

**PROSPECTS AND PROBLEMS ANALYSIS OF MANGO CULTIVATION
BASED ON SOME SELECTED AREAS IN RAJSHAHI DISTRICT OF
BANGLADESH**

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BASED ON SOME SELECTED AREAS IN RAJSHAHI DISTRICT OF
BANGLADESH**

BY

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A Thesis

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CERTIFICATE

This is to certify that the thesis entitled, “PROSPECTS AND PROBLEMS ANALYSIS OF MANGO CULTIVATION BASED ON SOME SELECTED AREAS IN RAJSHAHI DISTRICT OF BANGLADESH”. Submitted to the Faculty of Agribusiness Management, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF BUSINESS ADMINISTRATION IN MARKETING**, embodies the result of a piece of bona fide study work carried out by **MD. MASBAUL ISLAM, REGISTRATION NO. 11-04330** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

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Dedicated to
My
Beloved Parents



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ABSTRACT

The study was conducted among 104 mango producer to assess their, profitability in case of mango production, demographic and socio-economic condition e.g. age, education, profession number of family member ,number of income earner, amount of land, number of school going children, amount gardens area ,fertilizer dose, pesticides ,mango variety cultivated ,cost of capital, profit, , vehicle used for transportation, market size, market distance, presence of cooperative society and membership, types of marketing harvesting, grading, yield, weather, disease ,use of fellow land, training requirement, government intervention, storage facilities, export etc condition of in selected areas of four villages namely Bausha Hadati Para village under Bagha upazila, Baruipara village under Puthia upazila, Kismot Bogura village under Durgapur upazila Pannapara village under Chorghat upazila Northern region of Bangladesh during January-March 2018 . The study also encompasses the comparison of cost and profit of another crop cultivated with mango cultivation. Mostly farmer depend on mango production because the climate is very conducive for mango cultivation in Rajshahi district. Barind ecosystem (Rajshahi Region) is unfavorable for field crop production but suitable for production of fruits like mango, litchi and jujube etc .Fruits are significant component of agricultural farming system in Bangladesh. The primary data collected through scheduled questionnaire from the randomly selected 105 mango growers. Problem Confrontation Index (PCI) was used to measure the problems obtained from mango production were categorized into 6 types viz. very severe, severe, moderately severe, moderate, negligible, not at all. On the basis of Problem Confrontation Index (PCI) formula, out of the 16 problems, insects and diseases infestation was identified as the major problem with PCI 429 followed by dropping of fruits and flowers with PCI 409. Scarcity of better varieties/ Seedling/ grafts, Climate change and Lack of modern technology were also three major problems with PCI 387,276 and 193 respectively faced by mango farmers in case of mango production. About 65% of farmer are educated in this region.it was estimated 95% farmers have own land. All of the respondents interviewed aged between 28-98 years .Cost and return analysis of mango production revealed that 10 mango varieties are founds as profitable with the higher working investment and human labor development. Their fertilizer use ratios were as like Urea: TSP: MoP= 1.5: 2: 1. Data represented that every cultivator had to spend 106659 taka for one hectors of land or 120 mango trees and average profit was 299010 taka but it varies from 299010 to 300000 taka on the basis of respondents from 120 mango trees or from one hector without considering land rent. Average profit from mango cultivation was higher than Average profit from onion cultivation which amounted Tk. 299010 per hectare and 260412 per hectare respectively .Out of 104 mango producer, 59 producers were engaged in both supporting crop and mango,45 farmers were with mango only. Most farmers (87%) in the study areas practiced intercropping with mango. the cost incurred by Harvesting, Sorting and Grading of mango cultivation was more than other crops. Inadequate transport facility, higher cost of transportation, Preservation problem, Lack of feeder roads, Lack of shed in the market, Post-harvest loss and Strike / Political unrest problems were identified for the farmers in mango marketing. Marketing problems for traders were Unstable price, Selling on credit, Lack of capital, Lack of market place, High transport cost, Lack of market information, Lack of processing center, Lack of processing plant etc. Although respondents certified that Rajshahi district is profitable in respect of mango production as the yield of Mango was far greater than the yield of other crops but further study should be taken place with other variables and characteristics that related to farmers in mango production in different upazilas of Rajshahi district.

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ABBREVIATIONS AND ACRONYMS

BARC	Bangladesh Agricultural Research Council
BB	Bangladesh Bank
BBS	Bangladesh Bureau of Statistics
BOS	Bangladesh Orthonoitik Samikkha
BCR	Benefit-Cost Ratio
BKB	Bangladesh Krishi Bank
BRAC	Bangladesh Rural Advancement Committee
<i>et al.</i>	et alia (and others)
etc.	et cetera (and others and so forth)
GOB	Government of Bangladesh
GNP	Gross National Product
GDP	Gross Domestic Product
HSC	Higher Secondary Certificate
Kg.	Kilogram
Ln	Natural Logarithm
MoF	Ministry of Finance
M.S.	Masters of Science
ME	Market Efficiency
No.	Number
ha	Hectare
%	Percentage
SSC	Secondary School Certificate
SPSS	Statistical Package for Social Sciences
Tk.	Taka
AC	Average cost
AP	Average price

CHAPTER-1

INTRODUCTION

1.1 Background of the study

Bangladesh is situated between latitude 20°34N and 26°38N and longitude 88°01E and 92°41E, with a total land area of 1,47,610 square km. The country of mostly flat topography is characterized by highly variable amounts of rainfall. This country is blessed with many horticultural crops. More than 90 vegetables, 60 fruits and 25 spices are being grown in the country. Fruits play a unique role both in economic and social sphere for improving income and nutritional status, particularly rural masses. Fruits are highly valued in human diet mainly for vitamins and minerals. Along with these, orchards of fruits help in maintaining ecological balance. Fruit contributes 10% income of the national economy and 1-2% land covered of the total cultivable land in Bangladesh (Mondal *et al.*, 2011). Per capita per day fruit intake is 44.7 gram at national level and that of 42.6 gram for rural areas (HIES, 2010) as compared to the minimum requirement of 100 g/capita (FAO/WHO, 2003; BAN-HRDB, 2007). Bangladesh is Agro based country. Socio-economic condition of Bangladesh fully depends on production of Agricultural goods. Bangladesh is divided with 30 AEZ(Agro Economical Zone) on the basis of topography and climate conducive to different crop cultivation. Rajshahi belongs to AEZ-25(Barind Tract).The climate of Rajshahi is generally marked with monsoons, high temperature, considerable humidity and moderate rainfall. The hot season commences early in March and continues till the middle of July. The maximum mean temperature observed is about 32 to 36 °C (90 to 97 °F) during the months of April, May, June and July and the minimum temperature recorded in January is about 7 to 16 °C (45 to 61 °F). The highest rainfall is observed during the months of monsoon. The annual rainfall in the district is about 1,448 millimeters (57.0 in).

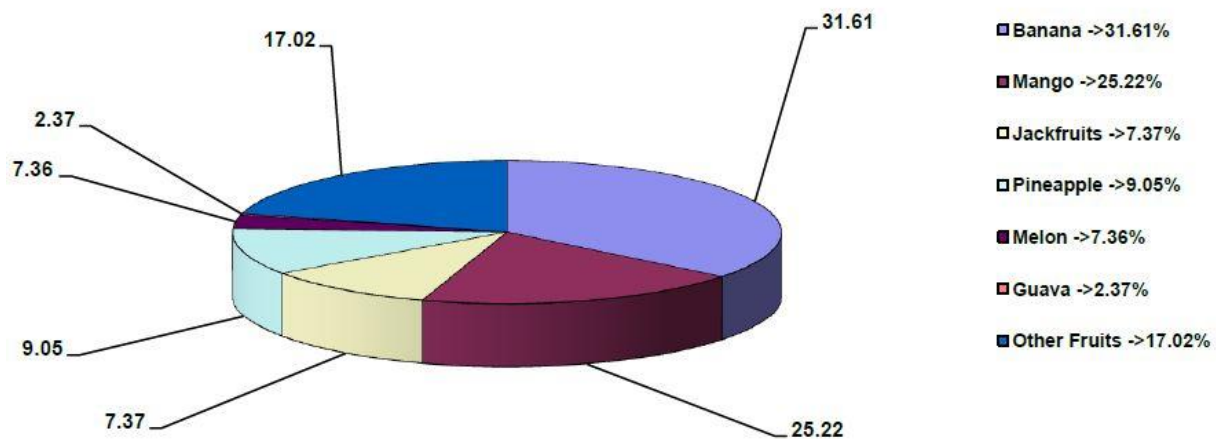
Table-1.1.1: Physiography of Barind Tract

Physiographic Unit	Agro-Ecological Zone (AEZ)		Area excluding river beds (acre)	Texture = T pH = pH Organic Matter Status = 0.m	Land Type					
	AEZ No.	Name			High	Medium High	Medium Low	Low	Very Low	Homestead + Water
Barind Tract	25.	Level Barind Tract	1247635	Type (%) T : pH: 0.m	30 Loamy 5.0-5.7 Low	55 Loamy 5.0-5.7 Low	4 - - -	2 - - -	- - - -	9 - - -
	26.	High Barind Tract	395370	Type (%) T : pH: 0.m:	93 Loamy 4.8-5.9 Low	1 - - -	- - - -	- - - -	- - - -	6 - - -
	27.	North-Eastern Barind Tract	266625	Type (%) T : pH: 0.m:	36 Loamy 4.8-5.9 Low	56 Loamy 4.8-5.9 Low	1 - - -	- - - -	- - - -	7 - - -

Source: BBS, 2017

There are multifaceted problems of crop production in northwest Barind area (Rajshahi region) of Bangladesh. Barind ecosystem is characterized by drought, extreme temperature, erratic rainfall and drawdown of groundwater, which restricts economic use of natural resources (particularly, land and water) for field crop production. The total area of the northwest region of Bangladesh is 3.49 Mha, out of which 76% (2.63 Mha) is net cultivated area. The estimated existing population of the area is around 35 million. Boro is the main irrigated crop and covers above 48% rice land. Aus and Aman rice cover 10 and 69% rice areas respectively. Groundwater irrigation is the main source of irrigation. But groundwater table has been depleted by 2.1 meter per year from 1985 to 2012 (Biswas, *et al.* 2014). Moderate to severe drought and soil nutrient depletions are adding more pressure on natural resources for sustainable crop production. Thus, farmers in the region have started to shift crop land into fruits (mango, litchi and jujube)

cultivation due to low water requirement, favourable agro-ecological condition, ready market and profitability. The sustained economic growth, rising per capita income and growing urbanization have caused a shift in the consumption patterns in favour of high valued crops like fruits and vegetables from staple food crops such as rice and wheat. In the recent past, demands for these high-valued crops such as fruits have grown much faster than that of food grains. Fruits play a significant role in nutritional improvement, employment generation, food and financial security of the farmers. In 2016-17, the national production and area of fruits were 5067798 million ton and 388857 acres respectively.



Source: BBS, 2017

Fig-1.1: Garden Area under Fruits in Bangladesh, 2015-2016

The cultivation of mango has gaining momentum among the farmers in the Rajshahi region (especially in Barind area) due to its low water requirement, favourable agro-ecological conditions, ready market and profitability. Mango ranks third among the tropical fruits grown in the world with a total production of million metric-tons (FAO, 2004). In Bangladesh, mango ranks 2nd in terms of area followed by banana and 1st in terms of production. Bangladesh produces 1288315 metric tons of mangoes annually from 102939 acres of land (BBS, 2017).

Table-1.1.2: National estimate of acreages and production of Mango, Banana and total Fruits Crops 2014-15 to 2016-17

Name of Crops	2014-15		2015-16		2016-17	
	(acres)	Production (MT)	Area (acres)	Production (MT)	Area (acres)	Production (MT)
Banana	115434	777427	117159	798012	120203	807104
Mango	61997	1018112	93480	1161685	102939	1288315
Total-	323699	4697636	370662	4812370	388857	5067798

Source:BBS, 2017

Mangoes are grown in almost all parts of Bangladesh but commercial and good quality mangoes are mostly grown in the north-western and south-western districts of the country. Bangladesh is blessed with a good number of commercial and promising cultivars of mango. Due to certain limitations of soil and climate conditions, the mango grows better in some selective areas of Bangladesh. The climate of Rajshahi is very fertile for different type of mango production. The leading mango growing districts are Nawabgonj, Rajshahi, Rangpur, Dinajpur and Kushtia.

Table-1.1.3: Crop Calendar of Bangladesh for Mango

Crop	Time of Sowing/ Transplanting	Time of Harvest	Per Acre Seed Requirement
Mango	a) Mid April to Mid June b) Mid September to Mid November	Mid April to Mid June Mid April to Mid June	28 Saplings

Source:BBS, 2017

Mango (*Mangifera indica L.*) belongs to the family Anacardiaceous, is an important and popular fruit of Bangladesh. It has a unique position in respect of nutritional quality, taste, consumer's preference etc., among the fifty kinds of fruits grown in Bangladesh (Ahmad, 1985)

Table-1.1.4: Area and Production of Mango in Rajshahi District 2014-15 to 2016-17

Zila/Division	Total Production of Inside & Outside Garden (M.Tons)		
	2014-15	2015-16	2016-17
Bogra	17125	17054	21413
Joypurhat	4945	4036	5777
Naogaon	20655	21319	21319
Natore	65914	69669	69206
Chapai Nawabganj	152285	166903	161347
Pabna	26012	28012	30170
Rajshahi	230981	277058	197315
Sirajganj	25153	33776	26046
Rajshahi	543070	617827	532593
Bangladesh	1018112	1161685	1288315

Source:BBS, 2017

The fruit is believed to have originated in the Eastern India, Asam, Burma or in the Malayan region (Mukherjee, 1997). Mango grows well in all types of soil with suitable pH range from 5.5 to 7.0 (Whiley, 1984), but it can be grown commercially up to pH 8.5 with proper nutritional management. It can grow well within the temperature ranging 24-30°C (Corbineau *et al.*,1986).

Table-1.1.5: Area, Yield Rate and Production of Mango 2014-15 to 2016-17.

Crop	2014-15			2015-16			2016-17		
	Area '000' Acres	Per acre Yield (Kg)	Production '000' Tons	Area '000' Acres	Per acre Yield (Kg)	Production '000' Tons	Area '000' Acres	Per acre Yield (Kg)	Production '000' Tons
Mango	62	76	1018	93	82	1162	103	92	1288

Source:BBS, 2017

With the rapid increase in population, the nutritional as well as economic problems are getting worse parallelly. To overcome these problems, development of mango varieties by evaluation at different agro-climatic regions may be important. Replacement of all the inferiors by the superior

varieties must be ensured. This requires a wide survey and collection of superior mango germplasm from home and abroad and thereafter their detailed evaluation under Bangladesh conditions or even for specific region is necessary. The commercial mango varieties namely Lokna, Gopalbhog, Fazli, Khirsapat, Langra, Fazli, Ashwina etc. have been selected from chance seedlings found in different parts of the Indian sub-continent. Still, there may be other superior chance seedlings available in the countryside of Bangladesh that remains unnoticed to the scientists. Some of these may be high yielder with superior quality and possess a regular bearing habit.

Table-1.1.6: Indices of Area and Production of Mango (Base: 1984-85=100)

Crops	Area					Production				
	2012-13	2013-14	2014-15	2015-16	2016-17	2012-13	2013-14	2014-15	2015-16	2016-17
Mango	76	855	55	83	92	588	610	626	714	792

Source: BBS, 2017

Recently, some exotic mango varieties including hybrid mangoes are gaining popularity in Bangladesh, which also could help to enrich our varietal lot. The eastern areas of Bangladesh do not produce commercially any reputed variety. Moreover, studies relating to the performance of such varieties grown in those areas are scanty. So, it is necessary to find out the qualitative performance of elite varieties in the eastern areas.

1.2 Origin

The mango tree appears to have originated in Malaysia, or more probably the Indo-Burmese region. Its cultivation rapidly spread to neighboring countries, becoming an intensive crop in South-East Asia from the 4th or 5th Century BC. In Africa, the mango was apparently introduced by the Arabs on the East Coast, in Madagascar and the Indian Ocean ports, whence it spread inland. Africans also played an important role in disseminating the mango across intertropical Africa before the colonial age. In addition to fruit production, the tree was frequently planted for its shade. Portuguese navigators propagated the mango to Brazil, from where it spread across South America and then to North America. It was introduced to Australia only during the 19th Century. Some plantations were set up in Europe from the 17th to 19th Century, but without any real success. At the outset, mango was propagated by sowing, which yielded small, highly fibrous fruit which had a pronounced taste of turpentine. It was only from the 19th Century that graft propagation of mono

embryonic varieties developed, giving rise to West Indian varieties such as Julie, Amelie, Divine, etc., which were introduced in West Africa.

Commercial mangoes are most often derived from free or controlled hybridization of original poly embryonic or mono embryonic varieties, the cross characteristics of which make it possible to obtain fruits meeting the market requirements. In the 20th Century, extensive research and selection efforts led to the production of the Haden variety, derived from the Indian variety Mulgoba, and obtained using the bud grafting technique. Numerous other varieties would follow, which have now spread around the world. Mango cultivation is favored by the inter-tropical zone, but recently it has progressed in peripheral regions such as the Mediterranean, where it is prospering in Israel, Egypt, Morocco and Spain. The fresh mango was long restricted to local or regional trade, given its perishability. It was only after the Second World War that it began to be traded over longer distances, as air transport developed. Refrigerated sea transport in the 1980s-1990s would rapidly boost mango flows to North America and Europe, major consumption centers.

1.3 Nutritional value

Mango is now recognized as one of the choicest fruits in the world and is called the “King of fruits”. It is rich in several vitamins and minerals. The composition generally differs with cultivar and the stage of maturity. There is perhaps no fruit other than ripe mango that contains so much carotene and unripe mango occupies the first position among all major fruits in containing iron. Flesh of a ripe mango contains about 15 per cent sugars, mostly sucrose, much vitamin A and fair amounts vitamins B & C. Mango is now recognized as one of the choicest fruits in the world market for its excellent flavor, attractive color and delicious taste. It has medium calorific and high nutritional values. Carbohydrate content in ripe mango pulp is 16.9% (Salunkhe and Desai, 1984). The main constituents of this fruit are water, carbohydrates, acids, proteins, fats, minerals, pigments, tannins, vitamins, and ethereal substances collectively forming its flavor. Mango contains appreciable quantity of pro-vitamin A, vitamin C and soluble sugar (Samad *et al.*, 1975). The unripe fruits contain nearly 50% more vitamin C than the ripe ones and in mineral content, mango holds an average position among fruits and in containing iron, unripe mango is the first and ripe fruit, about the 16th position among all major fruits (Hossain, 1989). The fruit has really of immense value in respect of money and prosperity. In Bangladesh it is called as “King of the fruit”.

1.3.1 Calories

An average crop of wheat will give 1,034,880 calories per acre, papaya with a yield of over 40 tonnes per acre will give 18,923,520 calories and banana with a yield of 10 tons per acre will give 15,052,800 calories. The corresponding figures for mango are 2,668,800 and for guava 1, 511,532.

Table-1.1.7: Nutritional qualities of mango

Constituents	Average content		
	Fresh mango	Juice	Nectar
Energy (kJ/100 g)	269	172	262
Energy (kcal/100 g)	63.5	41	61.7
Water (g/100 g)	83.1	86	84.3
Proteins (g/100 g)	0.7	0.2	0.2
Carbohydrates (g/100 g)	13.6	9.5	14.4
Fats (g/100 g)	0.2	0.2	0.2
Sugars (g/100 g)	13.1	9.3	-
Amidon (g/100 g)	0.3	0.2	-
Fibres (g/100 g)	1.76	Traces	0.6

Source:Google

1.3.2 Medicinal Value

The mango is also considered to have some medicinal properties. The ripe fruit is fattening, diuretic and laxative. The smoke of the burning leaves is supposed to cure hiccups and some throat troubles and the kernel are effective against diarrhoea and asthma. Baked and sugared pulp is given to patients of cholera and the plague. The bark is a source of resins and gums. The gum and the resinous substance exuded by the stem end of the harvested fruit are mixed with lime – juice and given in cases of scabies and coetaneous afflictions. Vitamin A, which gives resistance to diseases, prevents night –blindness and promotes growth in young age, is found abundantly in mango. Vitamin C, the absence of which causes scurvy, is also available in mango.

1.3.4 Uses

Best cultivators have delicious mango fruits with melting yellow flesh and good flavor. Juice and all kinds of preserves can be made from ripe fruits. While pickles and chutney are prepared from unripe fruits. Mango lends itself to a variety of uses: every part of this valuable tree, right from root to top, is utilized by mankind in one form or another. In the premature stage raw fruit is used for delightful chutneys, curries, cold drinks, pickles, etc. Ripe fruits are used for squashes, syrups, marmalades, jams, jellies, and candies. The stones are mostly used to raise seedlings while stones of some of the varieties provide fiber's from which fine brushes could be made. They also make a good stock feed for pigs. The starch can be used for industrial purposes. Goats and cattle are fed on mango leaves in times of fodder scarcity. Branches are used as fuel and are also used as good timber. Its barks have important organic compounds such as tannin and gums.

1.4 World status of mango production & export

1.4.1 Top Mango Producing Countries in the World

The number 1 mango producing country in the world is India. Production here reaches over 18 million tonnes, which is approximately 50% of the global mango supply. The principal mango producing states in India are Andhra Pradesh, Bihar, Gujarat, Karnataka, Maharashtra, and Orissa, although many other Indian states also cultivate mangoes. In total, India has about 2,309,000 acres dedicated to mango farming. The second largest mango producer is China with 4.77 million tonnes of mango. These figures include the mangoes produced in Taiwan. Significant commercial production began here during the 1960's, although mango has been grown in China for centuries. Most of the mango crops can be found in the southern regions, where temperatures are warmer. Major importers of mangoes from China include Russia, Japan, and South Korea. Thailand is the third largest mango producer in the world, with 3.4 million tonnes produced in 2016. Thailand has about 753,671 acres dedicated to mango production. Thailand processes and exports this fruit, including in the following presentations: fresh, frozen, canned, and dried. The majority of fresh mangoes, however, are sold in domestic markets. Only about 2% of the fresh fruit is exported to South Korea, China, Japan, Malaysia, and Singapore. Mango sales total over \$50 million. Bangladesh is the eighth largest mango producer in the world, with 1.16 million tonnes produced in 2016. Thailand has about 753,671 acres dedicated to mango production.

Table-1.1.8 : Rank of Mango Producing Countries

Rank	Area	Value (Tonnes)
1	India	18,779,000
2	China	4,771,038
3	Thailand	3,432,129
4	Mexico	2,197,313
5	Indonesia	2,184,399
6	Pakistan	1,606,091
7	Brazil	1,417,149
8	Egypt	1,277,008
9	Bangladesh	1,161,685
10	Nigeria	917,617
11	Philippines	827,075
12	Sudan	785,940

Source: Google

Table-1.1.9 : Fastest Mango exporting country

1. Uganda: Up 10,467% since 2013 (\$1.6 million)
2. Gambia: Up 9,961% (\$3.1 million)
3. Japan: Up 3,557% (\$256,000)
4. Bangladesh: Up 3,311% (\$648,000)
5. Cameroon: Up 2,234% (\$3.1 million)
6. Slovakia: Up 1,900% (\$40,000)
7. Ghana: Up 1,780% (\$36.4 million)
8. Venezuela: Up 1,354% (\$916,000)
9. Russia: Up 1,329% (\$200,000)
10. China: Up 948.1% (\$70.1 million)
11. Croatia: Up 833.3% (\$28,000)

Source: Google

1.5 Productivity of the Mango in the South Asia Region

It is grown over wide geographical areas particularly in India, Pakistan, Brazil, Mexico, the Philippines, Malayasia, Indonesia, Thailand, Burma and Srilanka. It has gained popularity in Egypt, South – East Africa, Hawaii and Northwest Australia. Producing 9.64 million tons of fruits from an area of 1.17 million hectare, India is the single largest producer of mangoes with approximately 66% of the world mango production (Jacobi *et al.*, 2001).

1.6 Scope of the study

The present study was undertaken with a view to have an understanding about the status of mango production, mango varieties produced, problems confronted by the grower and to explore their relationship with some selected characteristics. The findings of this study will be particularly applicable to the farmers of the respective study area. The findings may also have applicability to other areas of the country when the physical conditions are mostly similar with those of the study area. However, the findings of the study will be helpful for the specialist of different organizations and planners, policy makers and horticulturists to deal with mango production. The administrators, supervisors, field workers and others who are to work in the field of mango may find this study informative. This study could be helpful for commercial mango production programme in one hand and motivate to the authority to reduce hazards cause decline in mango production and source of earning money and reducing poverty.

1.7 Objective

The specific objectives were the followings:

- a. To identify the socio demographic status of the Mango cultivators.
- b. To identify the problems facing in producing and marketing of mango production.
- c. To measures overall cost and return on Mango production.
- d. To analyze marketing and cooperating facilities.

1.8 Justification of the study

Mango (*Mangifera indica*) is the favourite fruit in Bangladesh and has been repeatedly acclaimed as the King of Fruits. (Ahmed, 1994). Mango belongs to the family Anacardiaceae is a tropical to sub-tropical fruit, originated in the Indian sub-continent (Indo-Burma region) in the prehistoric times. It is the most important economic and delicious fruit. It has been cultivated for more than 4000 years (Candole, 1984). Mango is a commercial horticultural crop in many countries of South-East Asia, India, Pakistan, Philippines, Malaysia, Thailand, Burma, Srilanka and Java. The main mango producing countries of world are India, Pakistan, Mexico, Brazil, Haiti, the Philippines and Bangladesh. The Northern and North-western parts of Bangladesh are well known for better mango production (Bhuiyan, Roy & Ganguly, 1999). Rajshahi is one of the districts of these parts. A good percentage of farmers in this district depend on mango production as the major source of income but no study was conducted on mango production as well as on growers in this area. The main reason for the decline in mango production is due to the lack of proper cultural management practices and general neglect. But this low yield may be increased through the proper scientific cultural management practices (Alam et. al, 2017). This is why study was conducted in the district.

1.9 Limitations of the study

The present study was designed with a view to have and understanding about the status of mango production, mango varieties produced, problems confronted by the grower and to explore their relationship with some selected characteristics. Considering the time, money and other necessary resources available to the researcher and also to make the study meaningful and manageable the researcher had to impose certain limitations as follows:

1. The study was confined to Four villages namely Bausha Hadati Para village under Bagha upazila, Baruipara village under Puthia upazila, Kismot Bogura village under Durgapur upazila Pannapara village under Chorghat upazila Northern region of Bangladesh.
2. The study was confined mainly to status of mango production, mango varieties produced and problems confronted by the grower.
3. Out of many characteristics of mango growers only twelve characteristics were selected for investigation in this study.

4. For information about the study, the researcher was depended on the data furnished by the selected respondents during data collection.
5. The respondents for data collection were kept limited within the heads of farm families.
6. Various problems in adopting mango production were likely to be confronted by the growers. However, only 18 problems have been considered for investigation in his study

1.10 Outline of the Study

This thesis contains a total of eleven chapters which have been organized in the following sequence. Chapter 1 includes introduction. The review of literature is presented in Chapter 2. Methodology of the relevant study is discussed in Chapter 3. Chapter 4 Socio-Demographic Profile Of Mango Cultivar and market actors. Chapter 5 Result and Discussion .Chapter 6 deals with constrains and problem related to mango production. Finally, Chapter 7 represents summary, conclusion and recommendations to increase milk production. And chapter 8 and 9 represents references and appendices respectively.

CHAPTER-2

REVIEW OF LITERATURE

Introduction

Research on Mango production is not adequate particularly in Bangladesh, because very little work has been done on these discipline. The objective of this chapter is to provide a brief overview of the results of the previous studies related to the present research work. However, few relevant studies related to production and marketing efficiency, economics of Mango. This chapter is concerned with the review of research related to present work on Productivity, supply and value chain of Mango production conducted in previous recent years.

Khandoker *et al.* (2017) conducted a study on comparative profitability analysis of shifting land from field crops to mango cultivation in selected areas of Bangladesh. The study was conducted in three mango growing districts, namely Chapai Nawabganj, Natore, and Rajshahi during 2014-2015 to estimate the financial benefit of shifting cereal lands to mango production, factors influencing shifting decision, and explore related problems of mango cultivation in the study areas. A total of 180 farmers taking 60 farmers from each district were selected through using multistage stratified random sampling for the study. About 49% lands were shifted to mango cultivation from cereal crops which was higher in Chapai Nawabganj (55%) followed by Natore (48%) district. The main reason of this shifting was reported to be higher profit compared to other crops. The average total cost of mango cultivation was Tk. 1, 33,889 per hectare. Higher cost was observed in the 16th-20th year of garden (Tk. 1, 52,010) followed by 11th -15th year (Tk. 1, 48,952). The average yield of mango was found to be the highest in 16th – 20th year (26.48 ton/ha) followed by 11-16th year (19.38 ton/ha). Per hectare net return from mango cultivation was Tk. 1, 75,244. Total cost of mango cultivation was 10% higher than Boro-Fallow-T.Aman cultivation. On the other hand, total cost was about 40% lower than Wheat- Jute- T.Aman, Wheat-Aus-T.Aman and Potato-Fallow-T.Aman. The net return from mango cultivation was 75% higher than other cropping patterns. The shifting of cereal lands to mango cultivation was found to be a profitable since the BCR (2.89), net present value (Tk. 33, 71,166) and internal rate of return (39%) were very high.

Alam et al. (2017) estimated Production Performance of Mango in Dinajpur District of Bangladesh (A Case Study At Sadar Upazilla). Identify the status of mango production, mango varieties produced, and problems confronted by the growers and to explore their relationship with some selected characteristics. Data were collected from randomly selected 105 mango growers from eight selected villages of sadar upazila under Dinajpur district through personal interview during March to August, 2008. Data were collected on age, education, family size, farm size, land used in mango production, annual income, experience and knowledge on mango production, varieties and number of mango trees and so on. Relationship between the selected characteristics and dependent variables was done by Pearson's product moment co-efficient of correlation. In the study, 30 germplasm of mango were identified. Baramashi droop was found as the only year round variety. Gopalbhog holds the first position (15.90%) according to rank of recognized mango varieties based on their availability in respondents' farm. About three fourths (77.10 %) and more than the same (70.50 %) of the respondents had medium mango production and income respectively. Majority ((75.20 %) of the growers confronted medium problems. Although respondents certified that Dinajpur district is profitable in respect of mango production but further study should be taken place with other variables and characteristics that related to farmers in mango production in different upazillas of Dinajpur district

Uddin et al. (2016) conducted Trend and Output Growth Analysis of Major Fruits in Chittagong Region of Bangladesh. The study revealed that the area of all fruits increased over the period except banana, ber, pomelo and water melon. The highest increase in area was estimated for guava (131.6%) and the lowest for jackfruit (6.4%). Similarly, the production of all fruits over the period was increased except banana and pineapple. The average annual growth rates of area, production and yield for all fruits were found to be positive in all periods (i.e, period I: 1993/94-1997/98; Period II: 1998/99-2003/04, and Period III: 2004/05- 2009/10). But the magnitude of the growth rates of area for all fruits varied significantly. The growth rates of area for mango, jackfruit, litchi and pineapple were increased impressively and significantly. This might be due to the adoption of improved variety and management practices by the farmers. The growth rate of area, production and yield of banana decreased drastically over the period due to absence of modern variety of banana and lack of improved management practices in the region. The growth rates of production for mango were found to be highest in the period III (2004/05-2009/10). But the growth rate of

yield of mango was found to be decreased significantly over the periods due to improper management against the pest and diseases by the farmers. The highest percentage of output changed was observed in Banana (149%) followed by pineapple (106%) and jackfruit (83%) between the periods. The lowest percentage of output changed was found in guava (11.7%). The contribution of area was the highest in changing output for mango, jackfruit, litchi, guava, ber, pomelo, watermelon, lime and lemon. The contribution of yield was the highest for banana (135.57%), papaya (76.92%) and pineapple (158.62%) for changing output indicated that the increased area was more responsible for changing in output growth of selected fruits.

Matin et al. (2008) carried out Mango Marketing System in Selected Areas of Bangladesh.

This study was identified the most efficient and suitable marketing channels of mango in some selected areas of Bangladesh by using primary data collected randomly from 90 farmers and 55 traders. Out of 55 traders, 15 were Bairals, 15 were Beparis. 9 Aratdar (local), 6 Aratdar (urban), 10 Retailers (both local and urban). According to the volume of mango handled and longevity or participation of the intermediaries in the channel, five major channels were identified as dominant in the study areas. The channel Farmer Bairal- Bepari-Aratdar (Dhaka)-Retailer (Dhaka)-Consumer ranked first. The results showed that channel V, Farmer-Retailer Consumer, possesses the highest marketing efficiency followed by channel IV, III, and II. The performance indicators revealed that the channel I and channel II were not relatively efficient in the mango producing regions. Unstable price of mango was the first rank problem in the study area. Establishment of mango processing plant in the intensive growing areas may be the remedy of the problem, which will ensure fair prices for the farmer.

Majumder et al. (2013) estimated Genetic Diversity In Mango (*Mangifera Indica* L.) Through Multivariate Analysis. The study were grouped into eight clusters and the diversity was influenced by the morphological characters, not by the geographical distribution of the genotypes. The clustering pattern revealed that the genotypes collected from the same region did not fall in the single cluster. The maximum inter cluster distance was noticed between cluster II and cluster VIII, and the lowest between clusters VII and cluster VIII. From the cluster means, cluster I was high yielding and ranked first in terms of number of secondary branches per inflorescence, percent fruit set per inflorescence, and yield per plant. Cluster VIII had only one genotype which produced the

highest percentage of flowering shoots, % perfect flowers, number of fruits per plant, and %TSS. The genotypes of cluster VII produced the biggest sized fruits. The first nine characters of the principal component axes with eigen values above unity accounted for 88.3% of the total variation among the fifteen characters. Weight of harvested fruits per plant (0.990 and 0.181), number of fruits per plant (0.101 and 0.607) and individual fruit weight (0.027 and 0.107) for both the vectors were positive across two axes indicating the important components of genetic divergence.

Sarker et al. (2014) carried out Climate Change Adaptation and Economic Profitability: Crop Land Shifting to Mango Orchard in Rajshahi Region. The study find out the causes, challenges and opportunity of crop land shift to mango orchard in Barind areas. A total of 85 mango growing farmers were randomly selected for interviewing. The dominant mango orchard based patterns are: i) Wheat-Fallow-T. Aman (30%); and ii) Mustard-Fallow-T. Amam (29%). About 75% farmers are transforming crop land into mango orchard because of water scarcity, high profitability, easy cultivation process, land suitability and favourable environment for mango cultivation. Mango farmers obtained on average 231 kg/ha yield in 1st quarter (year 1-3) and then production increased sharply and reached 2,190 kg/ha in 5th quarter (year 13-15). The highest gross return of mango was found in the 5th quarter. The estimated net present worth (NPW) of the project was Tk 99,588 per hectare, which indicates that mango cultivation was profitable in Rajshahi area. The internal rate of return (IRR) was 28%, which is higher than the opportunity cost of capital. However, increasing life span of mango orchard increases yield loss of both rice and non-rice crops. In 11-year-old mango orchard, intercrop yield reduced drastically (65%). More than 83% farmers obtained increased income and about 67% achieved better livelihoods due to mango cultivation.

Patil et al. (2006) carried out Trends in the Export of Mango from India. The study find out India exports mango to more than 33 countries in the world. The export of mango in 2000-01 was 37,109 M.T. and it increased to 58, 863M.T. in 2010-11. The value of exported mango was Rs. 16481 lakhs in 2010-11. Though India is having world's more than 40 per cent mango production, our share in international market is comparatively very less. It was 5.97 per cent in volume and 3.96 per cent in value in the year 2000. In the year 2010, India's share was 4.36 per cent in terms of volume and 3.11 per cent in terms of value. Thus there is very vast scope for increasing export of mango from India.

Azad et al. (2009) carried out Qualitative Analysis of Mango (*Mangifera indica* L.) Fruits at Different Maturity Stages. The study find out Some chemical compositions of mango harvested at 24, 18, 12, 6 days before optimum maturity and at optimum maturity were analyzed. The amount of ascorbic acid, β -carotene and sugars of the harvested mangoes were significantly influenced by the stages of harvest and period of storage. Amount of ascorbic acid of the harvested mango fruits was the highest just after harvest. It was sharply declined with the elapse of time in storage. Fruits harvested before optimum maturity showed the highest amount of ascorbic acid, which decreased in delay of harvest. β -carotene was quite low at harvest but rapidly increased in storage. Fruits harvested before optimum maturity showed minimum β -carotene and it rapidly increased in late harvested fruits.

Subrahmanyam (1987) in his study on economics of investment in mango cultivation in Karnataka estimated the costs and returns and the soundness of investment, using investment appraisal techniques. The result showed that it is profitable to invest in mango cultivation, which gives an IRR around 30 per cent and a BCR above 2. It takes 11 years from planting to recover the initial investment. The income from mango cultivation was comparatively low due to neglect of orchards, because of price and yield fluctuations and prevailing methods of marketing. The optimum size of orchard was found to be around 0.8 ha.

Thorat et al. (1986) studied the impact of input subsidy on mango plantation in Konkan region of Maharashtra. To boost Alphonso mango production in the konkan region, Maharashtra state launched mango plantation scheme with 50 percent subsidy limited to Rs. 5,047.50 per hectare. The study attempted to examine the impact of subsidy on economic parameters, financial burden, employment and income to mango orchardists. The study was based on 99 mango growers, selected from 14 villages of Ratnagiri district in the Konkan region of Maharashtra selected by adopting multistage stratified sampling technique. Economic viability of mango plantation was judged by computing payback period (PBP), net present value (NPV), internal rate of return (IRR) and benefit cost ratio (BCR). Repayment schedules for the investment on establishment of mango

orchards were prepared by using compound interest rate formula. The study revealed that the mango plantation is an economically viable enterprise. The BCR, NPV, PBP at 10 per cent discount rate with subsidy were 1.74, Rs.33945, 4.86 and 10 years respectively whereas IRR was 25.71 per cent. The BCR with subsidy was higher by 0.17 as compared to without subsidy, NPV by Rs.4,756.00 and PBP was shorter by 2 years, while the IRR was higher by 6.01 per cent. The total repayment with interest exemption and 50 per cent subsidy worked out to Rs. 9,132.50 while without subsidy it was Rs. 18,263.20 without interest exemption, the total repayment with and without subsidy was Rs. 11,139.20 and Rs. 22,276.20, respectively. The mango plantation generated an additional employment to the tune of 97.36 man days per farm directly and 142.85 man days indirectly. The income of mango growers increased more than three times over their counterparts who engaged in annual crop production. Hence, the mango plantation scheme was encouraged to increase mango production, which was an immediate goal and to remove poverty and rural unemployment in the Konkan region of the state.

Krishna Rao *et al.* (1997) in his study on profitability of mango cultivation in drought-prone areas: A case study of Anantapur district of Andhra Pradesh made an attempt to estimate cost components and farm business analysis. Using multi-stage sampling technique, a sample of five pre-bearing gardens, (age groups 1 to 4 years) and 20 bearing gardens, (age 5 to 50 years) were randomly selected from ten villages. The establishment cost (pre-bearing period) per hectare of mango garden during the first four years were Rs. 3,748.00, Rs. 2,029.00 and Rs. 2,102.00 and Rs. 2,452.00, respectively at 1993-94 prices. During the first year, sowing and nursery accounted for about 32 per cent of the total establishment cost. The next important item of cost was irrigation which accounts 20 per cent of total cost. During the second year manuring, irrigation and intercultural operation were the important operations taken for total cost accounting that corresponded with 37.30 and 22 percent, of the total cost respectively. A similar trend was also observed during the third and fourth years. Fifth year onwards the annual maintenance cost was Rs. 5,169.00. The major heads of expenditure were manures, fertilizers, inter cultural operations, followed by plant protection and irrigation. The cost of production per hectare of a mango garden was Rs. 17,828.00, out of which direct costs sharing was 33 per cent and indirect costs were 67 per cent. The gross returns were Rs. 22,083.00 per hectare for a mango orchard. The net returns after deducting the direct cost from the gross returns worked out to Rs. 16,194.00 per hectare. The

results of the capital productivity measures indicated that the investments on mango garden in this region are rational with the profit. The investment can be productive after 11.5 years with a B C ratio 1.46 : 1.00. The positive NPV indicated the effectiveness of investment made in the mango cultivation. The IRR also indicated favourable nature of return. Since the levels of the present returns from the mango crop were low, the extension agency was to take steps for educating farmers regarding improved cultivation practices.

Singh and Sidhu (1987) conducted a study on Marketing of Mangoes in Punjab State to examine the operational aspects of the mango (fruit) market in Punjab. They reported that the share of the pre-harvest contractor was nearly 34 percent and owner received only 42 per cent of consumer's rupee. They also found that prices too varied according to varieties and grafted varieties fetched higher prices than local varieties of mango. Grading was not practiced on scientific lines, though there was evidence of good returns from grading. The study points out the need for better connecting roads for proper transport, cold storage facilities and better organization by the orchard owners.

Patil et al. (1983) in his study on Marketing Margins and Price Spread in the Marketing of Alphonso Mangoes in Ratnagiri district analysed the price spread and marketing costs for mangoes for four marketing channels viz. producer - consumer; producer - cooperative society - consumer; producer - commission agent - wholesale merchant - retailer - consumer; and producer - pre harvest contractor - commission agent - wholesale merchant - retailer - consumer. Out of the 4 channels the direct sale to consumer was the most profitable and the one through pre harvest contractor was the least profitable.

Srivastava and Bisaria (1987) in their study on marketing margins of various functionaries for mangoes marketed in Azadpur market in Delhi. This study examines the marketing margins of various market intermediaries for the year 1984. It was found that the growers hardly made any profit, especially when fixed costs were taken into account. Commission agents charged 8 per cent on the transactions. The profit reaped by the wholesalers/Mahakhores was around 81 per cent on their investment, and that for retailers was 45 per cent on their investment, after taking into account the mango losses in transit during different periods ranged from 8.0-12.5 per cent. The maximum losses were observed during the months of July and August when both the temperature and

humidity contributed to it. For the various processed products of the mango, the profit margin was 23.137 per cent. The study clearly highlights the exploitation of the mango market by various intermediaries at the cost of the growers. Hence, there was an immediate need for corrective measures, such as cooperative marketing and processing of mangoes was suggested.

Banerjee and Banerjee (1997) made an attempt to look in to the impact of mango processing on small producers income in Vishakhapatnam and Chittoor districts of Andhra Pradesh. These districts were purposively selected as they cover large area under mango with well-known varieties like Totapuri, Rosapuri, Alphonso etc. and these varieties are considered to be superior for jelly and canned pulp. Primary data were collected on cost of investment, production, manufacturing and gross and net incomes were estimated. The study found established soundness of the investments in mango processing and considerable labour absorption in jelly making. However, the major problems confronted by the units were high cost of plant and machinery/packing materials, seasonal availability of raw materials, weak linkage between processors and farmers, competition from synthetic products, high interest rates on capital, high taxes and duties etc. Therefore, concerted efforts were suggested to provide enabling atmosphere for running the processing units in a cost effective way to meet the challenge in future.

Brahambhatt (1984) conducted a study on production and marketing of mangoes in Gujarat. The study examined (i) detailed statistics of area, production and yield per hectare of mangoes; (ii) Marketing and handling channels, marketing costs and margins; (iii) The market distribution system; (iv) Losses incurred during the various stages of marketing; (v) Price behavior at different periods, of different grades; (vi) Availability of market intelligence on prices, supplies etc. and (vii) Constraints in the present marketing system and measures to overcome them. Net income from mangoes, after deducting production and marketing costs from gross mango revenue per hectare, was Rs. 1,377.00 during 1979/80 and Rs. 3,521.00 during 1980/81. The net income from mango crops was Rs. 1,680.00 per hectare during 1979/80 and Rs.3123.00 during 1980/81.

Agarwal (2000) studied the Economics of Production and Marketing of Dashehari Mango in Sitapur district of U.P. Khairabad block of Sitapur district was selected purposively. 5 villages, out of 114 were selected for the study. Total orchards were divided in 16 strata based on their age.

Then about 40 per cent orchardists under each stratum were selected randomly. Thus a sample of 77 orchards was selected. The main objectives of the study were; (i) to study the cost and returns and financial feasibility of mango orchards. (ii) to examine the existing level of employment generated in mango orcharding. (iii) to identify the various marketing channels of mango and to assess their efficiency, and (iv) to identify different constraints in production and marketing of mango, faced by producers. The study revealed that net profit in the establishment year was Rs. (-) 39640/orchard, Rs.(-) 23182/ha and Rs.(-) 322/plant. Net profit in the non-bearing stage was Rs. (-) 34813/orchard, Rs.(-) 20360/ha and Rs.(-) 292/plant and finally net profit in the bearing stage was Rs.219071/orchard, Rs.128113/ha and Rs.1831/plant. Feasibility analysis of mango revealed that the enterprise was economically viable with BCR of 2.76, NPV of Rs.149497.91, PBP of 8.15 years and IRR of 46.39 percent at 10.5% of discount rate. The project period was considered to be 50 years. Mango is a very labour intensive enterprise with a maximum of 231 man days/year/orchard employment in the establishment year. Marketing channels that were found to be prevalent along with the profit margins of each intermediary worked out were mentioned in the study. Direct sale from producer to consumer was found as best channel. Price instability, disease and pest problem, low producer's share, non-availability of irrigation water and non-availability and high cost of fertilizer and plant protection chemicals at their peak operational period, unorganized marketing, imperfect pricing mechanism, lack of integration among markets of mangoes etc. were the main constraints found in the study area.

Dewan et al. (2015) conducted a Scenario of Major Fruits Production and Marketing System in Chittagong Hill Tracts Study Based on Khagrachhari Hill District, Bangladesh. This study identified marketing channel of major fruits descriptive analysis was done. The highest growth rate of production was recorded in mango which was 9.11 percent and negative growth rate was recorded in banana (-11.23%). There are four type of market intermediaries involve in fruits marketing; Bepari, Faria, wholesaler and retailer. Problems affecting fruits production and marketing were divided into two main types; production related problem and marketing related problem. In production related problem the sever problem was disease problem and in marketing related problem the main problem was storage problem and lack of processing center in Khagrachhari Hill District

CHAPTER-3

METHODOLOGY

3.1 Introduction

The methodology is the general research strategy that outlines the way in which research is to be undertaken and, among other things, identifies the methods to be used in it. Methods, described in the methodology, define the means or modes of data collection or, sometimes, how a specific result is to be calculated. The methodology of the study is adopted by various steps to select the best method fit to attain the set objectives of research. For this study farm level data are collected from every respondent directly through interview method. Primary data collection is done with a set structured questionnaire. Survey method is followed considering time and cost of data collection. Bangladeshi farmers are not enough educated and sincere about maintaining records and accounts of farm business. so interview method is appropriate for accurate information required for the study. Selection of the study area, selection of respondents, Sample size and sampling technique, data collection procedure, Period of data collection and analytical techniques followed in this study are main concern of this chapter.

3.2 Selective area

The country is presently divided into eight divisions namely, Dhaka, Rajshahi, Khulna, Barishal, Sylhet, Chittagong, Rangpur, Mymensingh. The location of Rajshahi district is in the north western region of the country. This study was conducted in the four villages of four upazillas of Rajshahi district, in Bangladesh. Keeping in mind the objectives of the study and considering the adjacent limitations data was collected from four upazila eg. Bagha, Charghat, Puthia, Durgapur upazilas under Rajshahi district were purposively as study areas. Data were collected randomly from farmers through interview method.

The reasons behind the preference of the study areas were:

- Availability of farms relative to other areas.
- Easily accessible which made the work easy and saved time
- Favorable for mango production and marketing;

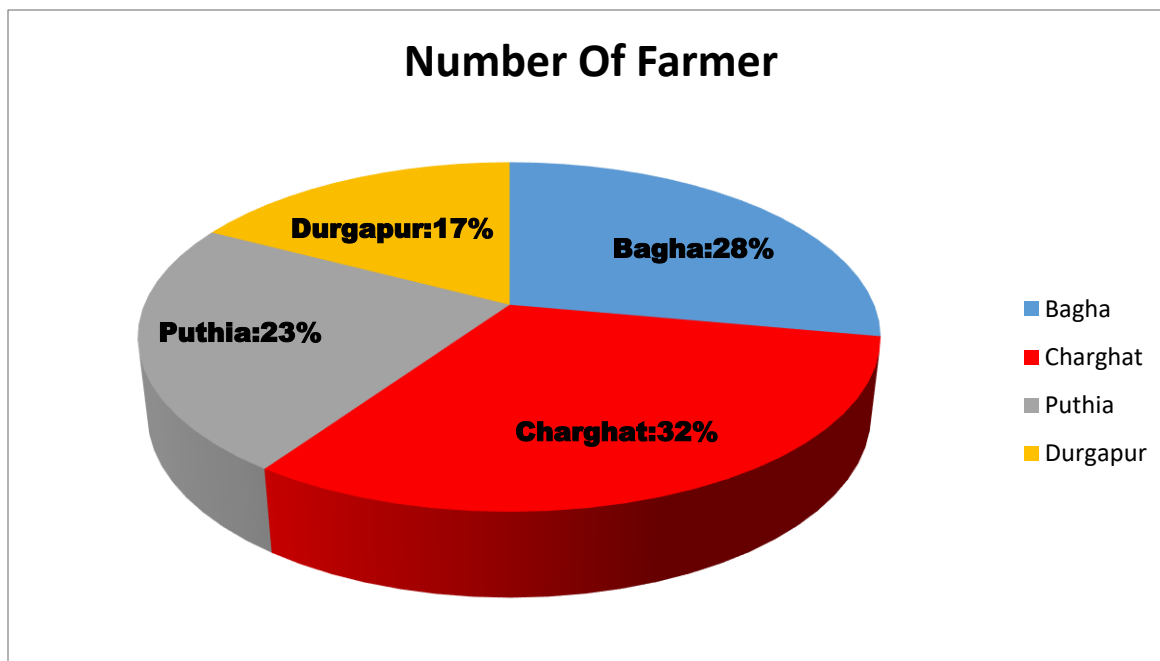
- Availability of different transportation and ways to communicate the respondents.
- To compare the result of present study with previous one.

3.3 Sources of Data

Data required for the present study were collected from primary and secondary sources. Primary data were obtained from Mango farmers. Secondary data were collected from various published sources e.g. Bangladesh Bureau of Statistics (BBS), Ministry of Environment, Forest and Climate Change, Bangladesh Bank (BB) and other related agencies in Bangladesh.

3.4 Sample size and sampling technique

Sampling is a crucial part of any research work. Conducting population census is quite impossible for anyone from economic point of view. Considering time and money constrain survey area was selected purposively. Mango farmers operating within the Rajshahi district were taken into account for this study considering availability and easy access. Simple random sampling technique was used in sampling Mango producer from the population. To assess the socio-economic condition of mango farmers four villages of four different upazillas in Rajshahi districts were covered. Mango producers of villages were chosen randomly among a list of four upazillas for data collection. From one division e.g. Rajshahi, the four upazillas and from each upazilla one village was selected. By this method four villages from four different upazillas were selected randomly. Farmers from four villages were selected randomly for collecting information about their socio-economic condition. 104 farmers were covered by this method randomly which include different numbers from different villages. The sample contained one hundred and four (104) mango producers.



Source: Field survey 2018

Fig-3.1: Pie chart of upazilas respond percentage.

3.5 Preparation of interview schedule

It is very important to prepare a draft survey schedule and pre-testing it in the survey area to get the desired result. One draft schedule was prepared and pre-tested by researcher himself in order to collect data from survey area. The draft survey was performed with 5 mango producers in selected area. After this pre-test, required correction, improvement and modification was done according to the practical experience. Final survey schedule and questionnaire were prepared after pre-testing. Unambiguous questions were avoided in order to get accurate result.

3.6 Questionnaire pattern for mango producers

- a) Name, Village, Thana and Area information of farmers
- b) Family member, earning members of family, educated members of family
- c) The socio-economic condition of farmers
- d) Source of Farm's production capital, Year to establish, Initial investment
- e) Comparison of mango cultivation with other crops, Experience of Mango Cultivation
- f) Cost price of fixed cost, profit to compare to mango and others agriculture crops like onion.
- g) Variable cost information ,Fertilizer use and doze information.
- i) Mango production information, what type of Mango cultivation? Production rate per hector.
- k) Problems of cultivation and Marketing of mango faced by farmer, solution and recommendation.

3.7 Collection of data

Required Data were collected by the researcher with structured questionnaire from primary sources. Interviews and survey methods were carried out to fulfil the objectives of the study. After fixing the survey schedule, field level primary data were collected from the farmers through direct interview. The purpose of the study was disclosed to the farmers before starting. Respondents were ensured that their information would be remained secret. Data were recorded in interview period and information was checked carefully. . A total of 104 mango growing farmers were randomly selected for interviewing from four upazilas . Out of 104 sample farms around 27%, 31%, 23%, 17% farmers are taken from Bagha, Charghat, Puthia, Durgapur upazilas respectively and most of them have 10-12 years mango farming experiences.

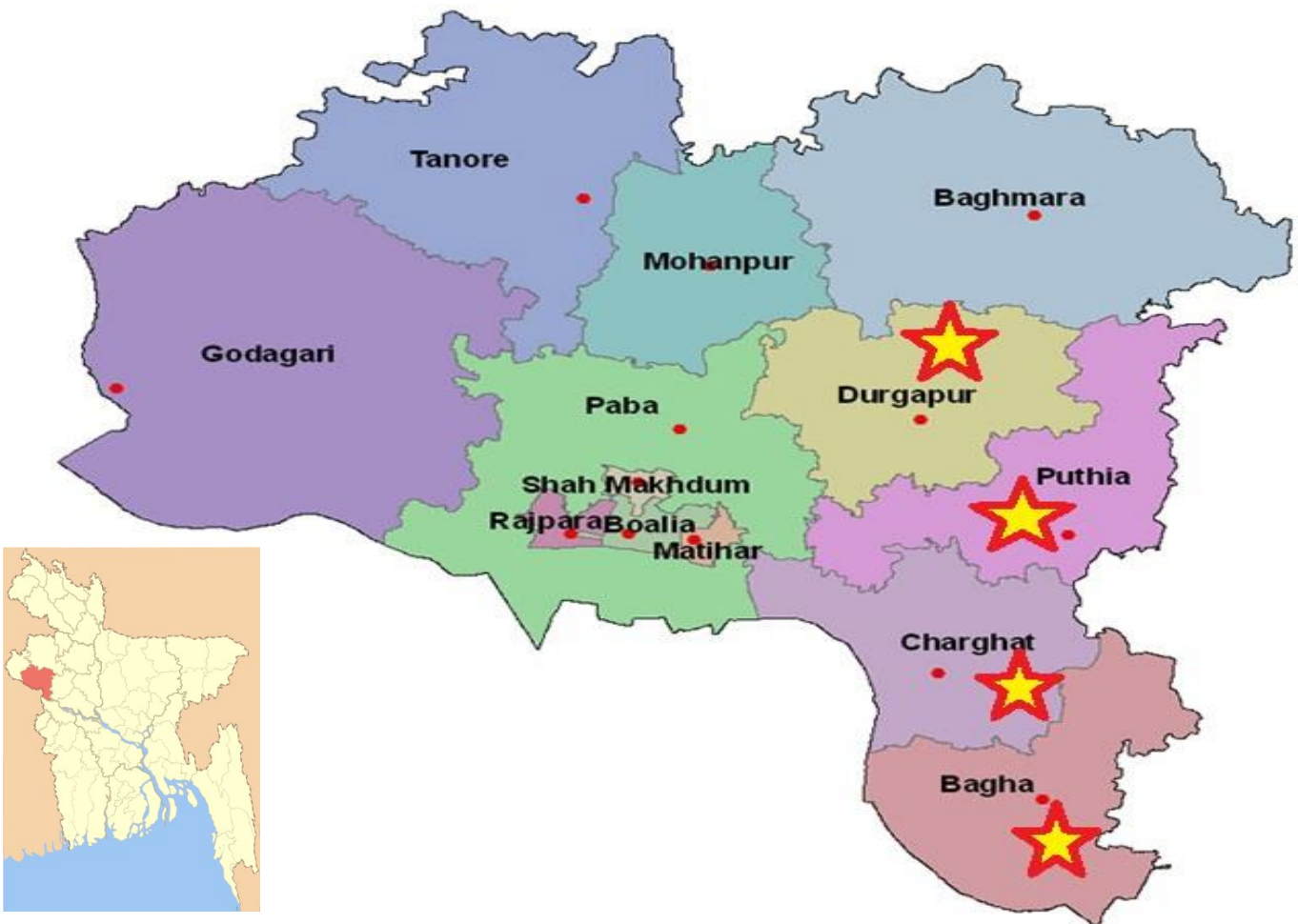


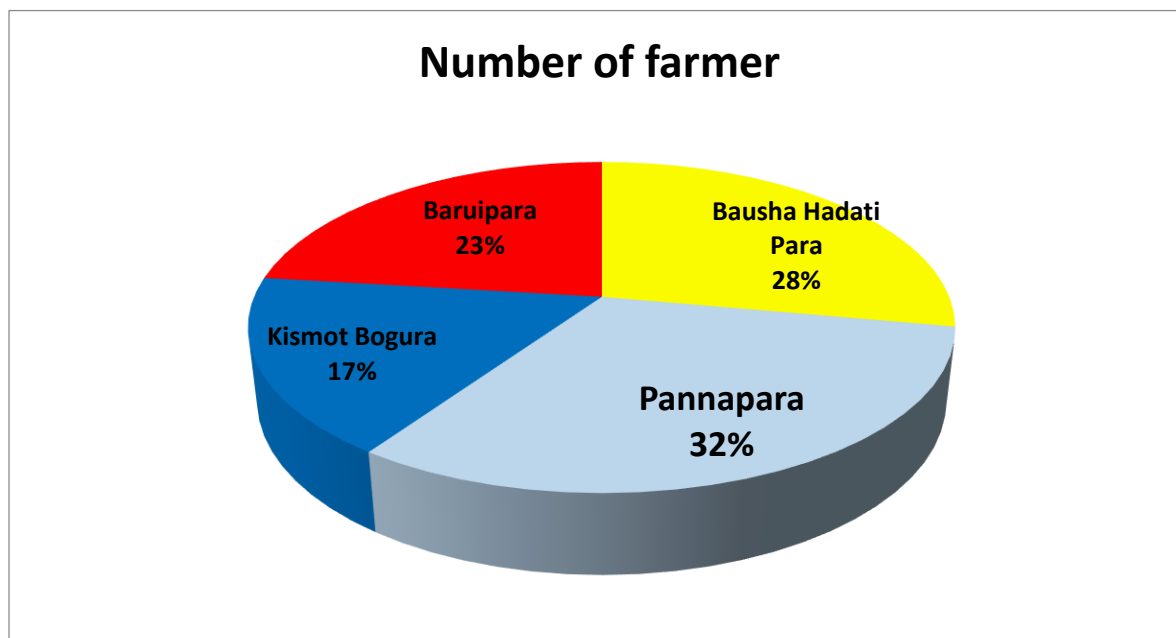
Fig-3.2 : Rajshahi District Map (Marking points were the Areas of data collection)

Table-3.1.1 : Upazilas respondent percentage.

Upazila	Respondent	Percent
Bagha	29	27.88
Charghat	33	31.73
Puthia	24	23.07
Durgapur	18	17.31
Total	104	100

3.8 Villages respond percentage

Mainly four villages under 4 upazilas were taken from where all the data were collected randomly. About 28% data from Bausha Hadati Para village under Bagha upazila, about 23% data from Baruipara village under Puthia upazila, about 17% data from Kismot Bogura village under Durgapur upazila and about 32% data from Pannapara village under Charghat upazila were collected. This percentages given below through pie chart Fig-3.3



Source: Field survey 2018

Fig-3.3: Pie chart of villages respond percentage.

3.9 Period of data collection

A sample of 104 producers was considered to represent the whole survey area. Survey was conducted from January to March, 2018 based on a semi-structured questionnaire designed for mango producers. Information obtained in the interview concerned the mango orchard; the farmers age, social, educational, professional status, family members , income , cost , profit on the production of fruit trees and fruits.

3.10 Processing of data

3.10.1 Compilation of data

Collected data from the farmers were compiled, coded tabulated and analyzed in accordance with the objectives of the study. In this process, all the response in the interview schedule was given numerical coded values. Local units were converted into standard units and qualitative data were converted into quantitative ones by means of suitable scoring whenever necessary. The response to the questions in the interview schedule was transferred to a master sheet to facilitate tabulation.

3.10.2 Categorization of data

For describing the different characteristics the respondents were classified into several categories. These categories were developed by considering the nature of distribution of data, general understanding prevailing in the social system and possible observed scoring system. The procedure for categorization of data in respect of different variable is elaborately being discussed.

3.10.3 Statistical technique

Data were entered into computer through MS Excel and the analysis was performed using SPSS (Statistical Package for Social Sciences) computer package. Descriptive analysis such as range, number, percentage, mean, and rank order were used whenever possible. Pearson's product Moment Co-efficient of Correlation (r) was used in order to explore the relationship between the concerned variables. Throughout the study, at least five-percent (0.05) level of probability was used as basis of rejecting a null hypothesis.

3.11 Analytical technique

For this study the following techniques will be used:

3.11.1 Descriptive Analysis

Tabular and Graphical techniques of analysis were generally used to find out the socio demographic profile of the respondent, to determine the cost, returns and profitability of mango farmers. It is simple in calculation, widely used and easy to understand. It was used to get the simple measures like average, percentage etc.

3.11.2 Problem confrontation in mango production

The respondents were asked about the problems they faced during the cultivation on mango. An item was prepared in the interview schedule. The problems obtained from them were categorized into 6 types viz. very severe, severe, moderately severe, moderate, negligible, not at all. Problem Confrontation Index (PCI) was measured for each problem-item with help of the following formula:

$$PCI = P_{vs} \times 5 + P_s \times 4 + P_{ms} \times 3 + P_m \times 2 + P_{ng} \times 1 + P_n \times 0$$

Where,

PCI = Problem Confrontation Index

P_{vs} = No. of respondents confronted very severe problem

P_s = No. of respondents confronted severe problem

P_{ms} = No. of respondents confronted moderately severe problem

P_m = No. of respondents confronted moderate problem

P_{ng} = No. of respondents confronted negligible problem

P_n = No. of respondents confronted no problem at all

3.11.3 Problem Faced in Data collection

During the period of data collection, the following problems were faced

i) Most of the farmers were reluctant to answer questions since they had very little idea about research and assumed that the researcher might use the information against their interest. To earn the confidence of the farmers lots of time was spent.

ii) The farmers did not keep records of their operating expenses. Therefore the author had to depend upon their assumption.

iii) The farmers were usually busy with their works. So, the researcher sometimes also had to pay extra visits and some money to meet the farmer.

iv) Afraid of taxes main causes of avoid in providing accurate information relating to the actual size of land area, income from mango production.

v) Personal barriers like inability to understand some agriculture terms created a few problems the researcher.

vi) The survey was conducted in the field. However, due to confidential reason, all necessary information was not available.

vii) Another problem was the initial non-cooperation of the respondents.

However, this problem was overcome through persuasive explanation with the respondents of the study area.

CHAPTER-4

SOCIO-DEMOGRAPHIC PROFILE OF MANGO CULTIVATORS

4.1 Introduction

Main purpose of this section is to identify socio economic characteristics of the mango farmers and provide basic information about the areas of observation. Type of Family, enterprise combination, educational qualification, employment status, percentage of incomes from mango orchard etc. are discussed here. For this reason various information related to age, gender, family size, educational level, occupation, training of farmers have been taken into account in this study. This chapter will describe briefly the socio-economic profile such as gender status of the households, age, family size, educational level etc. of the mango farmers.

4.2 Respondents education status

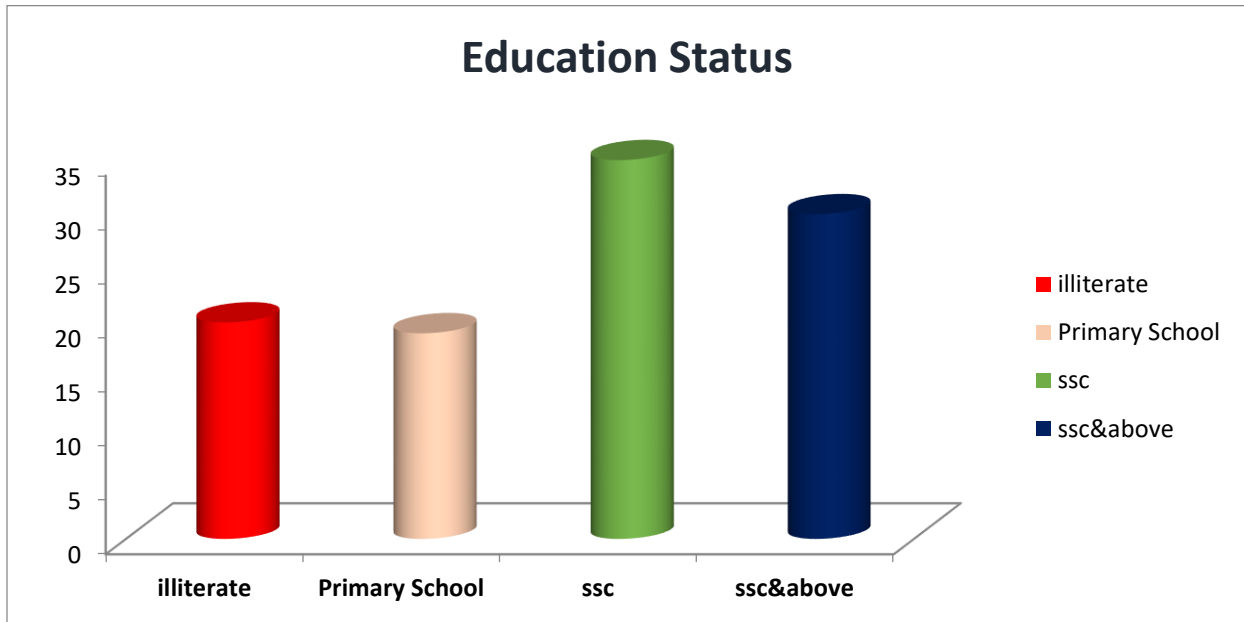
Most of the farmer were literate, but accurate percentage were calculated among them. The observed education of the respondents ranged from primary to ssc and above. On the basis of general education, the respondent were classified into four categories as presented in table-4.1.1. Data contained in the table-4.1.1 showed that the majority (33.65 %) of respondents were in the SSC level followed by SSC & Above (28.84 %) and illiterate (19.23 %). The lowest proportions of respondents (18.26 %) were primary level. The literacy percentage of the study area is under national average. But the trend of literacy percentage is becoming higher as the Secondary level indicates the second highest percentage.

Table-4.1.1: Respondents education status.

Educational status	Frequency	Percent
Illiterate	20	19.23077
Primary School	19	18.26923
SSC	35	33.65385
SSC&Above	30	28.84615
Total	104	100

Source: Field survey 2018

This tabulate value of education status of farmers in the research area is given below through Bar-diagram fig-4.1. About 35 out of 104 of the respondents were estimated for secondary education. In case of primary education status the number of the respondent was estimated about 20. For non schooling the number was estimated about 22 and for higher education that is above ssc the number was estimated about 33.



Source:Field survey 2018

Fig-4.1 : Bar-diagram of villages responds education status percentage.

4.3 Age range of respondent

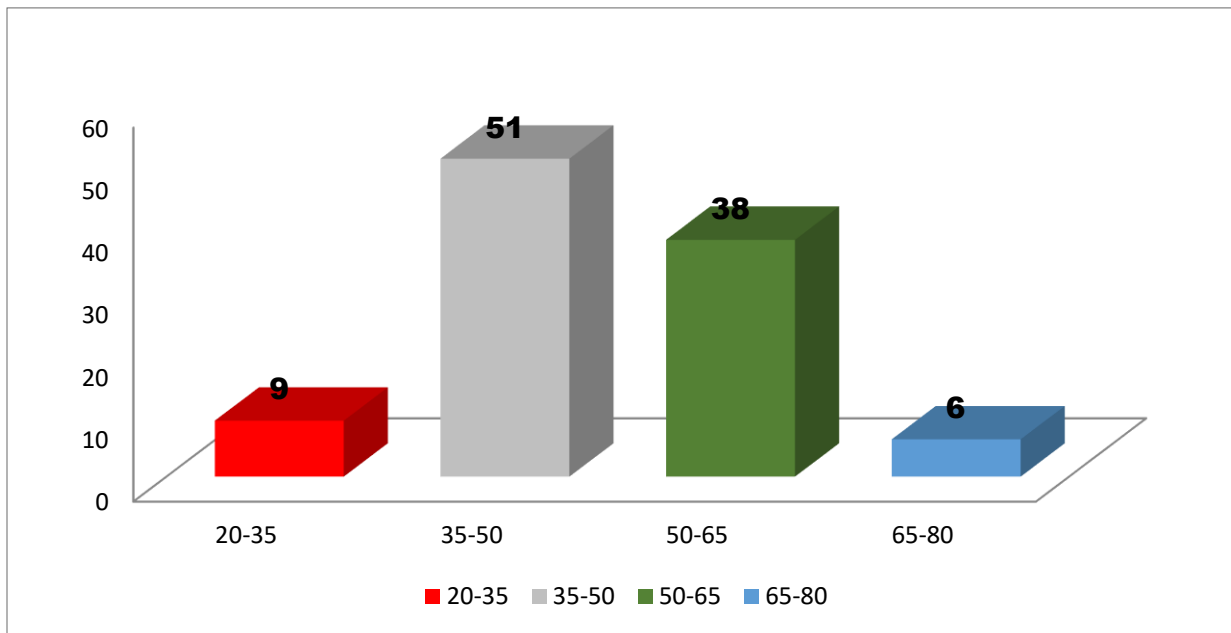
The observed age of the respondents ranged from 20 to 80 years and the highest proportions of the respondents (49.03%) were middle aged(35-50) followed by the 50-65 aged (36.53%) and only 8.65% of respondents were young. The lowest proportions of respondents (5.76 %) were old aged. On the basis of age, the respondents were classified into four categories as presented in Table-4.1.2 .Data presented in the Table-4.1.2 showed that. It was evident that middle-aged peoples were interested in mango production. And none with age 0-20 years were engaged in Mango production.

Table-4.1.2:Distribution of 104 respondent by age.

Range of age (year)	Number of respondent	Percent
20-35	9	8.65
35-50	51	49.03
50-65	38	36.53
65-80	6	5.76
Total	104	100

Source:Field survey 2018

From above Table-4.1.2 age range of respondent were plotted in Bar- diagram for better representation. These groups of people were aged from 20-35, 35-50, 50-65, 65-80 years. Age range started from twenty year and ended with 80. 51 farmers among 104 respondents were 35-50 years aged.



Source:Field survey 2018

Fig-4.2: Age range of respondent.

4.4 Family size

The observed family size of the respondents ranged from 0 to 9 members. Categories and distribution of the respondents on the basis of family size is shown in table-4.1.3. Data presented in the table-4.1.3 indicated that most of the respondents about 66 % had medium family size (3-5 members) followed by small family size (0-2 members) with about 21 % of respondents. Only about 12 % of the respondents had large family size (≥ 6 members). So, from the tabulated data it was clear that in the study area people like to live together in joint family. It was also revealed that most of the respondents having medium sized family were engaged in mango production.

Table-4.1.3: Family size of the sample farmer

Family size(No. of Members)	Respondents(Number)	Respondents (Percent)
Small family (0-2)	22	21.00
Medium family (3-5)	70	66.60
Large family ≥ 6	12	12.40

Source:Field survey 2018

4.5 Farm size

The observed farm size of the respondents ranged from 0.02 to 3.50 hectares. On the basis of farm size the mango growers were classified into five categories as shown in table-4.1.4. Data shown in the table-4.1.4 indicated that most of respondents (63.80 %) were medium land holder having 1.01-3.00 ha of land followed by 20 % of respondents which were small land holder having 0.21-1.0 ha of land, 4.80 % were marginal land holder having 0.02-0.20 ha and only 11.40 % were large land (>3 ha) holder. No landless (<0.02 ha) were found.

Table-4.1.4: Farm size of the sample farmer

Farm size(Hectare)	Respondents(Number)	Respondents (Percent)
Land less (<0.02)	0 0	0.00
Marginal (0.02-0.20) 5 4.80	5 4	4.80
Small land holder (0.21-1.0)	21	20.00
Medium land holder (1.01-3.00)	66	63.8
Large land holder (>3)	12	11.4

Source:Field survey 2018

4.6 Status of recognized mango varieties

Thirteen (13) recognized mango varieties were cultivated by the growers of the selected study area. Their percentages are shown in the table-4.1.5 which indicated the status of the varieties. Lokna ranked 1st as it occupied the highest percentage (20 %) out of total mango varieties which was followed by Kirsapat(Himsagor) (19 %) which ranked 2nd, Langra (17 %) which ranked 3rd.the occupied percentage for Fazli (13 %), Ashwina (11 %), Amrapali(10%), Gopalbhog (3 %), Arajam (2%), Dudhsor(1.5%), Tutapori(1.2%), Harivanga(1%), Mohonbhog(0.8%) and Kachamitha (0.5%) which ranked 4th ,5th ,6th ,7th ,8th ,9th ,10th ,11th .12th and 13th respectively.

Table-4.1.5: Ranking Status of Mango Varieties of the sample farmer

Mango Varieties	Percentage	Ranking Status
Lokna	20	1 st
Kirsapat(Himsagor)	19	2 nd
Langra	17	3 rd
Fazli	13	4 th
Ashwina	11	5 th
Amrapali	10	6 th
Gopalbhog	3	7 th
Arajam	2	8 th
Dudhsor	1.5	9 th
Tutapori	1.2	10 th
Harivanga	1	11 th
Mohonbhog	0.8	12 th
Kachamitha	0.5	13 th
Chusa		
Asari		
Vadri		
Athi amm		

Source:Field survey 2018

4.7 Respondents professional distribution percentage

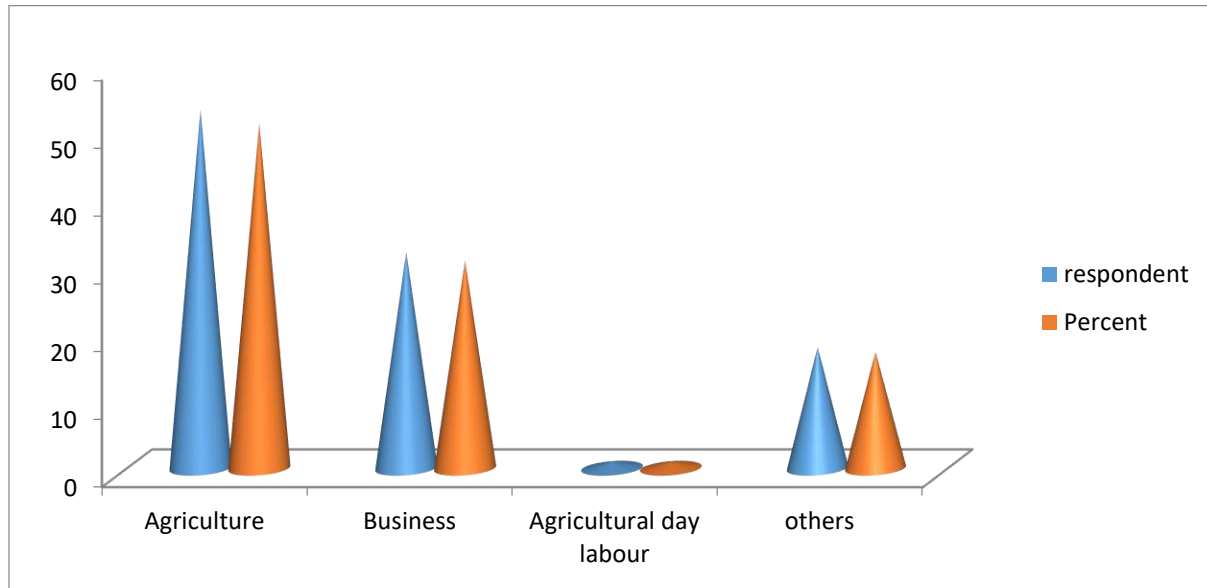
On the basis of profession, the respondents were classified into four categories as shown in table-4.1.6. From the collected data it was estimated that the highest proportion of respondent depend on agriculture and the percentage was about 51%, and the lowest percentage belonged to agricultural day labor group and the percentage was around 1%.The second highest percentage was around 31% which shows business group. The data was express by following table.

Table-4.1.6 : Percentage distribution of profession of the sample farmer

Profession	Number Of Respondent	Percentage
Agriculture	53	50.96154
Business	32	30.76923
Agricultural day labor	1	0.961538
others	18	17.30769
Total	104	100

Source:Field survey 2018

Percentage distribution of profession of the respondent of the survey area was expressed through pie chart Fig-4.3 and is given below which indicated that most of the respondents (53 among 104 respondents) were engaged in agriculture for their livelihood followed by the respondents who were depended on business and the number was 32. Lowest number only 1 indicated Agricultural day labor.

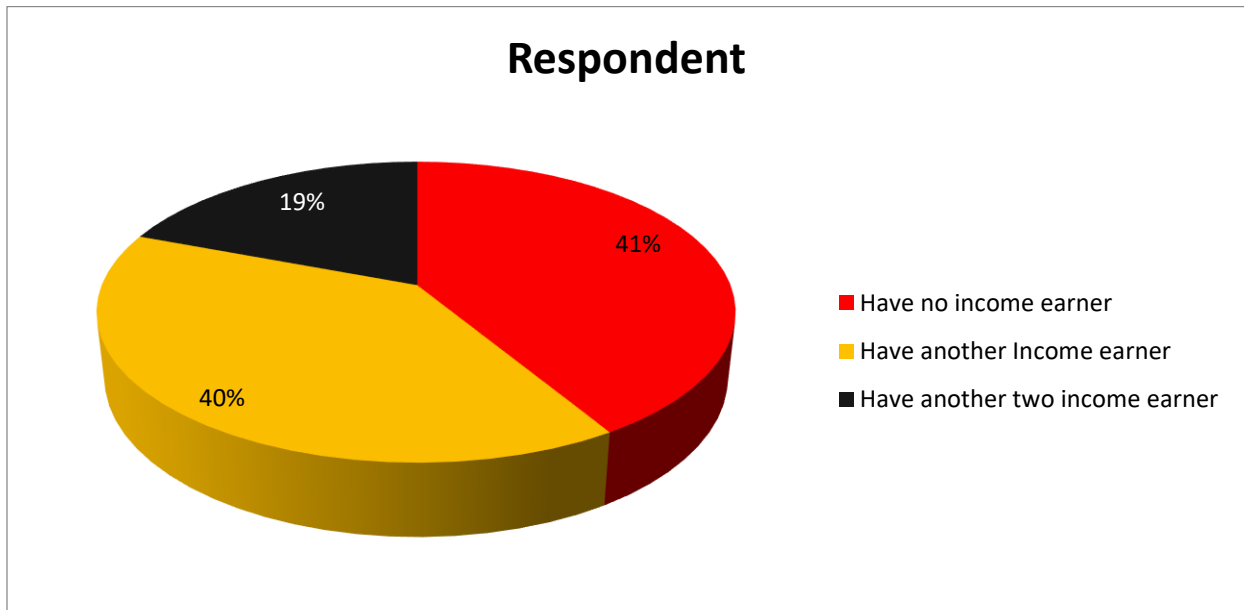


Source:Field survey 2018

Fig-4.3: Bar-diagram of respondents professional distribution percentage.

4.8 Family income earner

The highest proportion of family members had no income earner except only one person and the percentage of their number was about 41% .Other members were dependent on that person. About 40% family had another income earner who helped the head of family and remaining 19% family had another two income earners with the head. And this information presented in a diagram below.

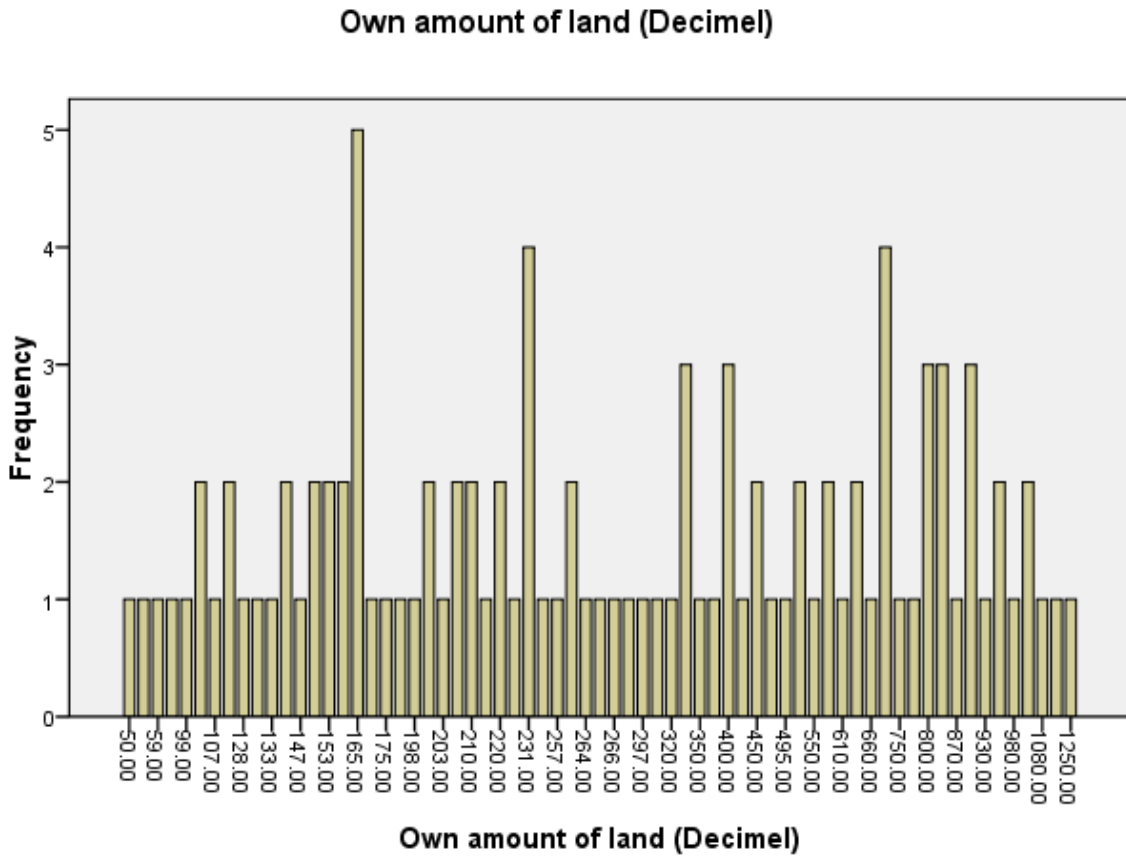


Source:Field survey 2018

Fig-4.4 : Pie chart of family income earner of the respondent.

4.9 Amount of land of a farmer

The following figure shows land ownership pattern of mango farmers. The observed range of total cultivable land size of the respondents was from 50-1250 decimal. On the basis of total cultivable land size, the respondents were classified into five categories as shown in figure-4.5



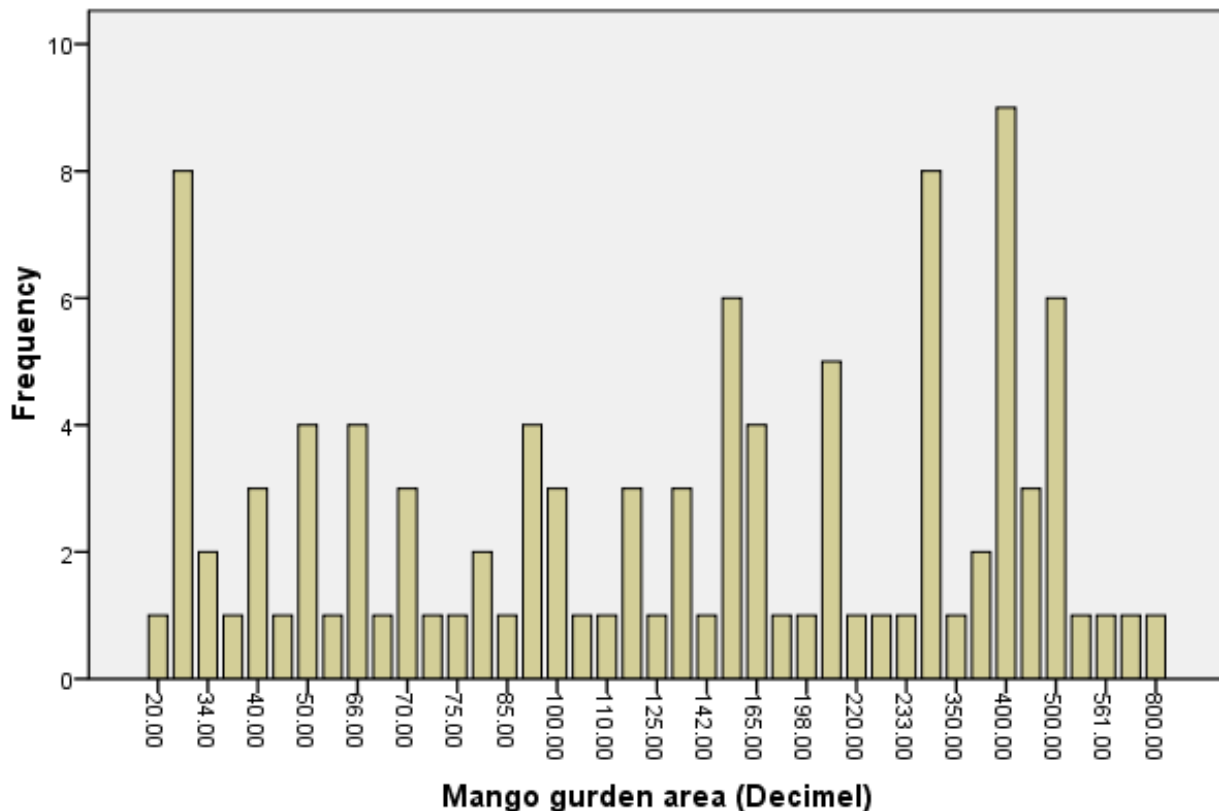
Source:Field survey 2018

Fig-4.5 : Amount of land a farmer has in decimal.

4.10 Amount of land under mango cultivation

The following figure shows Amount of land under mango cultivation of mango farmers. The observed range of total cultivable land size for mango production of the respondents was from 20-600 decimal. On the basis of total cultivable land size, the respondents were classified into ten categories as shown in figure-4.6.

Mango garden area (Decimel)



Source:Field survey 2018

Fig-4.6 : Amount of land under mango cultivation in decimal.

4.11 Land ownership and utilization pattern

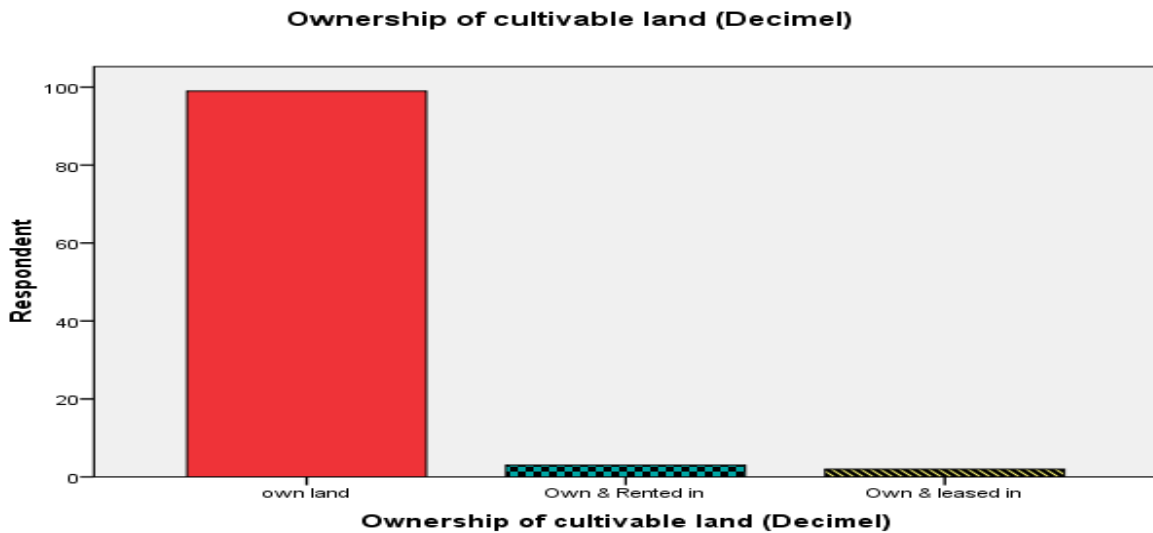
Analysis showed highest percentage of farmers that is about 95.2 percent of mango farmers used only their own land for mango cultivation. About 2.9 percent used their own and rented land, about 2 percent used their own & leased in land for mango production. Table-4.1.7 Ownership of cultivable land.

Table-4.1.7: Land ownership and utilization of the sample farmer

Respondent	Frequency	Percent	Cumulative Percent
own land	99	95.2	95.2
Own & Rented in	3	2.9	98.1
Own & leased in	2	1.9	100.0
Total	104	100.0	

Source:Field survey 2018

This tabulate value of land utilization of research area given below through Bar- diagram fig-4.7 where 99 mango producers among 104 respondants used their own land for mango cultivation.



Source:Field survey 2018

Fig-4.7: Land ownership and utilization patter.

4.12 Experience in mango production

The observed experience in mango production of the respondents ranged from 4 to 32 years. On the basis of experience in mango production, the respondents were classified into three categories as shown in table-4.1.8. Data shown in the table-4.1.8 indicated that the highest percent of respondents about 63.80 % had medium experience (10-20 years) followed by the respondents

about 21.90 % having high (>20 years) experience. Rest about 14.30 % of respondents had low experience (<10 years).

Table-4.1.8: Experience in mango production of the sample farmer

Experience in mango production(years)	Respondents(Number)	Respondents (Percent)
Low (<10)	15	14.30
Medium (10-20)	67	63.80
High (>20)	22	21.90

Source:Field survey 2018

4.13 Experience in Agriculture

The observed experience in agriculture of the respondents ranged from 5 to 40 years. On the basis of experience in agriculture, the respondents were classified into five categories as shown in table-4.1.9. Data shown in the table-4.1.9 indicated that most of the respondents around 38.10 % had medium experience (16-25 years) followed by the respondents about 27.60% having low experience (10-15 years). More than one-sixth about 15 % of respondents had high experience (>30 years) and only about 5.70 % of respondents had very low experience (<11 years).

Table-4.1.9: Experience in Agriculture of the sample farmer

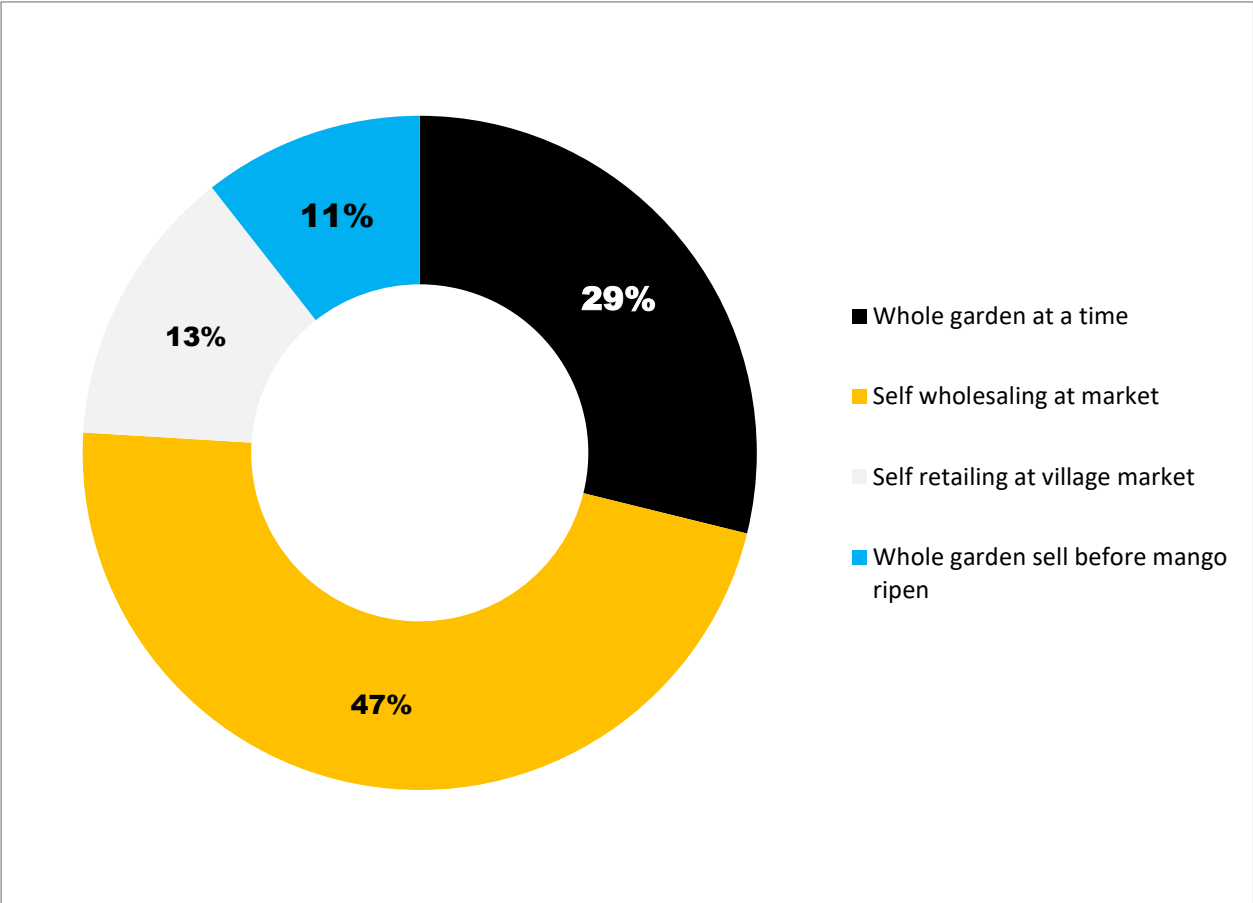
Experience in agriculture(years)	Number Of Respondent	Percentage
Very low (<10)	6	5.70
Low (10-15)	28	27.60
Medium (16-25)	40	38.10
High (26-30)	14	13.40
Very high (>30)	16	15.20
Total	104	100

Source:Field survey 2018

4.14 Selling type of mango

On the basis of type of selling of mango, the respondents were classified into four categories as shown in table. An alarming data were founded here about 11% of all mango cultivators are forced to sell their fruit earlier period or before maturity. the influence and abundance of middlemen

regarding this business were acute. Highest number of farmers about 47% of all cultivators from the selected area sold after harvesting in the wholesale market and only about 29% and 13% producers sold their whole garden at a time and at village retail market respectively.



Source:Field survey 2018

Fig-4.8: Selling type of Mango.

CHAPTER-5

RESULT AND DISCUSSION

5.1 Problems in mango production

On the basis of Problem Confrontation Index (PCI) formula, out of the 16 problems, insects and diseases infestation was identified as the major problem followed by dropping of fruits and flowers. Scarcity of better varieties/ Seedling/ grafts, Climate change and Lack of modern technology were also three major problems faced by mango farmers in case of mango production. The observed problem confrontation index of the problems ranged from 50 to 429. 1st, 2nd, 3rd, 4th and 5th ranked problems with their PCI are shown below.

Table-5.1.1: Ranking of Problems in Mango Production

SL. No.	Problem items	PCI	Rank order
1	Insect and disease infestation	429	1 st
2	Dropping of fruits and flowers	409	2 nd
3	Scarcity of better varieties/ Seedling/ grafts etc	387	3 rd
4	Climate change	276	4 th
5	Lack of modern technology	193	5 th

5.2 Insect and disease infestation status

It was found from the survey that majority of the growers (62.80 %) emphasized on diseases infestation followed by about 37.20% emphasized on Insects infestation.

Table-5.1.2: Distribution of the respondents based on insect and disease infestation status

Infestation	Respondents	
	Number	Percent
Diseases infestation	65	62.80
Insects infestation	39	37.20
Total	Total 104	100

5.3 Dropping of fruits and flowers

The occurrence of dropping of fruits and flowers has been shown in table 23. From the table-5.1.3 it was evident that all (100%) of the respondents said that the dropping of fruits and flowers is a common problem.

Table-5.1.3 Response on dropping fruits and flowers

Occurrence of dropping	Yes	No
Flower	100%	-
Fruit	100%	-

5.4 Correlations between educational level and profession of respondent

From collected data if we analyze the correlation between educational level of respondent and profession of respondent, we found result is significant at 1 percent level of significance and the two variables is correlated. Related data are tabulated on table

Table-5.1.4: Correlations between educational level and profession of respondent.

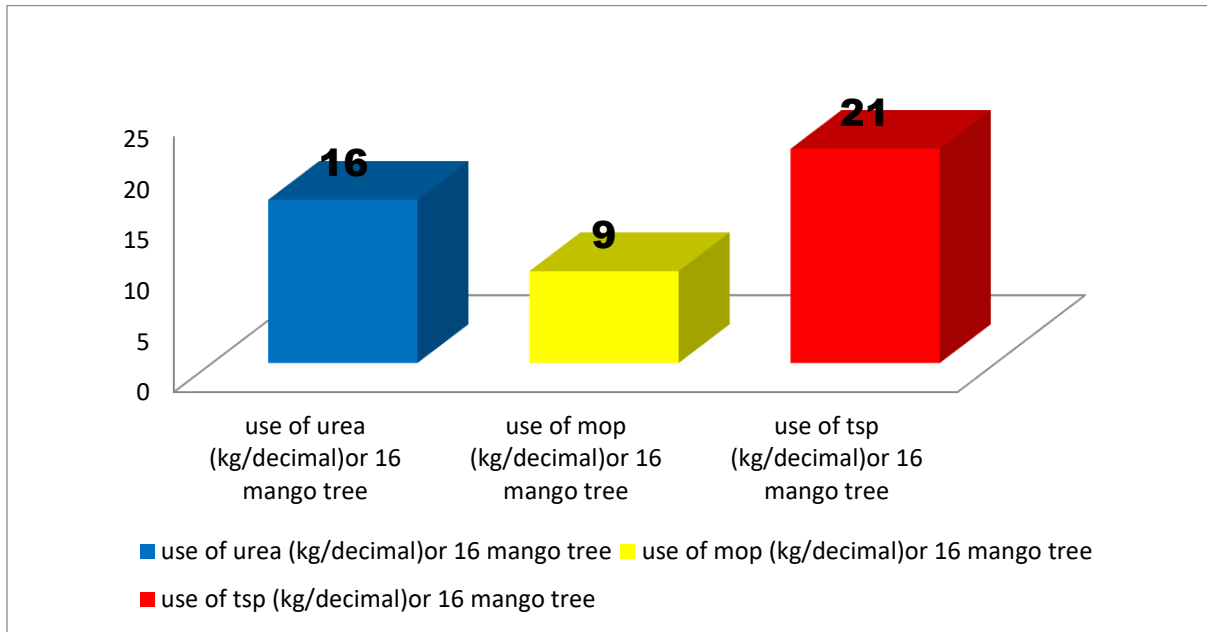
		Educatin Year	Profesion of Respondent
Education Year	Pearson Correlation	1	.623**
	Sig. (2-tailed)		.000
	N	104	104
Profession of Respondent	Pearson Correlation	.623**	1
	Sig. (2-tailed)	.000	
	N	104	104

** . Correlation is significant at the 0.01 level (2-tailed).

Source:Field survey 2018

5.5 Average dose of fertilizer

After establishing a mango garden cultivator should use different types of fertilizer for better fruiting and profit. Respondents used mainly MoP, TSP, and Urea fertilizer. Their fertilizer use ratios were as like Urea: TSP: MoP= 1.5: 2: 1. The highest amount of fertilizer used by mango farmers was TSP and they used 21kg/decimal or 21kg/16 mango trees followed by Urea which was used about 16 kg/decimal or 16kg/16 mango trees. Lowest amount indicated the use of MoP and they used 9kg/decimal or 9kg/16 mango trees.



Source:Field survey 2018

Fig-5.1: Use of fertilizer dose.

5.6 Fertilizer usage

It was observed that all of the respondents about 100% used cow dung and compost to the mango trees while about 95% of used the respondents Urea and TSP individually. MP was used by 94% of the respondents respectively according to the collected data. (Table-5.1.5).

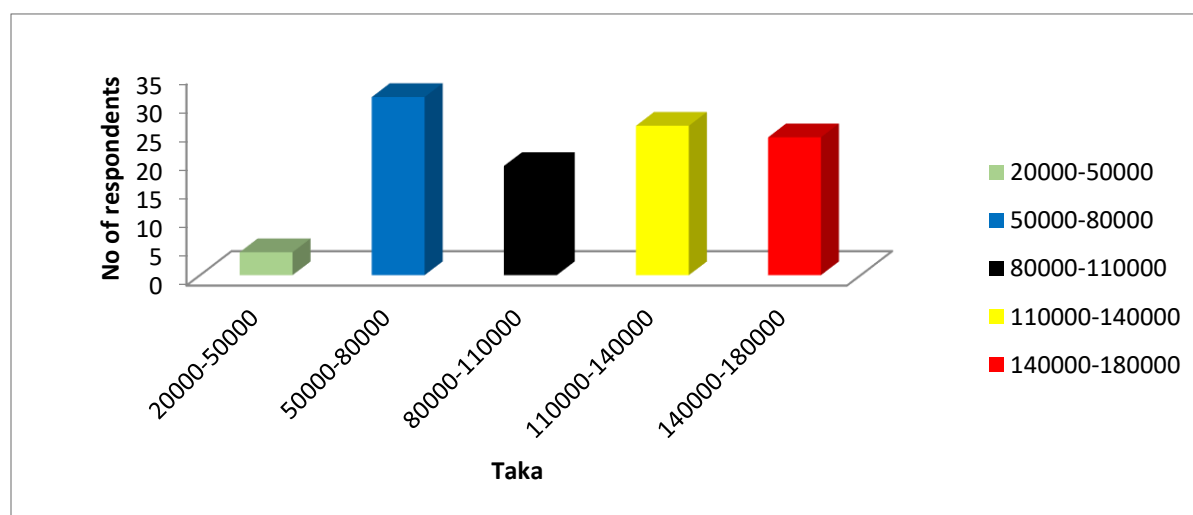
Table-5.1.5: Percentage of fertilizer use

Fertilizer	Number	Percentage
Urea	100	95
TSP	100	95
Compost	104	100
Cow dung	104	100
MP	99	94

Source:Field survey 2018

5.7 Average Cost and Profit

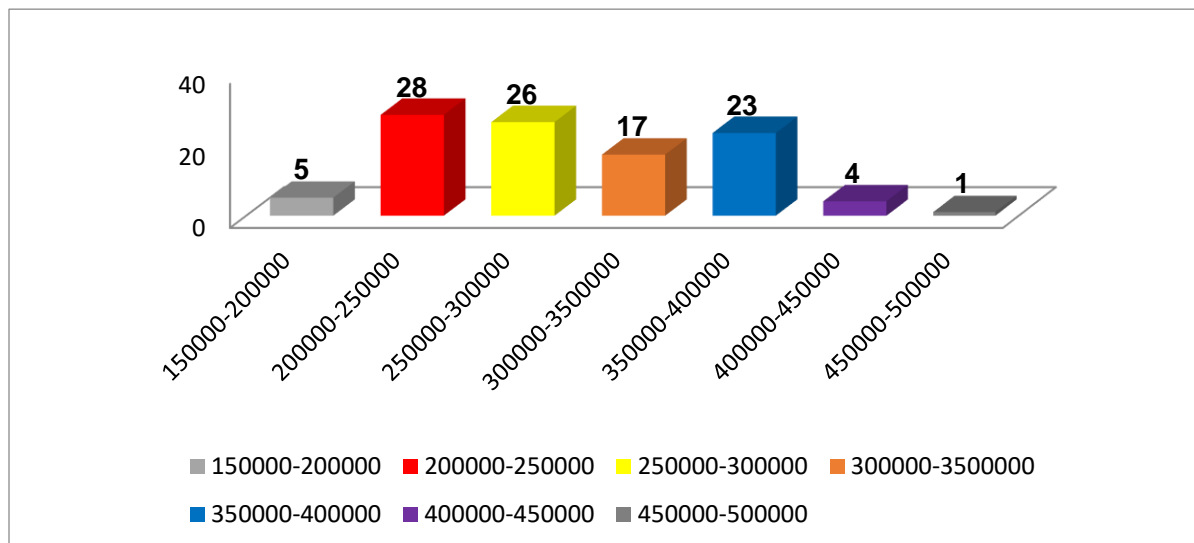
Data represented that every cultivator had to spend 106659 taka for one hectors of land or 120 mango trees. Maximum part of the cost incurred for fertilizer labor cost, pesticides. But it had less impact on profitability of the farm. More than 30 respondents spent tk 50000-80000 followed by 110000-140000 taka was spent by about 30 respondents. Highest cost about tk140000-180000 was spent by 25 respondents. Average cost of mango cultivation is 106659.Average cost shown as bar diagram given below-



Source:Field survey 2018

Fig-5.2: Average cost without considering land rent.

On the other hand average profit was 299010 taka but it varies from 299010 to 300000 taka on the basis of respondents from 120 mango trees or from one hector. Only 1 respondent earned profit of 450000-500000 Tk. and maximum number of respondents earned a profit of 200000-250000 tk followed by 250000-300000tk by 26 respondents from 120 mango trees or from one hector. Average profit earned by respondents shown as bar diagram given below



Source:Field survey 2018

Fig-5.3: Average profit without considering land rent.

5.8 Profit comparison between mango and onion cultivation

As farmers in the study areas were much interested in mango cultivation, it was common perception that it was highly profitable crop. Although profitability of mango cultivation was measured in this study, farmers' perception about comparative profitability was also revealed. Farmers also cultivated onion in their land. They felt better by cultivating onion in their land as they thought it kept their land good. Though cultivation of mango provided them more profit they didn't accept it easily. Causes were many like they didn't want to change their lands sizes and shapes. It also needed money costing for preparing land for cultivating Mango. As Mango provided them more profit even more than cultivation of Guava farmer changed their mind and also changed their Land shapes. A lot of fixed cost incurred at the beginning of the project. Average profit from mango cultivation was higher than Average profit from onion cultivation which amounted Tk. 299010 per hectare and 260412 per hectare respectively. As a result farmer thought twice about their decision. The result were shown on a table below-

Table-5.1.6: Average profit from mango and onion cultivation.

Particulars	Taka/Hector
Average profit from mango cultivation	299010
Average profit from onion cultivation	260412

Source:Field survey 2018

5.9 Intercropping with mango

Most farmers (87%) in the study areas practiced intercropping with mango (Table 7). Only about 13% farmers was not interested in intercropping with mango.

Table-5.1.7: Intercropping with mango of the sample farmers

Items	Percentage of respondents
Intercropping with mango	87
Not intercropping	13
Total	100

Source:Field survey 2018

It was found that a large number of crops were grown as intercrops in the mango field. Among the intercrops, majority of the farmers (22%) preferred intercropping with sweet gourd followed by Turmeric (20%) and Black gram (20%) respectively in the selected areas. Farmers were not used to cultivate Papaya in that area. Only about 12% farmers preferred Brinjal and Bitter gourd respectively in intercropping with mango. Minority of the farmers (6%) preferred intercropping with Guava followed by Lentil (20%).

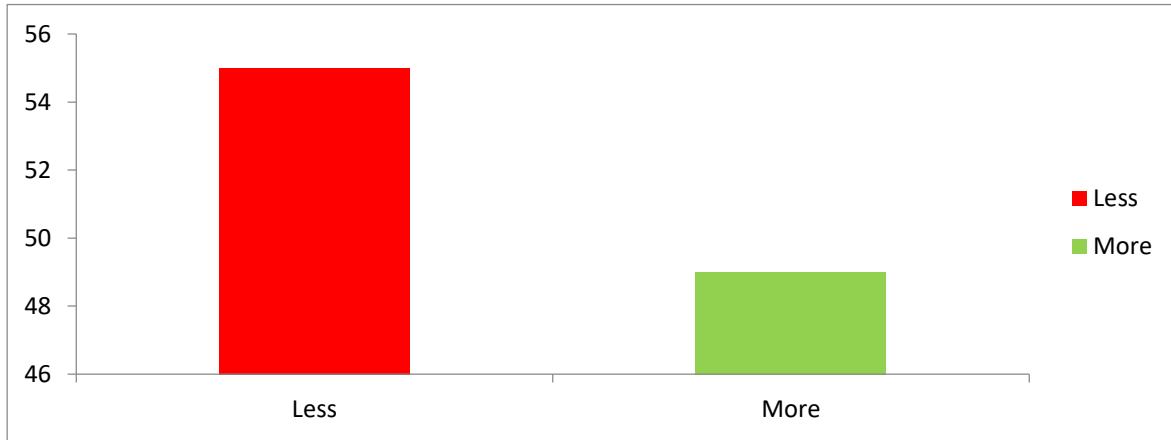
Table 5.1.8: Types of crop cultivated as intercrop of the sample farmers

Types of crop	Percentage of respondents
Sweet gourd	22
Lentil	8
Turmeric	20
Black gram	20
Brinjal	12
Bitter gourd	12
Guava	6
Papaya	-
Total	100

Source:Field survey 2018

5.10 Comparison of cost of plant materials of mango and other crops when planting

The study found out farmers perception about cost of mango plant materials compared to other crops cultivation. The highest percentage of farmers more than (53%) mentioned that cost of mango plant materials was lower than other crops. On the other hand, about 47% farmers responded negatively and said that cost of mango plant materials was higher than other crops.



Source:Field survey 2018

Fig-5.4: Comparison of cost of plant materials.

5.11 Comparison of cost of planting of mango with other crops

The study found out farmers perception about cost of mango cultivation compared to other crops cultivation. The highest percentage of farmers more than (62%) mentioned that cost of mango cultivation was lower than other crops. On the other hand, about 38% farmers responded negatively and said that planting cost of mango was higher than other crops.

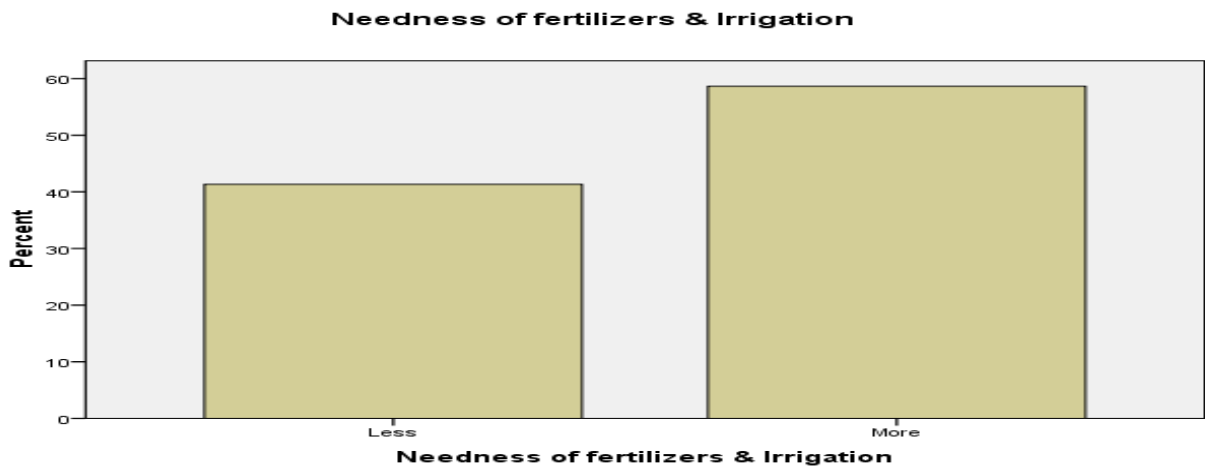


Source:Field survey 2018

Fig-5.5: Comparison of cost of planting of mango with other crops.

5.12 Comparison of necessities of fertilization and Irrigation

In case of analysis of the necessities of fertilizer and Irrigation about 89% of the respondents agree that Mango cultivation required less fertilization and irrigation than any other crops. On the other hand only about 11% told that cultivation of Mango required more fertilization and irrigation than other crops.

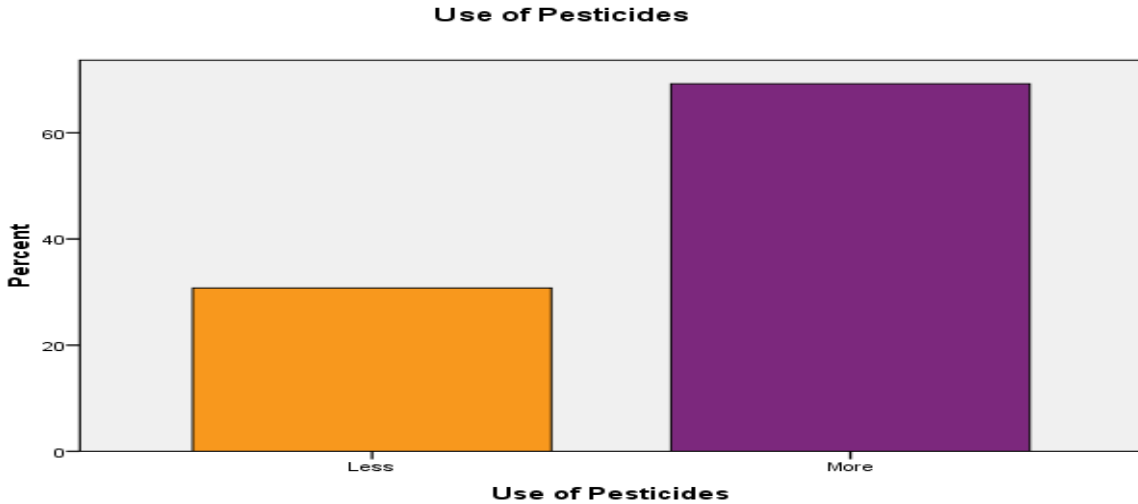


Source:Field survey 2018

Fig-5.6: Comparison of necessities of fertilization and Irrigation.

5.13 Comparison of necessities of Pesticide use

The study found out farmers perception about the necessities of use of pesticides. The highest percentage of farmers that was about (69%) respondents was agree that mango cultivation required more use of pesticides than other crops. On the other hand only about 31% farmers response negatively and said that cultivation of mango required less pesticides than other crops.

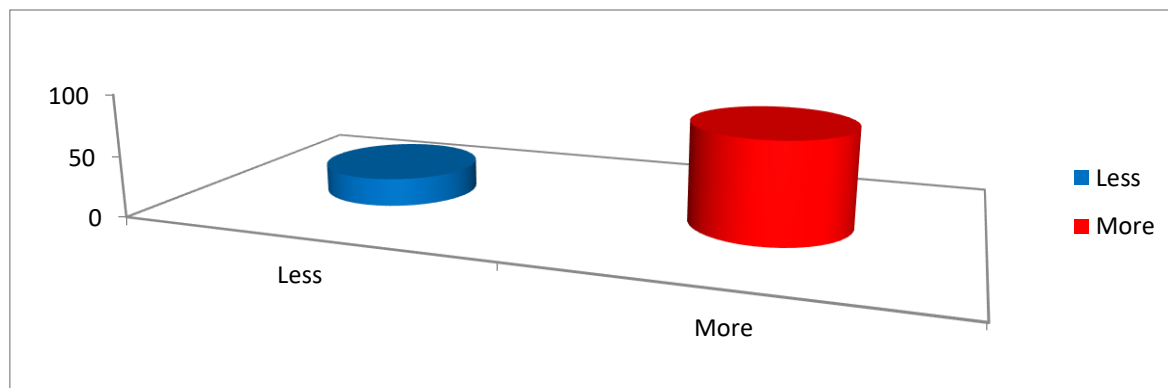


Source:Field survey 2018

Fig-5.7: Use of pesticides.

5.14 Comparison of Harvesting, Sorting and Grading cost of mango and other crops

The study found out farmers perception about the necessities of Harvesting, Sorting and Grading of mango. The highest percentage of farmers that was about (79%) respondents was agree that the cost incurred by Harvesting, Sorting and Grading of mango cultivation was more than other crops. On the other hand only about 21% farmers response negatively and said that cultivation of mango required less cost of Harvesting, Sorting and Grading than other crops.



Source:Field survey 2018

Fig-5.8: Harvesting, Sorting, Grading cost of mango.

5.15 Comparison of labor cost in Mango cultivation and other crop cultivation

On the basis of Comparison of labor cost in Mango cultivation and other crop cultivation, the answers of the respondents were classified into three categories as shown in table. An alarming data were founded here about 98% of the respondents agreed that the labor cost incurred by mango cultivation was higher than any other crops. About 4% of them answered negatively and told that cultivation of mango required less labor cost than other crops and only about 1% of them told that it required same labor cost as other crops. The data are tabulated bellow-

Table-5.1.9: Comparison of labor cost in mango cultivation and other crop cultivation

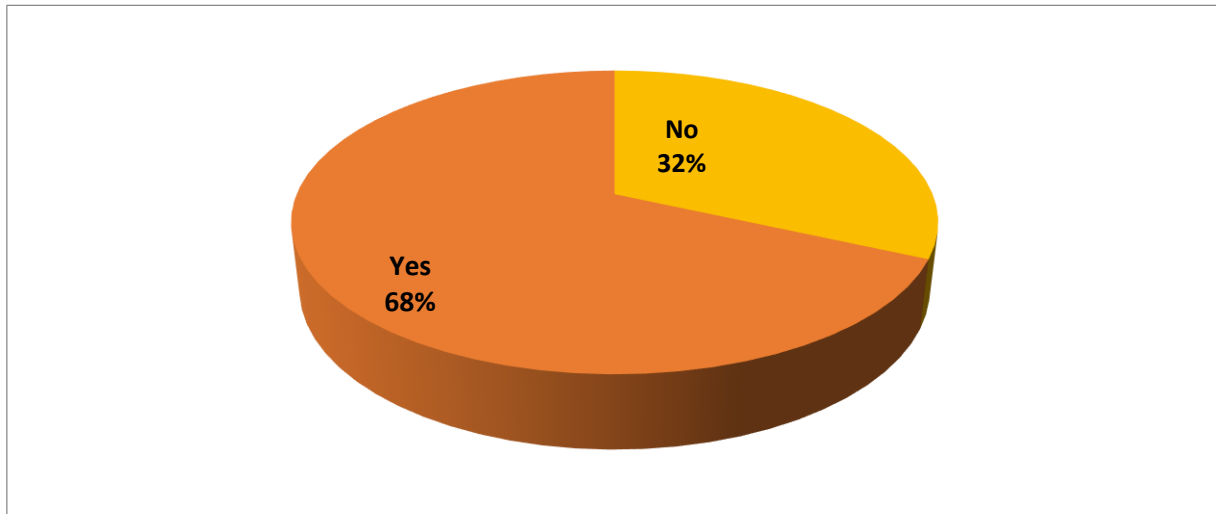
Respondent Answers	Respondent	Percent
Less	5	4.81
More	98	94.23
Same as other crops	1	0.96
Total	104	100

Source:Field survey 2018

5.16 Comparison of weather condition for Mango cultivation

The study found out farmers perception about weather condition for mango cultivation compared to other crops cultivation. The highest percentage of farmers more than (68%) mentioned that weather is favorable factor for cultivation of Mango than other crops. On the

other hand, about 32% farmers responded negatively and said that weather is not favorable factor for mango cultivation.

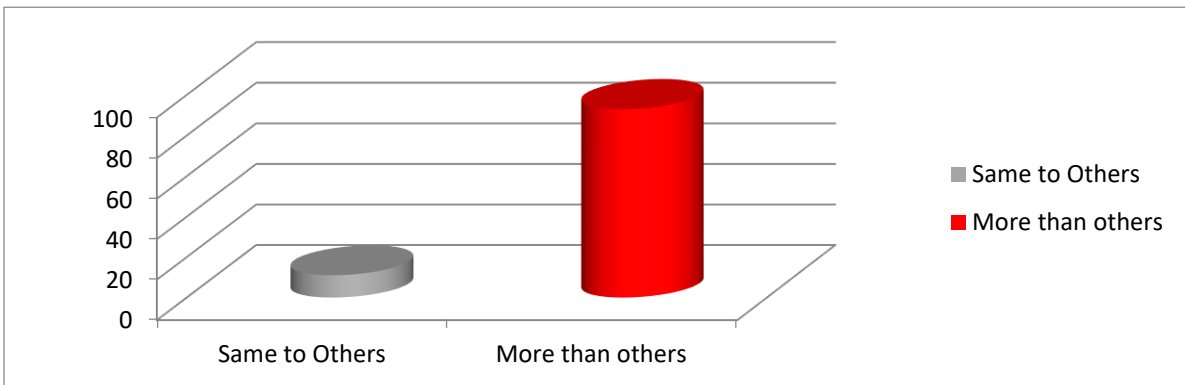


Source:Field survey 2018

Fig-5.9: Analysis of weather condition for cultivation of Mango.

5.17 Comparison of yield of mango and other crops

On the basis of Comparison of yield of mango and other crops, the answers of the respondents were classified into two categories e.g. same to other crops and more than other crops as shown in table In case of analyze the yield comparison of mango and other crops the highest percentage of farmers about 89% responded that yield of Mango was far greater than the yield of other crops. On the other hand only about 11% of them told that the yield was same to the yield of other crops. The data figured-5.10 as bellows one-



Source: Field survey 2018

Fig-5.10: Yield comparison of Mango cultivation and other crops

5.18 Reasons for shifting land to mango cultivation

Farmers in the study areas were asked to mention the reasons behind mango cultivation in the crops land. Respondent farmers mentioned that higher profit compared to other crops (71%) was the main reason for cultivating mango (Table-5.1.10). About 57% farmers mentioned the lower price of other crops as an important factor of shifting. Easy cultivation process (49%) was opined to be the third reasons. As Rajshahi was in Barind region, farmers of this district reported that lack of irrigation facility for rice was the main reason to about 58% respondents. Some farmers (37%) preferred mango because they could cultivate more than one crop in mango field (intercropping) which also influenced them to cultivate mango. Suitability of land for mango rather than other crops (43%), not requiring extra care (31%), and the lower yield of other crops (26%) were mentioned as the reasons for cultivating mango.

Table-5.1.10: Reasons for shifting to mango cultivation

Reasons	Percentage of respondents
Higher profit	71
Lower price of other crops	57
Easy cultivation process	49
Lack of irrigation facility for rice	58
Non-suitable land for other crops	43
Lower yield of other crops	26
Not required extra care	31
Can cultivate two crops at a time(Intercropping)	37

Source:Field survey 2018

5.19 Fellow land used for mango cultivation

The study found out farmers perception about Fellow land used for mango cultivation. The highest percentage of farmers more than (60%) mentioned that they can use fellow land for Mango cultivation but on the other hand about 39% of them told fellow land could not be used for commercial mango cultivation. The data tabulated as bellows one-

Table-5.1.11: Use of fellow land for Mango cultivation.

Fellow land can be used for Mango production		
Respondent Answers	Respondents	Percent
No	41	39.42
Yes	63	60.57
Total	104	100

Source:Field survey 2018

5.20 Share cropping with Mango and other crop cultivation

The study found out farmers perception about the cropping pattern of Mango and other crop cultivated in this region. The highest percentage of farmers more than (56%) told that they would like to practice share cropping with Mango cultivation even its possible in case of commercial cultivation. Share cropping practice is an important alternative source of earnings for Mango cultivator in the earlier period as they don't get any benefit even for the first 3-4 years. They earn money that time from other shared crop. On the other hand about 43% respondent answered in negative and said that they could not use share cropping with mango. The data were tabulated as bellows.

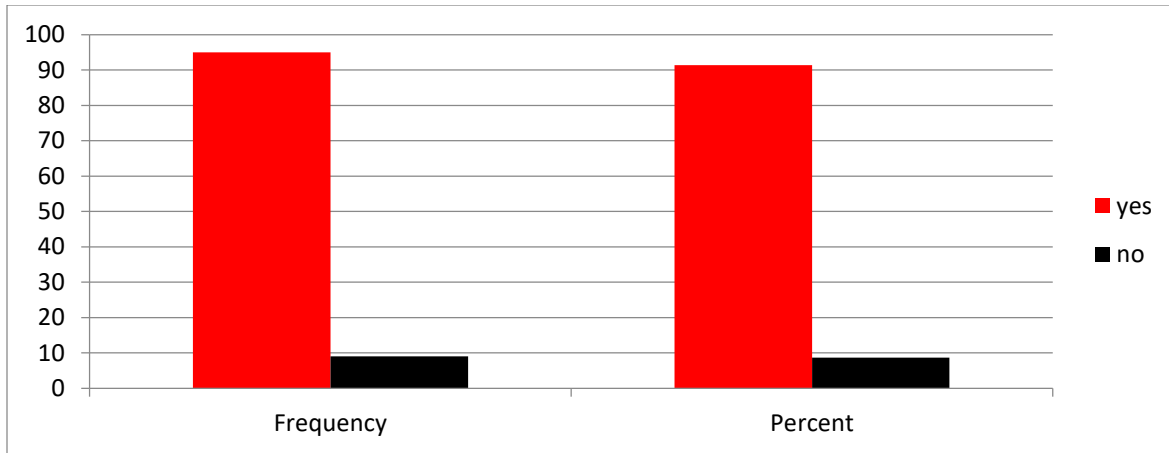
Table-5.1.12: Share cropping with Mango cultivation.

Share of intercropping used for Mango production		
Respondent Answers	No. of Respondents	Percent
No	45	43.27
Yes	59	56.73
Total	104	100

Source:Field survey 2018

5.21 Disease infection as a constraint for Mango cultivation

In case of analysis of the disease infection as a constraint for mango cultivation the study found out farmers perception related to Mango and other crop cultivated in this region and the highest percentage of farmers about 91% responded that it was a major constraint for mango cultivation on the other hand only about 9% of them told it was not a major problem faced by them in case of mango cultivation. The data shown as bar-diagram below

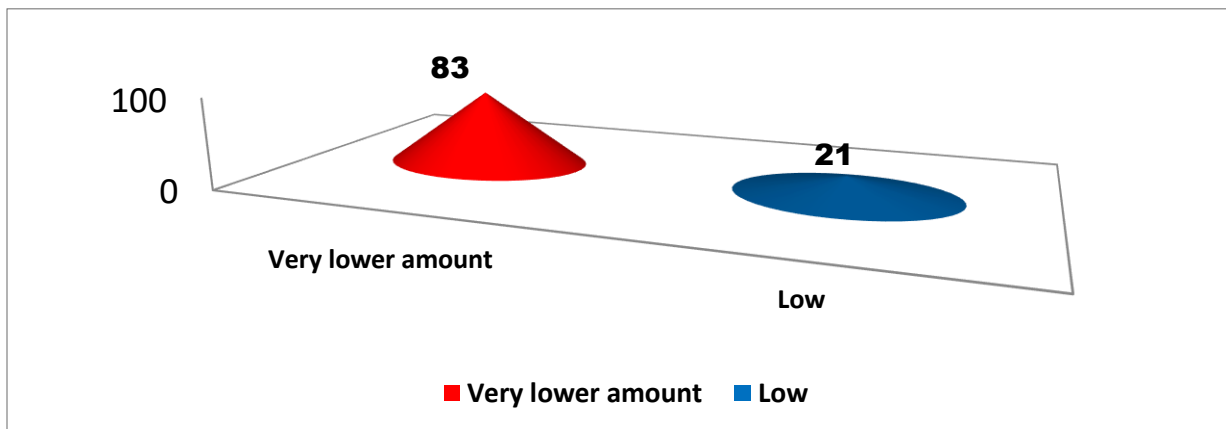


Source:Field survey 2018

Fig-5.11: Disease infection for Mango cultivation.

5.22 Return at the earlier period of Mango cultivation

The study found out farmers perception about the return at the earlier period of cultivation. Result found that the highest percentage of farmers about 83% of the respondents argued that in case of mango cultivation return at the earlier period in first 3-4 years after mango cultivation was very lower amount than other crops. On the other hand, only about 21% of the respondents told that cultivation of Mango can produce low amount of return at the earlier period.

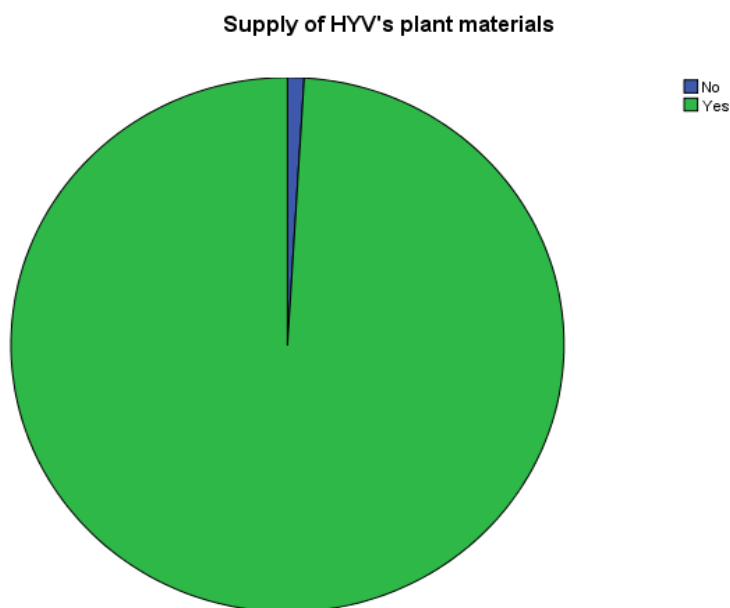


Source:Field survey 2018

Fig-5.12: Yield in first 3-4 years after mango cultivation.

5.23 Supply of HYV's plant materials as a Solution for better yielding and better profitability

The study found out farmers perception about Supply of HYV's plant materials as a Solution for better yielding and better profitability. Result found that almost all of the respondents about 99% of farmers thought that supply of HYV's planting materials could provide them better yield and profit. On the other hand a negligible percentage of the respondents only about 1% of them told existing plant materials are enough for that and steps should be taken for other sides to correct other faults. The data can be figured as pie chart bellows one-



Source:Field survey 2018

Fig-5.13: Supply of HYV's plant materials for better profit and yield.

5.24 Providing training to the people as a Solution for better yielding and better profitability

In case of analysis about providing training to the people as a solution for better yielding and better profitability. The result showed that almost all of the respondents about 99% respondents responded positively that it might be a solution for mango cultivation for better yielding and better profitability. On the other hand a negligible percentage of the respondents only about 1%

of them replied negatively and told that it was not a Solution for better yielding and better profitability. The data can be tabulated as bellows one-

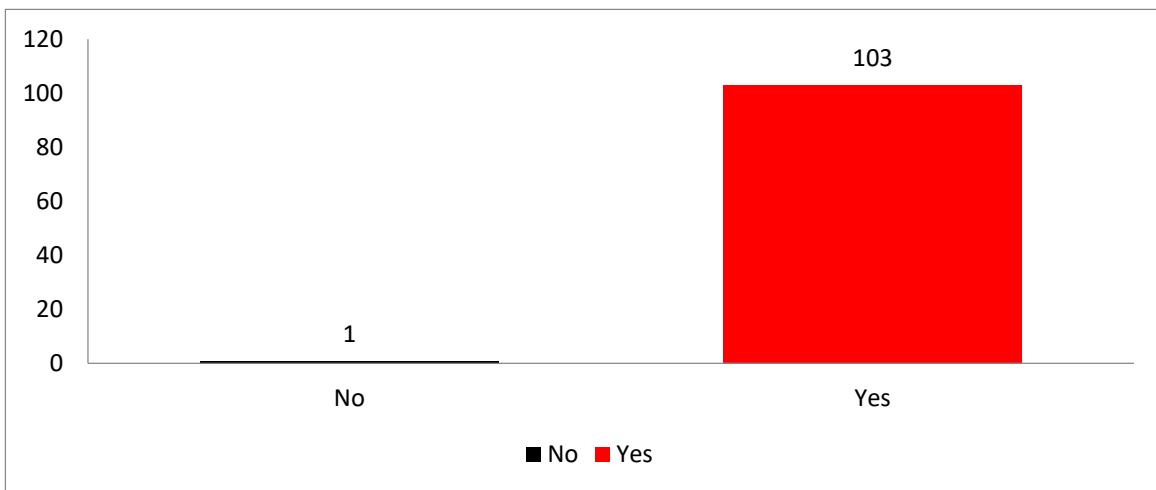
Table-5.1.13: Providing training facility requires for respondent.

Providing training for controlling rapid spreading of infection/use of fertilizer & pesticides		
Respondent	Frequency	Percent
No	1	0.961538
Yes	103	99.03846
Total	104	100

Source:Field survey 2018

5.25 Exporting as a step for flourishing of this industry

The study found out farmers perception about Exporting as a step for flourishing of this industry. The result showed that almost all of the respondents about 99% respondents responded positively and thought that exporting could play a pivotal role for flourishing this minor fruit cultivation practice. On the other hand a negligible percentage of the respondents only about 1% of them replied negatively and told that if they could explain the nutrient content of this fruit to their country people and encourage them to eat that would be better than exporting. At the same time that would make up their country people’s health better than present condition. The data were figured as bellow one-

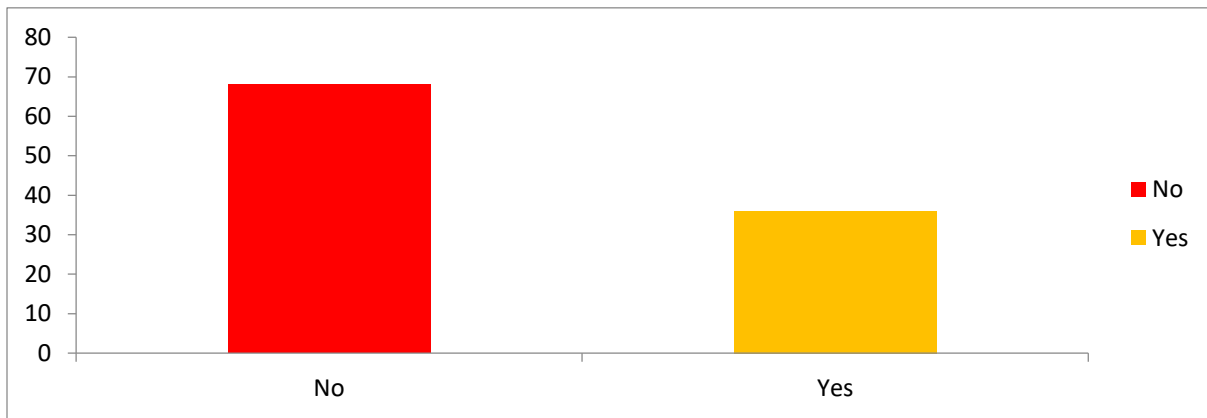


Source:Field survey 2018

Fig-5.14: Exporting facility needed for Mango cultivation.

5.26 Step taken by government & Department of Agriculture Extension

The study found out farmers perception about Step taken by government & Department of Agriculture Extension. Result found that the highest percentage of farmers about 65% of the respondents replied negatively and argued that steps taken by government & Department of Agriculture Extension were not enough for this sectors. On the other hand about 35% respondents was found who responded positively and were satisfied with the Step taken by government & Department of Agriculture Extension. The data can be as bar diagram bellows one-

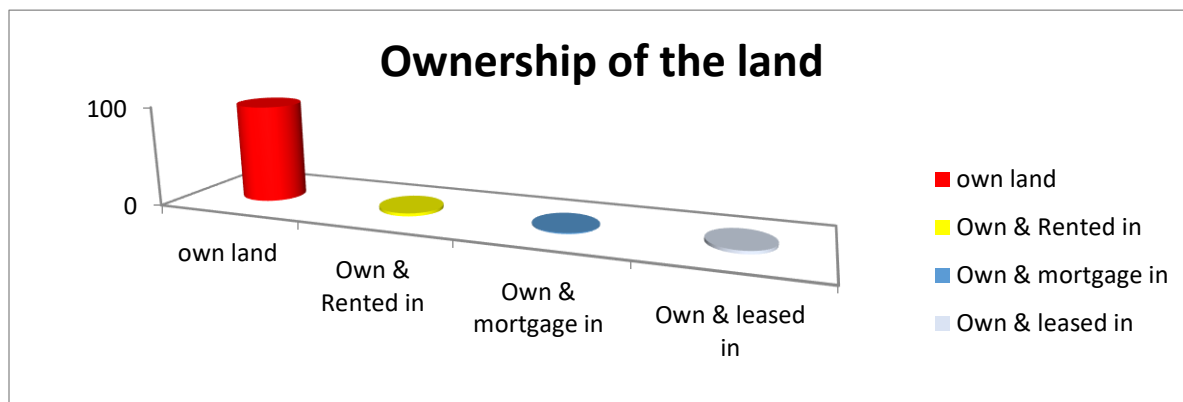


Source:Field survey 2018

Fig-5.15: Government intervention should take.

5.27 Ownership of the land of mango cultivation

The following figure (Figure-5.16) showed land ownership pattern of mango farmers under mango cultivation. From the following figure it could be explained that most of the farmers had their own land for Mango production e.g. about 96% of them cultivated mango in their own land. Very few of the farmers which was negligible to count had to depend on rented, mortgaged, leased land besides their own land. This percentage didn't exceed 4%.

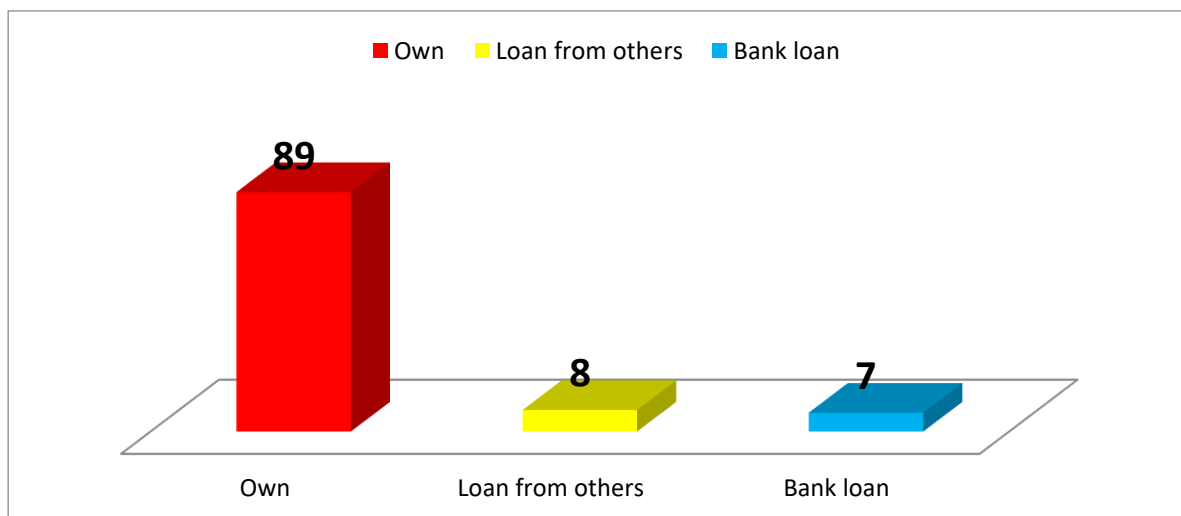


Source:Field survey 2018

Fig- 5.16: Ownership of the land.

5.28 Sources of capital

From this survey data, most of the mango producers used their own land as a source of capital for mango cultivation e.g. about 89% mango cultivators used only their own money or land as source of capital, about 8% mango producers collected money from relatives or peers as sources of capital and lowest number of farmers only about 7% of the cultivators collected loan from bank as their source of capital for mango cultivation.

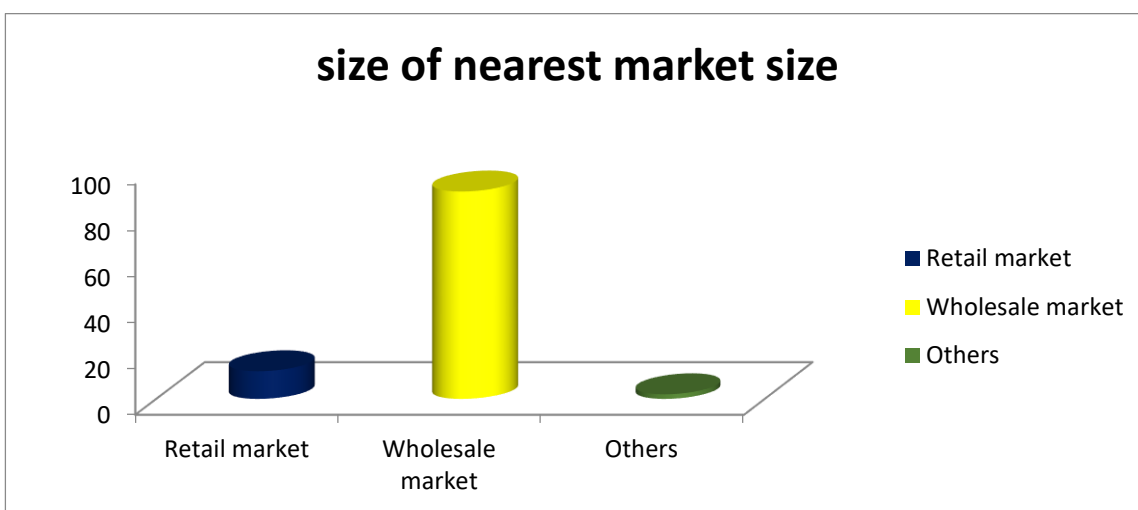


Source:Field survey 2018

Fig-5.17: Source of capital.

5.29 Size of nearest market

On the basis of Size of nearest market for mango, the answers provided by the respondents were classified into three different categories like retail market, wholesale market and others as shown in Fig-5.18. Highest percentage of markets was wholesale market and the percentage was about 80% e.g. of the mango producers sold their most of the production in nearest wholesale market. Second largest market was retail market and about 18% e.g. of the producers used to sale in nearest retail market and a negligible amount comprised several others.



Source:Field survey 2018

Fig-5.18: Size of nearest market.

5.30 Distance from mango garden to market

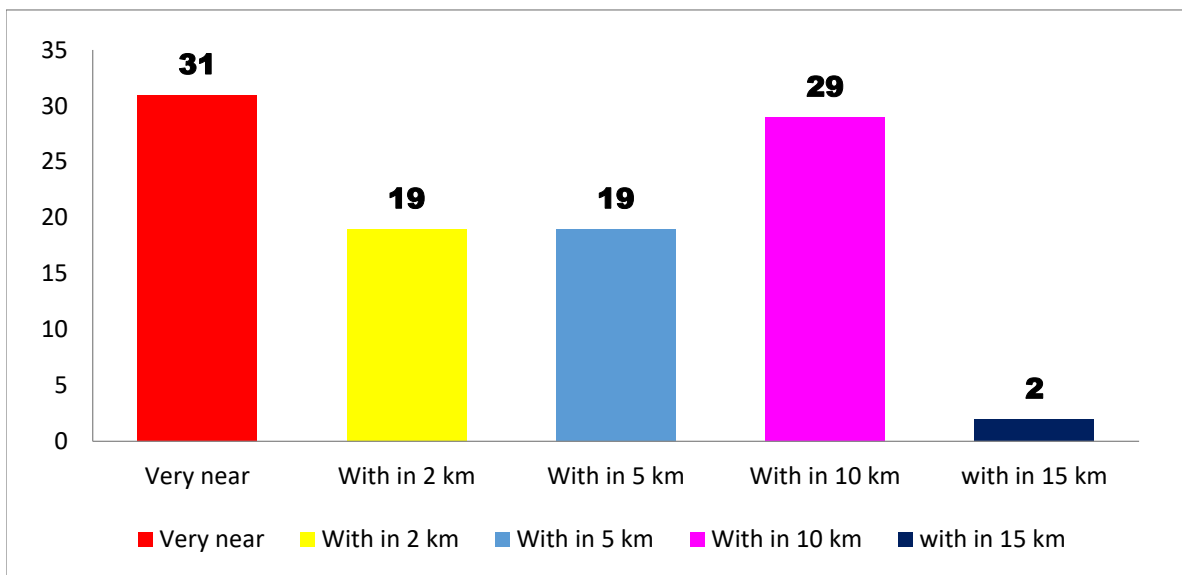
On the basis of Distance from mango garden to market ,the answers provided by the respondents were classified into six different categories like very near , within 2 km, within 5 km, within 10 km, within 15 km and within 20 km respectively. From the calculation about 30% of cultivators had market facility at near at hand and this was the highest percentage followed by within 10 km that is about 28% cultivator had marketing facility within ten kilometers, 18% had that facility within two kilometers and five kilometers respectively and 3% have within 20 km. Very negligible amount had market facility within 15 km e.g. around 2% of the respondents.

Table-5.1.14: Distance from mango garden to market.

Category	Frequency	Percent
Very near	31	29.81
Within 2 Km	19	18.27
Within 5 Km	19	18.27
Within 10 Km	29	27.88
Within 15 Km	2	1.92
Within 20 Km	4	3.84
Total	104	100

Source:Field survey 2018

The tabulated data were shown through bar diagram for better understanding and easy interpretation.

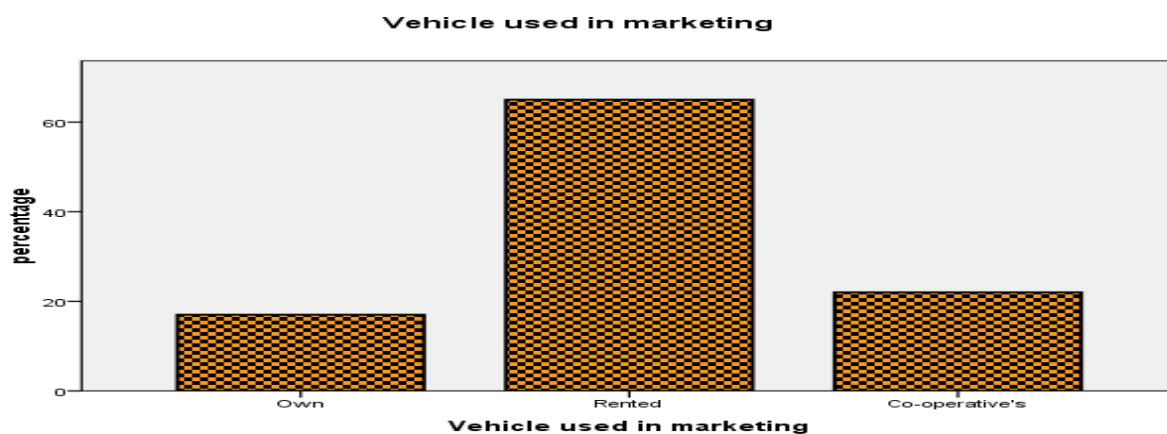


Source:Field survey 2018

Fig-5.19: Distance from mango garden to market.

5.31 Pattern of vehicle used in marketing

On the basis of Size of nearest market for mango, the answers provided by the respondents were classified into three different categories like own, rented and vehicles provided by co-operatives. In analysis of vehicle use pattern the highest percentage of the mango framers that is about 68% used rented vehicles in marketing of mangoes followed by vehicles provided by co-operatives which was about 22%. Lowest percentage of the farmers that is around 16% of cultivators used Their own vehicles for the same purpose.



Source:Field survey 2018

Fig-5.20: Vehicle used in marketing.

5.32 Existences of co-operatives in the market

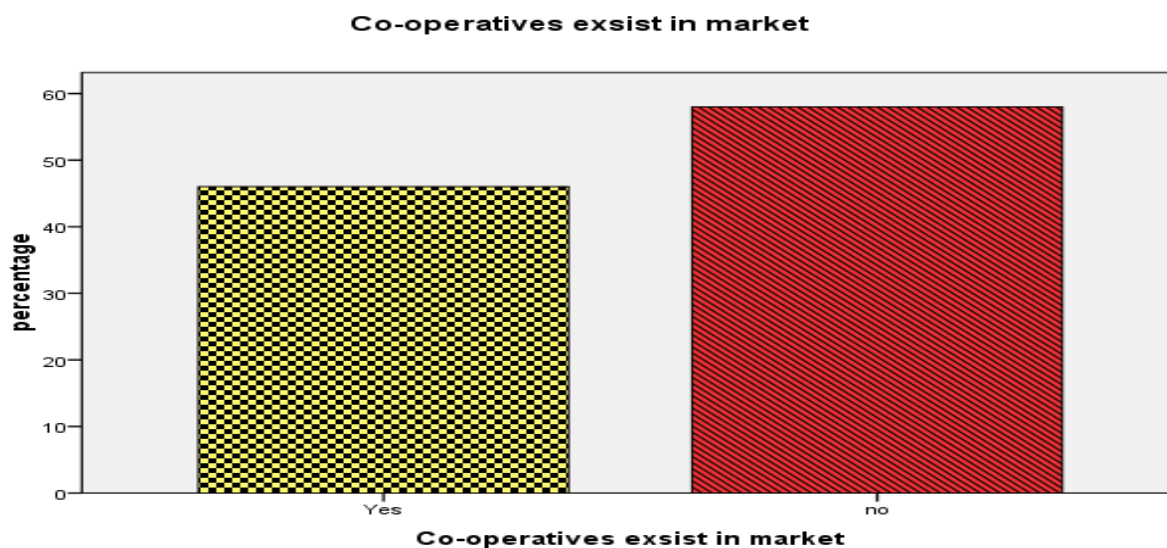
The study found out farmers perception about Existences of co-operatives in the mango market. Result found that the highest percentage of farmers about 55% of the respondents replied negatively and argued that they Existences of co-operatives in the mango market were not enough for this sectors. On the other hand about 44% respondents was found who responded positively and were satisfied with the Existences of co-operatives in the mango market. Only about 12% of the mango cultivators was member of that co-operative society existed in the mango market. The data were presented as Table-5.1.15 bellow-

Table-5.1.15: Existences of co-operatives in the market

Response	Respondent	Percentage
Yes	46	44.23
no	58	55.77
Total	104	100

Source:Field survey 2018

The tabulated data was presented through bar diagram Fig-5.21 below for easy understanding



Source:Field survey 2018

Fig-5.21: cooperative exists in market.

5.33 Marketing channel analysis

Different types of marketing channels were identified during the primary survey. However, the major marketing channels from Rajshahi to Dhaka city/ Khulna/Norshingdi/ Narayangonj/ Sylhet/ chittaganj etc are shown in Fig-5.22 Some green mangoes were also purchased by pran mango group to produce pulp for juice and pickles. There were owner of mango orchards and also Boiral who take land or plant lease and performed the day to day orchard management activities and sold mango to Faria or Bepari as those of the actual owners of the orchards. Along the mango marketing channel the highest share of net margins was received by retailers followed by Bepari. By contrast, Aratdar received the lowest share (Fig-5.22)

5.33.1 Marketing channels

Marketing channels are the alternative routes of products flow from producers to consumers (Kohls and Uhl, 1980). In the study areas, the mango moved from the producer seller to the consumers through some market intermediaries, such as Bairals, Beparis, Aratdars (both local and urban) and retailers (both local and urban). According to the volume of mango handled and participation of the intermediaries in the channel, six channels were identified as dominant in the study areas as shown in Table-5.1.15

Table-5.1.16: Mango run through the major channels in selected areas.

Marketing Channels	Percent of product run	Rank
Owner/ Producer - Bepari- Aratdar- Wholesaler- Retailer- Consumers	25	1 st
Owner/ Producer - Bepari- Aratdar- Wholesaler- Consumers	15	2 nd
Owner/ Producer - Faria- Bepari- Aratdar- Wholesaler- Consumers	14	3 rd
Owner/ Producer - Faria- Bepari- Aratdar- Wholesaler- Retailer - Consumers	10	5 th
Owner/ Producer - Processing unit-Consumers	12	4 th
Owner/ Producer - Retailer -Consumers	8	6 th

Source:Field survey 2018

5.33.2 Intermediaries involved in mango marketing channel

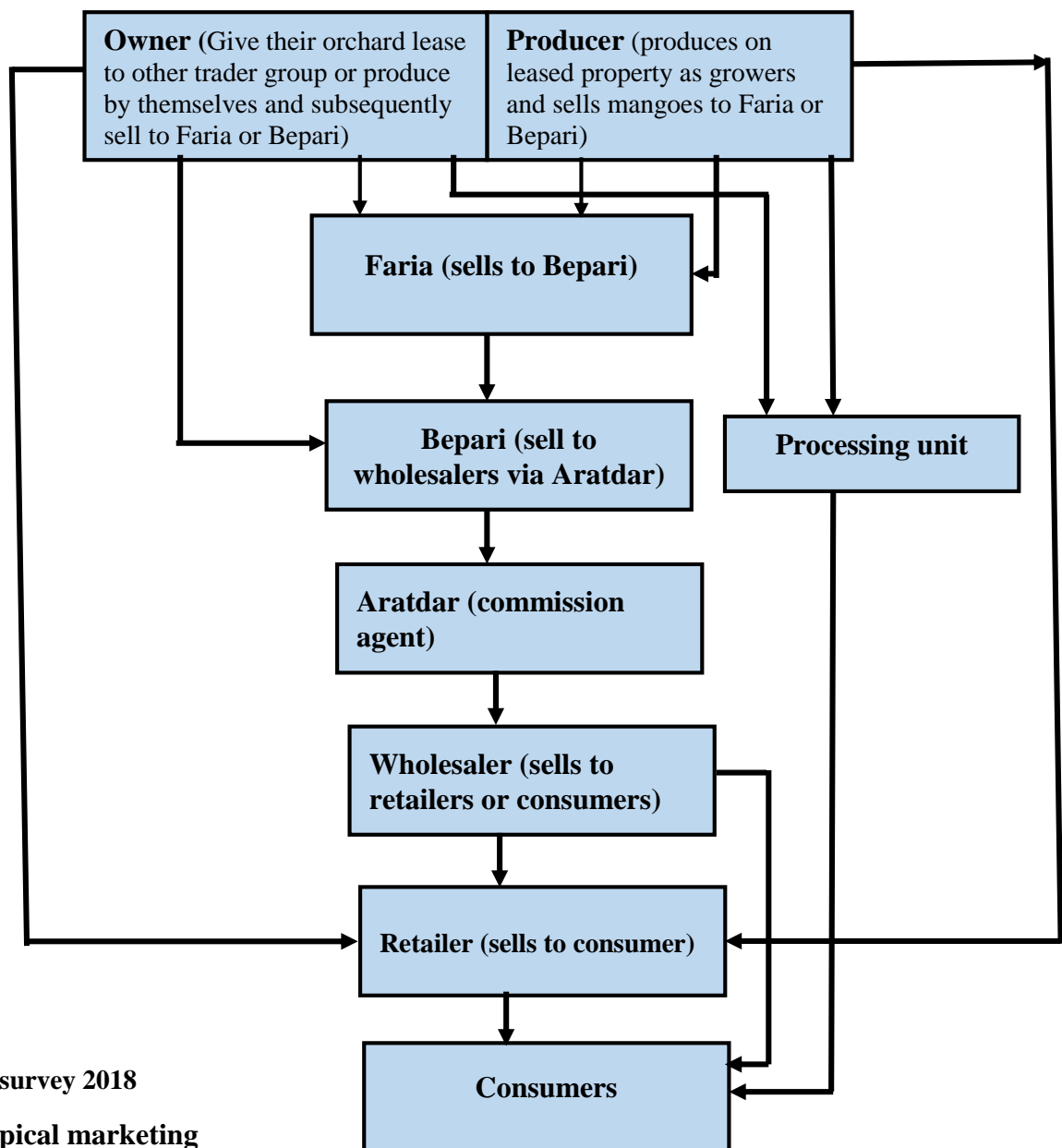
Bairal

The people who have no own orchard land but involved in mango business are Bairal. They are the advance buyers of mangos. They are doing their business allover mango growing centers and making the business competitive. Frequent hazardous weather and attack by mango hoppers during the flowering and fruit setting stage make the crop very uncertain. Therefore, in order to avoid the risk and uncertainty of the crop, most of the farmers in the selected districts sell their expected crop at the time of fruit setting on even before on the basis of estimation formed from the amount of bloom to the

classified advance buyers locally known as Bairal. Bairal are doing business with little capital of their own and sometimes borrowing the capital from Aratdars.

Beparis

Beparis are of two kinds. They are either local or coming from other districts Like Dhaka, Chittagong, and Khulna, etc. They buy harvested mango from farmers and Bairals in the local markets through the local Aratdar. The Beparis usually sell mango to the retailers in the local market or dispatch it to Aratdar of other big markets. They are doing their business in-group. In some cases, they borrow money from the dealing Aratdar.



Source:Field survey 2018

Fig-5.22: Typical marketing channel of mango

Aratdar

Aratdar are big traders. They are commission agent and have fixed establishment in the market and operated between Bairals, Beparies, and Retailers. They charged fixed fees and commission from the Beparies and Retailers.

Retailer

Retailer was last link in the mango marketing. There are two types of retailer's rural retailer's and urban retailer's. Rural retailers sell their mango in different local markets and urban Retailers sell at with permanent shops in the urban areas. They bought mango from the Beparies through Aratdar and sell it to the urban residents, the ultimate consumers.

CHAPTER-6

CONSTRAINTS AND PROBLEM RELATED TO MANGO PRODUCTION

6.1 Introduction

Mango is a year seasonal crop. During the period, the mango growers faced several problems. The most burning problems of growing mango that the farmers have usually been facing are summarized and briefly discussed in this chapter. The problem reported in this chapter is based on the opinions of the respondents. The most common and serious problems are summarized and presented below:

6.2 Problems faced by the farmers

Farmers were asked whether they faced any acute problem in producing mango. Most of the farmers faced the same kind of problems during mango production. It may be noted that problems confronted by the individual farmers were not identical for the enterprise. Some problems were in fact more severe than others. However, in this chapter an attempt has been made to identify some major problems of mango production as reported by the farmers growing mango in the study villages.

6.2.1 Lack of knowledge

Lack of knowledge of mango cultivation is major problem for now a days. Most of farmers were not well trained. They had to depend on their indigenous farming experience. But the scenario has changed too. Lack of knowledge and training about updated technology is a problem for mango cultivation today. Almost all of the respondents that is about 90% of the farmers were not trained farmer and they faced acute problem of lack of knowledge and training. Only about 10% of farmers faced tolerable problem of lack of training. This result shown in tabular form below Table-6.1.1.

Table-6.1.1: Lack of knowledge of the sample farmers

Problem level	Farmers	Percent
Acute	92	90.0
Tolerable	12	10.0
Total	104	100.0

Source:Field survey 2018

6.2.2 Capital problem

The farmers of Bangladesh are not well organized. They usually do not have enough money to invest in their farming business for mango cultivation. About 69 % of mango growers suffered from lack of capital problem as an acute problem. According to the answer they provided about 28% of the respondents faced it as a tolerable problem and only about 3% respondents felt this problem as general.

Table-6.1.2: Capital problem of the sample farmers

Problem level	Farmers	Percent
Acute	70	69.0
Tolerable	30	28.0
General	4	3.0
Total	104	100.0

Source:Field survey 2018

6.2.3 Non-availability of credit

Non-availability of credit is always a limiting factor to mango growers. About 74 % of the mango growers in the study area reported that they had general problems in obtaining bank loans. Some of them expressed their failure to have loan even applied for the same to the bank during the study year. About 5% of the respondents or farmers answered it as tolerable problem and about 24% respondents felt this problem as acute.

Table-6.1.3: problem of Non-availability of credit of the sample farmers

Problem level	Farmers	Percent
Acute	24	22.0
Tolerable	5	4.0
General	75	74.0
Total	104	100.0

Source:Field survey 2018

6.2.4 Insufficiency of credit

Some of the growers complained that amount of bank loan received was not sufficient to cover the production expenses. About 68 % of the respondents reported inadequacy of mango loan has been the general problem for timely completion of production practices to obtain better yield and thereby

higher income. About 4% of the respondents or farmers answered it as tolerable problem and about 28% respondents felt this problem as acute.

Table-6.1.4: Insufficiency problem of credit of the sample farmers

Problem level	Farmers	Percent
Acute	28	26.0
Tolerable	7	6.0
General	69	68.0
Total	104	100.0

Source:Field survey 2018

6.2.5 Low prices of output

The farmers of Bangladesh are not well organized. They usually do not get competitive prices for their product. About 72 % of mango growers sold their products at low prices. This was acute problem to most of the respondents. According to 27% of the respondents or farmers it was a tolerable problem and only about 2% respondents felt this problem as general.

Table-6.1.5: Low prices of output of the sample farmers

Problem level	Farmers	Percent
Acute	73	72.0
Tolerable	28	26.0
General	3	2.0
Total	104	100.0

Source:Field survey 2018

6.2.6 High prices of inputs

Some key inputs like fertilizer, manure, human labour and insecticides are important factors for mango cultivation. In the study area about 65 % of mango growers thought that the existing prices of these inputs for the selected enterprises were quite high for them and they indicated this problem as an acute problem. According to 34% of the respondents or mango farmers it was a tolerable problem and only about 4% respondents felt this problem as general.

Table-6.1.6: High prices of inputs of the sample farmers

Problem level	Farmers	Percent
Acute	66	65.0
Tolerable	34	35.0
General	4	4.0
Total	50	100.0

Source:Field survey 2018

6.2.7 Lack of human labor

Since mango is a labor intensive field crop, shortage of human labor is one of the major problems for growing mango, especially during the time of harvesting period. About 75 % of mango growers treated lack of human labor as a crucial problem. . About 19% of the respondents or mango farmers answered it as tolerable problem and about 9% respondents felt this problem as general problem.

Table-6.1.7:Lack of human labor of the sample farmers

Problem level	Farmers	Percent
Acute	76	75.0
Tolerable	19	17.0
General	9	8.0
Total	104	100.0

Source:Field survey 2018

6.2.8 Lack of quality variety /cultivar

Lack of good quality HYV variety /cultivar appeared to be a limiting factor in cultivating mango in the study area. Most of the farmers purchased this input from their neighboring farmers/relatives/traders but they opined that in many cases variety /cultivar were not of good quality and the rate of mortality was quite high. About 50 % of mango growers reported against this problem as acute one. About 30% of the respondents or mango farmers answered it as tolerable problem and about 20% respondents felt this problem as general problem.

Table-6.1.8 :Lack of quality variety /cultivar of the sample farmers

Problem level	Farmers	Percent
Acute	51	50.0
Tolerable	32	30.0
General	21	20.0
Total	104	100.0

Source:Field survey 2018

6.2.9 High prices of fertilizer and insecticides

Fertilizer being the vital input and insecticides for precautionary measure against pest attack is essential in the production of mango. It was reported that mangoes were seriously affected by pest and diseases

during the study year. About 87 % of the mango growers reported that although there was timely supply of fertilizer the price was high. They complained that they had to purchase fertilizer and insecticides at higher prices in the area. About 9% of the respondents or mango farmers answered it as tolerable problem and about 4% respondents felt this problem as general problem.

Table-6.1.9 :High prices of fertilizer and insecticides of the sample farmers

Problem level	Farmers	Percent
Acute	88	87.0
Tolerable	11	9.0
General	5	4.0
Total	104	100.0

Source:Field survey 2018

6.2.10 Lack of storage facilities

Storage problem for mango cultivation was another important problem in the study area. Because of banana being a perishable fruit crop, most of the output is sold after harvest at a lower price due to lack of proper storage facilities. About 53 % of mango growers reported that they had no proper storage facilities. About 36% of the respondents or mango farmers answered it as tolerable problem and about 11% respondents felt this problem as general problem.

Table -6.1.10:Lack of storage facilities of the sample farmers

Problem level	Farmers	Percent
Acute	55	53.0
Tolerable	37	36.0
General	12	11.0
Total	104	100.0

Source:Field survey 2018

6.2.11 Problem of theft

During the time of harvesting, stealing of mango was a common problem, which adversely affected the cultivation of mango. In the study area about 55 % of mango growers mentioned about the problems of theft of banana as an acute problem. About 32% of the respondents or mango farmers answered it as tolerable problem and about 13% respondents felt this problem as general problem.

Table-6.1.11 : Problem of theft of the sample farmers

Problem level	Farmers	Percent
Acute	56	55.0
Tolerable	33	32.0
General	15	13.0
Total	104	100.0

Source:Field survey 2018

6.2.12 Inadequate extension service

Most of the mango growers complained that they did not get any extension services regarding the improved method of mango storage as well as mango cultivation from the Department of Agricultural Extension (DAE). About 60 % mango of growers complained against the extension workers of the DAE.

6.3 Problems of mango marketing

Several problems were found for farmers and traders and presented in Table -6.1.12. The problems were categorized on the basis of priority ranking. Seven problems are identified for the farmers. Among the problems, inadequate transport facility ranked first followed by higher cost of transportation and preservation problem.

6.3.1 Marketing problems of farmers.

Table-6.1.12: Marketing problems of farmers.

Problems of farmers	Rank of Problems
Inadequate transport facility	1
Higher cost of transportation	2
Preservation problem	3
Lack of feeder roads	4
Lack of shed in the market	5
Post-Harvest loss	6
Strike / Political unrest	7

Source:Field survey 2018

6.3.1.1 Lack of transportation facility

About 90 percent of retailers complained that they did not face regarding problems regarding this issue. But situation was different for wholesalers and about 40 percent they complained that they faced regarding problem. For these reasons, it was a major problem for mango marketing.

6.3.1.2 High transportation cost

According to 80% Retailers, Wholesalers transportation cost was a major problem. Most of them purchased from farmers run their business in urban market. Due to perishable nature of mango they had to count a huge loss in this case. About 60% Wholesalers faced it as an acute problem. Because they had to purchase fresh mango and supply products to distant market, even in different district.

6.3.1.3 High storage cost

About 60 percent of Retailer, Wholesaler and Arottdars respectively reported that High storage cost was one of the most important problems for mango production as it is one of the most perishable fruit. Lack of storage facility and high cost of storage faced by mango cultivators.

6.3.1.4 Political unrest

About 90% of retailers and 100% of Wholesaler responded it as a major problem. According to them due to political unrest, they had to tolerate a huge loss in their business in previous 3 years. To 100% producers it was an acute problem too, which hampered their business adversely at all. In the case of traders, unstable price was the first ranked problem followed by selling on credit.

6.3.2 Marketing problems of traders

Table-6.1.13. Marketing problems of traders.

Problems of farmers	Rank of Problems
Unstable price	1
Selling on credit	2
Lack of capital	3
Lack of market place	4
High transport cost	5
Lack of market information	6
Lack of processing center	7

Lack of processing plant	8
Packaging cost	9
Lack of rules and regulations	10
High labor cost	11
High license cost	12
Transport problem	13
Risk to rotten by transportation, unfavorable weather	14

Source:Field survey 2018

6.3.2.1 Unstable price

Not only low price but also unstable prices were a main problem to middlemen, according to them. Price fluctuation was a common phenomenon faced by them. They also replied as due to perishable nature of product they could not get stable price. It was an acute problem to about 60% Retailers, 60% Wholesalers and 80% farmers.

6.3.2.2 Lack of processing plant

Lack of processing plant was a main problem to farmers, according to them. For mango production as it is one of the most perishable fruit due to this problem farmers had to face huge loss.

6.3.2.3 Risk to rotten by transportation, unfavorable weather

Similar to previous topic it was an acute problem to retailers and Wholesalers. Most of them sold their products in urban market. But situation was not like that to mango producers. About 60% of them faced it as a general problem.

CHAPTER-7

SUMMARY, CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

This chapter focuses on the summary in the light of the discussions made in the earlier chapters. Conclusion has been made on the basis of empirical result. Policy recommendations are drawn for improvement of the existing inefficiency of mango production in Bangladesh. Section 9.2 presents a summary of the major findings of the study, conclusion, policy recommendations, limitation of the study and scope for further study are given in Section 9.3, 9.4, 9.5 and 9.6, respectively.

7.2 Summary

Agriculture is the key driver of the growth and development of Bangladesh economy. The economic development is primarily linked with the performance of Agricultural sector. The performance of this sector has a crucial impact on major objectives of our country like employment generation, poverty alleviation, human resources development and food security. Agriculture provides employment to nearly about 40063 percent of its total labor forces (BER, 2018). Agriculture sector which includes crops, livestock, fisheries and forestry contributes 14.23 percent to the gross domestic product (GDP) as a whole in the FY 2017-18 (BER, 2018). Socio-economic condition of Bangladesh fully depends on production of Agricultural goods.

Moderate to severe drought and soil nutrient depletions in Barind ecosystem are adding more pressure on natural resources for sustainable crop production. Thus, farmers in the region have started to shift crop land into fruits (mango, litchi and jujube) cultivation due to low water requirement, favorable agro-ecological condition, ready market and profitability. It can contribute a vital role to increase the farmers' income, generate employment, alleviate poverty, ensure food security, empower women and increase social development of Bangladesh In 2016-17, the national production and area of fruits were 5067798 million ton and 388857 acres respectively (BBS, 2017). The cultivation of mango has gaining momentum among the farmers in the Rajshahi region (especially in Barind area) due to its low water requirement, favorable agro-ecological conditions, ready market and profitability. In Bangladesh, mango ranks 2nd in terms of area followed by

banana and 1st in terms of production. Bangladesh produces 1288315 metric tons of mangoes annually from 102939 acres of land (BBS, 2017).

The sampling frame for the present study were selected purposively as to select the area where the mango cultivation was intensive and weather was favourable for mango production. On the basis of higher concentration of mango production, four villages namely Barui para, Bausha hadati para, Panna para, Kismat bogura which were taken randomly four upazilas namely Bagha, Charghat, Puthia, Durgapur in Rajshahi district were selected for the study. A sample size of 60 is generally regarded as the minimum requirement for larger population that will yield a sufficient level of certainty for decision-making (Poate and Daplyn, 1993). A total of 104 farmers who were cultivating different varieties of mango in the selected areas were selected as samples.

Data for the present study collected during the period of January to March 2018. Primary data were collected from mango producers. Selected respondents were interviewed personally with the help of pre-tested questionnaires. The collected data were checked and verified for the sake of consistency and accuracy. Editing and coding were done before putting the data in computer. All the collected data were summarized and examined carefully to minimize all possible errors. Data entry was made in computer and analysis was done using the concerned software Microsoft Excel.

Socioeconomic condition of sample household considered composition of family size and household earning members, educational status, occupational status, and sources of income of the sample farmers. Out of 104 sample farms around 27%, 31%, 23%, 17% farmers are taken from Bagha, Charghat, Puthia, Durgapur upazilas respectively and most of them have 10-12 years mango farming experiences. About 65% of farmer are educated in this region.it was estimated 95% farmers have own land. About 49.03% of total mango farmers belonged to the age group 35-50 years and about 36.53%) of them belonged to the age group 50-65 years. On the basis of general education, the respondent were classified into four categories which explained that the majority (33.65 %) of respondents were in the SSC level followed by SSC & Above (28.84 %) and illiterate (19.23 %). The lowest proportions of respondents (18.26 %) were primary level. The literacy percentage of the study area is under national average. Most of the respondents about 66 % had medium family size (3-5 members) followed by small family size (0-2 members) with about 21 %

of respondents. Only about 12 % of the respondents had large family size (≥ 6 members). most of respondents (63.80 %) were medium land holder having 1.01-3.00 ha of land followed by 20 % of respondents which were small land holder having 0.21-1.0 ha of land, 4.80 % were marginal land holder having 0.02-0.20 ha and only 11.40 % were large land (>3 ha) holder. No landless (<0.02 ha) were found.

Thirteen (13) recognized mango varieties were cultivated by the growers of the selected study area. Lokna ranked 1st as it occupied the highest percentage (20 %) out of total mango varieties which was followed by Kirsapat(Himsagor) (19 %) which ranked 2nd, Langra (17 %) which ranked 3rd.the occupied percentage for Fazli (13 %), Ashwina (11 %), Amrapali(10%), Gopalbhog (3 %), Arajam (2%), Dudhsor(1.5%), Tutapori(1.2%), Harivanga(1%), Mohonbhog(0.8%) and Kachamitha (0.5%) which ranked 4th ,5th ,6th ,7th ,8th ,9th ,10th ,11th ,12th and 13th respectively.The highest proportion of respondent depend on agriculture and the percentage was about 51%, and the lowest percentage belonged to agricultural day labor group and the percentage was around 1%. About 41% of family members had no income earner except only one person. The observed range of total cultivable land size of the respondents was from 50-1250 decimal and range of total cultivable land size for mango production of the respondents was from 20-600 decimal. Analysis showed highest percentage of farmers that is about 95.2 percent of mango farmers used only their own land for mango cultivation.

Experience in mango production of the respondents ranged from 4 to 32 years. The respondents were classified into three categories and the highest percent of respondents about 63.80 % had medium experience (10-20 years) followed by the respondents about 21.90 % having high (>20 years) experience. Most of the respondents around 38.10 % had medium experience (16-25 years) followed by the respondents about 27.60% having low experience (10-15 years). About 47% of all cultivators from the selected area sold after harvesting in the wholesale market and only about 29% and 13% producers sold their whole garden at a time and at village retail market respectively. On the basis of Problem Confrontation Index (PCI) formula, out of the 16 problems, insects and diseases infestation was identified as the major problem with PCI 429 followed by dropping of fruits and flowers with PCI 409. Scarcity of better varieties/ Seedling/ grafts, Climate change and Lack of modern technology were also three major problems with PCI 387,276 and 193 respectively faced by mango farmers in case of mango production. Every cultivator had to spend 106659 taka

for one hectare of land or 120 mango trees and average profit was 299010 taka but it varies from 299010 to 300000 taka on the basis of respondents from 120 mango trees or from one hectare without considering land rent. Average profit from mango cultivation was higher than Average profit from onion cultivation which amounted Tk. 299010 per hectare and 260412 per hectare respectively.

Farmers faced a lot of problems in producing mango. Inadequate transport facility, higher cost of transportation, Preservation problem, Lack of feeder roads, Lack of shed in the market, Post-harvest loss and Strike / Political unrest problems were identified for the farmers in mango marketing. Marketing problems for traders were Unstable price, Selling on credit, Lack of capital, Lack of market place, High transport cost, Lack of market information, Lack of processing center, Lack of processing plant etc.

7.3 Conclusion

Bangladesh with its diverse 30 agro-ecological zones, 25th AEZ (Barind tract) is very suitable for almost year-round production of high quality mango fruits to meet the increasing demands of domestic and export markets for fresh and processed fruits. As Rajshahi was in Barind region, farmers of this district reported that lack of irrigation facility for rice was the main reason for shifting land to mango cultivation. The other reasons for shifting to mango cultivation were Higher profit from mango cultivation, Lower price of other crops than mango, Easy cultivation process of mango, Lack of irrigation facility for rice, Non-suitability of land for other crops, Lower yield of other crops than mango, Not required extra care for mango cultivation and farmers can cultivate two crops at a time (intercropping). In Bangladesh, mango ranks 2nd in terms of area followed by banana and 1st in terms of production. Bangladesh produces 1288315 metric tons of mangoes annually from 102939 acres of land (BBS, 2017).

The mango moved from the producer/seller to the consumers through some market intermediaries, such as Bairals, Beparis, Aratdars (both local and urban) and retailers (both local and urban). Owner/ Producer - Bepari- Aratdar- Wholesaler- Retailer- Consumers was the main marketing channel of that region. Mango is a year seasonal crop. During the period, the mango growers faced

several problems. Lack of knowledge of mango cultivation, lack of capital, Non-availability of credit, inadequacy of mango loan, Low prices of produced mango, high prices inputs like fertilizer, manure, human labour and insecticides, Lack of human labor, Lack of good quality HYV variety /cultivar, Lack of storage facilities, Problem of theft During the time of harvesting, stealing of mango and Inadequate extension service were some of the major problems.

However, Bangladesh's potential for mango production is not yet fully exploited. To improve this situation, many issues along the whole mango value chain need to be addressed. Suitable, high quality planting material e.g. cultivar is a prerequisite for improving the mango value chain. Research on this issue is urgently needed and should focus first on evaluation and characterization of available rootstock and scion varieties to select the most suitable ones for efficient dissemination to farmers in Barind track. Second, the number of mango varieties should be increased by importing material from advanced mango producing countries. Third, Supply of HYV's plant materials as a Solution for better yielding and better profitability should be enhanced. Fourth, training should be provided to the people as a Solution for better yielding and better profitability. Finally, the most promising mango varieties need to be further improved by systematic breeding programs for their better adaptation to present and future environmental and socioeconomic conditions in Bangladesh.

7.4 Recommendations

The present study was investigated with a view to have an understanding about the status of mango production, socioeconomic condition of the mango growers, number of varieties produced & problems confronted by them and to explore their relationships with some selected characteristics.

The following future studies should be undertaken, covering more dimensions in related matters-

1. Mango has a high demand in local and foreign markets and its production is highly profitable. The farmers in the study area confronted medium problems in mango production. So, Government, concern GOs and NGOs should take necessary steps to minimize the problem confrontation of the farmers.

2. The education of the growers is essential for any development programme. It is necessary for creating awareness about any improved production technologies. To increase the level of education of the growers, Government, concern GOs and NGOs should take proper steps.
3. To increase the annual income and production, mango growers need financial support in time. GOs, NGOs and concerned authority should take proper steps to reduce the financial problem of the farmers.
4. Growers confronted various problems during the whole production season. So, proper contact with extension personnel is necessary for reducing problem in mango production. The DAE, Horticulture Centre and non-government organizations should strengthen their services to the farmers to overcome their problem confrontation in mango production.
5. The agriculture officers and SAAO should also help the farmers for better production techniques and improved information so that the growers could increase their production and sell their products at a higher price.
6. Training exposure and organizational participation of the growers in mango production seem to increase production and income as well as minimize problem confrontation. Therefore, it is recommended that the Govt. and other NGOs should take steps, so that farmers can get more opportunity to receive training and organizational participation and other related practices.
7. The study was conducted on the farmers of eight villages of sadar upazila under Rajshahi district. Similar studies may be undertaken in other parts of the country to verify the findings of the present study.
8. The study investigated relationship of the farmers with only four dependent variables in mango production. Further research should be undertaken for exploring relationship of other characteristics of the farmers with other dependent variables.
9. The study investigated only sixteen problems related to mango production. So it is required to investigate other problems related to mango production.
10. Farmers should be motivated to cultivate mango in the fallow lands or areas where other crops are not grown well.
11. As mango cultivation was highly profitable in the study areas, there is a tendency in the study areas to reduce crop land. Therefore, scientists should develop new cropping pattern with mango so that farmers can cultivate different food crops with mango.

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CHAPTER-9 APPENDIX

QUESTIONNAIRES FOR SMPLE FARMERS OF MANGO CULTIVATION IN SOME SELECTED AREAS UNDER RAJSHAHI DISTRICT, DEPARTMENT OF AGRIBUSINESS & MARKETING, SHER-E-BANGLA AGRICULTURAL UNIVERSITY

1. Information of respondent:

Name:

.....
.....

Village: Union:.....

Upazilla: District:

Age (year): |

Educational Year:

Illiterate =0, Primary=(1-5 years)=1 High school(6-10 years)=2

Vocational/ college/ University (11-16)=3

Profession: Agriculture=1, Business=2, Agricultural day labour=3, Non-agricultural day labour=4, Others=5

2. Information about family members:

Code	Name of the family members	a) Relationship with household head	b) Age (year)	c)education	d)Income status	e) Types of profession
(1)						
(2)						
(3)						
(4)						
(5)						
(6)						

a) Relationship with household head: Husband=1, Wife=2, Son=3, Daughter=4, Mother=5, Father=6, Brother=7, Sister=8

b) Age (year):

c) education: Illiterate(00)=0 Primary=(1-5 years)=1 High school(6-10 years)=2

Vocational/ college/ University (11-16)=3

d) Income status of the family member: Earner=1, Not earner=2

e) Profession of the family member: Agriculture=1, Business=2, Agricultural day labour=3, Non-agricultural day labour=4, Housewife=5 Others=6

03) **Ownership and Use of land:**

Code	Ownership of land	Amount (decimal)
(i) Own cultivated land:		
(1)	Own land	
(2)	Leased in	
(3)	Mortgaged in	
(4)	Rented in	
(ii) Cultivable land to others		
(1)	Rented out	
(2)	Mortgaged out	
(3)	Leased out	
(iii) Total cultivable land (i=ii)		
(iv) Home stead area		
(v) Ponds		
(vi) Other fruit garden and jungle		

04) Amount of land under mango cultivation.....decimal

05) Ownership of mango garden's land: Own=1, other=2

06) Supply of capital: Self=1, loan from others=2, Bank loan=3

07) Reason for mango gardening:

More profit than other crops=1, better marketing facilities=2, Lower risk=3, Lower investment=4, More available planting materials=5

08) Nearest market:

Very near=0, within 1 km=1, within 2 km=2, within 5 km=3, Out of 5 km=4

09) Size of the market: Retail market=1, wholesale market=2, others=3,

10) Vehicle used in marketing: Self=1, Rented=2, Co-operatives'=3

11) Existence of co-operatives in the market: Yes=1, No=2

12) Types of selling of your mango:
Whole garden at a time=1, Self retailing=2, Self wholesaling=3,

13) Use of Fertilizer:

Name	Urea	TSP	MoP
Amount			

14) Cost and benefits:

Per hectore			Total production	Total profit
Income	Cost	Profits		

15) Comparison of mango cultivation with other crops:

- 01) Plant materials cost: Less=1, More=2
- 02) Planting cost: Less=1, More=2
- 03) Necessity of fertilizer and irrigation: Less=1, More=2
- 04) Use of pesticide: Less=1, More=2
- 05) Harvesting, Sorting and grading cost: Less=1, Moe=2
- 06) Labour cost: Less=1, More=2
- 07) Yield of mango: Same as other crops=1, More than other crop=2
Less than other crops=3
- 09) Use of fellow land: Possible=1, Impossible=2
- 10) Share cropping is possible: No=1, Yes=2

16) Problem faced for mango cultivation:

- 01) extra care in early age of planting: Yess=1, No=2
- 02) Disease infection is mre: Yes=1, No=2
- 03) rapid outbreak of disease: Yes=1, No=2
- 04) Lower yield in first 3-4 years: Yes=1, No=2

17) Measure should be Taken according to you:

- 01) Supply of HYV's Plant materials: Yes=1, No=2
- 02) Supply of better quality's pesticide: Yes=1, No=2
- 03) Reducing price of pesticide: Yes=1, No=2
- 04) Increasing facilities for marketing: Yes=1, No=2
- 05) Steps should be taken for exporting: Yes=1, No=2

18) What type of Mango do you cultivate ?.....

19) What type of problem do you face in cultivation and Marketing of mango?

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

20) Experience of Mango CultivationYears

21) Perception about governmental work and Department of Agricultural Extension's work about this regard: Good=1, Not good=2

.....Thank you for your nice co-operation.....