

**ASSESSMENT OF LOSSES OF JACKFRUIT AS PERCEIVED
BY THE FARMERS**

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**ASSESSMENT OF LOSSES OF JACKFRUIT AS PERCEIVED
BY THE FARMERS**

BY

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CERTIFICATE

This is to certify that the thesis entitled “**ASSESSMENT OF LOSSES OF JACKFRUIT AS PERCEIVED BY THE FARMERS**” submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science in Agricultural Extension and Information System**, embodies the result of a piece of bona fide research work carried out by **Md. WaliAhadSetu**, Registration No. 05-01621 under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, received during the course of this investigation has been duly acknowledged.

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***DEDICATED
TO
MY BELOVED TEACHERS***

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ACRONYMS AND ABBREVIATIONS

AEO	Agriculture Extension Officer
BAS	Bureau of Agricultural Statistics
BAU	Bangladesh Agricultural University
BBS	Bangladesh Bureau of Statistics
BARI	Bangladesh Agricultural Research Institute
DAE	Department of Agricultural Extension
et al.	All others
etc.	et cetera, and the other
FAO	Food and Agriculture Organization
GO	Government Organization
I.U.	International Units
mcg	Micro gram
NAC	National Academy of Sciences
NGO	Non-Government Organization
pH	A figure expressing how acid or alkaline a substance is.
SO	Scientific Officer
SPSS	Statistical Package for Social Science
SAAO	Sub-Assistant Agriculture Officer

ASSESSMENT OF LOSSES OF JACKFRUIT AS PERCEIVED BY THE FARMERS

ABSTRACT

The main purpose of this study was to assess the losses of jackfruit as perceived by the farmers and explore the relationships of the selected characteristics of the jackfruit farmers with the losses of jackfruit as perceived by them. The selected characteristics were age, level of education, jackfruit land size, number of jackfruit trees, annual income from jackfruit, experience in jackfruit cultivation, knowledge on jackfruit cultivation and problem faced by the farmers. Data were gathered from 120 jackfruit farmers of six villages such as Kachina and Honpara of Bhaluka Upazilla, Donua and Nagar haowla of Sreepur Upazilla and Naoghata and Sristighar of Shibpur Upazilla under Mymensing, Gazipur and Narsingdi districts respectively by using a structured interview schedule. For harmonious representation from each village 10 percent sample were drawn following stratified random sampling method. Appropriate scales were formulated in order to assess the concerned variables. SPSS software was used to probe the data and Pearson Product Moment Correlation Co-efficient was applied to examine the relationship among the variables. The findings revealed that the highest proportion of the farmers (71.7 percent) perceived medium loss, while 17.5 percent perceived high loss and 10.8 percent of them perceived low loss in jackfruit production. Hence, overwhelming majority (89.2 percent) of the respondents perceived medium to high loss in jackfruit cultivation. The statistical analysis exposed that annual income from jackfruit, experience in jackfruit cultivation and knowledge on jackfruit cultivation of the jackfruit growers had significant negative relationship with the losses of jackfruit while problem faced by the jackfruit farmers had significant positive relationship with the losses of jackfruit as perceived by them.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Jackfruit (*Artocarpusheterophyllus* Lam.) belongs to the family Moraceae, is one of the tropical fruits of Bangladesh which is produced in large quantity every year. It is an important and widely distributed and cultivated fruit crop in Bangladesh. The fruit is very popular among the rural people. It has acclaimed the status of Bangladeshinational fruit due to its popularity and nutritious values. Jackfruit is economically important throughout the tropics of Asia. It is grown in the homestead in almost all the rural areas of Bangladesh. It ranks top in production among the fruits grown in the country accounting 23.08 percent of total fruit production in 2008-09 (BBS, 2010).

It is a seasonal and also a perishable fruit because of its high moisture content. Though jackfruit is produced here in large quantity but the incomes derived from jackfruits are minimal due to wastage of this fruit each year owing to inadequate pre-harvest management, improper harvesting, preservation, storage, handling, transporting and marketing process. These practices of jackfruit ensuring quality would reduce the wide fluctuation of prices between peak harvesting period and off-season. It is important to look into its different parts to be utilized and recognize the fruits of *Artocarpusheterophyllus*.

The fruit of *Artocarpusheterophyllus* is technically termed 'syncarp', a type of multiple fruit consisting of several achenes (Corner, 1938; Purselove, 1968; Soepado, 1991). Each

achene is indehiscent and has only one seed, which is separable from the ovary walls. The fruit consists primarily of 3 regions: i) The axis ii) The persistent perianth and iii) The seed. The fruit axis is nothing but the modified mature stage of inflorescence axis. It is elongated and dome shaped. The axes region, also called the core of the fruit. The fruit is covered with a rubbery rind and spines. Inside the fruit are the fruitlets, or true fruit. These are usually called bulbs, mericarps, pods or pips (Acedo, 1992) which are actually fleshy 'achenes'. They are massed among narrow ribbons of thin, tough, undeveloped perianths which are also known as perigones, white pulps or rags. Each fruitlet (bulb) is composed of the fleshy aril and the seed. The aril, which is the part that is commonly consumed fresh or processed, is sometimes referred to as pulp, fleshy perianth, pericarp, flesh or carpel.

Aril: The ripe aril of crispy nature, after separating the seeds, are eaten usually as fresh fruit while aril of juicy bulb are used in various ways. In the later case, juice is extracted from aril and consumed as different preparations. Many people like a simple mixture of juicy aril and rice bubble to have a good breakfast (Haque, 2010). Ripe or semi-ripe arils are also used for making different delicious processed products like candy, chips, nectars, jam, morobba etc. Aside from its food value, the aril has medicinal properties. It has been reported to be demulcent and laxative (Coronel, 1983). In china, it is considered a cooling and nutritious tonic (Morton, 1965, 1987).

Seed: The seed is more nutritious than the aril, being richer in protein, carbohydrate and mineral contents (Acedo, 1992). Matured seeds are used in curry as vegetables. Seeds are

boiled, roasted, fried and eaten fresh. Roasted dried seeds are ground and mixed with wheat flour for baking also (Haque, 2010).

White bulb, rind and core: These are the non-edible parts of the fruit and considered by many as waste. White pulp (Jackfruit rigs) and rind are used as cattle feed, and core (axis) used by some as vegetables (Haque, 2010). The white pulp (undeveloped flower) can be used as a major component of jackfruit puree. Jackfruit rigs can be used to make good jam. A flavor extract can be prepared from rind or peel. The white pulp, rind and fruit core or receptacle can be processed to produce a pectin extract (Haque, 2010).

Thus, it is found that jackfruit has diversified uses. In many countries immature or semi-mature jackfruits are used as a vegetable popularly, where it is peeled, sliced and boiled and then seasoned or mixed with other food. Ripe jackfruit bulbs are usually consumed during breakfast and after meal. The jackfruit pulp is canned in syrup or used to make jams, jellies and ice cream. Young fruit are cooked in coconut milk and eaten curried. The bulbs mixed in milk will congeal and form pleasant, orange colored custard. In India, the ripe bulbs are dried, fried in oil and salted for eating like potato chips. The ripe bulbs, fermented and then distilled, produce potent liquor. The bulbs of the ripen jackfruit can be made into ice cream, chutney, jam, jelly, paste, and “leather” or papad. The ripe bulbs are mechanically pulped to make jackfruit nectar. The unripe green jackfruit is used as vegetable. Tender young fruits may be pickled with or without spices.

The dried latex yields artostenone, convertible to artosterone, a compound with marked androgenic action. Mixed with vinegar, the latex promotes healing of abscesses, snakebite and glandular swellings. The leaf extract is given to diabetic patients as a control measure. Crushed inflorescence is used to treat diabetes and gall stones.

Post harvest loss of fresh fruit is one of the important problem in the tropics, which occurs at all stages of marketing chain. These losses in quantity and quality of produce occur at different levels of respondents. The gross post-harvest losses from harvesting to consumption of jackfruit at different levels (growers, intermediators, wholesalers, retailers and consumers) were calculated as 25.42 percent(Molla *et al.*, 2011).

The averages loss of jackfruit at growers' level was found 5.23percent at Mymensingh, Gazipur and Narsingdi districts(Molla *et al.*,2011). According to the growers' opinion, these losses were mostly due to disease and pest infestation at pre-harvest condition but expressed at harvesting period. They also reported that a portion of these losses was also due to improper techniques or lack of care during manual harvesting.

There is a prospective market for jackfruit products in country as well as outside. If the excess amount of this seasonal fruit can be processed and dried for the future storage that may be an earning source of foreign currency. There is a good export market potential for these items especially in Middle East countries. On the other hand, jackfruit processing industries may generate an employment opportunity which is one of the urgent needs in the present context of Bangladesh.

It is envisaged that there is a good scope for setting up jackfruit processing units in jackfruit growing areas. This will not only help the farmers to utilize the perishable raw material but also generate more employment opportunities in rural areas. About twenty to twenty five units are engaged in unorganized sector manufacturing jackfruit chips and jackfruit preserves.

Table 1.1 Potential products of Jackfruit

Sl. Number	Standardized in Bangladesh	Standardized in Abroad
1	Jackfruit chips	Jackfruit chips
2	Jackfruit candy	Jackfruit candy
3	Jackfruit rags jam	Jackfruit rags jam
4	Jackfruit leather	Jackfruit Puree
5	Jackfruit pickles i) Jackfruit sweet pickles ii) Jackfruit hot pickles	Jackfruit pickles
6	Jackfruit Nectar	Jackfruit Nectar
7	Dehydrated Jackfruit	Jackfruit leather
8	Preservation of Jackfruit in salt solution	Jackfruit squash
9	Preservation of Jackfruit in sugar solution	Canning of Jackfruit

Source: Potential products of Jackfruit (Molla, *et al.*, 2011)

1.2 Justification of the Study

Jackfruit is mainly grown for its fruits. Fruits at 25-50 percent of full size are eaten unripe as a vegetable or ripe, full size as a fruit. The fruit has high nutritive value, and significantly contributes to the nutrition of the people of Bangladesh as a source of vitamins, minerals and calories. The arils, edible parts of ripe fruits contain high amount of vitamin A (175 I.U./100g), potassium (88-407 mg) and carbohydrates (22.4-24 g/100g), and considerable amount various kinds of vitamin B like Thiamine, Riboflavin and Niacin (Acedo, 1992). Each 100 gm of jackfruit contains: Calories: 94, Fat: 0.3 mg, Dietary fiber: 2 g, Protein: 1 g, Potassium: 303 mg, Calcium: 34 mg, Carbohydrate: 24 g, Folate: 14 mcg and iron: 0.6 mg. Seeds of jackfruits are also a good source of carbohydrates and potassium with considerable amount of phosphorus and calcium and protein (Acedo, 1992). It is estimated that around 30000 children become blind every year only due to vitamin A deficiency in Bangladesh. Vitamin B complex help convert food to energy. The minerals keep the body in balance and iron which is present in blood helps movement of oxygen through the body. The Chinese consider jackfruit pulp and seeds as tonic, cooling and nutritious, and to be, “useful in overcoming the influence of alcohol on the system.” The seed starch is believed to relieve biliousness and the roasted seeds are regarded as aphrodisiac. Jack-fruit is rich in dietary fiber, which makes it a good bulk laxative. The fiber content helps to protect the colon mucous membrane by decreasing exposure time and as well as binding to cancer causing chemicals in the colon. Another benefit of eating jackfruit is that it is a good source of Vitamin C. The human body does not make Vitamin C naturally so we must eat food that contains Vitamin C to reap its health benefits. The health benefits of Vitamin C are that it is an antioxidant that protects the body against free radicals, Vitamin C holds the cells in our

bodies together, and Vitamin C strengthens our immune systems and keeps our gums healthy.

Though a huge amount of jackfruit is produced in every year in Bangladesh, a significant portion of them goes to waste due to its high perish ability and cramped seasonality. The Peak harvesting period of jackfruit is June to July. It's a hot, humid and rainy period of Bangladesh. In this period, marketing of fruit becomes difficult, as the fruits are rotten quickly once it ripens. On the contrary, Sub-standard and outdated pre and post harvest management practices adopted by stakeholders like growers and intermediaries, inadequate and unscientific storage facilities, lack of smooth and timely transportation of agro-products to the sell points and indiscriminate use of non-recommended chemicals specially for ripening and preservations were identified as root causes of huge losses of Jackfruit. Lack of knowledge in the growers and latest technologies are also key-reasons behind such spoilage leads to enormous economic losses, the researchers pointed out. During the peak season for example, about 50 percent fruits mainly pineapple, watermelon, jackfruit, tomato etc. is lost due to inadequate processing facilities in Bangladesh (Hussain, 1993).

The losses have been found maximum 44 percent in jackfruit with main diseases syndromes of shoot and fruit borer, stem-bleeding, and died-back that appeared as the serious threat in the leading jackfruit producing areas such as Mymensingh, Gazipur and Narsingdi. Preservation of jackfruit ensuring quality would reduce the wide fluctuation of prices between peak harvesting period and off-season. Moreover, if the excess amount of this

seasonal fruit can be processed and dried for the future storage that may be a earning source of foreign currency. On the other hand, jackfruit processing industries may generate an employment opportunity which is one of the urgent needs in the present context of Bangladesh.

So assessing the losses of Jackfruit can be considered important alternatives for finding out the reason behind the pre and postharvest losses of this nutritive fruit. So that the necessary steps can be taken to minimize the losses fulfilling the above requirement. The researcher developed a felt need to conduct this sort of research. So the researcher is eagerly interested to undertake the research entitled “**Assessment of Losses of Jackfruit as Perceived by the Farmers**”. The findings of the study will be helpful to the extension providers and to the growers, intermediators, wholesalers, retailers, consumers and researchers of Jackfruit. It is assumed that if the reason of losses and amount of losses could be identified and minimized successfully, the deficiency of food and economic condition of our country would be improved undoubtedly.

1.3 Statement of the Problem

Among all other agricultural practices, only loss of jackfruit has been taken as present research topic. In order to minimize farmers’ losses in jackfruit production the researcher undertook the investigation entitled “Assessment of Losses of Jackfruit as Perceived by the Farmers” in some selected areas of Mymensing, Gazipur and Narsingdi districts in order to have an understanding of the extent of losses of jackfruit as perceived by the farmers. Research information is required which could be helpful to the policy maker, regarding supply of inputs, technological knowledge and problem being encountered on jackfruit

production. The purpose of the study was to assess the losses of Jackfruit as perceived by the farmers regarding production, harvesting and marketing and to explore the relationship of the selected characteristics of the farmers with the losses of jackfruit as perceived by them. In order to make the study manageable, the following research questions were taken into consideration.

1. Are there any losses in jackfruit production, harvesting and marketing as perceived by the farmers?
2. What is the extent of losses in jackfruit production, harvesting and marketing as perceived by the farmers?
3. What are the characteristics of the farmers?
4. Is there any relationship between the farmers' selected characteristics and losses of jackfruit as perceived by them?

1.4 Specific Objectives

The following specific objectives were formulated in order to give proper direction of the study:

1. To assess the losses of Jackfruit as perceived by the farmers
2. To assess the following selected characteristics of the jackfruit farmers:
 - (i) Age
 - (ii) Level of education
 - (iii) Jackfruit land size

- (iv) Number of jackfruit trees
 - (v) Annual income from jackfruit
 - (vi) Experience in Jackfruit cultivation
 - (vii) Knowledge on Jackfruit cultivation
 - (viii) Problem faced by the farmers
3. To explore the relationship of the selected characteristics of the jackfruit farmers with the losses of jackfruit as perceived by them
 4. To compare the severity of the problems faced by the jackfruit farmers

1.5 Limitations and Scope of the Study

The respondents of the study were exclusively selected from Gazipur, Mymensing and Narsingdi districts. But the findings may be applicable in other areas of Bangladesh where the physical, socio-economic and cultural conditions are alike with those of the study area. Thus, the findings of the study may be profitably utilized by the jackfruit production planners, extension personnel and field workers for successful prevention of jackfruit losses. However, in order to conduct the research in a meaningful and manageable way it becomes necessary to impose certain limitations in regard to certain aspects of the study, considering the time, money and necessary resources available to the researcher. The study was conducted with the following limitations:

- i) The study was confined to Sreepur, Bhaluka and Shibpur Upazilas under Gazipur, Mymensing and Narsingdi districts respectively.

- ii) Population for the present study was kept confined within the heads of farm families in the study area.
- iii) There were many characteristics of the farmers in the study area but only eight of them were selected for investigation.
- iv) For information about the study, the researcher depended on the data furnished by the selected respondents during their interview with him.
- v) Facts and figures collected by the researcher applied to the situation prevailing during the year 2011.
- vi) Reluctance of the farmers to provide information was overcome by establishing rapport.

1.6 Assumptions of the Study

An assumption has been defined as the supposition that an apparent fact or principle is true in the light of the available evidence (Goode and Hatt, 1952). That means the assumption is taken as a fact or belief to be true. The researcher had the following assumptions in mind while undertaking this study:

- The respondents, included in the sample were capable of satisfying proper responses to the questions included in the interview schedule.
- Views and opinions furnished by the respondents were the representative views and opinions of the whole population of the study.

- The responses furnished by the respondents were reliable. The researcher was well adjusted to the social environment of the study area. So, the respondents gave their opinions without any hesitation.
- All the data concerning the independent and dependent variables were normally and independently distributed with their respective means and standard deviation.
- The findings of the study will have general applications to other parts of the country with similar personal, socio-economic and cultural conditions.

1.7 Definition of Terms

A researcher needs to know the meaning and contents of every term that he uses. A concept is an abstract of observed thing; events or phenomenon. It should clarify the issue as well as explain the fact to the investigator and readers. However, for clarity of understanding, a number of key concepts/terms frequently used throughout the study are defined and interpreted as follows:

Respondents

Randomly selected people considered to be representable of the population are known as respondents. They are the people from whom a social research worker usually gets most data required for his research. In this study the respondents were the village level jackfruit farmers.

Farmers

The persons who were involved in farming activities are called farmers. They participated in

different farm and community level activities like crops, livestock, fisheries, other farming activities etc. In this study, jackfruit growers were treated as farmers.

Age

Age of a respondent is defined as the span of life and is operationally measured by the number of years from his/her birth to the time of interviewing.

Level of education

Empirically it was defined to the development of desirable changes in knowledge, skill and attitudes in an individual through reading, writing, walking, observation and other selected activities. It was measured on the basis of classes a farmer has passed from a formal educational institution.

Jackfruit land size

In this study, jackfruit land size refers to the area of land which was used by the farmers for jackfruit cultivation. It was expressed in hectare.

Number of jackfruit trees

In this study it refers to the jackfruit trees which are owned by the respondents.

Annual income from jackfruit

Annual family income of a respondent generally refers to the total earning by him and other members of his family from different sources during a year. Annual income from jackfruit of the respondent only includes the earning from jackfruit by the respondent. It was expressed in Thousand Taka.

Experience in jackfruit cultivation

Experience as a general concept comprises knowledge or skill of something or some event gained through involvement in or exposure to that thing or event. Experience refers to the nature of the events someone or something has undergone. Experience is what is happening to us all the time - as long as we *exist*. However, in this study, it refers to the years of cultivating jackfruit by the respondents.

Knowledge on Jackfruit cultivation

It is the extent of basic understanding of the farmers in different aspects of Jackfruit production, harvesting and marketing etc. It includes the basic understanding of the use of different inputs and practices for jackfruit cultivation.

Problem faced

Problem means any difficult situation which requires some actions to minimize the gap between “what ought to be” and “what is”. The term problem faced refers to different problem faced by the farmers in jackfruit production, harvesting and marketing.

Losses of jackfruit

Loss refers to a reduction in the value of an investment. However, in this study, it refers to the amount or number of jackfruit which was wasted.

CHAPTER 2

REVIEW OF LITERATURE

This chapter deals with the review of past research works that relates to this investigation directly or indirectly. The reviews are conveniently presented based on the major objectives of the study. The aim of this study was to have an understanding of assessment of losses of jackfruit as perceived by the farmers and their relationships with the selected individual characteristics. Despite frantic search, the researcher found only a few literatures related to this study. The researcher came across with some expert opinions and has tried his best to collect needful information through searching relevant studies, journals, periodicals, bulletins, leaflets, internet etc. These enhanced the researcher's knowledge for better and clear understanding of the present study. But unfortunately no previous literature was found related to relationship between losses of any fruits as perceived by the farmers and their characteristics. On this consideration, this chapter has been presented in two sections as follows:

Section 1: General findings on losses of jackfruit or any other fruits and vegetables

Section 2: The development of conceptual framework of the study

2.1 General Findings on Losses of Jackfruit or Any Other Fruits and Vegetables

Ahmed (2010) conducted a research on postharvest loss assessment and nutritional quality of jackfruit. The survey was conducted in Mymensingh and Gazipur districts and the laboratory experiments were conducted at the laboratories of the Department of

Horticulture, Plant Pathology and Biochemistry, BAU, Mymensingh. Findings of the study revealed that the postharvest losses of the jackfruit at the 'growers', 'Bepari', 'wholesalers' and 'retailers' levels were 16.13 percent, 11.40 percent, 9.22 percent and 6.76 percent, respectively and the total postharvest loss of jackfruit was estimated to be 43.51 percent in the entire supply chain. The losses occurred mainly due to improper storage, careless handling and traditional transport system.

Hassan *et al.* (2011) observed that post-harvest wastage of 13 selected fruits and vegetables in major growing areas annually costs the country about Tk 3,442 crore on retail price. Findings also showed that the post-harvest loss ranges from 23.6 to 43.5 percent of the fruits and vegetables that include jackfruit, pineapple, papaya, mango, litchi, banana, orange, cucumber, cauliflower, tomato, okra, brinjal, and red amaranth. Among the selected fruits, post-harvest losses have been found maximum 44 percent in jackfruit with main diseases syndromes of shoot and fruit borer, stem-bleeding, and died-back that appeared as the serious threat in the leading jackfruit producing areas such as Mymensingh and Gazipur. The loss is attributed to the fact that jackfruit is seriously damaged by fruit borer (insects) and is soft rot since the growers of the surveyed region, Mymensingh and Gazipur, hardly apply any pesticides or fungicides to reduce damages in the field. The second important reason for higher loss in jackfruit is the excessive use of ripening chemicals, which accelerate fruit ripening and dramatically shorten shelf life.

Majumder (2011) reported that local farmers have been counting losses due to low prices of jackfruit, which were supposed to get bumper yields in eight upazilas of hilly district of

Khagrachhari. In his report, he showed some scenario like a farmer namely AbulKashem from Taindong village under Matirangaupazilla counted a loss of Tk. 800 after selling 4,000 jackfruit at Tk 25,000 only. He blamed poor transpiration system, lower prices and absence of government control on the market regarding this issue.

Haq (2006) opined that post harvest losses of jackfruit can be as much as 30-34 percent.

In a study in India Mitra (2010) reported that high cumulative wastages were found across the supply chain which were Mango : 22 percent, Banana : 30 percent, Guava : 16 percent, Litchi : 25 percent, Pineapple : 20 percent, Jackfruit : 12 percent.

Medagoda (2011) observed in a study that a very low percentage of total produce is consumed as a food amounting 30 percent and greater percentages, amounting to about 70 percent is lost in the form of pre and post-harvest losses. The major constraint reported in marketing were the absence of properly organized marketing structures, lack of processing plants and the poor demand in local market for jack products. An integrated approach would improve productivity, quality and income from jack cultivation contributing to poverty alleviation in the rural sector to a considerable extent.

Patil (2008) found that 'Higher the value addition better the post-harvest management and lower will be losses'. He also mentioned some reasons for losses such as handling of raw produce through many stages of middlemen, processing is mostly controlled by urban rather than rural entrepreneurs which leads to losses in valuable by products, non availability of

adequate and efficient equipment and machinery to be used in catchment areas, low level of entrepreneurial urge in rural areas due to constraints of finance, assured market and proper training on technology and on the whole, there exists a fragmented and inefficient value chain.

Laordenet *al.*(2011) found average post harvest losses for jackfruit across marketing levels was 28.30 percent in Philippine.

Malik and Mazhar (2007) identified the nature and extent of postharvest quality losses in two major mango cultivars from the tree to the retailer. According to his study the estimated postharvest losses of Sindhri and Chaunsavariety of mango from harvest to the retailer were 68.56 percent and 75.36 percent respectively.

Mojica (2010) reported in a study that the official report from the BAS stated that mango production continued to slow down by three percent annually since 2003 and recorded a 13.14 percent drop from the period of January to September 2009. In its Crop Statistics report from the period of 2003-2008, BAS said that the country produced 884 thousand mt of mango in 2008, 14 percent lower than the 1,024 thousand mt in 2007. This drop, according to the report, resulted from the adverse effects of typhoon Frank, rains during flowering stage, less flower induction, toppling down of trees due to typhoon Cosme, and the attack of anthracnose.

Amiruzzaman (1990) found that the magnitude of post-harvest losses of major fruits and vegetables in Bangladesh is 25-50 percent and it is only 5-25 percent in developed countries as reported by Khader, 1992.

Carlos (1992) reported that the post-harvest loss of mango has been estimated 17 percent in Bangladesh.

Hossain(1989) stated that 40 percent post-harvest losses of mango occur due to improper harvesting, handling and lack of storage technique especially processing and preservation technique.

Azad (2000) reported that 27 percent post-harvest loss of mangoes occurs due to improper harvesting and handling.

Pantastico (1977) opined that the amount of post-harvest loss of fruits and vegetables each year in the Philippines has been estimated at 29 metric tons of protein which could supply the protein requirement of 1.3 M Filipinos.

Hussain, (1993) found that Post-harvest losses in durable crops ranged between 10-15 percent; loss in semi-perishable crops was 15-30 percent and that of perishables, 25-40 percent. During the peak season for example, about 50 percent fruits mainly pineapple, watermelon, jackfruit, tomato etc. is lost due to inadequate processing facilities in Bangladesh.

FAO (1989) reported that estimates of the post-harvest losses of food grains in the developing world from mishandling, spoilage and pest infestation are put at 25 percent; this means that one-quarter of what is produced never reaches the consumer for whom it was grown, and the effort and money required to produce it are lost-forever. Fruit, vegetables and root crops are much less hardy and are mostly quickly perishable, and if care is not taken in their harvesting, handling and transport, they will soon decay and become unfit for human consumption. Estimates of production losses in developing countries are hard to judge, but some authorities put losses of sweet potatoes, plantain, tomatoes, bananas and citrus fruit sometimes as high as 50 percent, or half of what is grown. Reduction in this wastage, particularly if it can economically be avoided, would be of great significance to growers and consumers alike.

Yuen and Teng (1990) revealed that Post-harvest losses in tropical fruits have been estimated to average between 15 percent–25 percent of production and do not appear to differ between the main crops of bananas, plantains, citrus, mangoes, pineapple, papaya, and avocado. The losses are caused by physical, mechanical, biological and social factors and have been derived using expert judgment, sampling of storage facilities and analysis of trade documents.

NAC (1978) found in a study that post-harvest losses occur up to 50 percent in perishable agricultural commodities in developing countries.

Chaudhry (1998) observed that the sum-total of losses in food grains amount to 1.44 million tons valued at Rs.3.13 billion which if converted into dollar currency units will equal to 316.15 million, US Dollars. From any international standard, it is an immense recurring loss which the developing economy of Pakistan can hardly afford to bear.

Oyeniran (1988) revealed that although postharvest loss estimate figure for fruits and vegetables are difficult to substantiate especially in developing countries like Nigeria, it is however estimated that losses as high as 50 – 70 percent are common in the tropics between the production areas and consumption points.

Kader (1992) showed that the magnitude of post-harvest losses of fresh fruits and vegetables is estimated to be 5 to 25 percent in developed countries and 20 to 50 percent in developing countries depending upon commodity.

Gathambiriet *al.* (2006) showed Percentage postharvest losses of mango fruit in Kenya is about 45 percent and one of the causes is due to excess fruits in the market during the peak seasons. Postharvest value addition technologies would reduce the losses giving farmers high returns for their crop.

Mollaet *al.* (2010) found that the postharvest losses of litchi were mainly at harvesting (8.0 percent), handling from orchard to selling point by the growers and beparies involved in harvesting (4.61 percent) and after buying to consumption by the consumers (7.5 percent). Considering the channels involved in litchi marketing, the growers and/or beparies engaged

in harvesting had the highest percent of losses (16percent in Dinajpur, 12percent in Ishurdi, and 11 percent in Natore) followed by the consumers (7.5percent).

2.2 The Conceptual Framework of the Study

In order to understand the nature of losses of jackfruit as perceived by the farmers, it was necessary to know about the characteristics of the farmers as well as their perception on losses of jackfruit.

Losses of jackfruit as perceived by the farmers were influenced by their different characteristics. These characteristics were considered to have influence on the perception on losses of jackfruit. Farmers were individuals and hence, their perception on impact on losses in jackfruit cultivation was likely to be influenced by their various characteristics. Losses of jackfruit as perceived by the farmers was the main focus of the study. Eight selected characteristics of farmers were considered for this study which might have relationship with losses of jackfruit as perceived by them. A simple conceptual framework in this connection has been presented in Figure 2.1

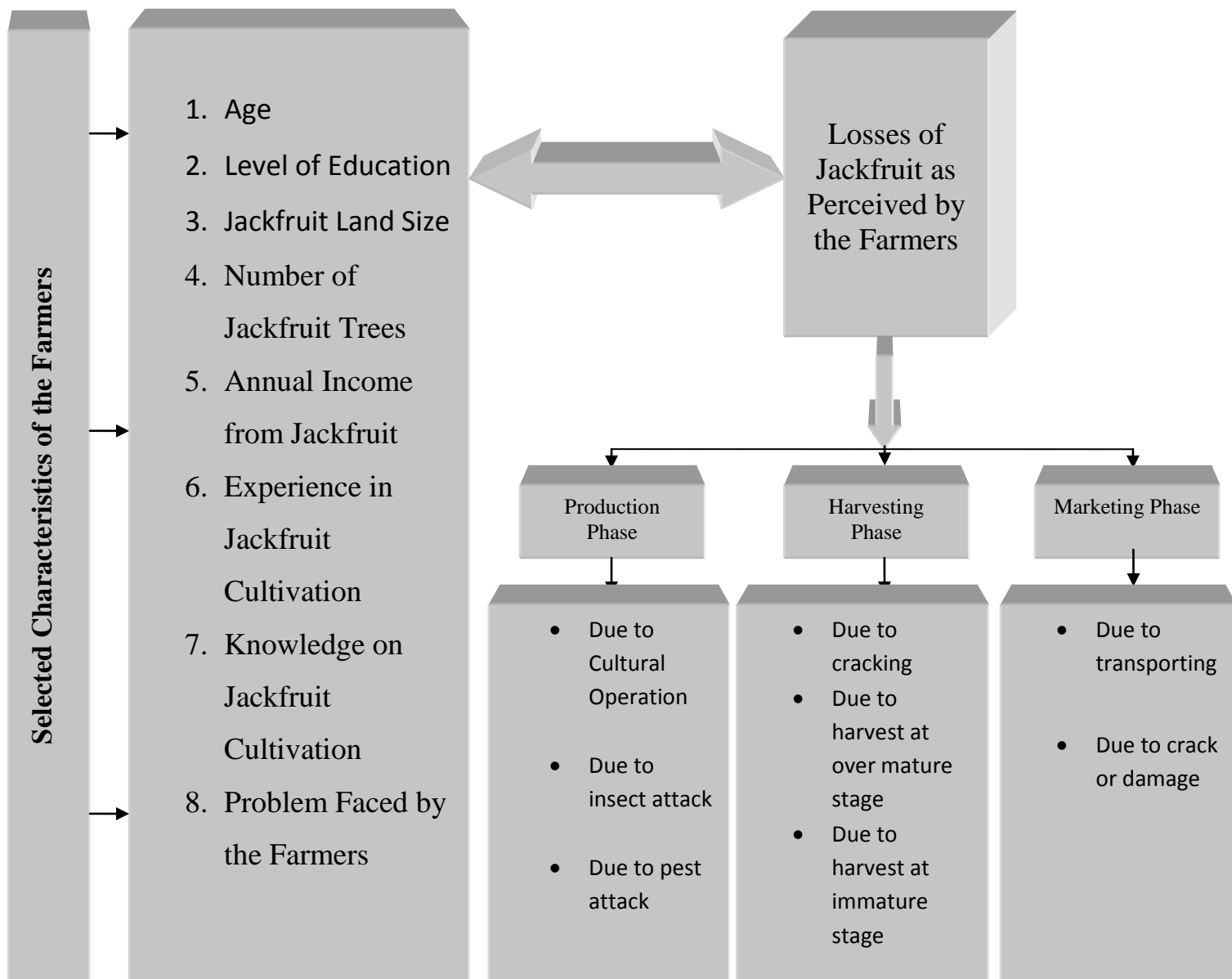


Figure 2.1 The conceptual framework of the study

CHAPTER 3

METHODOLOGY

Methodology refers to the methods and procedures in the research work. In any scientific research, methodology plays an important role and requires a very careful consideration. More appropriate the methodology more accurate the research. The basic materials for conducting any research are the unbiased information and facts. Methodology should be appropriate so that the research will be able to collect necessary data and analyze them in a proper way, which will help him to reach correct decision. Building of research methodology requires a vast knowledge, experience and skill. Considering this, the researcher went through previous studies, obtained from supervisors and experts regarding all aspects of this piece of the study. A sequential description of the methodologies followed in conducting this research work has been presented in this chapter.

3.1 Locale of the Study

The study was conducted in purposively selected three Upazillas namely Sreepur under Gazipur district, Bhaluka under Mymensing District and Shibpur under Narsingdi District. Two villages from each of the Upazillas as such Kachina and Honpara under Bhaluka Upazilla, Donua and Nagar haowla under Sreepur Upazilla and Naoghata and Sristighar under Shibpur Upazilla, in total six villages were also purposively selected as the locale of the study as these areas are very much famous of producing jackfruit. The map of Bangladesh showing the study districts appears in the Figure 3.1. The maps of selected districts showing locale the study Upazillas are shown in Figure 3.2 to 3.4.



Figure 3.1 A Map of Bangladesh Showing the Study Districts

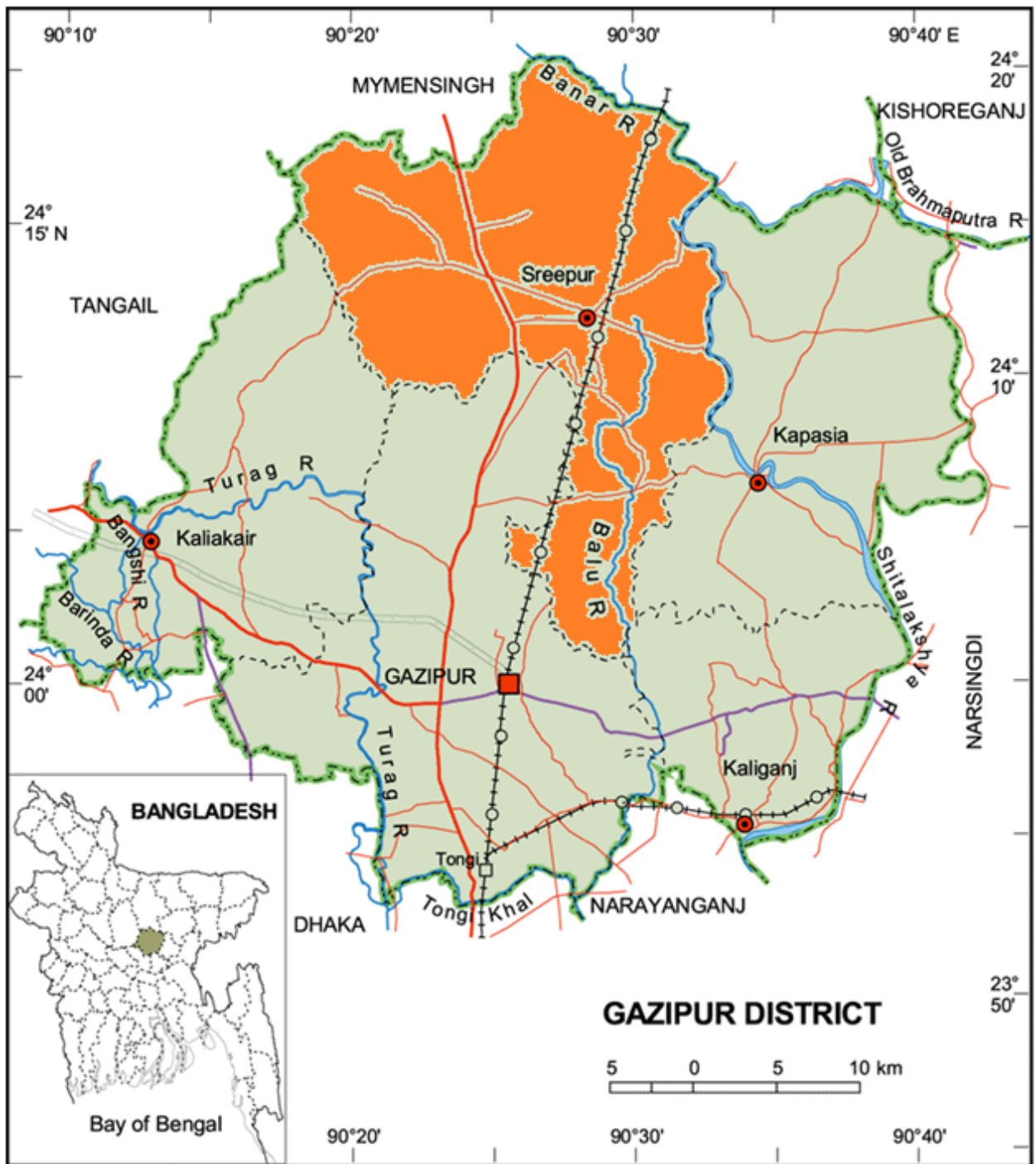


Figure 3.2 A Map of Gazipur District Showing the Study Area Sreepur Upazilla

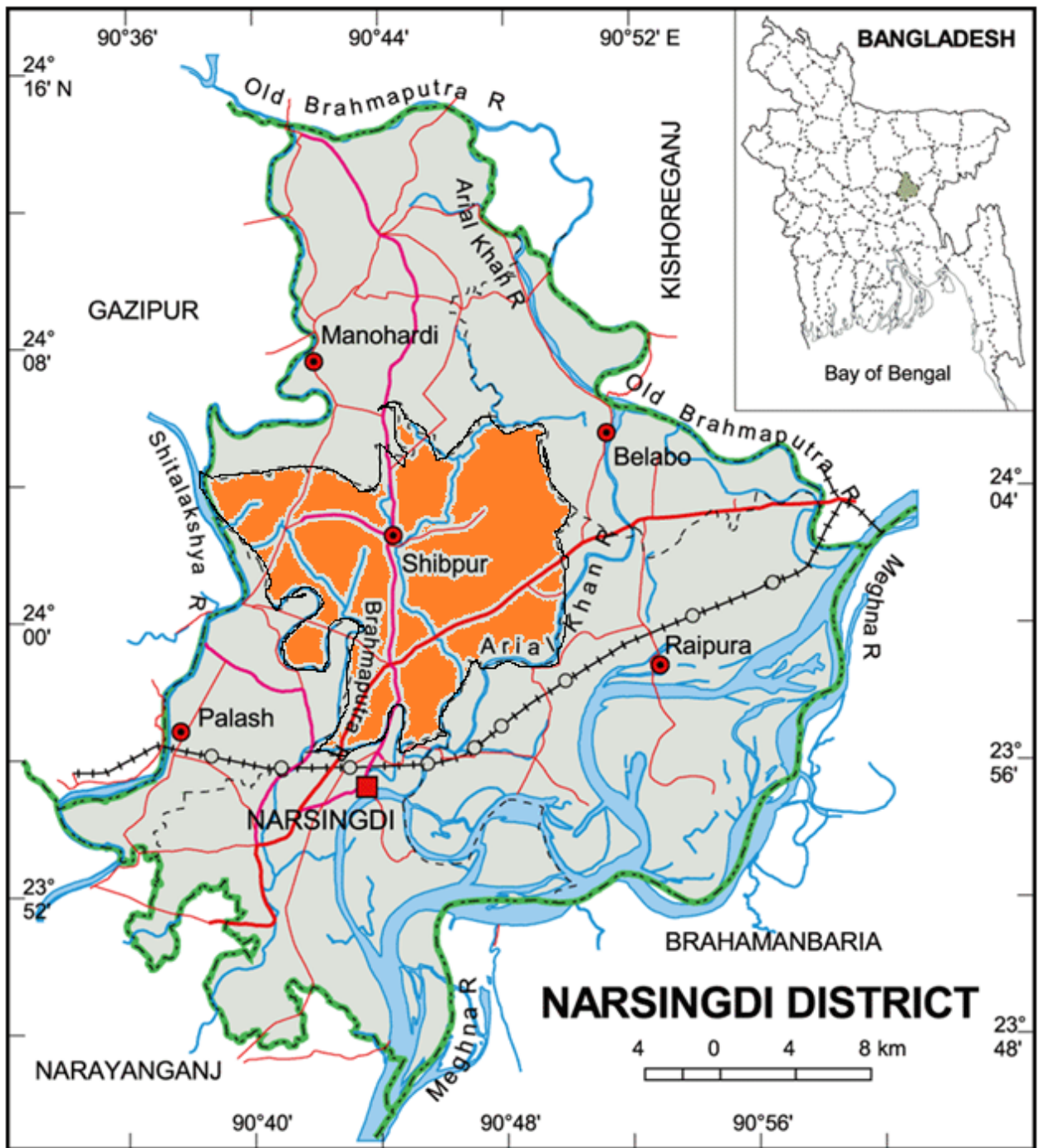


Figure 3.3A Map of Narsingdi District Showing the Study Area Shibpur Upazilla



Figure 3.4 A Map of Mymensingh district Showing the Study Area Bhaluka Upazilla

3.2 Population and Sample of the Study

A total of 1204 jackfruit growing farmers were listed which constituted the population of this study. For proportionate representation 120 jackfruit growers were selected as the sample of the study by taking 10percent of the growers from each of the six villages following stratified random sampling method considering each village as a stratum. A reserve list of 12 farmers was also prepared for use in case of unavailability of the respondents for any reason. The distribution of the population and those in the reserve list has been shown in the Table 3.1.

Table 3.1 Population and sample of the study

SL. NUMBER	District	Upazillas	Villages	Number of Jackfruit growing farmers		Reserve List Size
				Population	Sample	
1.	Gazipur	Sreepur	Donua	254	25	2
			Nagarhaowla	193	19	2
2.	Mymensing	Bhaluka	Kachina	206	21	2
			Honpara	191	19	2
3.	Narsingdi	Shibpur	Sristighar	184	18	2
			Naoghata	176	18	2
Total				1204	120	12

3.3 Data Collecting Instrument

In order to collect relevant information from the respondents, a previously structured interview schedule was prepared in Bengali considering the objectives of the study. The interview schedule was pre-tested in actual field situations before using the same for final data collection. This survey provided an opportunity to examine the effectiveness of the schedule which revealed some unforeseen defects associated with it. Necessary correction, modification and adjustment were made in the interview schedule on the basis of results of

pre-test. The interview schedule was then printed in its final form. An interview schedule in English version has been presented in Appendix- A.

3.4 Variables of the Study

A variable is any characteristics which can assume varying or different values in successive individual cases (Ezekiel and Fox, 1959). In a descriptive research, the selection and measurement of the variables are the important task. Based on relevant available literature, discussion with teachers, experts and research fellows in the relevant field and considering the time and resources available to the researcher, variables were selected. The researcher selected eight characteristics of the jackfruit growers as the variables. The characteristics includes age, level of education, jackfruit land size, number of jackfruit trees, annual income from jackfruit, experience in jackfruit cultivation, knowledge on jackfruit cultivation and problems faced by the jackfruit farmers. On the other hand, losses of jackfruit were the main focus of the study.

3.5 Measurement of Variables

In order to conduct the study in accordance with the objectives, it was necessary to measure the variables. The procedure for measuring the variables has been described below.

Age

Age of the respondents was measured in terms of year. The age of a respondent was measured by counting the period of time from his birth to the time of interview. A score of one (1) was assigned for each year of age. It was measured in complete years as reported by a respondent. Question regarding this variable appears in item number 1 in the interview schedule as presented in Appendix- A.

Level of Education

Level of Education of a respondent was measured in terms of years of successful schooling completed by an individual in educational institute. If a respondent did not know how to read and write, his literacy score was given zero (0). A score of 0.5 was given to that respondent who could sign his name only. Question regarding this variable appears in item number 2 in the interview schedule as presented in Appendix A.

Jackfruit land size

It refers to the area of land owned by a farmer on which jackfruit growing activities are carried out. However, it was estimated in terms of hectare. Data obtained in response to questions under item no. 3 in the interview schedule (Appendix-A) formed the basis for determining jackfruit cultivation area of the respondent.

Number of jackfruit trees

The number of jackfruit trees of a respondent was measured in terms of actual number. It was measured by counting the total number of trees what a respondent had. A score of one (1) was assigned for each tree. Question regarding this variable appears in item number 4 in the interview schedule as presented in Appendix- A.

Annual income from jackfruit

The annual income from jackfruit of a respondent is an important indicator of how much she can invest in his jackfruit business. Annual income from jackfruit was the income earned by the respondent from selling jackfruit. Annual income from jackfruit was measured in 'thousand' Taka. The score 1(one) was assigned for each '000' taka to compute the score

of annual income from jackfruit of the respondent. Questions regarding this variable appear in item no. 5 of the interview schedule.

Experience in jackfruit cultivation

Experience in jackfruit cultivation of a respondent was measured on the basis of his duration of jackfruit cultivation in terms of years. The experience of a respondent was measured by counting the period of time of jackfruit cultivation. A score of one (1) was assigned for each year of jackfruit cultivation. It was measured in complete years as reported by a respondent. Question regarding this variable appears in item number 6 in the interview schedule as presented in Appendix- A.

Knowledge on Jackfruit cultivation

Knowledge refers to the ability of a respondent to recall or recognize items of information related to anything. A scale consisting of 20 questions was used to determine the knowledge score of the respondents on jackfruit cultivation. The questions were selected from different dimensions of Jackfruit production, harvesting and marketing after thorough consultation with the relevant experts and review of relevant literatures as shown in Appendix A. Each respondent was asked 20 questions. A score of two (2) was assigned for each complete and correct answer and 0 (zero) for incorrect or no answer for each question. Partial score was assigned for partially correct answer for each question. Thus, the total assigned score of all the questions was 40. The total score obtained by answering all the questions by a respondent was the knowledge score of the respondents. Thus, the score could range from 0 to 40 where '0' indicating 'very low knowledge' and '40' indicating 'very high

knowledge' on jackfruit cultivation. Questions regarding this variable appear in item no. 7 of the interview schedule.

Problems faced by the jackfruit farmers

Problem faced in jackfruit production of respondent farmers was measured on the basis of the nature of problem that they faced in jackfruit production, harvesting and marketing activities. Twelve items of problems were asked to the respondents with the following four alternative responses with the following assigned scores:

Nature of problem	Scores assigned
No problem	0
Little problem	1
Medium problem	2
High problem	3

Score of problem faced in jackfruit cultivation of a respondent was computed by adding all the scores obtained by those responses from all the twelve problem items. Thus, the problem faced in jackfruit cultivation of the jackfruit growers could range from 0 to 36 where '0' indicated no problem and 36 indicated highest problem in jackfruit cultivation. Questions regarding this variable appear in item no. 8 of the interview schedule.

Measurement of Problem Faced Index (PFI) in Assessment of Losses of Jackfruit

Twelve problems were selected for the study after through consultation with supervisor and relevant experts. The respondents were asked to respond on four alternative responses as 'high problem', 'medium problem', 'little problem' and 'no problem' for each of twelve selected problems. Scores were assigned to those alternative responses as 3, 2, 1, and 0, respectively. Score for particular problem was measured by Problem Faced Index (PFI) as follows:

$$PFI = (P_h \times 3) + (P_m \times 2) + (P_l \times 1) + (P_n \times 0)$$

Where,

PFI = Problem Faced Index

P_h = Number of respondents faced high problem

P_m = Number of respondents faced medium problem

P_l = Number of respondents faced little problem

P_n = Number of respondents faced no problem

Thus, PFI for a particular problem could range from '0' to '360', while '0' indicating no problem '360' indicating highest problem faced. PFI for all the problems were determined.

Finally a rank order was made on the basis of PFI.

3.6 Measurement of Losses of Jackfruit as Perceived by the jackfruit Farmers

Eight different loss items of three phases namely production phase, harvesting phase and marketing phase were considered for measuring jackfruit losses at farmers' level in this study. Losses of Jackfruit were measured by asking perception on these eight different items of jackfruit loss to the each respondent individually. It was recorded based on the perception of the farmers and expressed in percentage. Percentage of losses of jackfruit was perceived in terms of total production of jackfruit. Finally losses of jackfruit was measured by adding the percentage of losses of all items. Losses of three different phases were determined

separately for better understanding. Questions regarding this variable appear in item no. 9 of the interview schedule.

3.7 Hypothesis of the Study

A hypothesis is a proposition or a set of proposition set forth as an explanation for the concurrence of some specific group of phenomena either asserted merely as a provisional conjecture to guide some investigation or accepted as highly probably in the light of established fact (Kothari, 1994). Hypothesis may be divided into two categories- a) Research hypothesis (H_i) and b) Null hypothesis (H_o). A null hypothesis states that there is no relationship between the concerned variables. The following null hypothesis was undertaken for the present study:

H_o : “There is no relationship between the selected characteristics of the farmers with the losses of jackfruit as perceived by the farmers”.

The related characteristics are age, level of education, jackfruit cultivation area, number of jackfruit trees, annual income from jackfruit, experience in Jackfruit cultivation, knowledge on jackfruit cultivation and problems faced by the jackfruit farmers.

3.8 Data Collection

The researcher himself collected data from the selected samples through personal interview. The interview schedule prepared earlier by the researcher was used to gather information. All possible efforts were made to explain the purpose of the study to the respondents in order to get valid and pertinent information from them. Interviews were conducted with respondents in their homes. While starting interview with any respondent, the researcher was willing and took possible care to establish rapport with them

so that they did not feel hesitation to furnish proper responses to the questions and statements in the schedule. The questions were explained and clarified whenever any respondent felt difficulty in understanding properly. Data were collected during 09 June to 20 July, 2011.

3.9 Data Processing

The collected raw data were examined thoroughly to detect errors and omission. As a matter of fact the researcher made a careful scrutiny while completing the interview schedule to make sure that the information were entered as complete as possible and well arranged to facilitate coding and tabulation. After completion of field survey, the entire interview schedule was compiled. Local units were converted into standard unit and qualitative data were converted into quantitative data by means of suitable scoring whenever necessary. The responses of the individual respondent contained in the interview schedule were transferred to a master sheet for entering the data in the computer. As soon as the data entered into the computer, it was then analyzed in accordance with the objectives of the study.

3.10 Statistical Analysis

Descriptive statistical methods like number and percentage distribution, range, mean, standard deviation etc. were used in describing the variables of the study. For clarity and understanding, tables were also used in presenting the data, for exploring the relationships between the extent of losses of jackfruit as perceived by the farmers and their selected characteristics; Pearson's Product Moment Coefficient of Correlation (r) was used.

The analysis of data was performed by using SPSS computer program. Throughout the study, at least five percent (0.05) level of probability was used as a basis of rejecting any null hypothesis

CHAPTER 4

FINDINGS AND DISCUSSION

Findings and discussion is the central point of whole research work. The purpose of this chapter is to describe the findings of the study. The research quality depends upon how well the findings of the research are interpreted. Procedures of using data for the measurement needed some discussion for clarity of understanding. Data obtained from respondents by interview were measured, analyzed, tabulated and statistically treated according to the objectives of the study. This chapter has been discussed in three sections such as (1) selected characteristics of the jackfruit growers (2) losses of jackfruit as perceived by them and (3) relationship between selected characteristics of the jackfruit growers and losses of jackfruit as perceived by them.

4.1 Characteristics of the jackfruit growers

An individual possesses various interrelated characteristics. It was therefore, hypothesized that the characteristics of the jackfruit growing farmers would have an effect on losses in jackfruit cultivation based on their perception. Farmers' individual characteristics and personal make-up play a vital role in adopting any practices. However, the eight selected salient features of the jackfruit growers such as age, level of education, jackfruit land size, number of jackfruit trees, annual income from jackfruit, experience in jackfruit cultivation, knowledge on jackfruit cultivation and problems faced by the jackfruit farmers greatly influence on losses in jackfruit cultivation have been discussed. The salient features of these individual characteristics of the farmers are shown in Table 4.1 and discussed in the following pages.

Table 4.1 Salient features of the farmers selected characteristics

Characteristics	Measuring units	Range		Mean	Standard Deviation
		Possible	Observed		
Age	Years	-	23 - 85	47.90	12.82
Level of education	Schooling Years	-	0 - 14	3.13	3.41
Jackfruit land size	Hectare	-	0.04 - 0.80	0.20	0.37
Number of jackfruit trees	Number	-	15 - 300	72.3	58.53
Annual income from jackfruit	'000' taka	-	2 - 120	30.93	25.60
Experience in jackfruit cultivation	Years	-	5 - 65	28.00	10.60
Knowledge on jackfruit cultivation	Scores	0-40	8 - 34	21.22	5.70
Problems faced by the farmers	Scores	0-36	6 - 36	18.29	4.82

4.1.1 Age

The observed age of the farmers ranged from 23 to 85 years with a mean of 47.90 years and standard deviation of 12.82. The respondents were classified into three age categories namely young (upto 35 years), middle aged (upto 50 years) and old (upto 85 years) as shown in Table 4.2.

Table 4.2 Distribution of the farmers according to their age

Categories (years)	Jackfruit Farmers	
	Number	Percent
Young aged(upto 35)	27	22.5
Middle aged (36-50)	41	34.2
Old aged (above 50)	52	43.3
Total	120	100

The largest proportion (43.3 percent) of the farmers were old aged, while 22.5 percent of them were young and 34.3 percent were middle aged. Thus, an over-whelming majority of the farmers belonged to middle to old aged categories. It is expected that middle-aged and young farmers (56.7 percent of the respondents) are more actively performing in jackfruit cultivation. The research work found that the old-aged farmers are well experienced and more acquainted with the jackfruit cultivation. Particularly, the younger farmers were not active enough to grow jackfruit and they also possess very low capability to perform jackfruit cultivation activities. The research work found that middle-aged and old farmers (77.5 percent) were more involved in jackfruit cultivation activities.

4.1.2 Level of education

The score of level of education of the jackfruit farmers ranged from 0 to 14 with an average of 3.13 and standard deviation of 3.41. On the basis of their level of education, the respondents were classified into five categories as shown in Table 4.3 .

Table 4.3 Distribution of the farmers according to their level of education

Categories (schooling years)	Jackfruit Farmers	
	Number	Percent
Illiterate (don't read and write)	20	16.7
Can sign only (0.5)	40	33.3
Primary level of education(1-5class)	34	28.3
Secondary level of education(6-10 class)	24	20
Above secondary level	2	1.7
Total	120	100

Table 4.3 shows that farmers under ‘can sign only’ category constitute the highest proportion (33.3 percent) compared to 28.3 percent ‘primary level of education’ category and 16.7 percent ‘illiterate’ category, 20 percent ‘secondary level of education’ category. On the otherhand the lowest 1.7 percent above ‘secondary level of education’ category. Thus, about half (50 percent) of the farmers were illiterate or could sign their name only.

It is expected that well educated farmer is likely to be more responsive to the ideas, technology and information of jackfruit cultivation. The research work found that the ‘illiterate’ and ‘can sign only’ respondents (50 percent) are well experienced and more acquainted with the jackfruit cultivation.

4.1.3 Jackfruit land size

Jackfruit land size of the respondents ranged from 0.04- 0 .80 hectares having an average of 0.20 hectares and standard deviation of 0.37. Respondents on the basis of jackfruit land size were classified into three categories as shown in Table 4.4.

Table 4.4 Distribution of the respondents according to their jackfruit land size

Categories of land size (hectare)	Respondents	
	Number	Percent
Small jackfruit land size (0.10-0.25)	52	43.3
Medium jackfruit land size (0.26-1.20)	62	51.7
Large jackfruit land size (1.32-2.0)	6	5
Total	120	100

Data presented in Table 4.4 show that above half(51.7 percent) of the respondents had medium jackfruit land size while 43.3 percent and 5 percent of them had small and large jackfruit land size respectively. Akther (2000) and Nahar (2000) found more or less similar

findings in their respective studies.

The research work found that majority of the families possessed small and medium size of land for jackfruit cultivation. Farmers are becoming small to medium and then landless for various reasons of which fragmentation of land due to inheritance is the most important one. Farmers of the small and medium farms are more active and involved in jackfruit production activities to support family expenses.

4.1.4 Number of Jackfruit trees

The observed jackfruit tree number of the farmers ranged from 15 to 300 with a mean of 72.3 and standard deviation of 58.53. On the basis of their jackfruit tree number, the respondents were classified into three categories as shown in Table 4.5.

Table 4.5 Distribution of the respondents according to their jackfruit tree number

Categories	Respondents	
	Number	Percent
Small (up to 50)	62	51.7
Medium (upto 100)	36	30
Large (>100)	22	18.3
Total	120	100

Table 4.5 shows that farmers under small number of jackfruit trees category constitute the highest proportion (51.7 percent) compared to 30 percent medium number category and 18.3 percent large number category. Thus, overwhelming majority (81.7 percent) of the farmers had small to medium number of jackfruit trees.

4.1.5 Annual income from jackfruit

Annual income from jackfruit of the respondents was measured in 'thousand taka' per year and in the present study that ranged from 2 to 120 with an average of

30.93 and standard deviation of 25.6. On the basis of annual income from jackfruit, the respondents were divided into three categories as shown in Table 4.6.

Table 4.6 Distribution of the respondents according to their annual income from jackfruit

Categories of Income from jackfruit (000 taka)	Respondents	
	Number	Percent
Low (<20)	36	49.2
Medium (22-50)	43	35.8
High (>50)	18	15
Total	120	100

Data furnished in Table 4.6 reveal that above half (49.2 percent) of the respondents had low annual income from jackfruit while 35.8 percent and 15 percent of them had medium and high annual income from jackfruit respectively. Major portion of the rural farm families possessed small to medium land size and thus income from jackfruit was low to medium. Aziz (2004), Islam (2003) and Nahar (2000) found more or less similar findings in their respective studies.

4.1.6 Experience in jackfruit cultivation

Experience in jackfruit cultivation of the respondents was measured in terms of actual years of jackfruit cultivation and in the present study that ranged from 5 to 65 with an average of 28 and standard deviation of 10.6. On the basis of experience in jackfruit cultivation, the respondents were divided into three categories as shown in Table 4.7.

Table 4.7 Distribution of the respondents according to their experience in jackfruit cultivation

Categories (years)	Respondents	
	Number	Percent
Low (up to 15)	17	14.2
Medium (upto 30)	67	55.8
High (>30)	36	30
Total	120	100

Table 4.7 shows that farmers under medium experience category constitute the highest proportion (55.8 percent) compared to 30 percent high experience category and 14.2 percent low experience category. Thus, overwhelming majority (85.8 percent) of the farmers had medium to high experience in jackfruit cultivation. It is logical that experienced farmers could minimize their losses in jackfruit production.

4.1.7 Knowledge on Jackfruit Cultivation

Knowledge on Jackfruit cultivation score of the respondents ranged from 8 to 34 against the possible range of 0 – 40 having an average of 21.22 and standard deviation of 5.70. On the basis of knowledge scores, the respondents were classified into three categories namely, ‘poor knowledge’, ‘moderate knowledge’ and ‘sound knowledge’. The distribution of the respondents according to their knowledge on jackfruit cultivation is given in Table 4.8.

Table 4.8 Distribution of the jackfruit growers according to their knowledge on jackfruit cultivation

Categories (score)	Respondents	
	Number	Percent
Poor knowledge (up to 13)	11	9.2
Moderate knowledge (14-26)	92	76.6
Sound knowledge (Above 26)	17	14.2
Total	120	100.0

Data of Table 4.8 shows that three-fourth (76.6 percent) of the respondents felt in moderate knowledge category followed by 14.2 percent in sound knowledge category and only 9.2 percent in poor knowledge category. The findings of the present study again reveal that 85.8 percent of the jackfruit growers in the study area had poor to moderate knowledge on jackfruit cultivation. Knowledge is to be considered as vision of an explanation in any aspect of the situation regarding jackfruit cultivation. It is act or state of understanding; clear perception of fact or truth, that helps an individual to foresee the consequence he may have to face in future. It makes individuals to become rational and conscious about related field. To perform optimum production, jackfruit growers should have adequate knowledge on different aspects of it.

4.1.8 Problem Faced by the Farmers in Jackfruit Cultivation

The scores of problem faced in jackfruit cultivation of the respondents ranged from 6 to 36 against the possible range of 0 – 36 with an average of 18.24 and standard deviation of 4.82. Based on the observed scores of problem faced in jackfruit cultivation, the respondents were classified into the three categories i.e. low problem, medium problem and high problem faced. The distribution has been shown in Table 4.9.

Table 4.9 Distribution of the farmers according to problem faced by the farmers in jackfruit cultivation

Categories (score)	Respondents	
	Number	Percent
Low problem (1-12)	12	10
Medium problem (13-25)	100	83.3
High problem (25-36)	8	6.7
Total	120	100

Majority (83.3 percent) of the respondents faced medium problem in jackfruit production activities, while 6.7 percent faced high problems and 10 percent faced low problems. Findings again reveal that overwhelming majority (90 percent) of the farmers faced moderate to high problems in jackfruit production. It quite logical that farmers facing lower problems could minimize their losses in jackfruit.

Problem Faced Index in Assessment of Losses of Jackfruit

The observed problem faced index of the problems in assessment of losses of jackfruit ranged from 102 to 310 against the possible range of 0 to 360. The formula for determining PFI has been shown in chapter 3. The selected twelve problems faced by the respondents which were arranged in rank order according to their problem faced index (PFI) are shown in Table 4.10.

Table 4.10 Rank order of 12 selected problems faced by the farmers in jackfruit cultivation

Problems	Extent of Problem faced				PFI	Rank Order
	High problem (3)	Medium problem (2)	Little problem (1)	No problem (0)		
Disease controlling problem	82	29	6	3	310	1
Insect controlling problem	73	34	8	5	295	2
Lower market price	42	63	8	7	260	3
Disease dissemination in inflorescence	53	43	14	10	259	4
Rotten inflorescence due to insect attack	40	32	37	11	221	5
Trees don't give jackfruit regularly	4	37	69	10	155	6
Unavailability of vehicles in marketing	13	23	47	37	132	7
Fall of immature fruit	6	17	77	20	129	8
Deformed fruits	3	16	83	18	124	9
Quick rot after harvesting	6	10	67	37	105	10
High prices of inputs	4	22	47	47	103	11
Cracking in marketing	0	14	74	32	102	12

PFI = Problem Faced Index

N = 100

On the basis of PFI, it was observed that 'Disease controlling problem' ranked first followed by 'Insect controlling problem', 'Lower market price', 'Disease dissemination in inflorescence', 'Rotten inflorescence due to insect attack', 'Trees don't give jackfruit regularly', 'Unavailability of vehicles in marketing', 'Fall of immature fruit', 'Deformed fruits', 'Quick rot after harvesting', 'High prices of inputs' and 'Cracking in marketing'.

4.2 Losses of Jackfruit as Perceived by the Farmers

Losses of jackfruit as perceived by the farmers ranged from 7 to 34 with the mean and standard deviation of 18.61 and 5.31 respectively.

Losses of jackfruit were measured in percentage asking 8 different items of losses of jackfruit at different phases at farmers' level. Losses of jackfruit at different phases and items based on farmers' perception are shown in Table 4.11.

Table 4.11 Losses of different items of jackfruit as perceived by the farmers

SL. NO.	Phases	Items	percentLosses in Terms of Total Production
1	Production Phase	Due to lack of cultural operation	4.23
		Due to insect attack	4.59
		Due to pest attack	4.48
2	Harvesting Phase	Due to cracking	1.29
		Due to harvest at over mature stage	1.35
		Due to harvest at immature stage	0.39
3	Marketing Phase	Due to transporting	1.24
		Due to crack or damage	1.04
Total			18.61

Losses of jackfruit at production phase, harvesting phase and marketing phase are shown in Figure 4.1.

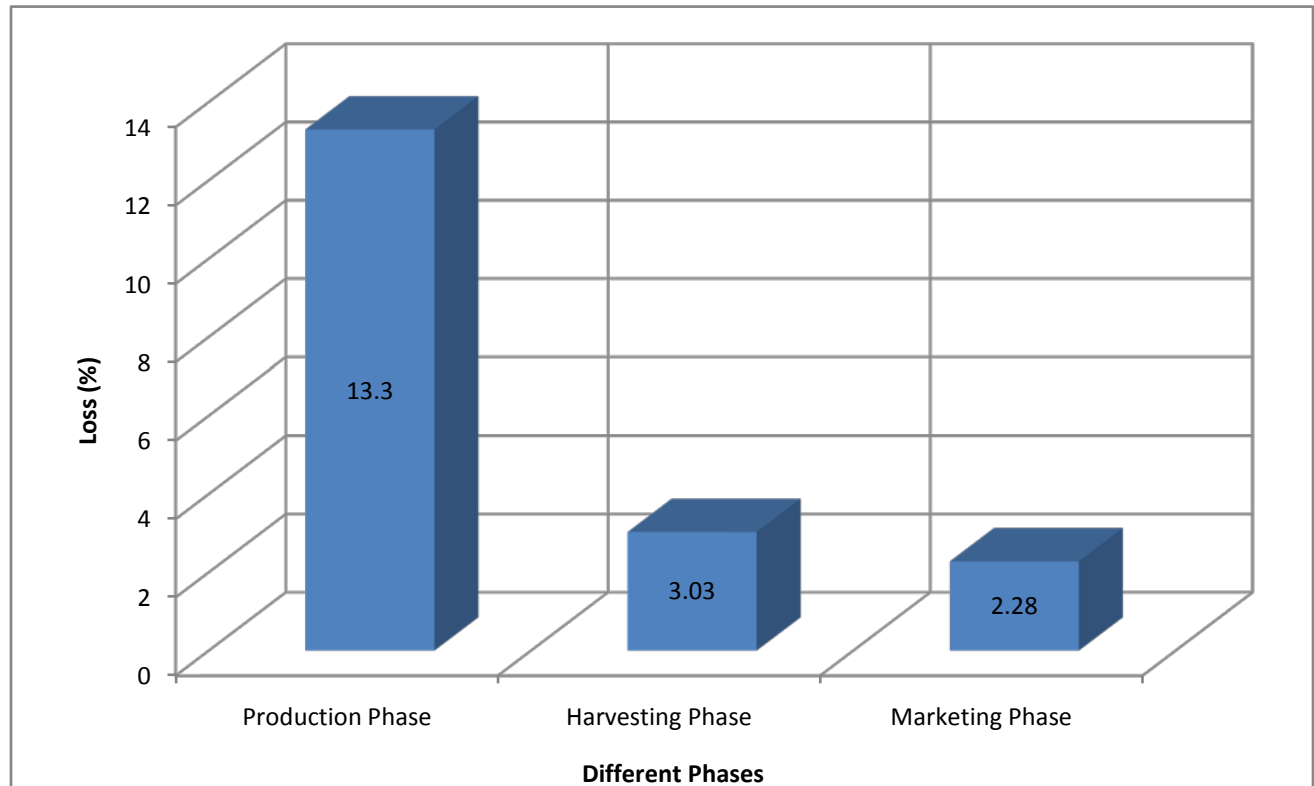


Fig. 4.1 Losses of jackfruit at different phases as perceived by the farmers

Total losses of jackfruit of a respondent were determined by adding the percentage obtained from all the loss items. Based on farmers' perception on losses of jackfruit, the respondents were classified into three categories as shown in Table 4.12.

Table 4.12 Distribution of the farmers according to the Losses of jackfruit as perceived by them

Categories (percent)	Respondents	
	Number	Percent
Low loss(below 11)	13	10.8
Medium loss (12-22)	86	71.7
High loss (above 22)	21	17.5
Total	120	100

Table 4.12 indicated that the highest proportion (71.7 percent) of the jackfruit farmers perceived medium loss followed by 10.8 percent low losses and 17.5 percent high losses. Therefore, it was found that an overwhelming majority (89.2 percent) of the respondent farmers perceive medium to high losses in jackfruit cultivation at production, harvesting and marketing phase. Molla *et al.* (2011) reported 5.23 percent post-harvest losses of jackfruit at farmers' level. Based on this findings, it may be said that necessary steps should be taken by the extension providers to minimize the losses of jackfruit at farmers' level by proper training and motivational campaign. Losses of jackfruit at farmers' level may be shown in Picture 4.2- 4.8.



Figure 4.2 Loss of jackfruit due to insect attack



Figure 4.3 Loss of jackfruit due to pest attack



Figure 4.4 Loss of jackfruit due to cracking at harvesting phase



Figure 4.5 Loss of jackfruit due to harvest at over mature stage



Figure 4.6 Loss of jackfruit due to Harvest at immature stage



Figure 4.7 Loss of jackfruit due to transporting



Figure 4.8 Loss of jackfruit due to improper handling at marketing phase

4.3 Relationship of the selected characteristics of the jackfruit farmers with the losses in jackfruit production as perceived by them

The purpose of this section is to examine the relationship of eight selected characteristics of the jackfruit farmers with the losses in jackfruit production as perceived by them. The selected characteristics of the farmers include age, level of education, jackfruit land size, number of jackfruit trees, annual income from jackfruit, experience in Jackfruit cultivation, knowledge on jackfruit cultivation and problems faced by the jackfruit farmers.

Pearson's Product Moment Coefficient of Correlation (r) has been computed to explore the relationships. The null hypothesis formulated for this study has already been described in Chapter 3. A null hypothesis was rejected when the observed ' r ' value was equal or greater than the table value of ' r ' at 0.05 level of probability. The relationships between each of the selected characteristics of the jackfruit farmers and losses in jackfruit as perceived by them are shown in Table 4.13 and discussed in the following sub-sections.

Table 4.13 Summarized Results of Pearson’s Product Moment Correlation Showing Relationships between each of the Selected Characteristics of the Jackfruit growers and the Losses of Jackfruit as perceived by them

N =120

	Characteristics of the farmers	Value of coefficient of correlation (r)	Tabulated value	
			0.05 level	0.01 level
Losses of Jackfruit as perceived by the farmers	Age	-0.027 ^{NS}	0.179	0.237
	Level of education	-0.071 ^{NS}		
	Jackfruit land size	0.114 ^{NS}		
	Number of jackfruit trees	0.115 ^{NS}		
	Annual income from jackfruit	-0.181 [*]		
	Experience in Jackfruit cultivation	-0.214 [*]		
	Knowledge on Jackfruit cultivation	-0.249 ^{**}		
	Problems faced by the jackfruit farmers	0.245 ^{**}		

^{NS} Not significant

^{**} Significant at the 0.01 level

^{*} Significant at the 0.05 level

4.3.1 Relationship between age of the jackfruit farmers and losses of jackfruit as perceived by them

The relationship between age of the farmers and losses of jackfruit as perceived by them was determined by Pearson product moment correlation coefficient and examined by testing the concerned null hypothesis:

“There is no relationship between age of the jackfruit farmers and losses of jackfruit as perceived by them”.

The coefficient of correlation between age of the jackfruit farmers and losses of jackfruit as perceived by them is presented in Table 4.13. The coefficient of correlation between the

concerned variables was found to be -0.027. The following observations were made on the basis of the value of correlation coefficient between the two concerned variables of the study under consideration:

- a. The relationship showed a negative trend between the concerned variables.*
- b. The observed value of 'r' (- 0.027) between the concerned variables was found to be smaller than the tabulated value ($r = 0.179$) with 118 degrees of freedom at 0.05 level of probability.*
- c. The null hypothesis could not be rejected.*
- d. The relationship between the concerned variables was not statistically significant at 0.05 level of probability.*

Based on the above findings, it was concluded that age of the jackfruit famers had no significant relationships with the losses of jackfruit as perceived by the farmers. That means losses of jackfruit occur for all aged farmers. This represent that age of the respondent farmers was not an important factor in losses of jackfruit as perceived by them.

4.3.2 Relationship between level of education of the jackfruit farmers and losses of jackfruit as perceived by them

The relationship between level of education of the jackfruit farmers and losses of jackfruit as perceived by them was determined by Pearson product moment correlation coefficient and examined by testing the concerned null hypothesis:

“There is no relationship between level of education of the jackfruit farmers and losses of jackfruit as perceived by them”.

The coefficient of correlation between level of education of the jackfruit farmers and losses of jackfruit as perceived by them is presented in Table 4.13. The coefficient of correlation between the concerned variables was found to be -0.071. The following observations were made on the basis of the value of correlation coefficient between the two concerned variables of the study under consideration:

- a. The relationship showed a negative trend between the concerned variables.*
- b. The observed value of ‘r’ (-0.071) between the concerned variables was found to be smaller than the tabulated value ($r = 0.179$) with 118 degrees of freedom at 0.05 level of probability.*
- c. The null hypothesis could not be rejected.*
- d. The relationship between the concerned variables was not statistically significant at 0.05 level of probability.*

Based on the above findings, it was concluded that level of level of education of the jackfruit famers had no significant relationships with the losses of jackfruit as perceived by

the farmers. That means losses of jackfruit occur for all 'level of education' category farmers. This represent that level of level of education of the respondent farmers was not an important factor in losses of jackfruit as perceived by them.

4.3.3 Relationship between jackfruit land size of the farmers and losses of jackfruit as perceived by them

The relationship between jackfruit land size of the farmers and losses of jackfruit as perceived by them was determined by Pearson product moment correlation coefficient and examined by testing the concerned null hypothesis:

“There is no relationship between jackfruit land size of the farmers and losses of jackfruit as perceived by them”.

The coefficient of correlation between jackfruit land size of the farmers and losses of jackfruit as perceived by them is presented in Table 4.13. The coefficient of correlation between the concerned variables was found to be 0.114. The following observations were made on the basis of the value of correlation coefficient between the two concerned variables of the study under consideration:

- a. *The relationship showed a positive trend between the concerned variables.*
- b. *The observed value of 'r' (0.114) between the concerned variables was found to be smaller than the tabulated value ($r = 0.179$) with 118 degrees of freedom at 0.05 level of probability.*
- c. *The null hypothesis could not be rejected.*

d. The relationship between the concerned variables was not statistically significant at 0.05 level of probability.

Based on the above findings, it was concluded that jackfruit land size of the farmers had no significant relationships with the losses of jackfruit as perceived by them. That means losses of jackfruit occur for all 'land size' category farmers. This represents that jackfruit land size of the respondent farmers was not an important factor in losses of jackfruit as perceived by them.

4.3.4 Relationship between number of jackfruit trees of the farmers and losses of jackfruit as perceived by them

The relationship between number of jackfruit trees of the farmers and losses of jackfruit as perceived by them was determined by Pearson product moment correlation coefficient and examined by testing the concerned null hypothesis:

“There is no relationship between number of jackfruit trees of the farmers and losses of jackfruit as perceived by them”.

The coefficient of correlation between number of jackfruit trees of the farmers and losses of jackfruit as perceived by them is presented in Table 4.13. The coefficient of correlation between the concerned variables was found to be 0.115. The following observations were made on the basis of the value of correlation coefficient between the two concerned variables of the study under consideration:

a. The relationship showed a positive trend between the concerned variables.

- b. The observed value of 'r' (0.115) between the concerned variables was found to be smaller than the tabulated value ($r = 0.179$) with 118 degrees of freedom at 0.05 level of probability.*
- c. The null hypothesis could not be rejected.*
- d. The relationship between the concerned variables was not statistically significant at 0.05 level of probability.*

Based on the above findings, it was concluded that number of jackfruit trees of the farmers had no significant relationships with the losses of jackfruit as perceived by them. That means losses of jackfruit occur for all 'tree number' category farmers. This represents that jackfruit tree number of the respondent farmers was not an important factor in losses of jackfruit as perceived by them.

4.3.5 Relationship between annual income from jackfruit of the farmers and losses of jackfruit as perceived by them

The relationship between annual income from jackfruit of the farmers and losses of jackfruit as perceived by them was determined by Pearson product moment correlation coefficient and examined by testing the concerned null hypothesis:

“There is no relationship between annual income from jackfruit of the farmers and losses of jackfruit as perceived by them”.

The coefficient of correlation between annual income from jackfruit of the jackfruit farmers and losses of jackfruit as perceived by them is presented in Table 4.13. The coefficient of

correlation between the concerned variables was found to be -0.181. The following observations were made on the basis of the value of correlation coefficient between the two concerned variables of the study under consideration:

- a. *The relationship showed a negative trend between the concerned variables.*
- b. *The observed value of 'r' (-0.181) between the concerned variables was found to be greater than the tabulated value ($r = 0.179$) with 118 degrees of freedom at 0.05 level of probability.*
- c. *The null hypothesis could be rejected.*
- d. *The relationship between the concerned variables was statistically significant at 0.05 level of probability.*

Based on the above findings, it was concluded that annual income from jackfruit of the farmers had a significant negative relationship with the losses of jackfruit as perceived by them. This represents that annual income from jackfruit of the farmers was an important factor in losses of jackfruit as perceived by them but with the increase of losses of jackfruit of the farmers, annual income from jackfruit of the farmers decreased and vice-versa. It is quite logical that individual having low losses in jackfruit can increase his/her income from jackfruit.

4.3.6 Relationship between experience in jackfruit cultivation of the farmers and losses of jackfruit as perceived by them

The relationship between experience in jackfruit cultivation of the farmers and losses of jackfruit as perceived by them was determined by Pearson product moment correlation coefficient and examined by testing the concerned null hypothesis:

“There is no relationship between experience in jackfruit cultivation of the farmers and losses of jackfruit as perceived by them”.

The coefficient of correlation between experience in jackfruit cultivation of the farmers and losses of jackfruit as perceived by them is presented in Table 4.13. The coefficient of correlation between the concerned variables was found to be -0.214. The following observations were made on the basis of the value of correlation coefficient between the two concerned variables of the study under consideration:

- a. The relationship showed a negative trend between the concerned variables.*
- b. The observed value of 'r' (-0.214) between the concerned variables was found to be greater than the tabulated value ($r = 0.179$) with 118 degrees of freedom at 0.05 level of probability.*
- c. The null hypothesis could be rejected.*
- d. The relationship between the concerned variables was statistically significant at 0.05 level of probability.*

Based on the above findings, it was concluded that experience in jackfruit cultivation of the farmers had a significant negative relationship with the losses of jackfruit as perceived by

them. This represent that experience in jackfruit cultivation was an important factor in losses of jackfruit as perceived by the farmers but with the increase of experience in jackfruit cultivation, losses of jackfruit of the farmers decreased. It is very much logical that individuals having higher experience in jackfruit cultivation can reduce his/her losses of jackfruit.

4.3.7 Relationship between knowledge on Jackfruit cultivation of the farmers and losses of jackfruit as perceived by them

The relationship between knowledge on Jackfruit cultivation of the farmers and losses of jackfruit as perceived by them was determined by Pearson product moment correlation coefficient and examined by testing the concerned null hypothesis:

“There is no relationship between knowledge on jackfruit cultivation of the farmers and losses of jackfruit as perceived by them”.

The coefficient of correlation between knowledge on Jackfruit cultivation of the farmers and losses of jackfruit as perceived by them is presented in Table 4.13. The coefficient of correlation between the concerned variables was found to be -0.249. The following observations were made on the basis of the value of correlation coefficient between the two concerned variables of the study under consideration:

- a. *The relationship showed a negative trend between the concerned variables.*
- b. *The observed value of ‘r’ (-0.249) between the concerned variables was found to be greater than the tabulated value ($r = 0.237$) with 118 degrees of freedom at 0.01 level of probability.*

c. *The null hypothesis could be rejected.*

d. *The relationship between the concerned variables was statistically significant at 0.01 level of probability.*

Based on the above findings, it was concluded that knowledge on Jackfruit cultivation of the farmers had a significant negative relationship with the losses of jackfruit as perceived by them. This represents that knowledge on jackfruit cultivation of the farmers was an important factor in losses of jackfruit as perceived by them but with the increase of knowledge on jackfruit cultivation losses of jackfruit of the farmers decreased. It is quite logical that knowledgeable persons can decrease their losses.

4.3.8 Relationship between problem faced by the jackfruit farmers and losses of jackfruit as perceived by them

The relationship between problem faced by the jackfruit farmers and losses of jackfruit as perceived by them was determined by Pearson product moment correlation coefficient and examined by testing the concerned null hypothesis:

“There is no relationship between problems faced by the jackfruit farmers and losses of jackfruit as perceived by them”.

The coefficient of correlation between problem faced by the jackfruit farmers and losses of jackfruit as perceived by them is presented in Table 4.13. The coefficient of correlation between the concerned variables was found to be 0.245. The following observations were made on the basis of the value of correlation coefficient between the two concerned variables of the study under consideration:

- a. *The relationship showed a positive trend between the concerned variables.*
- b. *The observed value of 'r' (0.245) between the concerned variables was found to be greater than the tabulated value ($r = 0.237$) with 118 degrees of freedom at 0.01 level of probability.*
- c. *The null hypothesis could be rejected.*
- d. *The relationship between the concerned variables was statistically significant at 0.01 level of probability.*

Based on the above findings, it was concluded that problem faced by the jackfruit farmers had a significant positive relationship with the losses of jackfruit as perceived by them. This represent that problems faced by the jackfruit farmers was an important factor in losses of jackfruit as perceived by them but with the increase of problems faced by the jackfruit farmers losses of jackfruit of the farmers also increased. It is quite logical that farmers faced low problem could decrease the losses of jackfruit.

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

5.1.1 Introduction

Jackfruit is an important and widely distributed and cultivated fruit crop in Bangladesh. It is produced in large quantity but the income from jackfruit is minimal due to losses of this fruit. According to the growers' opinion, these losses were mostly due to disease and pest infestation at pre-harvest condition but expressed at harvesting period. The respondents reported that a portion of these losses was also due to improper techniques or lack of care during manual harvesting (Molla *et al.*, 2011). So it is necessary to take initiative to reduce losses of jackfruit and ensure food as well as nutritional sufficiency of the people of Bangladesh.

The purpose of this study is to have an understanding about the losses of jackfruit as perceived by the farmers of three Upazillas namely Sreepur, Shibpur and Bhaluka. The study also aims to explore the relationship of the selected characteristics of the farmers. It is expected that this study will be helpful for the farmers who will comprehend the importance of loss portion of jackfruit and take necessary steps to reduce losses.

5.1.2 Specific Objectives

The following specific objectives were formulated in order to give proper direction of the study:

1. To assess the losses of Jackfruit as perceived by the farmers
2. To assess the following selected characteristics of the jackfruit farmers:
 - (ix) Age
 - (x) Level of education
 - (xi) Jackfruit land size
 - (xii) Number of jackfruit trees
 - (xiii) Annual income from jackfruit
 - (xiv) Experience in Jackfruit cultivation
 - (xv) Knowledge on Jackfruit cultivation
 - (xvi) Problem faced by the farmers
3. To explore the relationship of the selected characteristics of the jackfruit farmers with the losses of jackfruit as perceived by them
4. To compare the severity of the problems faced by the jackfruit farmers

5.1.3 Methodology

Three upazillas from Gazipur, Mymensing and Narsingdi districts was purposively selected as the study area. The selected three upazillas were Sreepur, Shibpur and Bhaluka. For the collection of the data an interview schedule was prepared. The Bangla version of the interview schedule was used to collect data from the respondents. One hundred and twenty farmers were selected from six villages of above mentioned Upazillas by stratified random sampling method as the sample of the study. Data were collected by the researcher himself.

The collected data were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. Various statistical measures were used in describing the variables.

All these variables of the study were measured by computing appropriate units. Various statistical measures such as number and percentage distribution, range, mean, standard deviation etc. were used in describing the variables. To explore the relationship between the independent and dependent variables Correlation Coefficient was measured.

5.1.4 Summary of the findings

The findings of the study and interpretation of the results have been presented elaborately in chapter IV. The findings of the study are summarized below:

5.1.4.1 Selected characteristics of the Farmers

Age: The highest proportion of the farmers (43.3 percent) felt in the old aged group, while 22.5 percent of the respondents felt in young and 34.2 percent middle aged group.

Level of education: The majority (33.3 percent) of the farmers could sign only while 28.3 percent had primary level of education, 16.7 percent were illiterate, 20 percent had secondary and only 1.7 percent had above secondary level of education.

Jackfruit Land size: The highest proportion (51.7 percent) of the farmers had medium land size compared to 43.3 percent having small land size and 5 percent had large land possession. This information indicates that majority (95 percent) of the farmers had small to medium land size.

Number of jackfruit trees: The highest proportion of the farmers (51.7 percent) had small number of trees, while 30 percent of the respondents had medium number of trees and 18.3 percent had large number of trees.

Annual income from jackfruit: Almost half of the respondents (49.2 percent) had low income, compared to 35.8 percent had medium and only 15 percent had high income from jackfruit.

Experience in jackfruit cultivation: The score of medium experience category constitute the highest proportion (55.8 percent) compared to 30 percent high experience category and 14.2 percent low experience category farmers in jackfruit cultivation. Overwhelming majority (85.8 percent) of the farmers had medium to high experience in jackfruit cultivation.

Knowledge on jackfruit cultivation: The highest proportion of the farmers (76.6 percent) had moderate knowledge, while 9.2 percent of the respondents had poor knowledge and 14.2 percent had sound knowledge.

Problem faced by the farmers in jackfruit production:Overwhelming majority (90 percent) of the farmers faced medium to high problem in jackfruit production.

Losses of Jackfruit as perceived by the farmers: Losses of jackfruit as perceived by the farmers ranged from 7 to 34 having a mean of 18.61 and standard deviation of 5.31. The highest proportion of the farmers (71.7 percent) perceived medium loss, while 10.8 percent of the respondents perceived low loss and 17.5 percent perceived high loss in jackfruit production. It means that overwhelming majority (89.2 percent) of the jackfruit growers perceived medium to high losses in jackfruit cultivation.

5.1.4.3 Relationship of the selected characteristics of the farmers with the losses of jackfruit as perceived by them

Annual income from jackfruit, experience in jackfruit cultivation and knowledge on jackfruit cultivation of the jackfruit growers had significant relationship with the losses of jackfruit while problem faced by the jackfruit farmers had significant positive relationship with the losses of jackfruit as perceived by them. The rest four variables namely age, level of education, jackfruit land size and number of jackfruit trees of the farmers had no significant relationship with the losses of jackfruit as perceived by the farmers.

5.2 Conclusion

“A conclusion presents the statements based on major findings of the study and these statements mostly confirm to the objectives of the research in the shortest form. It presents the direct answers of the research objectives, or it relates to the hypothesis”(Labon and Schefter, 1990).

Findings of the present study and the logical interpretation of other relevant facts prompted the researcher to draw the following conclusions:

- i. Overwhelming majority (89.2 percent) of the jackfruit growers perceived medium to high losses in jackfruit at their production, harvesting and marketing phases. Therefore, it may be concluded that there is necessity to reduce the losses of jackfruit.
- ii. A negative relationship was found between knowledge on jackfruit cultivation of the farmers and the losses of jackfruit as perceived by them which leads to the conclusion that with the increase of knowledge the losses of jackfruit were decreased. Actually the farmers having more agricultural knowledge receive more agricultural information. It helps an individual to create his understanding and awareness on different aspects of agricultural information.
- iii. Problems faced by the jackfruit farmers had a positive and highly significant relationship with the losses of jackfruit as perceived by them which lead to the conclusion that the more the problems faced by the jackfruit farmers the more was their losses of jackfruit.
- iv. Experience in jackfruit cultivation of the farmers had a negative and significant relationship with the losses of jackfruit as perceived by them which lead to the

conclusion that the more the experience in jackfruit cultivation the less was their losses of jackfruit.

- v. Annual income from jackfruit of the farmers had a negative and significant relationship with the losses of jackfruit as perceived by them. Therefore, it may be concluded that with the decrease of annual income the losses of jackfruit is increased.

5.3 Recommendations

5.3.1 Recommendations for policy implications

On the basis of experience, observation and conclusions drawn from the findings of the study following recommendations are made:

- i. Overwhelming majority (89.2 percent) of the jackfruit growers perceive medium to high losses in jackfruit production. It might be happened due to improper due to improper cultivation, harvesting and marketing procedures. Therefore, it may be recommended that proper extension providers like Department of Agricultural Extension (DAE) should take necessary action to reduce the losses of jackfruit farmers by providing necessary training and motivational campaign.
- ii. Overwhelming majority (90 percent) of the farmers faced moderate to high problems in jackfruit production. In order to solve their problem, it is necessary to arrange more training and motivational programs by DAE and other related organizations that help to minimize the problems in jackfruit cultivationas well as losses of jackfruit at farmers' level.

- iii. Farmers having more agricultural knowledge were more likely to reduce losses of jackfruit. It is recommended that farmers' knowledge should be increased by arranging training program.
- iv. Farmers having more experience can reduce losses. The new farmers may be conducted by an experienced farmer for motivational purpose and to practice intercultural operations. Agriculture Extension Officer (AEO,Sub-Assistant Agriculture Officer (SAAOs) and local leaders can play a vital role in this case.
- v. Annual income from jackfruit of the farmers had significant relationship with their perception on jackfruit losses. Therefore, it may be recommended that special attempts should be taken by the concerned authorities for the farmers having lower income from jackfruit production.

5.3.2 Recommendations for further study

A small and limited research work can not provide unique and universal information related to actual impact of improving socio-economic status of the farmers. Further studies should be undertaken on related matters. On the basis of scope and limitations of the present study and observation made by the researcher, the following recommendations are made for further study:

- i. The present study was carried out in only three upazillas of Bangladesh. Similar studies should be conducted in other parts of the country to get a clear picture of the whole country which will be helpful for effective policy formulation.
- ii. The present study was undertaken to explore relationships of eight selected characteristics of the farmers with their extent of losses of jackfruit as perceived by them. Therefore, it could be recommended that further studies should be designed considering other agricultural and non-agricultural activities and including other characteristics of the farmers that might affect the losses of jackfruit.
- iii. In the present study age, level of education, jackfruit land size and number of jackfruit trees had no significant relationship with the losses of jackfruit. In this connection, further verification is necessary.
- iv. The present research was conducted on jackfruit losses only. Similar research should also be undertaken on other crops.

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Appendix-A

(English version of the Interview Schedule)

**DEPARTMENT OF AGRICULTURAL EXTENSION AND INFORMATION SYSTEM
SHER-E-BANGLA AGRICULTURAL UNIVERSITY
DHAKA-1207**

Interview Schedule for Collection of Data in connection with the study

“ASSESSMENT OF LOSSES OF JACKFRUIT AS PERCEIVED BY THE FARMERS”

Serial No.:

Respondent Name :

Village : Upazilla : District:

[Please provide the following information. Your information will be kept confidential and will be used for research purpose only.]

1. Age

Please mention your age.....years.

2. Level of Education

Please mention your level of education.

- a. I cannot read or write.
- b. I can sign only
- c. I have studied up to class (.....)

3. Jackfruit Land Size

Please mention your jackfruit land size.....centi-/acre/hectare

4. Number of Jackfruit Trees

How many jackfruit trees are there in your garden?

5. Annual Income from Jackfruit

Please mention your annual income from jackfruit per year.Tk.

6. Experience in Jackfruit Cultivation

For how many years do you cultivate jackfruit?years

7. Knowledge on Jackfruit Cultivation

Please answer the following questions regarding jackfruit.

Sl. No.	Questions	Assigned Score	Obtained Score
1	Name two varieties of jackfruit.	2	
2	When and how much fertilizer do you apply to a jackfruit tree?	2	
3	How do you irrigate the jackfruit field?	2	
4	How do you spray insecticides on jackfruit trees?	2	
5	How do you give training and pruning to the trees?	2	
6	Mention two insects of jackfruit.	2	
7	Mention two ways of controlling insects.	2	
8	Mention two diseases of jackfruit.	2	
9	Mention the ways of controlling diseases.	2	
10	When do you see the inflorescence of jackfruit?	2	
11	How many types of inflorescence are there?	2	
12	What will you do if the inflorescence is about to rot?	2	
13	Mention the symptoms of a mature jackfruit.	2	
14	When is it good to harvest jackfruit?	2	
15	How is the jackfruit harvested?	2	
16	How is the jackfruit graded and sorted?	2	
17	Which jackfruit seems to be good and tasty?	2	
18	Mention the advantages of jackfruit cultivation?	2	
19	Which products can be produced from jackfruit?	2	
20	Why is the jackfruit produced in large quantity in your locality?	2	
Total		40	

8. Problem Faced by the Jackfruit Farmers

Please mention the extent of problems related to jackfruit cultivation and marketing.

Sl. No.	Problems	Nature of Problem faced			
		High problem	Medium problem	Little problem	No problem
1	Trees don't give jackfruit regularly.				
2	Rotten inflorescence due to insect attack				
3	Disease dissemination in inflorescence				
4	Deformed fruits				
5	Fall of immature fruit				
6	Insect controlling problem				
7	Disease controlling problem				
8	High prices of inputs				
9	Quick rot after harvesting				
10	Unavailability of vehicles in marketing				
11	Lower market price				
12	Cracking in marketing				
Total					

9. Losses of Jackfruit as Perceived by the Farmers

Please mention your perception on losses of jackfruit in percentage.

SL. NO.	Phases	Items	percent Loss of Jackfruit in Terms of Total Production
1	Production Phase	Due to lack of cultural operation	
		Due to insect attack	
		Due to pest attack	
2	Harvesting Phase	Due to cracking	
		Due to harvest at over mature stage	
		Due to harvest at immature stage	
3	Marketing Phase	Due to transporting	
		Due to crack or damage	
Total			

Thank you very much for your kind cooperation.

.....
Signature of the interviewer

Date:

Appendix-B (Correlation Matrix)

Characters	X1	X2	X3	X4	X5	X6	X7	X8	X9
X1	-								
X2	-0.034	-							
X3	0.216 [*]	-0.063	-						
X4	0.194 [*]	-0.031	0.895 ^{**}	-					
X5	0.257 ^{**}	-0.009	0.725 ^{**}	0.707 ^{**}	-				
X6	0.818 ^{**}	0.062	0.213 [*]	0.179	0.272 ^{**}	-			
X7	0.080	0.238 ^{**}	0.137	0.143	0.277 ^{**}	0.167	-		
X8	0.068	-0.084	0.066	0.038	0.040	0.018	-0.303 ^{**}	-	
X9	-0.027	-0.071	0.114	0.115	-0.181 [*]	-0.214 [*]	-0.249 ^{**}	0.245 ^{**}	-

- X1: Age
- X2: Level of Education
- X3: Jackfruit Land Size
- X4: Number of Jackfruit Trees
- X5: Annual income from Jackfruit
- X6: Experience in Jackfruit Cultivation
- X7: Knowledge on Jackfruit cultivation
- X8: Problem faced by the Farmers
- X9: Losses of Jackfruit as Perceived by the Farmers