	Total
Up to 12 acre	8 15.4% 7.14	28 53.8% 25.00	16 30.8% 14.29	52 100 46.43
13 to 25 acres	7 25.9% 6.25	20 74.1% 17.86	0 0.0% 0.00	27 100 24.11
Above 25 acres	0 0.0% 0.00	27 81.8% 24.11	6 18.2% 5.36	33 100 29.46
Total	15 13.4%	75 67.0%	22 19.6%	112 100

Chi-square = 18.98**

(c) Attitude level

Land holding	Low	Medium	High	Total
Up to 12 acre	8 15.4% 7.14	19 36.5% 16.96	25 48.1% 22.32	52 100 46.43
13 to 25 acres	7 25.9% 6.25	20 74.1% 17.86	0 0.0% 0.00	27 100 24.11
Above 25 acres	0 0.0% 0.00	9 27.3% 8.04	24 72.7% 21.43	33 100 29.46
Total	15 13.4%	48 42.9%	49 43.8%	112 100

Chi-square = 34.60**

(d) Adoption level

Land holding	Low	Medium	High	Total
Up to 12 acre	9 17.3% 8.04	28 53.8% 25.00	15 28.8% 13.39	52 100 46.43
13 to 25 acres	12 44.4% 10.71	15 55.6% 13.39	0 0.0% 0.00	27 100 24.11
Above 25 acres	0 0.0% 0.00	9 27.3% 8.04	24 72.7% 21.43	33 100 29.46
Total	21 18.8%	52 46.4%	39 34.8%	112 100

Chi-square = 43.01**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 52 indicated that up to 12 acres of land holders 32.14 percent had high level of knowledge, 25.00 percent had medium level of skill, 22.32 percent had high level of attitude and 25.00 percent had medium level of adoption. Similarly 13.39 percent of 13-25 acres of land holders had high level of knowledge and 17.86 percent had medium level of skill and attitude and 13.39 percent had medium level of adoption. While 21.43 percent of above 25 acres of land holders had high level of knowledge, 24.11 percent had medium level of skill, 21.43 percent had high level of attitude and adoption. Where as none of the fruit growers had low level

of attitude and adoption in this category. Table further showed that the chi- square values 23.77 ($p< 0.01$) for knowledge level was highly significant for skill level chi- square value 18.98($p<0.01$) highly significant. It means that there was highly significant relationship between size of land holding and knowledge and skill level of respondents. The chi-square value between size of land holding and attitude level was 34.60 ($p<0.01$) highly significant. For adoption level chi- square value 43.01 ($p<0.01$) highly significant. It means that there was highly significant relationship between attitude level and adoption level of respondents and size of land holding.

The next table presents information regarding the relationship between age group and knowledge, skill, attitude and adoption level of recommended practices concerning date production, protection and marketing.

Table 53: Responses (%) between age group and respondents knowledge, skill, attitude and adoption level of recommended practices concerning date production, protection and marketing.

(1) Age group

(a) Knowledge level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	0 0.0% 0.00	6 100.0% 17.14	6 100 17.14
31-45 years	0 0.0% 0.00	7 58.3% 20.00	5 41.7% 14.29	12 100 34.29
Above 45 years	6 35.3% 17.14	0 0.0% 0.00	11 64.7% 31.43	17 100 48.57
Total	6 17.1%	7 20.0%	22 62.9%	35 100

Chi-square = 21.95**

(b) Skill level

Age group	Low	medium	High	Total
Up to 30 years	0 0.0% 0.00	6 100.0% 17.14	0 100.0% 0.00	6 100 17.14
31-45 years	7 58.3% 20.00	5 41.7% 14.29	12 100.0% 0.00	12 100 34.29
Above 45 years	6 35.3% 17.14	11 64.7% 31.43	17 100.0% 0.00	17 100 48.57
Total	13 37.1%	22 62.9%	35 100.0%	35 100

Chi-square = 5.88^{NS}

(c) Attitude level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0% 0.00	0 0.0% 0.00	6 100.0% 17.14	6 100 17.14
31-45 years	4 33.3% 11.43	3 25.0% 8.57	5 41.7% 14.29	12 100 34.29
Above 45 years	6 35.3% 17.14	0 0.0% 0.00	11 64.7% 31.43	17 100 48.57
Total	10 28.6%	3 8.6%	22 62.9%	35 100

Chi-square = 10.01*

(d) Adoption level

Age group	Low	Medium	High	Total
Up to 30 years	0 0.0%	0 0.0% 0.00	6 100.0% 17.14	6 100 17.14
31-45 years	4 33.3% 11.43	3 25.0% 8.57	5 41.7% 14.29	12 100 34.29
Above 45 years	6 35.3% 17.14	6 35.3% 17.14	5 29.4% 14.29	17 100 48.57
Total	10 28.6%	9 25.7%	16 45.7%	35 100

Chi-square = 9.13^{NS}

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 53 concluded that age group of date growers of up to 30 years of age 17.14 percent each had high knowledge, medium level of skill, high level of attitude and adoption and none of the respondents in this category had low level of knowledge , skill, attitude and adoption. where as date growers of age group 31-45 years of age had medium 20.00 percent level of knowledge, 20.00 percent had low skill level, 14.29 percent had high attitude level and 14.29 percent had high adoption level where as above 45 years of age 31.43 percent had high level of knowledge and medium level of skill and 31.43 had high level of attitude and 17.14 percent of the growers had low and medium level of adoption. Data further showed that Chi-square values for knowledge 21.95 ($p< 0.01$) was highly significant, skill non significant, attitude

10.01 significant and for adoption level 9.13 was non significant. Which showed that positive and highly significant relationship was found between age groups and knowledge and non significant relationship between skill and adoption level of recommended practices concerning date production protection and marketing.

The next table presents information regarding the relationship between education level and knowledge, skill, attitude and adoption level of recommended practices concerning date production, protection and marketing.

Table 54: Responses (%) between education level and respondents knowledge, skill, attitude and adoption level of recommended practices concerning date production, protection and marketing.

(2) Education level

(a) Knowledge level

Education level	Low	Medium	High	Total
Up to matric	6 50.0% 17.14	0 0.0% 0.00	6 50.0% 17.14	12 100 34.29
Above matric	0 0.0% 0.00	3 15.8% 8.57	16 84.2% 45.71	19 100 54.29
Any diploma	0 0.0% 0.00	4 100.0% 11.43	0 0.0% 0.00	4 100 11.43
Total	6 17.1%	7 20.0%	22 62.9%	35 100

Chi-square = 31.08**

(b) Skill level

Education level	Low	High	Total
Up to matric	6 50.0% 17.14	6 50.0% 17.14	12 100 34.29
Above matric	3 15.8% 8.57	16 84.2% 45.71	19 100 54.29
Any diploma	4 100.0% 11.43	0 0.0% 0.00	4 100 11.43
Total	13 37.1%	22 62.9%	35 100

Chi-square = 11.33**

(c) Attitude level

Education level	Low	Medium	High	Total
Up to matric	6 50.0% 17.14	0 0.0% 0.00	6 50.0% 17.14	12 100 34.29
Above matric	0 0.0% 0.00	3 15.8% 8.57	16 84.2% 45.71	19 100 54.29
Any diploma	4 100.0% 11.43	0 0.0% 0.00	0 0.0% 0.00	4 100 11.43
Total	10 28.6%	3 8.6%	22 62.9%	35 100

Chi-square = 21.23**

(d) Adoption level

Education level	Low	Medium	High	Total
Up to matric	6 50.0% 17.14	0 0.0% 0.00	6 50.0% 17.14	12 100 34.29
Above matric	0 0.0% 0.00	9 47.4% 25.71	10 52.6% 28.57	19 100 54.29
Any diploma	4 100.0% 11.43	0 0.0% 0.00	0 0.0% 0.00	4 100 11.43
Total	10 28.6%	9 25.7%	16 45.7%	35 100

Chi-square = 24.16**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 54 showed that up to matric 17.14 percent had high and low level of knowledge and low and high level of skill, had low and high level of attitude and adoption level. While above matric 45.71 percent had high level of knowledge , skill and attitude. 28.57 percent had high level of adoption. Where as diploma holders 11.43 percent had medium level of knowledge and low level of skill, attitude and adoption. Table further showed that Chi-square values between education levels of date growers and knowledge 31.08 (p=<0.01, between education and skill level Chi- square value= 11.33, between attitude level Chi- square value=21.33 and between education levels and adoption level Chi-square value= 24.14 (p=<0.01) which showed highly significant positive relationship between education levels and

knowledge level, skill level, attitude level and adoption level of recommended practices concerning date production, protection and marketing.

The next table presents information regarding the relationship between tenancy status and knowledge, skill, attitude and adoption level of recommended practices concerning date production, protection and marketing.

Table 55: Responses (%) between tenancy status and respondents knowledge, skill, attitude and adoption level of recommended practices concerning date production, protection and marketing.

(3) Tenancy Status

(a) Knowledge level

Tenancy status	Low	Medium	High	Total
Owner	0 0.0% 0.00	7 24.1% 20.00	22 75.9% 62.86	29 100 82.86
Tenant	6 100.0% 17.14	0 0.0% 0.00	0 0.0% 0.00	6 100 17.14
Total	6 17.1%	7 20.0%	22 62.9%	35 100

Chi-square = 35.00**

(b) Skill level

Tenancy status	Low	High	Total
Owner	7 24.1% 20.00	22 75.9% 62.86	29 100 82.86
Tenant	6 100.0% 17.14	0 0.0% 0.00	6 100 17.14
Total	13 37.1%	22 62.9%	35 100

Chi-square = 12.26**

(c) Attitude level

Tenancy status	Low	Medium	High	Total
Owner	4 13.8% 11.43	3 10.3% 8.57	22 75.9% 62.86	29 100 82.86
Tenant	6 100.0% 17.14	0 0.0% 0.00	0 0.0% 0.00	6 100 17.14
Total	10 28.6%	3 8.6%	22 62.9%	35 100

Chi-square = 18.10**

(d) Adoption level

Tenancy status	Low	Medium	High	Total
Owner	4 13.8% 11.43	9 31.0% 25.71	16 55.2% 45.71	29 100 82.86
Tenant	6 100.0% 17.14	0 0.0% 0.00	0 0.0% 0.00	6 100 17.14
Total	10 28.6%	9 25.7%	16 45.7%	35 100

Chi-square = 18.10**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 55 indicated that 62.86 percent of owner cultivators had high level of knowledge, skill and attitude and 45.71 percent had high level of adoption. While 17.14 percent of tenants had low level of knowledge, skill, attitude and adoption level. Table further showed that Chi square values between tenancy status and knowledge level had 35.00 ($p< 0.01$) , between skill level had 12.26 ($p< 0.01$), between attitude level had 18.10 ($p< 0.01$) and between tenancy status and adoption level had 18.10($p< 0.01$) which indicated that highly significant relationship was found between tenancy status and knowledge, skill attitude and adoption level of recommended practices concerning date production, protection and marketing.

The next table presents information regarding the relationship between size of land holding and knowledge, skill, attitude and adoption level of recommended practices concerning date production, protection and marketing.

Table 56: Responses (%) between size of land holding and respondents knowledge, skill, attitude and adoption level of recommended practices concerning date production, protection and marketing.

(4) Size of land holding

(a) Knowledge level

Land holding	Low	Medium	High	Total
Up to 12 acre	6 50.0% 17.14	0 0.0% 0.00	6 50.0% 17.14	12 100 34.29
13 to 25 acres	0 0.0% 0.00	4 44.4% 11.43	5 55.6% 14.29	9 100 25.71
Above 25 acres	0 0.0% 0.00	3 21.4% 8.57	11 78.6% 31.43	14 100 40.00
Total	6 17.1%	7 20.0%	22 62.9%	35 100

Chi-square = 17.54**

(b) Skill level

Land holding	Low	High	Total
Up to 12 acre	6 50.0% 17.14	6 50.0% 17.29	12 100 34.29
13 to 25 acres	4 44.4% 11.43	5 55.6% 14.29	9 100 25.71
Above 25 acres	3 21.4% 8.57	11 78.6% 31.43	14 100 40.00
Total	13 37.1%	22 62.9%	35 100

Chi-square = 2.54^{NS}

(c) Attitude level

Land holding	Low	Medium	High	Total
Up to 12 acre	6 50.0% 17.14	0 0.0% 0.00	6 50.0% 17.14	12 100 34.29
13 to 25 acres	4 44.4% 11.43	0 0.0% 0.00	5 55.6% 14.29	9 100 25.71
Above 25 acres	0 0.0% 0.00	3 21.4% 8.57	11 78.6% 31.43	14 100 40.00
Total	10 28.6%	3 8.6%	22 62.9%	35 100

Chi-square = 12.16*

(d) Adoption level

Land holding	Low	Medium	High	Total
Up to 12 acre	6 50.0% 17.14	6 50.0% 17.14	0 0.0% 0.00	12 100 34.29
13 to 25 acres	4 44.4% 11.43	0 0.0% 0.00	5 55.6% 14.29	9 100 25.71
Above 25 acres	0 0.0% 0.00	3 21.4% 8.57	11 78.6% 31.43	14 100 40.00
Total	10 28.6%	9 25.7%	16 45.7%	35 100

Chi-square = 20.87**

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

The data given in table 56 indicated that up to 12 acres of land holders17.14 percent had low and high level of knowledge, skill, low and high level of attitude and 17.14 percent had low and medium level of adoption. Similarly 14.29 percent of 13-25 acres of land holders had high level of knowledge ,skill, attitude and adoption. While 31.43 percent of above 25 acres of land holders had high level of knowledge, skill, attitude and adoption. Where as none of the date growers had low level of knowledge, skill, attitude and adoption. Table further showed that chi-square values 17.54 ($p< 0.01$) for knowledge level is significant, for skill level chi- square value

2.54 ($p<0.01$) non significant. It means that there was no relation ship between size of land holding and skill level of respondents. The chi-square value between size of land holding and attitude level was 12.16 ($p<0.01$) significant. For adoption level chi- square value 20.87 ($p<0.01$) highly significant. It means that there was highly significant relationship between knowledge and adoption level of respondents and size of land holding.

The next table depicts the information regarding the appropriate time for training program as reported by 317 respondents.

Table 57: Appropriate time for training program as reported by 317 respondents.

months	No of respondents	Percent
January	95	29.97
February	84	26.49
March	23	7.25
April	0	
May	0	
June	15	4.74
July	15	4.74
August	20	6.4
September	55	17.35
October	10	3.15
November	0	
December	0	

The data presented in table 57 indicate that a simple majority (29.97, 26.49 and 17.35 percent) of the respondents reported that January, February and September are the appropriate months for the conduction of training program for fruit growers. Where as a few of them (7.25, 4.74, 4.74, 6.4 and 3.15 percent) pointed out that the months of March, Jun, July, August and October are the best time for the conduction of training programs for fruit growers. Mohammad (2002) reported in his study that the majority of the fruit growers desired that the best time for the conduction of training program to be offered should be before crop season. It is recommended that the management of the Department of Agricultural Extension Govt. of Punjab should arrange training courses in the months of January, February and September for the fruit growers in the main competency categories identified in the study because during qualitative discussions farmers reported that they are not so much busy in the farm business in the months of January, February and September.

The next table depicts the information regarding the duration of courses to be developed for the training of fruit growers.

Table 58: Duration of courses for the training of fruit growers as reported by 317 respondents

Duration	No	Percent
One week	161	50.78
Two week	118	37.22
One month	31	9.78
More than one months	7	2.22
Total	317	100.00

The data given in table 58 concluded that (50.78 and 37.22 percent) of the respondents indicate that one week and two week are the appropriate time for the training of fruit growers. While a few of them (9.78 and 2.22 percent) reported that one months and more than one months are the appropriate time period for the training of fruit growers in order to improve their technical competencies. Mohammad (2001) conducted study for the training of fruit growers regarding time period and reported that majority (78.00 percent) of the respondents reported that training program should be completed within one week. It is suggested that the Agricultural Extension Department should develop training courses of duration up to one week to two weeks according to the amount of training material to be taught for the training of fruit growers in order to improve their technical competencies

The next table depicts the information regarding the centre for the training of fruit growers.

Table 59: Centre for Training of fruit growers as reported by 317 respondents

Centre	No.	%
Office of union council	43	13.57
On the farm of a farmer	32	10.09
At research station	68	21.45
University of agriculture Faisalabad	174	54.89
Total	317	100.00

The data given in table 59 indicate that majority (54.89) percent of the respondents reported that University of Agriculture Faisalabad is the suitable place for the conduction of training program for the training of fruit growers in order to increase their knowledge, skill and attitude level. While a few of them (13.57, 10.09 and 21.45 percent) reported the union council office, farm of the farmer and research station is suit able place for the conduction of training programs for the training of fruit growers. Muhammad (2001) reported that 63.00 percent of the respondents reported their own village, 82.00 percent reported that the training program should be conducted in the fields of farmers.

It is recommended that management of Department of Agricultural Extension should arrange short-courses for the training of fruit growers to improve their technical competencies in the University of Agriculture Faisalabad.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

Fruits are known to be the prime source of food for human beings and the fruit gardening can play a significant role in the economic development of any country. In Pakistan, agro-climatic environment is suitable for the cultivation of various types of fruits. The cultivation of fruits resulted in more income per hectare than major crops (Ahmad et al 1993). The use of land for fruit plants instead of major crops is an economic advantage to the country. In the year 2009 area under all fruits in the Punjab was 400.9 thousand hectares with an annual production of 4562.2 thousand tones and area in Pakistan under all fruits was 853.4 thousand hectares with an annual production of 7178.7 thousand tones. The mango had average yield of 10.24 tones/hectare with a potential yield of 20 tones / hectare. Citrus had average yield 9.98 tones/hectare and potential yield per hectare was 40 m ton. The average yield of guava had 8.92 tones / hectare and date had average yield 5.7 tones/ hectare. The actual yield of fruit crops produced at the farmers' fields was considerably less than the potential yield of these fruits. One of the major factors causing this huge yield gap was the unawareness of fruit growers to modern production technology. This deficiency on the part of the fruit growers can be overcome by comprehensive training and extension of modern fruit production techniques. There existed a significant positive relationship between the education level and the adoption of the respondents (Abbas 2008). It may imply that farmers with higher level of education were more likely to adopt the practices than those of having little or no education.

Keeping in view the present status of fruit production in comparison with crops it can be stated that the fruits are of more importance and are economically more beneficial. They are more profitable when grown according to the recommendations of the experts.

The field staff of the Department of Agriculture (Extension), Govt. of the Punjab like the similar other departments of the province is responsible for the dissemination of agricultural technology to the farmers but the fruit growers have little access to agricultural information.

Partap & Partap (2001, Alkire et al 1992 and Memon 1989) pointed out that the majority of farmers were poor accepters of innovations. One of the reasons of poor adoption / acceptance was the low level of knowledge and skill of fruit growers in growing and managing fruit plants / gardens. Various researchers has discussed competencies possessed by Extension field staff and teachers etc. but no systematic and comprehensive study is found on the competencies of fruit farmers in Pakistan. Thus, still there remains a gap between the available knowledge and knowledge required to clearly identify the levels of competencies possessed by fruit plant growers so that training programs / extension campaigns may be planned for them to equip them with the knowledge and skills required to be competent enough in growing and managing good fruit gardens The present study was therefore planned to fill this knowledge gap and to identify and prioritize competencies possessed by fruit garden owners in district Faisalabad, Pakistan. Following are the specific objectives of the study.

(i). To identify the sources of information of fruit growers.
(ii). To analyze the problems faced by fruit growers.
(iii). To determine the levels of technical competencies possessed by the fruit growers.
(iv). To determine the rank order of the technical competencies in which the fruit growers need training.
(v). To suggest feasible measures for the improvement of fruit growers' competence in fruit production, storage and marketing.

This study used a descriptive research design. It was designed to identify and prioritize the competencies possessed by fruit garden owners in district Faisalabad, Pakistan. Fruit farmers are those who grow fruit crops at their farms.

The population of this study consisted of four types of major fruit i.e. mango, citrus, guava and dates, growing farmers of Faisalabad district of the Punjab.

A stratified random sample of fruit growing farmers was selected from each Tehsil of district Faisalabad. From the total number of 1993, only 317 respondents were selected as sample of the study. From each Tehsil these were as under:

Tehsil	**Population**	**Sample Size**
Faisalabad	496	80
Jaranwala	562	90
Sammundri	722	112
Tandilian wala	99	16
Chakjumra	114	19
Total	1993	317

The researcher arranged several meetings with the academic staff of the Department of Agricultural Extension, University of Agriculture, Faisalabad and the members of supervisory committee and developed a structured interview schedule based on the review of relevant literature, personal insights of the researcher and qualitative field interviews especially the focus group interviews. The instrument was reviewed by the members of the supervisory committee of the researcher. The instrument was field tested for validity and reliability before using in the field. The collected data were analyzed by using application specifically designed for the analysis of data i.e. SPSS (Statistical Package for Social Sciences). The data related to biographical information of the respondents from each of the category were analyzed using rank orders, percentages, standard deviations and numbers. The chi-square was calculated to find out the relationship between two variables.

Following conclusions were drawn from the study.

5.2 Conclusions

5.2.1 Biographic information

(a). Majority (72.9%) of the fruit growing formers was above 45 years of age. Forty- three percent of the respondents had fallen in the education level of matric and above. A comparatively higher percentage (54.9%) of the respondents had land holding up to 12 acres of land. Majority (83.00%) of the respondents were owner cultivators.

(b). Majority (59.6 %) of the respondents were citrus growers, while (41.3 %) were mango growers, (35.3 %) were guava growers and (11 %) of the respondents were date growers, a few farmers were growing more than one fruit crop. Higher percentage (40.4%) of the respondents were commanding up to 3 acres of land under fruit orchard.

5.2.2 Awareness regarding the sources of information

Majority (87.70, 80.4 and 72.2 percent) of the respondents reported their sources of information as Field Assistants, Agricultural officers and friends with an average mean score of ($\overline{X}$= 2.58, 2.30 and 2.13) level of availability and low ($\overline{X}$ = 2.13, 2.48 and 2.05) level of correctness. Only (4.4) percent of the respondents reported their sources of information as the staff of the University of Agriculture Faisalabad had high ($\overline{X}$=3.43) level of availability and had high (X=3.57) level of accuracy.

5.2.3 Technical competencies

(a). Majority of the respondents (97.00 percent, 94.00 percent and 93.6 percent) of the respondents reported the problem of improper training regarding fruit

growing practices; shortage of irrigation water and lack of timely information regarding fruit production, protection and marketing as their main problems with an extent of severity level (2.40, SD =0.86, 1.76, SD =0.84 and 1.86, SD =0.70).

(b). The data indicate that guava growers had better medium ($\overline{X}$=3.25) level of knowledge, had medium ($\overline{X}$= 2.57) level of skill and had medium ($\overline{X}$= 3.02) level of attitude than other fruit growers regarding preparation of field for transplantation of nursery plants in the field. While the citrus growers had better adoption low ($\overline{X}$= 2.20) level regarding adoption of field preparation practices than other selected fruit plants.

(c). The fruit growers had low–medium ($\overline{X}$= 2.60-3.10) level of knowledge, skill, skill and adoption regarding system layout for transplanting of selected fruit plants in the gardens.

(d). The fruit growers had low ($\overline{X}$=2.31-2.97) level of knowledge, skill, attitude and adoption which indicate a need to train farmers regarding proper plant to plant distance and size of planting pit for transplanting of fruit nursery plants in the field.

(e). The date, citrus and guava growers had medium ($\overline{X}$=3.33-3.02) level of knowledge, skill, attitude and adoption higher level than mango growers ($\overline{X}$= 2.90- 2.15) regarding filling of pits with ingredients of fill for transplanting of selected nursery fruit plants.

(f). The fruit growers had low ($\overline{X}$=2.78- 2.68) level of knowledge, skill, attitude and adoption regarding fertilizer application to mango, citrus and date plants after transplanting in the field, Whereas the guava growers had medium (3.00-2.70) level of knowledge, skill, attitude and adoption regarding fertilizer application to guava fruit plants in the field which show that guava

growers had better knowledge, skill, attitude and adoption for fertilizer application than the growers of other selected fruit plants.

(g). The fruit growers had medium ($\overline{X}$= 3.14-1.97) level of knowledge, skill, attitude and adoption regarding application of irrigation water to selected fruit plants in all the seasons of the year.

(h). The fruit growers had medium ($\overline{X}$=3.09-2.77) level of knowledge, skill, attitude and adoption regarding weed control and recommended pruning method for selected fruit plants in the field.

(i). The fruit growers of guava, ,citrus and mango fruit plants had low level and date growers had medium level of knowledge, skill, attitude and adoption regarding pollination practices of selected fruit plants. The fruit growers had low ($\overline{X}$=2.65-1.71) level of knowledge, skill, attitude and adoption concerning insect/ pest / diseases and control measures for selected fruit plants in the fruit gardens. The fruit growers of fruit plants guava, mango and citrus had low ($\overline{X}$=2.87-1.89) level of knowledge, skill, attitude and adoption concerning recommended harvesting practices and marketing of selected fruit plants in the field. Whereas date growers had medium ($\overline{X}$= 3.37-3.24) level of knowledge, skill, attitude and adoption concerning recommended harvesting and marketing practices of date fruit plants in the field.

(j). The top five competencies in which mango growers need maximum training were: (1) Intercropping in mango gardens in kharief season ($\overline{X}$= 2.06), (2) time of fertilization application to mango fruit plants ($\overline{X}$=2.16), (3) intercropping in Rabi season in mango orchards ($\overline{X}$=2.34), (4) control measures of insects/ pests and diseases ($\overline{X}$=2.37) and (5) pollination of mango fruit plants ($\overline{X}$= 2.40). While the mango farmers were found

competent in (25) weed control in mango orchards ($\overline{X}$=3.04), (24) filling of pits with ingredients of fill (x=2.88), (23) fertilizer application above ten years of aged mango fruit plants ($\overline{X}$=2.80), (22) recommended harvesting practices of fruits ($\overline{X}$=2.75), (21) fertilizer application from five to ten years of aged mango fruit plants ($\overline{X}$= 2.74) were ranked at the end of all the competencies need comparatively less training for mango growers.

(k). The top five competencies in which citrus growers need maximum training were: (1) Intercropping in citrus gardens in Kharief season ($\overline{X}$= 1.96), (2) intercropping in Rabi season in citrus orchards ($\overline{X}$=2.23), (3) time of fertilizer application to citrus fruit plants had ($\overline{X}$=2.26), (4) control measures of insects/ pests ($\overline{X}$=2.31), (5) control measures for diseases ($\overline{X}$=2.34). While the citrus growers were found comparatively competent (26) filling of pits ($\overline{X}$= 3.18), (25) weed control in citrus orchards, ($\overline{X}$=2.90.), (24) fertilizer application above ten years of aged citrus fruit plants ($\overline{X}$= 2.89), (23) preparation of field ($\overline{X}$=2.86), (22) fertilizer application from five to ten years of aged citrus fruit plants ($\overline{X}$=2.85) were ranked at the end with high mean score need a little bit less training to citrus growers.

(l). The top five competencies in which guava growers need maximum training were: (1) Intercropping in guava gardens in Kharief season ($\overline{X}$= 1.94), (2) intercropping in Rabi season in guava gardens ($\overline{X}$=2.18), (3) time of fertilizer application to guava fruit plants ($\overline{X}$=2.20), (4) pollination of guava fruit plants ($\overline{X}$=2.28) and (5) recommended pruning method of guava fruit plants ($\overline{X}$=2.36). The competency statements need less attention are (24) filling of pits with ingredients of fill ($\overline{X}$=3.16), (23) fertilizer application from five to ten years of age plants ($\overline{X}$=2.98), (22) fertilizer application less than five years of aged guava fruit plants ($\overline{X}$=2.98), (21)

fertilizer application above ten years of aged guava fruit plants ($\overline{X}$=2.97), (20) preparation of field for transplantation of guava nursery plants in the field ($\overline{X}$=2.95) need comparatively less training for guava growers.

(m). The top five competencies in which date growers need maximum training were: (1) Intercropping in date gardens in Kharief season ($\overline{X}$=2.02), (2) insect pest and diseases ($\overline{X}$=2.19), (3) intercropping in Rabi season in date orchards ($\overline{X}$=2.19), (4) control measures of insects/ pests and diseases ($\overline{X}$=2.20) and (5) application of irrigation method to date fruit plants ($\overline{X}$= 2.28). The competency statements for which the date growers need less attention are (24) pollination of date fruit plants in orchards ($\overline{X}$=3.87), (23) filling of pits with ingredients of fill ($\overline{X}$=3.29), (22) recommended harvesting practices ($\overline{X}$=3.24), (21) irrigation practices of date fruit plants in winter ($\overline{X}$=2.88), (20) weed control in date fruit plants in the gardens ($\overline{X}$= 2.87) need less training for date growers than first five identified competency statements.

(n). The Chi- square values for association between age groups, education level, tenancy status and size of land holding and knowledge level, skill, attitude, adoption level was highly significant which showed highly significant positive relationship between the age group, education level, tenancy status, size of land holding of respondents and knowledge, skill, attitude and adoption level of recommended practices concerning mango production, protection and marketing. While only the relationship between size of land holding and knowledge level and skill level was non significant.

(o). The Chi- square values for the relationship between age groups, education level, tenancy status, size of land holding and knowledge level, skill, attitude and adoption level was highly significant which showed highly significant positive relationship between the age group, education level, tenancy status, size of land holding of respondents and knowledge, skill, attitude and

adoption level of recommended practices concerning citrus production, protection and marketing.

(p). The Chi- square values for the relationship between age groups, education level, tenancy status, size of land holding and knowledge level, skill, attitude and adoption level was highly significant which showed highly significant positive relationship between the age group, education level, tenancy status, size of land holding of respondents and knowledge, skill, attitude and adoption level of recommended practices concerning guava production, protection and marketing. While only relationship between tenancy status of guava growers and skill level was non significant.

(q). The Chi- square values for association between age groups, education level, tenancy status, size of land holding and knowledge, skill, attitude and adoption level was highly significant which showed highly significant positive relationship between the age group, education, tenancy status, size of land holding of respondents and knowledge, skill, attitude and adoption level of recommended practices concerning date production, protection and marketing. Where as the relationship between age group and skill level, adoption level was non significant.

5.2.4 Training program:

(a). Majority of the respondents reported that months of January, February and September are the appropriate time for the arrangements of training program for the training of fruit growers in the identified competencies.

(b). Majority of the respondents reported that one week to two week are the appropriate time according to the training material to be taught for the training of fruit growers in the identified competencies.

(c). Majority of the respondents reported that University of Agriculture, Faisalabad is the suitable place for the conduction of training program for the training of fruit growers in order to increase their knowledge, skill and attitude level in the identified technical competencies**.**

5.3 Recommendations

On the bases of findings of the study, following recommendations were developed:

5.3.1 For the Deptt. of Agriculture (Ext.)

(a). The management of Deptt. Of Agricultural Extension Govt. of Punjab should immediately arrange training courses for fruit growers in the main competency categories identified in the study.

(b). The management of Deptt. Of Agricultural Extension Govt. of Punjab Should arranges seminars, workshops regarding fruit growing practices such as plant production, protection and marketing after transplantation of fruit nursery plants in the field.

(c). Owning to the shortage of irrigation water in the Punjab, the Govt. of the Punjab should provide subsidy and training to the fruit growers that they should not flooding their fruit gardens and used drip irrigation system to their fruit plants by doing this method the area under fruit plants and production of fruit plants can be increased.

(d). The irrigation Department should provide extra irrigation water for fruit gardens.

5.3.2 For the University Of Agriculture Faisalabad.

The data show that University of Agriculture Faisalabad provided correct information but very few fruit growers. It should make arrangements for the dissemination of fruit growing technologies and develop short courses for the training of the fruit growers of District Faisalabad regarding fruit growing practices for selected fruit plants.

5.3.3 For Fruit Growers.

(a). The fruit growers in order to get maximum income and return from their orchard should utilize all the sources of information which are providing the fruit production technology and grow their fruit plants according to the recommendations of the experts and adopted all the fruit growing practices from preparation of field to harvesting and marketing of fruits.

(b). Big fruit growers should pay due attention to the establishment of fruit industry in the vicinity of fruit growing areas and arrangements should be made with the help of govt. of the Punjab to export their surplus fruit. It would help earn foreign exchange on one hand and growers will get good income on the other.

5.4 For Future Researchers

The Division of Education and Extension, University of Agriculture Faisalabad should plan and conduct such research studies to assess the training needs of fruit growers in other fruit growing districts of the Punjab.

REFERENCES

Abbas, M, W 2008. An Investigation into Extent of Awareness And Adoption of Awareness And Adoption Of Date palm Production Technologies Among The Farmers Of District Bahawalpur. M.Sc (Hons.)Agri. Ext. Thesis, U, A, Faisalabad.

Abid, M.2004 studies on low productivity of mango orchards: its causes & possible remedies. National research program for Universities. University college of Agriculture, Bahauddin Zakariya University Bosan Road, Multan, NRPU Proposal Summary # 243.

Ahmad. I, 2008 Effectiveness of Fruit and Vegetable Development Project as Perceived by the Mango Growers of District Multan. M. Sc. (Hons.) Agri. Thesis, U. A. Faisalabad

Ahmed, B., Z. Hussain and J Longmire. 1993. Farm Management Handbook. Published in collaboration with the economic and Policy analysis Project (Chemonics International Consulting Division, Washington D. C.), ASSP/USAID Under the provision of USAID contract no. 391-0492-C-00-0831.

Ahamad, A. 1975. Adoption of the Recommended Horticultural Practices by the mango Growers in Multan Tehsil. M.Sc. (Agri. Ext.) Thesis, U.A; Faisalabad.

Ahamad, A. 1988, A study into the Adoption of Recommended maize Growing Practices by the Farmers of Faisalabad Tehsil. M.Sc (Agri. Ext.) thesis, U. A., Faisalabad.

Alkire, S., A. Safranko and A. khan. 1992. Farmers access to information and its impact on technology adoption in North West frontier province, Pakistan. Journal: Development and Administration .24(4):

Anwar, M. 1988. A Study into the extent of adoption of improved gardening practices by the citrus growers of Teh Phalia Distt. Gujrat. M.Sc. Thesis (Dett. Agri. Ext.), University of Agriculture, Faisalabad, Pakistan.

Asif. J. 1989. A Study in to the extent of adoption of recommended citrus fruit marketing practices by the citrus growers in Samundri Tehsil, District Faisalabad. M.Sc. (Hons.) Agri. Ext. Theses, U.A., Faisalabad.

Aslam, K.L. and poe, S.L. 1980 Spider mites of elsavador, central America, Aacari: Tetranchildae Fal. Ent. 63 (4):502-505.

Awolola, M.D. 1995. Education and farmers' motivation: The case of the five villages in Zaria Area of Kaduna state. Nournal of Rural Development and administration, 25 (2):

Butt, S.A. 2002. Role of Television in the Dissemination of Agricultural Technology among the farmers of Tehsil Faisalabad. M.Sc. (Hons.) Agri. Ext. Thesis, U.A., Faisalabad.

Cheema, S.S. and Malhi, C.S. 1986 Effect of N, P and K fertilizers on the incidence of mango malformation, anthracnose and powdery mildew. Punjab Hort. J. 26 (1): 6-7.

Desai, C. P., Patel, A.A. and patel, M.R. 1999 constraints faced by mango growers in Adoption of irrigation system Gujrat Agri. Res. J. 24 (2):52-57.

Fitzggibbion, Taylor, C. and Morris, L.L. 1987. How to design a Programme evaluation. New Burry Park CA; Sage.

Flower, J. 1990. Competency based education in North Carolina Agriculture Programmes. Journal of Agri. Edu 3: 62-66

Gott, R.E., C.M. Donald. 1981. Perceptions of the value adult/young farmers educational Competencies needed by vocational agriculture teachers.

Govt. of Pakistan 2007. Economic Survey of Pakistan: Finance division, economic advisor's wing Islamabad.

Govt. of Pakistan 2007-08S. Agricultural Statistics of Pakistan, Ministry of Food, Agriculture and Livestock. Finance Division. Economic Advisers' Wing. Islamabad.

Hanif. S.,1992. Comparative effectiveness of various sources of information for cane growers in crescent sugar mills' zone area, Faisalabad. M. Sc. (Hons.) Agri. Ext. Thesis, U.A., Faisalabad.

Haq, I. 1965. K "Looses in the Marketing of Agricultural Produce". Paper presented at the Seminar of Agricultural Marketing Sponsored by the west Pakistan Agricultural University, Lyallpur.

Haraikawa. N. 1990. Construction of an imperial linear programming model to analyze Japanese farmers' behavior the case of vegetable (fruit) growers. Bulletin of the National Agriculture Research Center, Japan, 18:1-18.

Hassan, M.Z.Y. 1999 and investigation in to the extent of adoption of recommended plant Protection measures against insect/pests and diseases by the mango growers in Tehsil Muzaffargrah. M.Sc (Hons.) Agri. Ext. Thesis, U.A., Faisalabad.

Hassan, Z.U. 1989 the adoption of recommended horticultural practices with special reference to citrus fruit by the farmers of Tehsil Sargodha. M.Sc. (Hons.) Agri. Ext. Thesis, U.A., Faisalabad.

Haq, I.u. 2009 An Analysis of Paradigm shift from public Extension to public private partnership Extension system in N W F P, Pakistan. . M.Sc. (Hons.) Agri. Ext. Thesis, U.A., Faisalabad.

Hussain, M.Z.U. 1991. A study into the adoption of plant protection measures among mango growers of Tehsil Muzafar Garh. M.Sc thesis. Deptt. Of Agri. Ext. Univ., Agri . Faisalabad, Pakistan

Hussain. N. 1992 An investigation in to the adoption constraints regarding recommended Horticultural practices as experienced by the citrus growers of Jaffarabad District of Balochistan. M.Sc. (Hons). Thesis, U.A. Faisalabad.

Iftikhar, M . 2009 Training need assessment of cotton growers to meet the challenges of W T O by maintaining cotton quality in the Punjab, Pakistan. . M.Sc (Hons.) Agri. Ext. Thesis, U.A., Faisalabad.

Ingram, J 2008 are farmers in England equipped to meet the knowledge challenge of sustainable soil management ? An analysis of farmer and advisor views. Journal of Environmental Management. Vl-86, vl 214-228

Iqbal, A. 2009 identification and prioritization of production, protection and marketing problems faced by the rice growers in tehsil Hafizabad. M.Sc (Hons.) Agri. Ext. Thesis, U.A., Faisalabad.

Iqbal. S, M. H. Sial and Z. Hussain. (2009) Technical efficiency of citrus production in Sargodha District, Punjab. International journal of Agriculture and Allied Sciences vol-01, No 02 page 68-75, Faculty of Management and Administrative Sciences, University of Sargodha, Pakistan.

Jaskani, M.M. 2002. Mango orchards on the verge of extinction; published in the Daily Dawn 11 Feb. Karachi, Pakistan.

Joshi. Y.R. Sharma. Rai and B.K. Mitychelhill. 1990. Monitoring and evaluation of the Kitchen Garden programme in local target area of pakhribas Agriculture Center. PAC Technical Paper, Pakistan Agriculture Center, 140:82pp, Kathmando, Nepal.

Kadian. K.S 1999. Factors influencing the adoption of improved horticultural practices in Kangra valley. Agri.Sci.Digest.Kernal.19 (1): 35 – 38

Khan, M.A, and I. Ahmed Khan. 1994. Plant Breeding. National Book Foundation, Islamabad.

Khan . A. G, (2010) Present and prospective role of electronic media in the dissemination of agricultural technologies among farmers of the Punjab, Pakistan. Ph.D. Thesis, Department of Agricultural Extension, Univ. of Agri., Faisalabad.

Kibriaul. K. 1988. Growing multipurpose fruit trees in Bangladesh: farmer's perceptions of Opportunities and obstacles. "Multipurpose Tree Species for small-Farm use". Proceedings of and International Workshop held Nov. 2-5 1987 ion Pattaya, Thailand. (Eds. Withington, D., MacDicken, K.G., Sastry, C.B., Adams, N.R) 1988. 191-196

Lees: J.W, and I. J. Reeve. 1991. Competencies for farming: a compendium of Profiles. TRDC Publication No. 175m 116 pp. Armidale. New South Wales, Australia; The Rural Development Centre, university of New England.

Martin. R.A. and S.B. Sajilian. 1989. Teaching competencies needed by extension workers In transferring agricultural technologies to Malaysian farmers Journal Agricultural Education, 30(2):68-72.

Martin, R.A. And M. H. Omer. 1987. Factor associated with participation of lowa young Farmers in agricultural extension programmes. Journal of A.A.T.E.A. 29(1):45-52.

McCubbin, M. J. 2007. The south African date palm industry strengths and weaknesses. Acta hort. (ISHS) 736:59-63

McGee, M.B and I. G. Cheek. 1987. Competencies possessed by students enrolled in Fundamentals of Agri business and Natural Resources Education. Journal of AATEA29 (11)

Memon. M.Y. 1989. Economic competencies needed and possessed by farmers in Hyderabad District, Sindh Pakistan. Unpublished doctoral dissertation, lowa State University, Ames.

Mohammad, N.S.E. 2001 Modern technologies. North western zone-status report. Regional research station. Vridhachalam – 606 001. Tamil Nadu Agricultural University. http://www.tnau.ac.in/dr/zonepdf/NorthWesternZone.Pdf

Mohy-ud-Din, A.I. 1989 Integrated pest management of three mango pests-proceedings of International mango workshop. Directorate of Agriculture (ext.) Multan Region, Punjab, Pakistan; 137-141.

Mohayidin. M.G. 1984.b a review of different decision- making models for fruit farmers. Malaysian J. Agric. Econ. 1:6-15.

Nazri. M.I. and R.K. Barrick. 1990. Professional knowledge competency achievements of Agricultural teachers with or without pre-service teacher preparation in peninsular Malaysia. Journal of Agricultural Education 31(2):19-54.

Niazi, A.Q.K. 1993 To determine the extent of adoption of recommended horticultural Practices by the mango growers of Tehsil Muzaffargarh M.Sc (Hons) Agri. Ext. Thesis, U.A., Faisalabad.

Nosheen,F. (2010) Analysis of gender involvement in agricultural decision making and rural development in Punjab, Pakistan; Acase study of district chakwal. Ph. D. Thesis, Department of Agricultural extension, Univ. of Agri., Faisalabad.

Okorley, E. L., J. A. Kwarteng, and A. O. Mensah, 2005. Extension training needs in pesticides use by urban and pefi- urban vegetable growers in central region of Ghana .j. Ext. Sys. 21 (1):14-30.

Owusu, A.O., M.M. Jinnah and F.A Frempong. 2000. Professional competencies of agricultural extension agents in Ghana. Perceptions of agricultural extension agents, and their supervisors in Central and Northern regions. Conference Proceeding Confirmed Browlny of AIAEE 16th Annual Conference March, 29 – April 1st Arlington, Virginia, USA.

Partap. U and T .Partap., 2001 Declining apple production and worried Himalayan farmers; promotion of honeybees for pollination. International- centre for- integrated-mountain- development; No .1, 6 pp.; 7 ref.

Pfenninger, K. and W. Koblet. 1989. The Swiss Viticulture Association and Viticulture in eastern Switzerland; Advice to the wine growers through the Swiss fruit Viticulture Association. Schweizerische Zeitschrift fur Obst und Winbau. 125:14,359-364; 365-369.

Pirzada, S.W.H. 2003 Mango export from Pakistan and WTO regime on food and agriculture. http://worldtradereview.com

Protasov. N.I. I.V. Sorochinskii and V. V. Bolottnikova. 1986, protection of potato, vegetable \and fruit crops in farmer's personal plots. 127pp., Minsk, USSR; 'Uradchal'.

Qazi. A. R. A.H. Mirza and S.A. Cheema. 1993. Farmers' characteristics affecting adoption of agricultural innovation. Journal of Rural Development and Administration, 25(3):

Rahman. M. L, Mannan. M. A, Hasanuzzaman. M and Islam. M. K (2009) Fruit diversity related household characteristics in a selected island of Bangladesh. American-Eurasion Journal of scientific research 4(3): 128-136, ISSN 1818-6785. IDOS1 Publication, (2009)

Ramasubramaninian, M. and manoharan, M. 2003 Mango growers perception about training subject matter areas and training methods assessed through pair wise matrix ranking. J. of Ext. sys. 19 (2): 67-76.

Ramzan. M., 2003 Assesment of knowledge, skill and attitude of small farmers of tehsil Jalalpur Pir wala regarding insect/pests control in cotton crop. M.Sc. (Hons.) Agri. Ext. Thesis, U. A. Faisalabad.

Rauf, A. 1986. Extent of adoption of land leveling and othert irrigation application practices by thefarmers on improved eatercoursees in Tehsil Faisalabad. M.Sc. (Hons.)Agri. Ext. Thesis, U.A.Faisalabad.

Robin. S. 1991. Farming systems and farmers' strategies fin the Tombali region (Guinea-Bissau). The role of fruit production system in the rice growing systems. Cahiers de la recherché development, No. 30:14-27.

Roger, E. M. (1995) Diffusion of innovation(4th edition). The free press. New York.

SG. Puri, BV. Ghodki., 1999. Study of knowledge level of sapota growers about the recommended package of practices for sapota cultivations. Journal of soil and crops. 9:1,118-119; 2 ref.

Shahid, S. 2006. Business and finance review. What went wrong with the mango crop. Available at, http//www . Jang. Com.pk/ news/ oct. 2006- weekly/ bus. Rev-09 -10-2006/p7.htm

Siddiqui. B. N., 1991 A Study into the Adoption Behavior of Apple (Melous sylrestris) Growers with Regard to Recommended Horticultural Practices to Tehsil Quetta. M.Sc. (Agri. Ext.) Thesis, U.A., Faisalabad.

Shahbaz. B, T. ALi, I. A. Khan and M. Ahmad (2010) An analysis of the problems faced by farmers in the mountains of northewest Pakistan: challenges for Agri. Extension. Pak. J. Agri. Sci. Vol. 47(4) , 417-420.Department of Agri. Extension, University of Agriculture Faisalabad, Pakistan.

Van de Waart. A.J.P. and A.J.P. Van de Waart. 1989. Consequence of hail damage in three Miseries are slight for fruit growers. Fruitteelt, 79:13,17.

Yasin. G, M. Aslam, I. Pervez and S. Naz. (2003) Socio- Economic correlates of pesticide usage: The case of citrus farmers. Journal of Research (Science) Bahauddin Zakria University, Multan, Pakistan. Vol. 14, No.1, June 2003, pp- 43-48

Zehri, N.1993. Determination of effectiveness of Agri. Extension field staff in the diffusion of Agricultural information among the farmers of district Jaffarabad of Balochistan province. M.Sc. (Hons.) Agri. Ext. Thesis, Univ. Of Agri., Faisalabad.