ECONOMICS OF PRODUCTION AND MARKETING OF KING CHILLI IN UBVZ OF ASSAM

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IN

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By

Saradi Sondhya Baruah

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(Roll No. 2017-AMJ-10)

DEPARTMENT OF AGRICULTURAL ECONOMICS AND FARM MANAGEMENT

College of Agriculture

ASSAM AGRICULTURAL UNIVERSITY

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FACULTY OF AGRICULTURE

CERTIFICATE – I

This is to certify that the thesis entitled **"Economics of Production and Marketing of King Chilli in UBVZ of Assam"** submitted to the faculty of Agriculture, Assam Agricultural University, in partial fulfillment for the degree of Masters of Science (Agriculture) in **Agricultural Economics and Farm Management**. It is the record of research work carried out by **Saradi Sondhya Baruah** under my Personal supervision and guidance.

All helps received by her have been duly acknowledged.

No part of this thesis has been reproduced elsewhere for any degree.

Place: Jorhat

The …… July, 2019

_____

(Riaz Abdul Halim)
Professor
Department of Agril.Economics & F.M
Faculty of Assam Agricultural University
Jorhat - 785013

CERTIFICATE – II

This is to certify that the thesis entitled **"Economics of Production and Marketing of King Chilli in UBVZ of Assam"** submitted by **Saradi Sondhya Baruah, Roll no. 2017-AMJ-10** to the Assam Agricultural University, in partial fulfilment of the requirements for the degree of Master **of Science (Agriculture)** in the discipline of **Agricultural Economics and Farm Management** has been examined and approved by the student's Advisory Committee after viva-voce.

_____
(Riaz Abdul Halim)
Major Advisor

_____
Chairman
Board of Examiner

Members of the Advisory Committee:

1. _____
(Nivedita Deka)

2. _____
(Prasanta Mishra)

3. _____
(Hemanta Saikia)

_____
Professor and Head
Department of Agricultural Economics and Farm Management
Assam Agricultural University
Jorhat-785013 (Assam)

_____
Director
Post-Graduate Studies
Assam Agricultural University
Jorhat-785013 (Assam)

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ABSTRACT

India is gifted with diversified chilli varieties. Among the important chilli varieties of India, King Chilli (*Capsicum sinense* Jacq.) is well known for its distinct pungency and aroma which had its origin in north-east India. King Chilli got its name and fame after it was crowned as the "World's Hottest Chilli" by the Guinness World Record in September, 2006. The title of hottest chilli created international demand for the chilli. Since then efforts were made to extend chilli cultivation in the region to increase production to meet the rising demand. So, the present study entitled "Economics of Production and Marketing of King Chilli in UBVZ of Assam" was undertaken to depict the overview of production and marketing situation prevailing in the study area.

For the study two districts, namely Jorhat and Sivasagar were selected under Upper Brahmaputra Valley Zone of Assam. Primary data was collected for the analysis following multistage stratified random sampling technique. A total of 120 farmers were selected as the ultimate sample in the ratio of 4 Marginal:3 Small:2 Medium: 1 Large.

The study revealed that return per rupee invested was 5.6 for marginal farms, 5.9 for small farms, 6.3 for medium farms and 6.2 for large farms. Thus, return per rupee showed increasing trend with the increase in the size of farm. For studying the marketing channels a total of 29 marketing agents were personally interviewed. Different channels were identified in different harvesting period. Highest efficiency was found in marketing the products directly from producer to consumer which was calculated by using Acharya's formula. Various production and marketing constraints faced by the respondents were also examined through Garrett's ranking technique. Attack of pest and disease was found as important constraint faced by the farmers during production period while in marketing the products, wide price fluctuation was considered as the highest constraints. Hence, the study was taken up to study the economics of King Chilli in the region.

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CHAPTER I

INTRODUCTION

The origin of chilli is believed to be in Mexico during 7000 BC while in India it was introduced much later by the Portuguese during the 15th century. Christopher Columbus was the first person to bring chilli to the other parts of the world. (Geetha*et al*. 2017). Itscultivation grew rapidly in the European and Asian countries. In fact, Asia is embraced for producing diversified chilli varieties and contributing major share in the international market. Countries like India, China, Japan, Bangladesh, Pakistan, Thailand, Vietnam, and Mexico are worth notable. In India, added by its suitable climatic condition, chilli cultivation got popularity during the 17^{th} century. Gradually chilli became the commercial crop of the country, contributing the largest share (36.57 per cent) to the international chilli market accounting for 13.76 million tonnes of chilli annually. (Geetha*et al*. 2017). It occupies a huge position in the spice hub of India, potentially earning foreign income. Countries like Malaysia, Sri Lanka, Indonesia, US, UK and Singapore are the major importers of chilli.

During the period from 2004-05 to 2014-15, the average area under chilli cultivation, production and productivity were found to be 765.12 thousand hectares, 1269.30 thousand tonnes and 1.66 tonnes per hectare respectively, with an increasing trend from 1.61 tonnes per hectare to 1.95 tonnes per hectare in the following years. (Directorate of Arecanut and Spices Development) In 2016-17 significant amount of dried chilli was supplied by Andhra Pradesh, i.e 47.17% to total India's production, followed by the states like Telangana, Madhya Pradesh, West Bengal and others while the score in green chilli production was highest in Karnataka (Horticulture Statistics Division, Department of Agriculture & Farmers Welfare).North Eastern states like Nagaland, Manipur, Assam also contributed greatly to the chilli basket of India.

India is bestowed with diversified chilli varieties. Among them, King chilli is valued globally for its exceptional hotness. It is said that one equals to the hotness of hundreds of normal chillies, a single piece is enough to be shared by the whole family and so is the 'King' of all other chillies. King chilli originated in the North Eastern region of India. It has been one of the important cuisines of North East people since the past but it was almost unknown to the world. Defence Research Laboratory in Tezpur district of Assam first knocked its fiery hotness in the year 2000.

Thereafter,research began and King chilli got its fame after it was certified by the Guinness World record as the hottest chilli on earth with 1,001,304 Scoville Heat Unit in September 2006. Nagaland Government also received Geographical Indication for this chilli in 2008 to favour commercial benefit.

King chilli belongs to Solanaceae family and species *Capsicum sinenseJacq*. Assam, Nagaland and Manipur are the major King Chilli growing states. It is known by several names, such as

- Ghost Pepper or King Chilli in English,
- *U-morok* in Manipuri,
- Naga King Chilli or *Raja Mirchi* in Nagaland.
- In Assamese, it is called as *BihJolokia* comparing its killing hotness to poison (Assamese translation of *Bih*) or *BhutJolokia* for its typical large size pod.

King Chilli (*Bhut Jolokia*) is an indispensable part of Assamese tradition, every family is accustomed to its aroma, texture and sensational taste by consuming either freshly plucked fruit or as spices in dishes or as a processed form like pickles, dried powder, sauces etc. Besides, its incorporation in medicinal preparation has been described in ancient literature. It acts as a rich source of vitamin A, C and E. According to researchers, king Chilli contains high capsaicin content, the active principle behind pungency of the fruit. Capsaicin is of the view to provide novel service in the field of medicine like pain relief, anti-obesity treatment, as an antioxidant, antimicrobial agent and as an anti-cancerous molecule. It is reported that around 2-4% capsaicin is present in King Chilli compared to 1% capsaicin content in other Indian chillies. This fact emphasizes its advantage to explore commercially drawing attention and demand in the national and international market.The smoke of this chilli is also used to keep elephants away from rice fields. Making of Chilli grenade is another area where King Chilli is gaining importance as a defensive mechanism.

Commercially cultivated King Chilli (*Bhut Jolokia)* plant is annual, also exhibit as semi-perennial in the kitchen garden of most households of Assam. The plant is bushy herbaceous, attaining a height of 57-125cm and even more. The tender green stems tend to fall, so needs to be supported by bamboo sticks. Mostly self-pollinated, considerable cross-pollination may also occur (upto 10%). Leaves are ovate, green and crinkle in form. Fruits are soft, bright, larger than normal chilli, ranging 5-7cm long with interestingly differentshades based on variety, basically, Red King Chilli of color

red is commonly grown in Assam among the other variety Chocolate and White varieties are also seen to grow. Immature King Chilli (*Bhut Jolokia)* inhibiting light green colour gradually turns attractive red when ripen, while young dark green turn dark chocolate at maturity and whitish immature turn bright orange. Varieties, namely *Raja* and *Rani* are being cultivated in the locality, with *Raja* being bigger in size and longer shelf life compared to *Rani*, while the latter shows higher productivity. Farmers believed to use as high as 3-5kg FYM per plant to obtain a good yield, does not prefer to use chemical fertilizer however could not escape from applying high amount of plant protection chemicals as the plant is very much prone to disease infestation. They are mostly planted in a raised bed as it is susceptible to waterlogging. Here, in the plains sowing in December or January is most suitable while in the hills it is May or June. Transplanting is completed within 1-2 months time. Harvesting is peak during June or July fetching low price to the farmers due to increase supply at that time. Therefore, efforts have been seen by the cultivators to dispose of early during March to exploit attractive prices. Approximately 10-12 quintals can be harvested from 1 bigha of land, yielding 1-2 kg per healthy plant in a season.

Having one or two King Chilli plants in the kitchen garden of most Assamese household was the situation ten years back which was considered sufficient for the family. The thought for commercial exploitation of this crop is a new concept. Seeing its increasing demand and high market value, people are taking up King Chilli cultivation as a new enterprise. Even students after passing out from colleges are motivated to earn huge sum of money by choosing King Chilli farming as an option for self employment. But the important question arises is whether the progress in terms of production and marketing is worthwhile to bit the rising competition? Undoubtedly its need in different fields is scaling up while its pace in meeting the requisite demand is not synonymous. It isstill in the nascent stage in the field of production and development. If its potential areas are not pinpoint practically and necessary implementationis not made, soon the market would be grabbed by the competitors.

Status of King Chilli

Increasing fame worldwide for serving distinct flavor and aroma as well as its utility in other fields poise a major factor for growing interest in King Chilli. Hence, to tap the emerging market and demand, country is making an effort to trade the produce overseas. According to the data reported by SEAIR, a company based in Delhi, providing global trade data, India exported different products of King Chilli, realizing a

value of around 95 thousand USD(in 2016). The major importers were US-210.84 Kg (dried chilli powder), Belgium-50 Kg (powdered chilli), UK-50 Kg (Powdered chilli), Canada-8 Kg (powdered chilli), Switzerland-3 Kg (powdered chilli), China-100 PCS (dried pods), Singapore-300 Nos (Driedchilli), and US-3100 gm (seeds).

Viewing the economic potential, King Chilli cultivation is emerging as a viable option in north-east India. In Nagaland, increasing trend has been recorded from the year 2002-03, with 824ha of land producing 15584 metric tonnes to 950 ha of land producing 15745 metric tonnes during 2008-09 as more entrepreneurs linked in that field. Sensing its profitability in Arunachal Pradesh, a project on commercial cultivation of King Chilli was adopted under the scheme of RashtriyaKrishiVikashYojana. Mr. Chow AmatNamchoom, a youth under the project, earned huge income of Rs 28, 40,000 from supplying 2000 Kg of King Chilli. To some extent Mizoram and Meghalaya also set off for its production.

In Assam, King Chillicultivation is mainly embraced by the regions ofGolaghat, Sivasagar, Jorhat, Tinsukia, Dibrugarh and Tezpur districts of Assam. In the year 2009-10, 490 acres of land was used for *Bhut Jolokia* cultivation in the districts of Golaghat, KarbiAnglong and Jorhat under the Technology Mission for Horticulture Development to uplift the production to meet the rising market demand. Under that programmeRs 63.70 lakhs was spent by the government as an incentive to buy quality seeds and other necessary things needed by the farmers. Huge returns encouraged more and more farmers for its adoption.Sarupothar and Barpothar regions of Golaghatcontributes significantly to the total production. Almost ninety percent of the families of Panitolagaonand Sirakhondain Jorhat and Kukurachuwa and Dulia village of Sivasagar has taken up commercial cultivation of *Bhut Jolokia* backed by the familiarity of indigenous raising technique. Its cultivation has also spread to neighbouring areas like Tulsijaan, Bonai, Dohgaon, Chagmaigaon, Boloma, Moran gaon, Kakojaan, Alegmara in Jorhat and Misajaan, Karunasagar, Himparagaon, Mahmara, Garkakharia in Sivasagar. A combined association is being formed by the agriculture department officers with the King Chilli growers to establish a processing unit in Kaliapani (Jorhat) to avoid loss and distress sell during peak time.

Small initiative has been taken by the processors to produce dried chilli to increase self life, which are then sent to Cochin for testing its hotness and then exported to countries like USA, Australia, and Switzerland etc. Frontal Agritech Private

Limited, King Chillibased company in Jorhat owned by LeenaSaikia produces dried chilli flakes, Bhut Jolokia paste and powder, which are mostly exported to different parts of the world, constituting 25 tonnes. USA being the major importer, nearly 10 tonnes of products is exported annually.

Peculiar trend of King Chilli exchange is being observed between Assam and Dimapur. During April to July, chillies from Assam goes to Dimapur and then to other North Eastern states whereas from September onwards till December/January the reverse route is seen due to different harvesting time in the plains and in the hilly regions. Several intermediaries are seen to perform their roles in the movement of King Chilli from farmers hand to the final consumers.

Scope of King Chilli

King Chilli has become one of the important cash crop of Assam. There is high demand in the domestic as well as in the external market. Bestowed with the indigenous technique of growing King Chilli by the people of Assam, there is immense scope for commercial exploitation. In addition people here can also reap the benefits of prevailing climatic condition suitable for its cultivation. Recently NEDfi has prepared a detailed project on processing of King Chilli for a capacity of 5 tonnes of dried chilli and 10 tonnes of chilli pickle with estimated cost as Rs 9, 98,000. This upholds the opportunity for establishing such units by the local populace. Processing would greatly reduce distress sale during peak season. Moreover taking up such venture would undoubtedly generate employment opportunity.

Statement of the problem

After its worldwide recognition, King Chilli has become a popular number among the hottest chillies. Yet its development in the trading business is sluggish due to bottlenecks in production and marketing faced by the growers. Producers are not able to meet the expected production level as crop failure resulting from pest and disease infestation has proved to be a major challenge. The presence of high moisture content in the fruit is another important problem that increased post harvest loss. Unorganized marketing system has led to interference of private traders, dominating the market. Therefore, emphasis may be given by the institutional agencies for healthy distribution in the supply chain. Formation of various cooperative society may be encouraged to create a platform for direct sale. In this case, options like contract farming, forward auction may be adopted by different industries for assured sale of the products from the farmers. This would significantly help the farmers to obtain their remunerative price added by provision of financial support needed for development.

Thus, systematic evaluation holds necessary for policy implication that would boost the economics of production and marketing of King Chilli. In Assam King Chilli is popularly known as *Bhut Jolokia*. Hence, in the present study King Chilli and *Bhut Jolokia* are used synonymously. As no such literature has been available that studies the economics of King Chilli in the study area, therefore with the concern to extend knowledge on the prevailing condition and by keeping all the above mentioned points in view the present study entitled, "Economics of Production and Marketing of King Chilli in UBVZ Of Assam" has been designed by considering following objectives:

Objectives

1. Estimate the production, cost and return from bhut jolokia cultivation
2. Study the marketing of bhut jolokia
3. Identify the constraints faced by the farmers in the cultivation of bhut jolokia

Limitations of the study

1. In this study, limited area was covered due to constraints on time and resource factor. So, generalization of the results has been made on the surveyed area only.
2. The primary data collected for the study were based on the respondents recall from memory due to lacking the habit of data recording, thus may pertain to errors in recalling.
3. Due to fluctuation in prices over time and space, calculation on cost and price concept was done based on approximation and average.
4. Collected data pertains to agricultural year 2017-18. Therefore, conception can be made for that reference period only.

CHAPTER II

REVIEW OF LITERATURE

In this chapter, a review of past research works in the field has been compiled to enable a better understanding of the research in various regions, the method of analysis on the research subject. The chapter is presented under the following headings.

2.1 Production, cost and returns from chilli

2.2 Identification of marketing channels and marketing efficiency of chilli cultivar

2.3 Constraints associated with production and marketing of chilli

2.1. Production, cost and returns from chilli

Gaidhani (1977) revealed that in Nagpur district, the cost A incurred by small medium and large farmers were Rs.935.41, Rs. 1136.24 and Rs. 1171.30 respectively in chilli production, while cost B was Rs.1411.18, Rs. 1677.49 and Rs. 1906.69 respectively in the same sequence. Gross income earned by small, medium and large farmers were Rs. 1838.43, Rs. 2092 and Rs. 2055.71 respectively while net income at cost C was found to be Rs. 362.10 and 283.98 and Rs. 109.11 in case of small, medium and large size groups respectively.

Singh and Singh (1998) evaluated economic aspects of green chilli in Sikher block, District Mirzapur, Uttar Pradesh, India, during 1994/95. Cost on cultivation was Rs. 29371.93/ha, which increased with the size of the holding. Labour accounted for the highest share of the total cost, followed by manure and fertilizers, the rental value of owned land, insecticides, pesticides and seed. The average production of chilli was 176.40 quintals/ha. Average net income, family labour income and farm business income were estimated as Rs 28627/ha, Rs.31599.96/ha, and Rs. 34630.07/ha, respectively. The average production found to be 105.52, 184.01 and 180 quintal/ha. For the small (0-1.5), medium (1.5-3) and large (above 3 ha) farm groups respectively.

Sharma (2011) examined the production of King chilli and assessed the cost of cultivation per hectare in Dimapur district. He recorded the cost-benefit ratio as 1:4.425, found maximum on marginal (1:4.313), followed by small (1:4.278) and least

on medium (1:4.134) farm size group. He also noted maximum correlation (90.98%) between age and area of specialization, whereas observed least correlation (52%) between the area of specialization and pre-training knowledge among the extension functionaries.

Jagtap *et al.* (2012) studied the economics of chilli production in India. They analyzed that cost 'C' data for the period 2009-10 for small, medium and large farmers were Rs 40541.72, Rs 42811.07 and Rs 53421.29 per acre respectively. Net returns over cost 'C' was found to be Rs 19329.52, Rs 24114.79 and Rs 21400.51 per acre and the input-output ratio at cost 'C' were observed as 1:1.48, 1:1.56 and 1:1.40 for small, medium and large farmers respectively.

Madaria (2015) conducted a study on economic analysis of green chilli production in Dhar district of Madhya Pradesh. He found that chilli production is a high cost and labour intensive which involves a higher cost of production in per unit of area, hence, needs a careful assessment regarding cost incurred and returns obtained in the production process of such valuable crop with use of different technological status.

Srikala *et al.* (2016) revealed the per hectare cost of cultivation of chillies in Andhra Pradesh for the period from 2005 -06 to 2010-11. They indicated that the operational costs ranged from Rs 93,332 in 2005-06 to Rs 1, 84,391 in 2010-11 and the total costs varied from Rs 1, 09,597 to Rs 2, 21,656 for the corresponding period. Similarly, they worked out the net return for the corresponding period, which increased from Rs66, 403 to Rs 1, 63,430 per hectare.

Geetha *et al.* (2017) conducted a study on area, production and productivity of chillis in India also studied the status of the export. It was revealed that India was the largest producer of chillies in the world, accounting 13.76 million tonnes annually. During 2014-15, the statistics of the area was 774.9 thousand hectares production 1492.10 thousand tonnes and productivity was 1.93 tonnes per hectare.

Khan *et al.* (2017) analysed the economics of open field chilli production in Punjab, Pakistan by collecting data from 70 respondents. They found out the BCR to be highest for medium farmers, received Rs. 2.02 by investing rupee one in this activity followed by small (Rs. 1.94) and large (Rs. 1.70) farmers. Education, experience in capsicum production, extension services and labour cost showed a positive impact on revenue whereas land preparation and chemical cost showed a negative impact on revenue. R2 was found to be 0.707 for the model with f-value as 16.006.

2.2 Identification of marketing channels and marketing efficiency of chilli

Rajpur and Patil (2010) worked out the price spread, marketing costs and margins of chilli in Karnataka state. Based on the primary data collected from three markets, namely Raichur, Gulbarga and Bijapur, they found that the marketing cost incurred by the farmers of Raichur was highest, followed by Bijapur and Gulbarga i.eRs 112.02, Rs 110.02 and Rs 103.80 per quintal of chilli respectively. Also found that Raichur was most exploited by commission agents, followed by Gulbara and least in Bijapur. Whereas Gulbarga, Bijapur and Raichur was the trend from highest to lowest in the case of the total cost incurred by wholesalers. Similarly, Bijapur, Gulbarga and Raipur was the trend of total retailers cost incurred. Channels observed by the authors were, channel-I (Farmer-Village merchant- Wholesaler- Retailer- Consumer) and channel II (Farmer- Commission agent – Wholesaler- Retailer Consumer). The extent of price spread in the channel I was seen more in Gulbarga, followed by Bijapur and Raichur while in channel II it was more in Gulbarga followed by Raichur and Bijapur. In channel I, the retailers share was more in Gulbarga while in channel II, it was more in Bijapur, which form the major constituent of the total marketing margin.

Hoq, *et al.* (2014) analysed production and marketing of green chilli in Jamalpurand Bogra district of Bangladesh. With B: C ratio of 1.64, chilli cultivation was found profitable in the study area. Seven different types of marketing chain were noted. Among the intermediaries, highest marketing margin was received by urban retailers (Tk 333/qt) and the next was bepari, local retailer, faria and paiker respectively. It was observed that the price spread was Tk.20/Kg in chain-I and Tk. 27/kg for value chain- II. On the other hand, producer share was 62.26 % for value chain-I and 55 % for value chain-II, thus indicating that marketing chain-I was more efficient than marketing chain-II.

Parthasarathi *et al.* (2014) conducted study on "Marketing of Chillies in Thoothukudi district of Tamilnadu". Random sampling technique was used for the selection of the sample. Both primary and secondary data were used for the study. It was revealed from the study that five marketing channels were identified in the study area. The price spread was Rs.3745, Rs.3295, Rs.2640, Rs.2015 and Rs.5300 fro channels I, II, III, IV and V, respectively. Farmer's share in consumer's rupee was 50.57, 63.59, 73.39, 77.10 and 55.83 per cent of consumer's rupee in channels I, II, III,

IV and V, respectively. Among five channels, channel IV was efficient according to both Acharya's approach (2.19) and Shepherd's approach (2.84).

Giribabu *et al.* (2016) studied the economic analysis of production and marketing of chilli in Mokokchung district of Nagaland through information collected from 50 chilli growers, 12 retailers, and eight wholesalers of the region. They revealed that after holding 9.5% for domestic purpose, producers were left with 90.5% as the marketable surplus of which the actual marketed surplus was 86.33% due to 4.17% loss in spoilage and wastage. Also, found that area and production were two major determinants having a positive impact on marketed surplus at the 1% probability level of significance showed by regression coefficient. They observed that channel – II was the most prominent channel as the majority of the farmer-producers (52.3%) sold their produce to retailers. The net price received by producers in consumer's rupee in channel-I was 97.63%, channel - II: 82.43%, and channel - III: 61.9%, thus signifying that the producer-consumer channel was the highest marketing efficiency channel. Further, they concluded that 93% of chilli traded in the market was through retailers and wholesalers and only 7% was traded within the village.

Sabaritnathan (2016) studied Marketing of Chillies in Sivagangai district. Both primary and secondary data were collected for the study. From the findings it was found that, 45.83 % of the respondents preferred to mini lorry transport, 40% of the respondents preferred to van transport and 14.17 % preferred other types of transport. It was also found that 25 per cent of the large farmers and 20 per cent of the small farmers sold their produce through regulated markets. The average quantity of chilies sold per acre by the small and large farmers was 0.90 and 0.8 quintals, respectively. The percentage to the market surplus of the group concerned namely the small and large farmers were 10.55 and 11.37 per cent, respectively.

Stephan *et al.* (2016) studied the Markting of Byadgi Chilli grown in Dharwad and Hvaeri districts of Karnataka. The study was based on information collected from the 56 Byadgi chilli growers, 20 Village traders and 20 Wholesalers from each selected districts. It was revealed from the findings that the average marketing cost incurred by the producer-seller in channel I (Producer seller- Village merchant-Wholesaler-Retailer-Consumer) accounted for Rs. 51.84/ q and for channel II (Producer seller- Commission agent- Wholesaler-Retailer-Consumer) it was Rs. 645.26/q. The

channel I was the best for the farmers and as well as consumers because of its low marketing cost and get optimum prices for their produce as compare to channel II.

Malangmeih and Rahaman (2016) conducted a case study in Manipur on economics and marketing of Naga King Chilli in the region. For that, they collected primary data from 100 samples belonging to Taosem and Nungba of Tamenglong district of the state. It was obtained that the producer accounted for 17.2 to 33.33 % of the consumer's rupee. Net marketing margin varied from 58.88 to 77.12 % of consumer's price. Also noted higher efficiency in the marketing Taosem block (channel II) which had fewer market intermediaries. And thus described the economic importance of the crop in generating income and livelihood to various stakeholders from producer to traders and processors in the marketing channel.

Kaur (2017) conducted a study on Production and marketing of green chilli in Punjab. The marketing channels noted by the researcher in the study were

Channel-I: Producer- Wholesaler- Retailer-Consumer

Channel-II: Producer-retailer-consumer and

Channel-III: Producer-consumer

The study concluded that net price received by the producer was low in channel-I, *i.e*. 61.96 per cent followed by channel-II, 72.77 per cent and channel-III, 98.59 per cent of the consumer's prices. The producer's share in consumer's rupee was found to be highest in channel-III and therefore, was the most efficient channel, involved in direct marketing to the consumer, excluding the intermediaries.

Meena *et al*. (2017) conducted study on Marketing of Green Chilli in Kolhapur district of Maharashtra. The study was conducted on the 90 farmers during 2013-14 in Shirol and Hatkanangale tehsils of Kolhapur district in Maharashtra state. From the study I was found that The Producer-Wholesaler-Retailer-Consumer was the major marketing channel and the producer's share in consumer's rupee was found to be 64.83 % in channel-I, 67.43% in channel- II and 80.32% in channel-III. Per quintal cost of marketing of green chilli was highly incurred by retailer followed by wholesaler/ commission agent and village trader. It was also found that major marketing problems were high commission charges (86.67%), high transport charges (86.67%) and price fluctuations (84.44%), in market. They also suggested that Government should fix

support price as well as ceiling prices level fair to both producers and consumers and formation of co-operative marketing societies for better sale.

Jorwar *et al.* (2018) in their study marketing of chilli in Amravati district, identified three major channels in the study area.

Channel-I: Producer-Consumer

Channel-II: Producer –Retailer- Consumer

Channel-III: Producer- Wholesaler- Retailer- Consumer

It was found that price spread increased from channel-I (Rs. 214.80 per quintal) to channel-III (Rs. 923.26 per quintal), resulted in decreased marketing efficiency from channel-I (24.02) to channel-III (8.24).

2.3 Constraints associated with production & marketing of chilli

Prajapati *et al.* (2002) conducted research on constraints experienced by growers in the adoption of recommended chilli technology in Gujarat. They followed a ranking method to the constraints and found that lack of knowledge pertaining to recommended variety (94.16%) and recommended fertilizers (85%) were the serious constraints faced by the chilli growers. Other significant constraints accessed were 'unavailability of fertilizers in time and adequate quantity', 'inadequate power supply' and 'lack of knowledge regarding plant protection measures'.

Ruchira and Gupta (2010) reported production and marketing constraints faced by the chilli growers of Jaipur district of Rajasthan. In production, the major problems were high cost of fertilizers (98.33%), pest problem (83.33%), disease incidence (84.16%), high cost of plant protection chemicals (41.66%), and limited and irregular power supply (39.16%). Whereas in marketing price fluctuation poised as the major problem (84.16%). Growers also faced the problem of poor transportation facilities (83.33%) and much exploitation by middlemen (75.00%) that reduced their share of consumer's rupee.

Sharma and Gupta (2010) analyzed the knowledge and constraints in chilli among the farmers. For the study, a total of 200 sample farmers were selected from eighteen villages of Punjab. The study revealed heavy price fluctuation as the major issue, expressed by 73.5 per cent respondents as chilli prices vary from Rs. 1 in the peak season to Rs. 10 per kg, which significantly altered the remunerative prices received by the farmers. 67.5 per cent of them expressed their inadequate skill for

nursery raising as one of the main constraint. Respondents also viewed lack of support price, high cost of hybrid seeds and high infestation of insects' pests and diseases as important issues, expressed by 61.5 per cent, 29.5 per cent and 21.0 per cent respondents respectively. Few respondents, around 13.5 per cent of them also revealed the problem of non-availability of labour.

Prabhavathi *et al*. (2013) studied the constraints faced by producers of red chillies in Khammam, Warangal, and Guntur districts of Andhra Pradesh. Constraints covered in the questionnaire were grouped under ten headings. They identified the following constraints as important: poor transportation facilities, poor market information, delay in sale of produce, poor weighing procedures, unfair practices during in open auction, delay in payments from agents, collection of excess commission, lack of storage facilities at market yard, poor finance for warehouse receipts during lean market prices and lack of facilities for farmers at market yard.

Dangore *et al.* (2015) reported that lack of technical knowledge constitutes a major constraint in production while non-remunerative price and high cost of transportation in marketing was found to be the crucial problem faced by the dry chilli growers in Wardha district of Maharashtra

Geetha and Selvarani (2015) revealed that the major constraint pertaining to chilli growers of Virudhunagar District was lack of suitable processing unit in terms of production and inadequate traders, price fluctuation, delay in payment were other problems observed in the marketing of chillies. The authors also suggested ways to tackle the problems through the adoption of improved package and practices, establishment of processing unit and effort on the part of the extension workers to impart training in order to improve knowledge skill of the chilli growers.

Patel *et al.* (2015) conducted a study on chilli performance in Raigarh district of Chhattisgarh. Several constraints faced by the farmers were encountered in the surveyed area responsible for yield reduction in chilli. The most important problem felt by 81.82 per cent of the chilli growers were the attack of insect pest and diseases. Another important constraint was the imbalanced use of fertilizers and pesticides, perceived by about 76 per cent farmers. Other aspects include lack of sufficient soil testing facilities, scarcity of labour, lack of institutional support for chilli cultivation, lack of latest technical know-how about chilli production, which were felt by 63.64 per cent, 54.55 per cent, 45.45 per cent and 21.82 per cent farmers respectively.

Biswas *et al.* (2017) revealed the constraints faced by the Naga King chilli growers in Mokokchung district of Nagaland and found that high cost of fertilizer was most problematic (68.57%) in case of production, lack of financial subsidies (77.14%) among the economic problems and lack of proper post-harvest storage among the marketing problems, which was the major constraint expressed by 90% of the King chilli growers in the region.

Sowjanya and Kumari (2017) studied the constraints faced by the farmers in the adoption of Integrated Crop Management in chilli in Telangana. They collected data from30 ICM, 30 IPM and 30 Non- IPM farmers belonging from Warangal and Khammam districts. Garrette ranking technique was used for the analysis. They noted that for all the categories of farmers, market price information from commission agents was ranked first with the mean scores of 73.33, 72.83 and 74.87 respectively for ICM, IPM and Non-IPM farmers. Problems faced by the ICM farmers were reported as labour scarcity for farm operations, power cut, requirement of more labour for the production of quality chilli and more expenditure towards plant protection chemicals ranked first, second, third and fourth with mean scores of 71.03, 70.17, 63.17 and 59.40 respectively. While IPM farmers ranked power cut, labour scarcity for farm operations, high cost of plant protection chemicals and requirement of more labour as first, second, third and fourth problems with mean scores 70.83, 70.33, 63.43 and 62.33 respectively. Hence, the researcher also suggested the need for farm mechanization to overcome the problem of labour shortage and solar system for power generation in the farm. Besides, Non-IPM farmers expressed requirement of more labour (73.63), difficulty in the adoption of ICM/IPM practices (63.50) and high cost of cultivation (61.93) as first, second and third constraints respectively for non-adoption of ICM/IPM.

Venkata *et al.* (2017) conducted study on Constraints and suggestions of the Chilli farmers in Bhiwapur Panchayt Samiti of Nagpur district. The study revealed that the important constraints were more labour charges, shortage of labour at the time of harvesting, grading and bagging of chilli produce, non remunerative prices during the time of glut in market, lack of knowledge about current market prices, less knowledge about correct quantity of insecticides, costly seeds and shortage of water. They also suggested to overcome the constraints that, minimum support prices should be fixed by the Government, reduce the labour problem by providing mechanized agricultural inputs, Government should provide storage and irrigation facilities throughout the year.

Singh *et al.* (2018) assessed the constraints encountered by the Chilli Growers of Telangana in the adoption of recommended chilli production technologies. Data were collected from 112 selected respondents from ten villages. Frequency and percentage method were used to analyze the data. Constraints observed in the adoption of recommended chilli production technologies were grouped into, Economic, Marketing, Technical, Situational and Extension problems. High labour charges (91.07%), high cost of agricultural inputs (83.03%) forms the major economic problem. In the case of marketing, the low market price of chilli (100%) constitutes the major problem. Technical constraints encountered were lack of knowledge about seed treatment (89.46%), lack of training regarding recommended chilli production technology (100%) and lack of knowledge about insects, pests and diseases (80.35%). The problem of electricity(100%), non-availability of agricultural input materials in the village were some of the situational problem observed in the study area. Unavailability of agriculture related information in the local language (72.32%) and irregular visit of agriculture officers (60.71%) were reported as the major extension problem. Further, the respondents also provided suggestions to overcome the constraints such as minimum support price, low rate of agricultural inputs, and provision of crop loan on time, communication of timely and relevant information on agriculture by extension officers (78.57%).

CHAPTER III

METHODOLOGY

This chapter outlines briefly the characteristics of the study area, the methods adopted in the selection of the samples, the nature and sources of data collection and the various statistical tools and techniques employed for substantiating the objectives of these research findings.

The methodology used is presented under the following heads:

3.1 Study area

3.2 Collection of data

3.3 Interpretation of data

3.4 Analytical tools and techniques

3.1 Study area

The study was conducted in the Upper Brahmaputra Valley Zone of Assam as this zone contributes major share to the total King Chilli production of Assam

3.1.1 Period of study

The field investigation was started in the firstweek of February 2019 and was completed by the first week of April 2019.

3.1.2 Sampling design

The sampling design used for the study was multistage stratified random sampling considering district at the first stage, ADO circle at the second stage, village at the third stage and individual farm as the ultimate stage of sampling.

3.1.3 Selection of districts

Two districts, namely Jorhat and Sivasagar were selected under UBVZ as the districts accounts for the highest area under King Chilli. In the present study the words King Chilli and *BhutJolokia* are used synonymously as the King Chilli is popularly known as *BhutJolokia* in the region.

3.1.4Selection of ADO circle

One ADO circle from each district was selected in the second stage, namely Selenghat ADO circle of Jorhat and Namti ADO circle of Sivasagar were randomly selected for the present investigation.

3.1.5 Selection of villages

In the next stage, three villages were selected at random from each ADO circle,*viz.*Tulsijaan, Sirakhonda and Panitola Gaon of Selenghat Circle and Misajaan, Dulia and Kukurachuwa of Namti ADO Circle. Thus, a total of 6 villages were selected for the study.

3.1.6 Selection of sample farmers

On the basis of size of operational holdings, the sample farmers were stratified into four distinct group by following the stratification given by Agricultural Census, India, 2010-11, Agricultural Census Division, Department of Agriculture & Co-operation, Ministry of Agriculture, Government of India, with slight modifications.

The given stratification was as follows

Sl. No.	Group	Classes(ha)
1	Marginal	Below 1 ha
2	Small	1 to <2 ha
3	Semi Medium	2 to <4 ha
4	Medium	4 to <10 ha
5	Large	10 ha and above

As no farmers were found with 10 ha operational holdings, therefore medium and large group were merged and semi medium group was renamed as medium category of farmers. Therefore, the modified stratification followed for the present study is presented below

Sl. No.	Group	Classes(ha)
1	Marginal	Below 1 ha
2	Small	1 to <2 ha
3	Medium	2 to <4 ha
4	Large	4 ha and above

Accordingly, 20 sample farmers growing King Chilli were selected from each villages belonging to Marginal, Small, Medium and Large category in the ratio of 4:3:2:1,i.e 8 Marginal, 6 Small, 4 Medium and 2 large farmers. Thus 48, 36, 24 and 12 marginal, small, medium and large farmers were selected at random from each category respectively, comprising a total of 120 farmers as the ultimate sample.

For studying the marketing channels, 1 Processor, 4 Village Aggregators, 4 Wholesalers, 10 Retailers and 10 Consumers were surveyed. Thus a total of 29 marketing agents were interviewed personally for the study.

3.2 Collection of data

Primary data have been collected with the help of a set of pre-tested schedule through personal interview method. Separate schedule were prepared for King Chilli growers and marketing agents. Different sources like internet and journals were also studied in view of the subject of research.

While preparing the schedule, available literatures were studied on the concerned subject consistent with the objectives specified and examined thoroughly for gaining proper knowledge of the parameters to be used and based on it the required schedule was designed to collect information from the respondents.

3.3. Interpretation of data

The data collected were compiled and tabulated for the purpose of analysis. Percentages and averages were calculated wherever necessary and presented in the tables.

3.4 Analytical tools and techniques

To meet the given objectives of the study, based on the nature and extent of availability of data, the following analytical tools and techniques were used.

3.4.1 Percentage analysis

Simple tabular analysis with average and percentage analysis were used for examining the demographic details, occupational status, educational status, land utilization pattern etc.

3.4.2 Economic Analysis

Economic analysis incorporates economics and viability of the individual farms. It forms the major part of the findings being analyzed. Following concepts are being employed in the present study.

3.4.2.1 Cost Analysis

Cost concept used in the farm management studies was employed for working out the expenses incurred in the King Chilli cultivation. The various costs used were: Cost A1, CostA2, Cost B1, Cost B2, Cost C1and Cost C2

a. **Cost A_1**: Cost A1 consists of all actual expenses in cash and kind, incurred incultivation by the farmers. In the present study, it includes the cost of hiredhuman labour, cost of machine charges, cost of planting materials, manures and compost, plant protection chemicals and electricity charges in irrigation, cost of polybag, miscellaneous expenses, and interest on working capital, landrevenue and depreciation.

b. **Cost A_2**: Cost A2 equals to Cost A1 plus Rent paid for leased in-land

c. **Cost B_1**: Cost A2 plus Interest on value of owned fixed capital assets(excluding land)

d. **Cost B_2** : Cost B1 plus Rental value of owned land (net of land revenue)

e. **Cost C_1**: Cost B1 plus Imputed value of family labour

f. **Cost C_2**: Cost B2 plus Imputed value of family labour

3.4.2.2 Return analysis

Returns over different cost concept were worked out to assess the feasibility of King Chilli cultivation. Following types of incomes were analyzed in the study

a. **Gross income**: Gross income was imputed by multiplying the main and differentiated products by their value or relevant market prices.

b. **Farm business income**: Gross return over Cost A1 is the farm business income

c. **Owned farm business income**: Gross return over Cost A2 is the Owned farm business income

d. **Family labour income**: Family labourincomeis the Gross return over Cost B2

e. **Net income**: Net income is the Gross return over Cost C2

3.4.3 Marketing analysis

Marketing analysis involves various concepts like Marketable and Marketed surplus, Marketing cost, Marketing margin, Price spread and Marketing efficiency. These are discussed and explained individually in this section.

3.4.3.1Marketed surplus and marketable surplus

According to Acharya *et al.*, 1987, Marketed surplus is the quantity of a commodity, which a farmer actually sells in the market.On the other hand, marketable surplus is the actual quantity of a commodity that is available with the farmer after meeting his seed requirement, family requirements, kind payments as wages and payments to other to whom he pays for their services

3.4.3.2Marketing cost

The total marketing cost (TMC) incurred by the producer / seller and by various intermediaries was calculated as:

$$TMC = C_p + \Sigma\, MC_i$$

Where,

TMC is the total marketing cost

C_p is the marketing cost incurred by farmer

$MC_i$is the marketing cost incurred by i^{th}trader or intermediary

3.4.3.3Marketing margin

Marketing margin of middlemen was calculated as the difference between the total payment (marketing cost + purchase price) and receipts (sale price) of themiddlemen and was calculated as:

$$A_{mi} = P_S – (P_P + MC_i)$$

Where,

A_{mi} is the absolute marketing margin of i^{th} middlemen

P_S is the selling price of the i^{th} middlemen

P_P is the purchase price of the i^{th}middlemen

$MC_i$is the marketing cost incurred by i^{th}intermediaries

3.4.3.4Price spread

Price spread is defined as the difference between the retail price and the farm gate price.

$$\text{Price spread} = P_C – P_F$$

Where;

P_C is the price paid ultimately by the consumer

P_F is the price received by the farmer

3.4.3.5 Producer's share in consumer's rupee

Producer's share in consumer's rupee was calculated by the formulae:

Producer's share in consumer's rupee = $(P_F/P_C)*100$

Where;

P_F is the price received by the farmer

P_C is the price paid by the consumer

3.4.3.6Marketing efficiency analysis

The marketing efficiency of the selected channels was studied by using Modified Acharya's formula:

$$MME = \frac{P_f}{(TMC + TMM)}$$

Where, MME = modified measure of marketing efficiency

P_f = price received by farmer

TMC = Total marketing cost incurred in a particular marketing channel

TMM = Total marketing margin of all intermediaries

3.4.4Henry Garrett'srankingtechnique

This technique was used to evaluate the most disturbing factor or constraints faced by the respondents. The rank assigned by each respondent for all the factors was first converted into score value with the help of the following formula:

$$\text{Percent position} = 100 \frac{(R_{ij} - 0.5)}{N_j}$$

Where

R_{ij} = Rank given for the i^{th} variable by j^{th} respondents

N_j = Number of variable ranked by j^{th} respondents

The estimated percent position was converted into scores with the help of Garrett's Table. For each factor, the scores of each individual were added and then total Garrett's score was worked out. The constraint with highest average score was given 1^{st} rank, considered most important factor and others were ranked successively.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter presents the results of the study and discusses the results in accordance with the objectives of the study. The data collected were tabulated and analysed with the help of specific tools and appropriate methods for the accomplishment of the objectives. The main results of the study are presented in this chapter under the following heads:

4.1 Socio-economic characteristics of the respondents in the study area

4.2 Cropping pattern of sample farmers

4.3 Analysis of production, cost and return from King Chilli (*Bhut Jolokia*) cultivation

4.4 Analysis of marketing pattern of King Chilli *(Bhut Jolokia*)

4.5 Identify the constraints in production and marketing of King Chilli (*Bhut Jolokia*)

4.1 Socio-economic characteristics of the respondents

A study was carried out to analyze the socio-economic status in respect to family size, type of family, educational level, occupation and land holding and land utilization pattern of the sample farmers in the study area.

4.1.1 Family size

The table 4.1 shows the family size of the sample household along with the distribution of population of the sample households according to sex and age

It was revealed from the table that for the overall farm, 15.29 per cent were males and 17.21 per cent were females in the age group of below 15 years of age while 27.65 per cent and 26.91 per cent were males and females respectively in the age group of 15-59 years of age. In the age group of 60 years and above, the same accounted for 6.91 per cent and 6.03 per cent respectively. Out of the total population of 680 members, 339 were males (49.85 per cent) and 341 were females (50.15 per cent). The total population was found to be the highest in marginal farms, followed by small, medium and large

farms. Whereas average family size was found the lowest in case of marginal farms with 5 members and highest in large farms with 8 members. For the overall farms, the average family size was 6 members.

4.1.2 Type of family

It was found that for the entire sample about 66.67 per cent of the respondents had nuclear family while other respondents had joint family. The percentage of nuclear family type was the highest for the marginal farmers (79.17 per cent) while it was the lowest for the large farmers (41.67 per cent). Data on type of family of the sample respondents are presented in Table 4.2

4.1.3 Education

Table 4.3 shows the education level of the respondents across various farm sizes. It was observed that only 7.50 per cent of the respondents of the overall sample were illiterate, of which the highest illiteracy was seen in marginal farmers (10.42 per cent) whereas all the large farmers were literate. In case of marginal, small and medium farmers, majority of the respondents were found to obtain middle level education, constituting 47.92 per cent, 41.67 per cent and 45.83 per cent respectively while in case of large farmers, majority of the respondents obtained higher level education (41.67 per cent). Of all the respondents, 3.33 per cent were graduates and above. This reveals that the respondents after colleges were interested in choosing King Chilli cultivation as an option for self-employment.

4.1.4 Occupational status

Table 4.4 reveals the occupational status of the sample farmers across different farm sizes. It was found that all the marginal farmers were engaged in agriculture as primary occupation, while 20.83 per cent of the respondents were also engaged in business as a secondary occupation. In case of small farmers, 91.67 per cent of the respondents were engaged in agriculture as a primary occupation, while 8.33 per cent were engaged in agriculture as secondary occupation. In case of medium farmers, 75.00 per cent were engaged in agriculture as primary occupation, while in large farmers, 83.33 per cent were engaged in agriculture as primary occupation. Overall 90.83 per cent of the respondents were primarily involved in agriculture, while the rest 9.17 per cent of the

respondents were involved in business primarily, who also opted for agriculture as secondary occupation.

4.1.5 Land utilization pattern

Land is the basis for agricultural use and any other productive activity. Land utilization pattern shows how the limited land area is being utilized under different purposes.

In the entire sample the average size of holding was found to be 1.730 hectares. Out of which 1.530 hectares were utilised for cultivation, constituting 88.43 per cent share to the total land area, remaining land were used for other purposes. The percentage share of land for cultivation decreased with the increase in farm size, as marginal farmers devoted the entire land excluding the homestead land (6.208 per cent) for cultivation whereas the other groups kept fallow land and also utilised their land for plantation crops. Plantation crops mainly tea and agaru were grown commercially by small (6.04 per cent), medium (5.74 per cent) and large farmers (14.29 per cent).

Table 4.2 Type of family of the sample respondents across farm sizes

Farm size	Total number of household	Family type	
		Nuclear	Joint
Marginal	48	38	10
	(100)	(79.17)	(20.83)
Small	36	24	12
	(100)	(66.67)	(33.33)
Medium	24	13	11
	(100)	(54.17)	(45.83)
Large	12	5	7
	(100)	(41.67)	(58.33)
All farms	120	80	40
	(100)	(66.67)	(33.33)

Figures in parentheses indicate percentage of the respective population

Table 4.3: Distribution of sample respondents according to educational standard across farm sizes

Size Group	No. of respondents	Education				
		Illiterate	Primary	Middle	Higher	Graduation and above
Marginal	48	5	10	23	9	1
	(100)	(10.42)	(20.83)	(47.92)	(18.75)	(2.08)
Small	36	3	5	15	13	0
	(100)	(8.33)	(13.89)	(41.67)	(36.11)	(0)
Medium	24	1	5	11	5	2
	(100)	(4.17)	(20.83)	(45.83)	(20.83)	(8.33)
Large	12	0	2	4	5	1
	(100)	(0)	(16.67)	(33.33)	(41.67)	(8.33)
All farms	120	9	22	53	32	4
	(100)	(7.50)	(18.33)	(44.17)	(26.67)	(3.33)

Figures in parentheses indicate percentage of the respective population

Table 4.5 Per farm land utilization pattern

(Figures in hectare)

Sl. No.	Land use pattern	Types of farm				
		Marginal	**Small**	**Medium**	**Large**	**All farms**
1	Operational holding/average size of holding	0.902	1.423	2.610	4.270	1.730
		(100)	(100)	(100)	(100)	(100)
2	Owned land	0.896	1.412	2.670	4.600	1.780
		(99.780)	(99.230)	(102.300)	(107.730)	(102.360)
3	Leased in land	0.006	0.011	Nil	Nil	0.004
		(0.190)	(0.770)			(0.230)
4	Leased out land	Nil	Nil	0.060	0.330	0.050
				(2.300)	(7.730)	(2.890)
5	Total land area	0.902	1.423	2.610	4.270	1.730
		(100)	(100)	(100)	(100)	(100)
6	Permanent fallow	Nil	0.015	0.080	0.020	0.020
			(1.060)	(3.070)	(0.470)	(1.160)
7	Land under plantation crop	Nil	0.086	0.150	0.610	0.110
			(6.040)	(5.740)	(14.290)	(6.360)
8	Home stead land	0.056	0.067	0.080	0.100	0.070
		(6.208)	(4.710)	(3.070)	(2.340)	(4.050)
9	Cultivated land	0.846	1.255	2.300	3.540	1.530
		(93.792)	(88.190)	(88.120)	(82.900)	(88.430)

Figures in parentheses indicate the percentage of the operational holding

Table 4.6 Cropping pattern and cropping intensity across farm sizes

(Figures in hectare)

Sl. No.	Season	Crops	Types of farm				
			Marginal	**Small**	**Medium**	**Large**	**All farms**
1	Kharif	Rice	0.68	0.99	1.75	2.79	1.20
			(56.86)	(71.22)	(74.47)	(78.15)	(72.65)
2	Rabi	Potato	0.05	0.06	0.06	0.08	0.06
			(4.18)	(4.32)	(2.55)	(2.24)	(3.52)
		Tomato	0.02	0.02	0.02	0.02	0.02
			(1.67)	(1.44)	(0.85)	(0.56)	(1.21)
		Cabbage	0.02	0.05	0.04	0.04	0.04
			(1.67)	(3.60)	(1.70)	(1.12)	(2.12)
		Yum	0.02	0.01	0.01	0.02	0.02
			(1.67)	(0.72)	(0.43)	(0.56)	(0.91)
		Brinjal	0.01	0.02	0.02	0.02	0.01
			(0.50)	(1.44)	(0.85)	(0.56)	(0.87)
		King Chilli	0.12	0.18	0.36	0.52	0.24
			(10.03)	(12.95)	(15.32)	(14.57)	(14.74)
3	Summer	Cucumber	0.23	0.01	0.02	0.01	0.01
			(19.23)	(0.72)	(0.85)	(0.28)	(0.58)
		Okra	0.02	0.02	0.03	0.03	0.02
			(1.67)	(1.44)	(1.28)	(0.84)	(1.39)
		Spine Gourd	0.01	0.01	0.01	0.01	0.01
			(0.50)	(0.72)	(0.43)	(0.28)	(0.51)
		Ridge Gourd	0.02	0.02	0.03	0.03	0.02
			(2.01)	(1.44)	(1.28)	(0.84)	(1.49)
4	Gross Cropped Area		1.20	1.39	2.35	3.57	1.65
			(100)	(100)	(100)	(100)	(100)
5	Net Sown Area		0.84	1.26	2.30	3.54	1.53
6	Cropping intensity (%)		142.38	110.32	102.61	102.54	107.78

Figures in parentheses indicate the percentage of the gross cropped area

4.2 Cropping pattern of sample farmers

Cropping pattern indicates the proportion of area under various crops at a particular period of time and space. As no cropping pattern is fixed for a particular region at a point of time and so it is referred as a dynamic concept. The change in cropping pattern over space and time signifies the changes that have taken place in the sphere of agricultural development.

Table 4.6 shows the general cropping pattern followed in the study area. The gross cropped area was found to be 1.20, 1.39, 2.35 and 3.57 hectares in marginal, small, medium and large farms respectively with an average of 1.65 hectares. For all the farms, in Kharif season only sali rice was grown, sharing the highest area of the gross cropped area (72.65 per cent)

The share of both Rabi vegetables (excluding King Chilli) and summer vegetables were low as more emphasis was given to King Chilli being high value crop with a share of 14.74 per cent of the gross cropped area for the entire farm. As a whole, potato, tomato, cabbage, yum and brinjal shared 3.52 percent, 1.21 per cent, 2.12 per cent, 0.91 per cent and 0.87 per cent respectively while cucumber, okra, spine gourd and ridge gourd shared 0.58 per cent, 1.39 per cent, 0.51 per cent and 1.49 per cent respectively.

The cropping intensity was found to be as low as 107.78 per cent for an average farm because in the study area less attention was given to grow other vegetables as more attention was diverted to King Chilli cultivation. From the table, it is clear that cropping intensity decreased with increase in the size of holding.

4.3 Production, Cost and return from King chilli (*Bhut Jolokia*) cultivation

4.3.1 Production of King Chilli (*Bhut Jolokia*) by different farm size group

The study found that production of King Chilli increased with increase in the farm size. It was 6.31 quintals, 8.96 quintals, 18.30 quintals and 25.02 quintals for marginal, small, medium and large farms respectively. However, productivity was found the highest in marginal farms (52.58 q/ha), followed by medium farms (50.83 q/ha), small farms (49.78 q/ha) and large farms (48.12 q/ha). Table 4.7 depicts the area, production and productivity of King Chilli of the sample farmers.

Table 4.7 Area, Production and Productivity of King Chilli (*Bhut Jolokia)* per farm

Category of farms	Area (ha)	Production (q)	Productivity (q/ha)
Marginal	0.12	6.31	52.58
Small	0.18	8.96	49.78
Medium	0.36	18.30	50.83
Large	0.52	25.02	48.12
All farms	0.23	11.37	50.94

Table 4.8 Cost A1 of King Chilli (*Bhut Jolokia*) cultivation per hectare across different size of farms

(In Rupees)

Cost items	Farm size				All farms
	Marginal	Small	Medium	Large	
Seeds/planting material	10009	9805	6880	5634	8884
	(11950	(1729)	(2463)	(2925)	(1782)
FYM	19843	20780	23143	19775	20777
	(2369)	(3665)	(8283)	(10267)	(4730)
Vermicompost	5393	5937	5763	8523	5943
	(644)	(1047)	(2063)	(4425)	(1427)
Plant protection chemicals	14817	16378	12235	13194	14607
	(1769)	(2889)	(4379)	(6850)	(3135)
Electricity	492	819	1187	1268	807
	(59)	(144)	(425)	(658)	(218)
Machine charge	1222	2780	2998	2472	2169
	(146)	(490)	(1073)	(1283)	(548)
Polybag	Nil	Nil	838	963	264
	Nil	Nil	(300)	(500)	(110)
Hired labour	4630	10679	23001	21504	11806
	(553)	(1884)	(8232)	(11164)	(3549)
Miscellaneous	4607	5134	3912	3050	4470
	(550)	(906)	(1400)	(1583)	(930)
Total working expenses	61012	72310	79957	76383	69728
	(7283)	(12755)	(28618)	(39656)	(16429)
Interest on working capital (4%)	2466	2892	3198	2673	2761
	(294)	(510)	(1145)	(1388)	(639)
Land revenue	450	450	450	450	450
	(54)	(81)	(161)	(234)	(101)
Depreciation on machines and implements	6723	7247	7980	11759	7635
	(803)	(1278)	(2856)	(6105)	(1886)
Cost A_1	70651	82900	91585	91265	80574
	(8434)	(14624)	(32780)	(47382)	(19055)

Figures in parentheses indicate per farm cost

Table 4.9 Total cost of King Chilli (*Bhut Jolokia*) cultivation per hectare across different size farms

(In Rupees)

Cost items	Farm size				All farms
	Marginal	Small	Medium	Large	
Cost A_1	70651	82900	91585	91265	80574
	(8434)	(14624)	(32780)	(47382)	(19055)
Rent paid on leased in land	2003	2314	Nil	Nil	1495
	(240)	(417)	-	-	(221)
CostA_2	72654	85214	91585	91265	82069
	(8675)	(15041)	(32780)	(47382)	(19276)
Interest on value of owned fixed capital assets (Excluding land) 7%	471	507	559	823	534
	(56)	(89)	(200)	(427)	(132)
Cost B_1	73124	85721	92144	92088	82604
	(8731)	(15130)	(32980)	(47809)	(19408)
Rental value of owned land	35497	35186	37500	37500	36005
	(4260)	(6333)	(13417)	(19469)	(8234)
Cost B_2	108621	120907	129644	129588	118608
	(12990)	(21464)	(46396)	(67278)	(27642)
Imputed value of family labour	44122	28711	16506	15461	31109
	(5267)	(5064)	(5908)	(8027)	(5610)
Cost C_1	117246	114432	108650	107550	113713
	(13998)	(20194)	(38887)	(55836)	(25018)
Cost C_2	152743	149618	146150	145050	149718
	(18257)	(26528)	(52304)	(75305)	(33253)

Figures in parentheses indicate per farm cost

4.3.2 Cost of King Chilli (*Bhut Jolokia*) cultivation in different size farms

The present section deals with the cost analysis of King Chilli cultivation using Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2.

The various items of Cost A_1 in King Chilli production across different category of farms are presented in Table 4.8, which portrays that on an average Cost A_1 was worked out to be Rs 80574 per hectare and Rs 19055 per farm. It includes cost incurred in material inputs, electricity charge for hiring and fuel cost, polybag, hiring labour, miscellaneous cost, interest on working capital (computed as 4 per cent of the total working capital), revenue paid on land prevailing in the surveyed area (Rs 60 per bigha) and depreciation cost of machinery and implements.

It is evident from the table that money spent on planting materials was considerably high for the marginal farmers, followed by small and medium farmers while it was least for the large farmers, which were Rs 10009, Rs 9805, Rs 6880 and Rs 5634 per hectare respectively because most of the marginal and small farmers preferred to buy seedlings that is feasible for small area while medium and large farmers mostly preferred to buy seeds or fruits of King Chilli and raised their own seedlings. Details of planting material cost are show in the Appendix I.

For the entire sample, the extent of FYM cost was the highest among all the cost items included in CostA1, recorded as Rs 20777 per hectare and Rs 4730 per farm. Other important cost items were cost of planting protection chemicals (Rs 14607 per hectare) and cost of hired labour (11806 per hectare). On an average depreciation cost per hectare for the entire sample was found to be Rs.7635 and it varied from Rs 6723 in marginal farms to Rs. 11759 in large farms, thus showing an increasing trend with the increase in farm size. It means that large farms were more mechanised. Overall farms of higher size groups incurred more amount of Cost A_1 per hectare than the smaller size groups.

Table 4.9 shows cost A_1, cost B_1, cost B_2, cost C_1 and cost C_2 for various size groups. Cost A_2 was computed by adding Cost A_1 and rent paid in leased land. For medium and large farms no leased land was found, so Cost A_2 was same as cost A_1. The study revealed that Cost A_2 for the entire sample was Rs. 82069 per hectare and Rs. 19276

per farm. The table clearly shows that Cost A_2 was the highest for medium farms (Rs. 91585 per hectare) and lowest for marginal farms (Rs. 72654 per hectare). Cost B_1 was worked out by adding cost A_2 with the interest on value of owned fixed capital asset, while Cost B_2 was worked out by adding Cost B_1 with rental value of owned land. Cost B_1 and Cost B_2 on an average were Rs 82604 and Rs 118608 per hectare respectively. Cost C_1 for the average farm was found to be Rs 113713 per hectare, calculated by adding the imputed value of family labour to Cost B_1 while Cost C_2 was computed by adding the imputed value of family labour to cost B_2. Cost C_2 was the total cost of King Chilli production, which was found decreasing with increase in the farm size per hectare. It was Rs 152743, Rs 149618, Rs 146150 and Rs 145050 for marginal, small, medium and large farms respectively.

4.3.3 Returns from King Chilli (*Bhut Jolokia*) cultivation

Returns from King Chilli was studied by taking into consideration the various types of farm income such as gross income, farm business income, owned farm income, family labour income, net income. Return per rupee based on total cost was also worked out.

To find out the gross income from King Chilli, total production of fresh product was multiplied by the per quintal price and also number of planting materials sold were multiplied by the seedling price to find the income from planting materials. The gross income included both the income from selling fresh product and income from planting materials. Thus, both the incomes were added to obtain the final gross income.

Gross income from selling fresh King Chilli for the entire sample farm was found to be Rs. 878928 per hectare while income from selling planting material was found to be Rs 3563 per hectare. Income from planting material was significantly low for marginal farms (Rs 454) compared to large farms (Rs 6742). It was due to the fact that not many farmers had entered the business of planting materials as few of them had acquainted with the skill of raising seedlings. The combined gross income per hectare (income from fresh product and income from planting material) was calculated to be Rs 859169, Rs 885117, Rs 918260 and Rs. 896368 for marginal, small, medium and large farms respectively. Details of gross return from King Chilli, i.e. *Bhut Jolokia* is presented in Table 4.10

Farm business income for the entire sample was recorded at Rs. 801918per hectare which is shown in Table 4.11. It was the lowest in marginal farms (Rs 788519 per hectare) and the highest in medium farms (Rs 826674 per hectare)

Table 4.12 presents the owned farm income across different farms, which was found to be Rs 800422 per hectare for the entire sample. It also followed same trend as farm business income, i.e. the lowest in marginal farms (Rs 786516per hectare) and the highest in medium farms (Rs 826674 per hectare).

The family labour income and the net income for the entire sample was calculated to be Rs 763883 per hectare and Rs 732774 per hectare respectively. Family labour incomes for different farms are shown in Table 4.13. It is understood from the Table 4.14 that net income increased with the increase in the size of farm, except for the large farms, whose income was lower than medium farms due to lower productivity of large farms.

Returns per rupee ratio was found to be 5.6 for marginal farms, 5.9 for small farms, 6.3 for medium farms and 6.2 for large farms. Table 4.15 depicts that returns per rupee for an average farm was 5.9.

The above analyses brought out the fact that returns increased with increase in the size of farm. Per hectare Cost A1 was found least for marginal farms. However, with the additional cost of leased in land and family labour cost, the total cost, i.e. Cost C_2 altered and thus found the highest in marginal farms. Moreover, due to decreased total cost (per hectare) in large farms, return per rupee increased trend with the increase in the farm size

Table 4.10 Gross return from King Chilli (*Bhut Jolokia*) cultivation

Particulars	Unit	Farm size				All farms
		Marginal	Small	Medium	Large	
Total production						
a) Fresh product	q	52.58	49.78	50.83	48.12	50.94
b) Price of fresh product	Rs/q	16332	17684	17940	18488	17254
c) Income from fresh product	Rs	858716	880329	911903	889627	878928
d) Planting materials	No.	130	1368	1816	1926	1018
e) Price of planting materials	Rs/plant	3.5	3.5	3.5	3.5	3.5
f) Income from planting material	Rs	454	4787	6356	6742	3563
g) Gross income = c + f	Rs	859169	885117	918260	896368	882491

Table 4.11 Farm business income per hectare from King Chilli (*Bhut Jolokia*) cultivation

(In rupees)

Particulars	Farm size				All farms
	Marginal	Small	Medium	Large	
Gross income	859169	885117	918260	896368	882491
Cost A1	70651	82900	91585	91265	80574
Farm business income	788519	802217	826674	805103	801918

Table 4.12 Owned farm income per hectare from King Chilli (*Bhut Jolokia*) cultivation (In rupees)

Particulars	Farm size				All farms
	Marginal	Small	Medium	Large	
Gross income	859169	885117	918260	896368	882491
Cost A2	72654	85214	91585	91265	82069
Owned farm income	786516	799903	826674	805103	800422

Table 4.13 Family labour income per hectare from King Chilli (*Bhut Jolokia*) cultivation (In rupees)

Particulars	Farm size				All farms
	Marginal	Small	Medium	Large	
Gross income	859169	885117	918260	896368	882491
Cost B2	108621	120907	129644	129588	118608
Family labour income	750548	764209	788616	766780	763883

Table 4.14 Net income per hectare from King Chilli (*Bhut Jolokia*) cultivation (In rupees)

Particulars	Farm size				All farms
	Marginal	Small	Medium	Large	
Gross income	859169	885117	918260	896368	882491
Cost C2	152743	149618	146150	145050	149718
Net income	706426	735498	772110	751318	732774

Table 4.15 Returns per rupee over total cost of King Chilli (*Bhut Jolokia*) cultivation

Particulars	Farm size				All farms
	Marginal	Small	Medium	Large	
Gross income	859169	885117	918260	896368	882491
Cost C2	152743	149618	146150	145050	149718
Returns per rupee	5.6	5.9	6.3	6.2	5.9

4.4 Analysis of marketing pattern of King Chilli (*Bhut Jolokia*)

4.4.1 Marketable and marketed surplus of different farm size

Table 4.16 clearly shows the production of King Chilli by different size category of farms along with marketable and marketed surplus. It was observed from the Table that the average production of King Chilli (*Bhut Jolokia)* for the entire sample was 11.37 quintal, out of which the quantity kept for consumption and other uses was 0.56 quintal (4.93 percent) and marketable or marketed surplus was found to be 10.81 quintal (95.07%). As the shelf life of King Chilli is very less, so soon after harvesting, the products were marketed. That is why marketable and marketed surplus were found to be same in case of King Chilli. The marketed surplus for marginal, small, medium and large farms was found as 93.66 percent, 94.20 percent, 96.28 percent and 96.68 percent respectively. It is revealed from the Table that with increased production from marginal farms to large farms, marketed surplus also increased similarly.

Table 4.16 Category wise Marketable and Marketed Surplus of the Sample Area

Category of farms	Production (q)	Consumption and other uses (q)	Marketable Surplus (q)	Marketed Surplus (q)
Marginal	6.31	0.40	5.91	5.91
	(100)	(6.34)	(93.66)	(93.66)
Small	8.96	0.52	8.44	8.44
	(100)	(5.80)	(94.20)	(94.20)
Medium	18.3	0.68	17.62	17.62
	(100)	(3.72)	(96.28)	(96.28)
Large	25.02	0.83	24.19	24.19
	(100)	(3.32)	(96.68)	(96.68)
All farms	11.37	0.56	10.81	10.81
	(100)	(4.93)	(95.07)	(95.07)

Figures in parentheses indicate the percentage of the total production of different farms

4.4.2 Marketing channel, cost, margins, price spread and efficiency

The marketing channel shows the various paths through which product moves from the hands of the producer to the ultimate consumer. The study of marketing channel is important to know the efficiency of marketing, in terms of price spread. An efficient marketing channel will ensure minimum cost involved in various stages, enough margins for the intermediaries to stay in the channel, also ensuring minimum involvement of middle men and larger share to the producer in terms of consumer's rupee. The marketing agents involved in the marketing of King Chilli or *Bhut Jolokia* were village aggregator/trader, wholesaler, retailer and processor. They perform different role in various stages of the channel. In marketing of King Chilli they play the following role:

Village aggregator/trader: They procure the products directly from the producer's field going door to door and trade the aggregated products from the village to the wholesalers of different places. They also link the marketing channel with the distant traders.

Wholesaler: They procure the products in bulk from the village aggregator. Sometimes they also collect the products directly from the nearby farmer's field. They market the aggregated products to the retailers of different markets.

Retailer: They buy product from various market middlemen mostly from wholesalers and sell their produce directly to consumer.

Processor: The processor (here, the processor of dried King Chilli products) sell their value added products to the distant traders or directly to the distant consumers through the online mode.

4.4.2.1 Marketing cost incurred by the intermediaries in the various stages of marketing

Table 4.17 depicts the marketing cost incurred by various market functionaries. Marketing cost incurred by the producer was Rs 1120 per quintal of King Chilli. However in case of selling the products to the wholesaler or village aggregator, they did not incur any marketing cost as the products have been collected from the farmer's field. The total cost incurred by the village aggregator in selling the products to the retailers in nearby markets was Rs 1120 per quintal of King Chilli as bus fare or train fare in delivering the products to the distant market were excluded from the total cost of

Rs 1520. Similarly, while selling the products to the distant wholesalers, village aggregators incurred Rs 1440 per quintal of King Chilli as market fee was excluded from the total cost of Rs 1520. The total cost borne by the wholesaler was found to be Rs1220 per quintal of King Chilli. Wholesalers while receiving the products from the village aggregator, they incurred Rs 720 per quintal of King Chilli as transportation cost of collecting directly from the farmer's field was excluded from the total cost. The marketing cost incurred by the retailer was found to be Rs 1250 per quintal of King Chilli. The marketing cost of processor was found to be Rs 12305 per quintal of dried King Chilli or *Bhut Jolokia*.

4.4.2.2 Channels of distribution, marketing efficiency and price spread of King Chilli in the early season (March/April)

In the early season four channels were identified. During that period mostly unripened King Chilli or *Bhut Jolokia* were demanded. High market price prevailed during that period as initial production was less and mostly unripened King Chilli or *Bhut Jolokia* was demanded. Intermediaries like village aggregators, wholesalers and retailers entered the marketing chain.

I. Producer ⟶ Consumer

In this channel, the producer directly sold their products to the consumer in the nearby markets. From Table 4.18 it is revealed that 25 per cent of the products of the early season moved through this channel. This channel was followed by the producer who intended to get high market price of unripened King Chilli in the early season.

It is evident from Table 4.19 that producer's share in consumer's rupee was the highest in this channel (97.20 per cent). Marketing efficiency of this channel was found to be the highest (34.71) as the price spread was least (Rs. 1120).

II. Producer ⟶ Retailer ⟶ Consumer

In this channel producers carried their product to nearby market area and sold their products to retailers. From the Table it is revealed than only 5 per cent of the marketed surplus of the early season moved through this channel. As initially production was less during March/April and market price was high, so rather selling the products to retailers, farmers mostly sold their products directly to the consumers.

It is found from Table 4.19 that price spread was Rs 6120 and producer's share in consumer's rupee was 87.50. So, marketing efficiency of this channel was found 5.54, lesser than channel I.

III. Producer ⟶ Wholesaler ⟶ Retailer ⟶ Consumer

In this channel, wholesaler themselves visited farmer's field and collected King Chillies from nearby village areas and further sold their products to the retailers and finally through them reached the consumers. Table 4.18 shows that 35 per cent of the marketed surplus moved through this channel.

In this channel producer's share in consumer's rupee was 84.70 per cent with higher price spread of Rs 8000 than the earlier channels. Table 4.19 shows that marketing efficiency of this channel was 4.

IV. Producer ⟶ Village aggregator ⟶ Retailer ⟶ Consumer

Producers sold their products to village aggregators, who collected King Chillies or *Bhut Jolokia* from the farmer's place and sold the products to retailers. As the quantity of the collected products was less initially, so they excluded wholesalers in the channel to earn better margin for their product by selling to retailers directly. Though transaction was found minimum due to initial stage of production, village aggregators entered the channel in order to develop market relationship with the farmers in the subsequent season. Table 4.18 shows that 35 per cent of the marketed surplus of the early season moved through this channel.

It is observed from Table 4.19 that marketing efficiency was 4, same as the previous channel.

Table 4.17 Marketing cost incurred by various intermediaries

Sl. No.	Name of the intermediaries	Item of cost	Cost Incurred per quintal of King Chilli (In Rs.)
1	**Marketing Cost incurred by Producer**	Labour Charge	200
		Packing bag	240
		Transportation charge	500
		Market fee	80
		Miscellaneous	100
		Total	1120
2	**Marketing Cost incurred by Village aggregator/trader**	Personal expenses	200
		Packing bag	240
		Transportation charge	500
		Delivery charge (Bus fare, not incurred in case of nearby market)	400
		Market fee (not incurred if delivered to distant market)	80
		Physical loss and Spoilage	100
		Miscellaneous	100
		Total	1520
3	**Marketing Cost incurred by Wholesaler**	Personal expenses	200
		Packing bag	240
		Transportation charge (not incurred, if delivered by traders)	500
		Market Fee	80
		Physical loss and Spoilage	100
		Misc.	100
		Total	1220
4	**Marketing Cost incurred by Retailer**	Personal expenses	200
		Packing bag	50
		Transportation charge	800
		Physical loss and Spoilage	100
		Misc.	100
		Total	1250

Table 4.17 contd…

Sl. No.	Name of the functionaries	Item of cost	Cost Incurred per quintal of King Chilli (In Rs)
5	**Marketing Cost incurred by Processor (dried chilli)**	Labour Charge	200
		Packaging charge	7000
		Delivery charge	500
		GST	5
		Online market fee	3500
		Physical loss and Spoilage	100
		Misc.	1000
		Total	12305

Table 4.18 Marketing channels identified for King Chilli in the early season (March/April) and channel wise transaction

Particulars	Marketing Channels	Percentage of commodity transacted (%)
Channel I	Producer – Consumers	25
Channel II	Producer-Retailer-Consumer	5
Channel III	Producer – Wholesaler-Retailer-Consumer	35
Channel IV	Producer-Village aggregator-Retailer-Consumer	35

Table 4.19 Price buildup of King Chilli in the early season (March/April) in the identified marketing channel

Market Player	Price build up (per quintal of King Chilli)	Channel I	Channel II	Channel III	Channel IV
Producer	Farm selling price(Rs)	40000	35000	32000	32000
	Farmer's marketing cost(Rs)	1120	1120	0	0
	Farm gate net price (Rs)	38880	33880	32000	32000
Village aggregator	Purchase price (Rs)				32000
	Aggregator's marketing cost (Rs)				1120
	Aggregator's margin (Rs)				1880
	Margin as pc of sale price (%)				5.37
	Village Aggregator's sale price(Rs)				35000
Wholesaler	Purchase price(Rs)			32000	
	Wholesaler's marketing cost(Rs)			1220	
	Wholesaler's margin(Rs)			1780	
	Margin as pc of sale price (%)			5.09	
	Wholesaler's sale price (Rs)			35000	
Retailer	Purchase price (Rs)		35000	35000	35000
	Retailer's marketing cost (Rs)		1250	1250	1250
	Retailer's margin (Rs)		3750	3750	3750
	Margin as pc of sale price (%)		9.38	9.38	9.38
	Retailer's sale price to consumer(Rs)		40000	40000	40000
Consumer	Price paid by consumer(Rs)	40000	40000	40000	40000
Total marketing cost(Rs)		1120	2370	2470	2370
Total marketing margin(Rs)		0	3750	5530	5630
Price spread(Rs)		1120	6120	8000	8000
Producer's share in consumer's Rupee (%)		97.20	84.70	80.00	80.00
Marketing efficiency		34.71	5.54	4.00	4.00

*pc=percentage

4.4.2.3 Channels of distribution, marketing efficiency and price spread of King Chilli in the mid-season (May)

In the mid season a total of six channels were identified. With increased production from the earlier season, products were also traded to distant market.

I. Producer ⟶ Consumer

In this channel, 10 per cent of the marketed surplus of the mid season was sold directly to the consumers. With no involvement of market middlemen, producer's share in consumer's rupee was the highest (96.27 per cent), also price spread was the least (Rs 1120) and marketing efficiency was the highest in this channel during mid-season (25.79) shown in Table 4.21.

II. Producer ⟶ Retailer ⟶ Consumer

It is revealed from Table 4.20 that 8 per cent of the marketed surplus moved through this channel, which is higher than early season. Thus, with increased production, producer was found getting more dependent on intermediaries than direct sale as harvested King Chillies were sold on the harvesting day itself. Table 4.21shows that price spread and producer's share in consumer's rupee in this channel were Rs 6120 and 79.6 per cent respectively. The marketing efficiency was found to be 3.90.

III. Producer ⟶ Wholesaler ⟶ Retailer ⟶ Consumer

In this channel, 15 per cent of the marketed surplus of mid season was sold through wholesaler and retailer. Table 4.21 shows that producer's share in consumer's rupee was 73.33 per cent. The marketing efficiency was 2.75, decreased compared to channel II, due to increased price spread of Rs 8000.

IV. Producer ⟶ Village aggregator ⟶ Wholesaler ⟶ Retailer ⟶ Consumer

In this channel, village aggregator sold their collected products to the wholesalers of remote areas as production was scaling up in that period. Wholesalers in this channel were dependent on village aggregator, rather than collecting directly from the farmer's place. Price spread was found to be Rs 10000 depicted in Table 4.20. Producer's share in consumer's rupee was 66.67 per cent. With increased margins by the

intermediaries, the marketing efficiency was found to be least efficient. It was found as 2 by Acharya's formula. However, significant amount of the marketed surplus (30 per cent) moved through this channel.

V. Producer ⟶ Village aggregator ⟶ Distant Trader ⟶ Distant Retailer ⟶ Distant Consumer

In this channel, village aggregator collected King Chillies from the nearby villages and traded the products to distant retailer or distant consumer, mainly to Dimapur. Highest amount of marketed surplus of the mid season (35 per cent) was traded through this channel due to high demand and market price in the hills, as it was the off season for hill regions.

VI. Producer ⟶ Distant Trader ⟶ Distant Retailer ⟶ Distant Consumer

Through this channel, very less quantity of the marketed surplus (2 per cent) was traded due to lower risk bearing ability of the farmers. As consumption of King Chilli or *Bhut Jolokia* cannot be increased beyond certain limit, so products were marketed through this channel.

Table 4.20 Marketing channels identified for King Chilli in the mid-season (May) and channel wise transaction

Particulars	Marketing Channels	Percentage of commodity transacted (%)
Channel I	Producer – Consumers	10
Channel II	Producer-Retailer-Consumer	8
Channel III	Producer – Wholesaler-Retailer-Consumer	15
Channel IV	Producer-Village aggregator-Wholesaler-Retailer-Consumer	30
Channel V	Producer-Village aggregator-Distant Trader-Distant Retailer-Distant Consumer	35
Channel VI	Producer-Distant Trader-Distant Retailer-Distant Consumer	2

Table 4.21 Price buildup of King Chilli in the mid-season (May) in the identified marketing channel

Market Player	Price build up (per quintal of King Chilli)	Channel I	Channel II	Channel III	Channel IV
Producer	Farm selling price(Rs)	30000	25000	22000	20000
	Farmer's marketing cost(Rs)	1120	1120	0	0
	Farm gate net price(Rs)	28880	23880	22000	20000
Village aggregator	Purchase price(Rs)				20000
	Aggregator's marketing cost(Rs)				1440
	Aggregator's margin(Rs)				1560
	Margin as pc of sale price (%)				6.78
	Village aggregator's sale price(Rs)				23000
Wholesaler	Purchase price (Rs)			22000	23000
	Wholesaler's marketing cost(Rs)			1220	720
	Wholesaler's margin(Rs)			1780	1280
	Margin as pc of sale price (%)			7.12	5.12
	Wholesaler's sale price(Rs)			25000	25000
Retailer	Purchase price(Rs)		25000	25000	25000
	Retailer's marketing cost(Rs)		1250	1250	1250
	Retailer's margin(Rs)		3750	3750	3750
	Margin as pc of sale price (%)		12.50	12.50	12.50
	Retailer's sale price to consumer(Rs)		30000	30000	30000
Consumer	Price paid by consumer (Rs)	30000	30000	30000	30000
Total marketing cost(Rs)		1120	2370	2470	3410
Total marketing margin(Rs)		0	3750	5530	6590
Price spread(Rs)		1120	6120	8000	10000
Producer's share in consumer's Rupee (%)		96.27	79.6	73.33	66.67
Marketing efficiency		25.79	3.90	2.75	2

*pc = percentage

4.4.2.4 Channels of distribution, marketing efficiency and price spread of King Chilli in the peak season (June/July)

Highest numbers of channels were identified during the peak season. Low market price prevailed during that period as higher supply of King Chilli or *Bhut Jolokia* was reported in the peak season. In addition to village aggregator/traders, wholesalers, retailers and distant traders, processor also entered the marketing channel in June/July.

I. Producer⟶ Consumer

During this period of production, only 2 per cent of the marketed surplus of the peak season was sold by the producers directly to the consumers shown in table 4.22. Price spread was found the least in channel I. It was Rs1120 while producer's share in consumer's rupee was 94.40 per cent. Marketing efficiency was 16.86. Details of which are presented in Table 4.23.

II. Producer ⟶Retailer⟶ Consumer

It is revealed from the table 4.22 that 5 per cent of the marketed surplus moved through this channel, which was very less compared to other channels during the peak season. The marketing efficiency was found to be 2.27. From the Table 4.19, Table 4.21 and Table 2.23, it is revealed that marketing efficiency in the same channel decreased further in the peak season (2.27) than the early (5.54) and mid-season (3.90), also the margin of the retailers were 9.38 per cent in the early season, 12.50 per cent in the mid-season and 18.75 per cent in the peak season. Thus, it was found that with increased volume of marketed surplus in the market, the producers were more exploited by the intermediaries.

III. Producer ⟶ Wholesaler ⟶ Retailer ⟶ Consumer

In this channel, 12 per cent of the marketed surplus was sold through wholesaler and retailer. The marketing efficiency was 1, decreased compared to channel II, due to increased price spread of Rs10000. Also margin of the wholesaler was found more, 25.20 per cent. Therefore, wholesaler was found reaping the benefits as an intermediary in the channel. Whereas, the producers share in consumers rupee was found to 50 per cent, details of which are shown in Table 4.23.

IV. Producer → Village aggregator → Wholesaler → Retailer → Consumer

In this channel, product move through village aggregators, wholesalers, retailers and finally reached the consumers. The margin of wholesalers in this channel was found 15.20 per cent, decreased than channel III (25.20 per cent) due to involvement of additional intermediate, while margin of village aggregator was found 29.67 per cent. In the contrary, producer's share in consumer's rupee was found least, only 35 per cent and price spread was Rs 13000. Price received by the producer was least, Rs 7000 per quintal of King Chilli. Due to increased supply in the market producers lost their bargaining power as the product cannot be stored after harvest. With the involvement of various intermediaries earning more margins in the channel, the efficiency of this marketing channel found least, only 0.54, though considerable amount of marketed surplus of peak season moved through this channel, it was found 25 per cent from Table 4.22.

V. Producer → Village aggregator → Distant Trader → Distant Retailer → Distant Consumer

In this channel, 30 per cent of the marketed surplus was transacted as the village aggregator or traders made huge money through this channel. As the products were sold to distant traders in Dimapur and subsequently to distant retailers and consumers in Nagaland, Manipur and other hill regions, its efficiency could not be worked out.

VI. Producer → Distant Trader → Distant Retailer → Distant Consumer

In this channel, producer directly sold to the distant traders, retailers and consumers without involvement of local traders or village aggregator in middle. The producers earned considerable amount of money through this channel but only 2 per cent of the marketed surplus was found moving through this channel as much risk was associated with this marketing chain.

VII. Producer → Processor → Distant Consumer

In this channel, after harvesting producer sold their products at the processors place, who in turn dried the fresh products and sold to consumers at different parts of India. Processor purchased fresh King Chilli when price was low during the peak season and sold the dried products throughout the year. Table 4.22 depicts that 10 percent

of the marketed surplus moved through this channel. The margin of the processor was nearly 30 per cent, which was more than other intermediaries in the marketing channel of King Chilli, also producers share in consumers rupee was 55.92 percent, indicating that producer got better price in this channel rather than the products sold to wholesaler or village aggregator. Price spread in this channel was Rs 8640 and marketing efficiency was found to be 1.27, shown in Table 4.23.

VIII. Producer⟶Processor⟶Distant Trader ⟶Consumer

In this channel, fresh products collected from producer were dried and were sold to the traders in distant places, like Mumbai and Chennai and finally to the consumers. Through this channel 14 per cent of the marketed surplus was transacted.

Table 4.22 Marketing channels identified for King Chilli in the peak season (June/July) and channel wise transaction

Particulars	Marketing Channels	Percentage of commodity transacted (%)
Channel I	Producer – Consumers	2
Channel II	Producer-Retailer-Consumer	5
Channel III	Producer – Wholesaler-Retailer-Consumer	12
Channel IV	Producer-Village aggregator/Trader-Wholesaler-Retailer-Consumer	25
Channel V	Producer-Village aggregator/trader-Distant Trader-Distant Retailer-Distant Consumer	30
Channel VI	Producer-Distant trader-Distant Retailer-Distant Consumer	2
Channel VII	Producer-Processor-Distant Consumer	10
Channel VIII	Producer-Processor-Distant Trader-Distant Consumer	14

Table 4.23 Price buildup of King Chilli in the peak season (June/July) in the identified marketing channel

Market Player	Price build up (per quintal of King Chilli)	Channel I	Channel II	Channel III	Channel IV	Channel VII
Producer	Farm selling price (Rs)	20000	15000	10000	7000	12000
	Farmer's marketing cost (Rs)	1120	1120	0	0	1040
	Farm gate net price (Rs)	18880	13880	10000	7000	10960
Village aggregator	Purchase price (Rs)				7000	
	Aggregator's marketing cost (Rs)				1440	
	Aggregator's margin(Rs)				3560	
	Margin as pc of sale price (%)				29.67	
	Village aggregator's sale price (Rs)				12000	
Wholesaler	Purchase price(Rs)			10000	12000	
	Wholesaler's marketing cost(Rs)			1220	720	
	Wholesaler's margin(Rs)			3780	2280	
	Margin as pc of sale price (%)			25.20	15.20	
	Wholesaler's sale price(Rs)			15000	15000	
Retailer	Purchase price(Rs)		15000	15000	15000	
	Retailer's marketing cost(Rs)		1250	1250	1250	
	Retailer's margin(Rs)		3750	3750	3750	
	Margin as pc of sale price (%)		18.75	18.75	18.75	
	Retailer's sale price to consumer (Rs)		20000	20000	20000	
Processor (Dried chilli)	Purchase price(Rs)					12000
	Processor's marketing cost (Rs)					1722.70
	Processor's margin(Rs)					5877.3
	Margin as pc of sale price (%)					29.99
	Processor's sale price to consumer(Rs)*					19600
Consumer	Price paid by consumer(Rs)	20000	20000	20000	20000	19600
Total marketing cost(Rs)		1120	2370	2470	3410	2762.70
Total marketing margin(Rs)		0	3750	7530	9590	5877.30
Price spread(Rs)		1120	6120	10000	13000	8640
Producer's share in consumer's Rupee (%)		94.40	69.40	50.00	35.00	55.92
Marketing efficiency		16.86	2.27	1.00	0.54	1.27

*pc=percentage

*Sale price of dried chilli (Rs 1400/Kg) was obtained from Indiamart online marketing app used by the processor. Conversion factor, '1quintal of fresh King Chilli=0.14 quintal of dried chilli' was used.

**Consumers in channel VII are distant consumers

4.4.2.5 Channels of distribution, marketing efficiency and price spread of King Chilli in the end season (August/ September)

During the month of August/ September, production was limited to few farmers who followed late planting technique. Price of King Chilli was reported as high during the end season. So, margins of the intermediaries decreased in that period. Therefore, village aggregators or traders left the channels during that month. Further, decreased weight of King Chilli (*Bhut Jolokia)* made it unsuitable for trading to the distant market. That is why only following channels were observed during the end season.

I. Producer⟶ Consumer

It is revealed from the Table 4.24 that 27 per cent of the marketed surplus moved through this channel as more amount of marketed surplus was found possible to transact directly by the producer to the consumer. The marketing efficiency was found 39.18 and producers share in consumer's rupee was 97.51 per cent, depicted in Table 4.25.

II. Producer ⟶ Retailer⟶ Consumer

It is revealed from the Table 4.24 that 23 per cent of the marketed surplus moved through this channel. The Table 4.25 shows that margin of retailers was 8.33 per cent while producer's share in consumer's rupee was 86.40 per cent. Price spread and marketing efficiency were Rs 6120 and 6.35 per cent respectively in channel II.

III. Producer ⟶ Wholesaler ⟶ Retailer⟶ Consumer

In this channel, 50 per cent of the marketed surplus of the end season was sold. The margin of wholesaler was found 6.62 per cent, decreased considerably from the previous period. Producer's share in consumer's rupee was 84.44 per cent. The marketing efficiency in this channel was 5.43, presented in Table 4.25.

Table 4.24 Marketing channels identified for King Chilli in the end season (August/September) and channel wise transaction

Particulars	Marketing Channels	Percentage of commodity transacted (%)
Channel I	Producer – Consumers	27
Channel II	Producer-Retailer-Consumer	23
Channel III	Producer – Wholesaler-Retailer-Consumer	50

Table 4.25 Price buildup of King Chilli in the late season (August/September) in the identified marketing channel

Market Player	Price build up (per quintal of King Chilli)	Channel I	Channel II	Channel III
Producer	Farm selling price(Rs)	45000	40000	38000
	Farmer's marketing cost(Rs)	1120	1120	0
	Farm gate net price(Rs)	43880	38880	38000
Wholesaler	Purchase price(Rs)			38000
	Wholesaler's marketing cost(Rs)			1220
	Wholesaler's margin(Rs)			2780
	Margin as pc of sale price (%)			6.62
	Wholesaler's sale price(Rs)			42000
Retailer	Purchase price(Rs)		40000	42000
	Retailer's marketing cost(Rs)		1250	1250
	Retailer's margin(Rs)		3750	1750
	Margin as pc of sale price (%)		8.33	3.89
	Retailer's sale price to consumer(Rs)		45000	45000
Consumer	Price paid by consumer(Rs)	45000	45000	45000
Total marketing cost (Rs)		1120	2370	2470
Total marketing margin (Rs)		0	3750	4530
Price spread(Rs)		1120	6120	7000
Producer's share in consumer's Rupee (%)		97.51	86.4	84.44
Marketing efficiency		39.18	6.35	5.43

*pc=percentage

4.4.2.6 Marketing channel of planting materials of King Chilli

Only one channel was noted in the movement of planting materials, *i.e*, 100 per cent transaction occurred directly from the grower's field to the hands of buyer or the producer farmers. Growers were the farmers or any person who had the skill in seed extraction for seedling purpose and raised them with the intention to sale as well for their own farms. Customers of the planting materials were the farmers who opted for production but not acquainted with the skill of nursery raising of King Chilli.

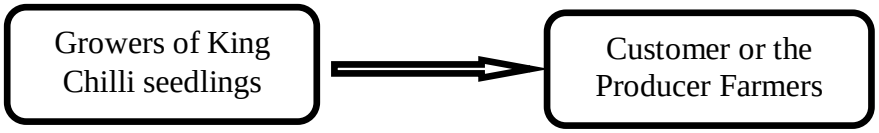

Fig 4.1 MARKETING CHANNEL OF PLANTING MATERIALS OF KING CHILLI

4.5 Constraints faced by the sample respondents in Bhut Jolokia cultivation

In the present study, major constraints opined by the sample respondents were categorized under two heads, namely, production and marketing constraints. The respondents were asked to rank the attributes in a scale of one to ten for the production constraint and one to eight for the marketing constraint. The constraints were then ranked based on Garrett ranking technique and the details of the problems confronted by them were discussed in this chapter.

4.5.1 Constraints in production of King Chilli (*Bhut Jolokia*)

From the Table 4.25, it is revealed that pest and disease infestation was reported as a major constraint faced by the farmers with the highest mean score of 71.33. The crop was found susceptible to many viral infections (carrier-whitefly) which was considered as a serious problem whose chances of incidence increased with rainy weather. Crop failure also occurred in severe cases. Many fungal and bacterial diseases also caused trouble to the growers. Thrips infestation was also reported in the study area that posed as major challenge to the growers.

Secondly, high cost of pesticides and insecticides was expressed as an important constraint with mean score of 64.74. Instability in yield due to various biotic and abiotic stresses was considered as third most important problem with mean score of 58.83. Growers also stated their difficulty in pest and disease management as they lacked

the knowledge of identifying the causal agent and measures to control them. So, it was considered as the fourth important constraint with mean score of 56.81. The crop yield was also affected by uneven rainfall, which was ranked fifth with mean score of 54.13. King Chilli being cost intensive crop, farmers faced shortfall of credit needs for commercial cultivation and it was ranked 6th with mean score of 44.29. Labours lacked the technique of harvesting skills that was needed in King Chilli being a tender fruit and so in most of the farmer's field, family members were found involved in harvesting which was regarded as a constraint during the peak period. It was ranked 7th with mean score of 40.98. Due to high moisture content in King Chilli, post harvest loss was considered as a major problem, ranked 8th with mean score of 36.88.

Some other constraints expressed by the farmers were non availability of quality seed materials (mean score was 36.53) and non availability of high yielding and pest resistant varieties (mean score was 33.48).

4.5.2 Constraints in marketing of King Chilli (*Bhut Jolokia*)

Bottlenecks in marketing is a major cause of lower income, if the products are not marketed well, even higher production will not develop the economic conditions of the farmers.

From the perusal of the marketing constraints, wide fluctuation in the price of King Chilli was looked upon as the most important constraint among the various problems listed by the farmers (mean score was 75.88). Steep price fall was reported with increased supply that disturbed the steady income of the farmers. No measures were taken by the Government to control wide price variation. So lack of Government support price was considered by the respondents as an important constraint. King chilli marketing was found exploitative in nature, mostly it was in the hands of middlemen. Bigger markets were lacking near the producers place so mostly they were trapped in the hands of middlemen to market the products to the distant markets. Dissemination of market information was lacking that is why intermediaries were found deceiving the farmers. Due to lack of public transport from the farmer's field to the market place, high marketing cost was borne by the producer and so it was considered as an important constraint faced by the farmers. Other constraints expressed by the sample farmers were lack of cooperative

society and high market charges or fees. Ranking of the marking constraints listed by the sample respondents are presented in the Table 4.26.

Table 4.25 Production constraints experienced by the sample respondents

Sl. No	Production Constraints	Mean score	Rank
1	Attack of pest and diseases	71.33	1st
2	High cost of pesticides and insecticides	64.74	2nd
3	Instability in yield	58.83	3rd
4	Lack of knowledge on pest and disease management	56.81	4th
5	Uneven rainfall	54.13	5th
6	Non availability of adequate credit facilities for crop production	44.29	6th
7	Scarcity of skilled labour during peak period	40.98	7th
8	High post harvest loss	36.88	8th
9	Non availability of quality seed materials	36.53	9th
10	Non availability of high yielding and pest resistance varieties	33.48	10th

Table 4.26 Marketing constraints experienced by the sample respondents

Sl. No.	Marketing constraints	Mean score	Rank
1	Wide fluctuation in prices	75.88	1st
2	Exploitation of farmers by intermediate agencies	57.83	2nd
3	Lack of government support price	58.36	3rd
4	Lack of market information	46.96	4th
5	Non availability of bigger market nearby	48.14	5th
6	Poor transportation facility	41.98	6th
7	Lack of cooperative society	41.65	7th
8	High market charges/fees	30.19	8th

CHAPTER V

SUMMARY AND CONCLUSION

In this chapter, attempt is made to present a brief summary of the findings of the study entitled, "Economics of Production and Marketing of King Chilli in UBVZ of Assam" as per objectives laid down in the previous chapter. The objectives of the study were:

1. Estimate the production, cost and return from King Chilli *(Bhut Jolokia)* cultivation
2. Study the marketing of King Chilli *(Bhut Jolokia)*
3. Identify the constraints faced by the farmers in the cultivation of King Chilli *(Bhut Jolokia)*

The present study was conducted in the Upper Brahmaputra Valley Zone of Assam. Multistage stratified random sampling technique was used to draw the desired sample size for the study. In the first stage, two districts, namely Jorhat and Sivasagar were selected under UBVZ as the districts accounts for the highest area under King Chilli. One ADO circle from each district was selected in the second stage viz. Selenghat ADO circle of Jorhat district and Namti ADO circle of Sivasagar were selected purposively as these circles had maximum area under King Chilli. In the next stage, three villages were selected at random from each ADO circle. Thus, a total of 6 villages were selected for the study. From each sample village, 20 King Chilli growers were selected randomly belonging to Marginal, Small, Medium and Large category in the ratio of 4:3:2:1. Thus, 48 marginal, 36 medium, 24 small and 12 large farmers were selected randomly, comprising a sample size of 120 farmers in total. For studying the marketing channels, 4 Village Aggregators, 4 Wholesalers, 10 Retailers, 1 Processor and 10 Consumers, constituting a total of 29 marketing agents were surveyed in the study area.

The primary data was collected with the help of pre tested schedules through personal interviews with the respondents, pertaining to the year 2017-18. Simple tabular analysis, cost concepts analysis and various marketing analysis were carried out to substantiate the various objectives. In addition, Garrett's ranking technique was used to

rank various production and marketing constraints faced by the sample respondents in the study area.

5.1 Socio-economic characteristics of the respondents in the study area

Some of the general characteristics of the sample farmers such as family size, family type, education status, occupational pattern etc. were found as under.

The study found that the average family size of the overall farms was 6 members with dominant population in the age group of 15-59 years. Out of the total respondents, 66.67 per cent had nuclear family while others had joint family. Only 7.50 per cent respondents were found illiterate while rest were literate, found to obtain primary, middle and higher level of education constituting 18.33 per cent, 44.17 per cent and 26.67 per cent respectively. Also 3.33 percent of the respondents were graduates and above. Overall 90.83 per cent of the respondents were primarily involved in agriculture while rest 9.17 percent were involved in business and others as primary occupation. The study revealed that, agriculture was the primary occupation of most of the respondents.

5.2 Land utilization pattern

The operational holding for the entire sample was found to be 1.73 hectares. Out of the total holdings, 1.53 hectares of the land were used for cultivation.

5.3 Cropping pattern and cropping intensity

In the cropping pattern followed in the study area, rice occupied the highest area (72.65 %) of the average gross cropped area of 1.65 hectares per farm. The Rabi vegetables grown in the area were potato, tomato, cabbage, yum, brinjal and King Chilli, whose share to the gross cropped area was very low, except for King Chilli. For the overall farm, 14.74 per cent of the gross cropped area was under King Chilli. The share of summer vegetables was also found less in the entire sample area. The cropping intensity was found to be 107.78 per cent for an average farm.

5.4 Production, cost and return from King Chilli *(Bhut Jolokia)* cultivation

1. The average area under King Chilli (*Bhut Jolokia*) was 0.23 hectare. Per farm production for the entire sample was 11.37 quintals, while productivity was recorded as 50.94 quintals per hectare. Productivity of marginal, small, medium and large farms was 52.58, 49.78, 50.83 and 48.12 quintals per hectare.

2. For the whole farm, highest input cost was incurred in FYM (Rs 20777 per hectare), followed by plant protection chemicals (Rs 14607 per hectare) and hired labour cost (Rs 11806 per hectare).
3. Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1 and Cost C_2 for the average farm per hectare were Rs 80574, Rs 82069, Rs 82604, Rs 118608, Rs 113713, and Rs149718 respectively. The study found that farms with bigger size groups incurred more amounts of Cost A_1, Cost A_2, Cost B_1 and Cost B_2 per hectare than the smaller size groups while reverse trend was found in case of Cost C_1 and Cost C_2.
4. Gross income for the entire farm was Rs 882491, of which Rs 878928 was earned from selling fresh product while Rs 3563 was earned from selling planting materials.
5. On an average farm business income was worked out as Rs 801918 per hectare, while owned farm income was Rs 800422 per hectare, family labour income was Rs 763883 per hectare and net income was Rs 732774 per hectare.
6. Returns per rupee for marginal, small, medium and large farm were 5.6, 5.9, 6.3 and 6.2 respectively.

5.5 Marketing of King Chilli *(Bhut Jolokia)*

1. Marketable or marketed surplus for the entire sample was 10.81 quintals per farm that constituted 95 per cent of the total production after retaining for consumption and other purposes (gifts, retention for seed purpose, post harvest lost).
2. Due to wide variation in price of King Chilli, intermediaries either joined or left the marketing channel according to their margins. Thus different marketing channels observed during early season, mid season, peak season and late season were presented in the study.
3. In the early season, unrippened King Chillies were marketed at high price. Mainly village aggregators, wholesalers and retailers entered the channel. In the mid season with increased production, the products were also transacted to distant place (Dimapur). Due to increased supply of King Chillies in the market, price decreased considerably in the peak season. In addition, dried chilli processor entered the marketing chain that purchased fresh products during June/July in low price while they marketed dried products round the year to traders in Mumbai and Chennai and

consumers in different parts of India through online mode. In the late season market price was increased as production declined. Due to reduced weight of the fruit, distant trading was ceased. Only wholesalers and retailers remained in the marketing chain.

4. From the study, it is revealed that marketing channels with least number of market intermediaries was found to be more efficient. With more margins obtained by the middlemen, price spread was more which resulted lower producers' share in consumers rupee. Market middlemen were found more exploitative when supply increases in the market.
5. More efficiency was observed in marketing the products to processor compared to wholesales or village aggregators during the peak season.

5.6 Constraints faced by sample respondents in King Chilli *(Bhut Jolokia)* cultivation

1. In case of production, attack of pest and diseases was ranked as the first important constraint with highest mean score of 71.33. Other constraints faced by the respondents during production were high cost of pesticides and insecticides, instability in yield, lack of knowledge on pest and disease management, uneven rainfall, non availability of credit facilities for crop production, scarcity of labour, high post harvest lost, non availability of high yielding and pest resistant varieties.
2. In marketing the products, wide price fluctuation was revealed as the most important constraint with mean score of 75.88, followed by lack of government support price, exploitation by intermediaries, non availability of bigger market nearby, lack of market information, poor transportation facility, lack of cooperative society and high market charges/fees was ranked least among different attributes.

CONCLUSION

a. From the present study following conclusions can be drawn
b. Productivity did not follow any particular trend, it was the highest in marginal farms, followed by medium farms, small farms and least in case of large farms as farms were categorized based on total operational holdings.
c. From the study, King Chilli was found as cost intensive crop. The highest cost was incurred in application of FYM, plant protection chemicals and use of hired labour.

d. It can be concluded that cost increased with increase in the farm size, however with the additional cost of leased in land and imputed family labour cost, total cost decreased in bigger farms.
e. It was noticed that incomes showed increasing trend with farm size
f. The analysis showed that returns per rupee increased with the increase in the size of farm
g. It was found that soon after harvesting King Chillies were harvested to avoid loss due to high moisture content in the fruit.
h. Various channels were identified in marketing of King Chilli or *Bhut Jolokia.*
i. Marketing middlemen were found more exploitative during the peak season
j. The study revealed that pest and disease infestation and wide price fluctuation as the major constraint in production and marketing King Chilli respectively.

SUGGESTIONS

Examining the constraints noted in the study area, following suggestions can be drawn:

i. Training should be held by Assam Agricultural University or KVK's of respective areas on management of pest and diseases.
ii. Proper package and practices should be adopted for getting satisfactory yield.
iii. Mechanization of some operations should be done.
iv. Credit should be borrowed from financial institution along with insurance to overcome yield loss.
v. Attempt should be made for processing the products to avoid losses.
vi. Forward contract may be encouraged for assured sale at pre agreed price.
vii. Efforts should be made to dispose the products in the early or late season to grab higher market prices.
viii. Cooperatives should be formed to facilitate direct marketing in order to avoid exploitation by marketing middlemen.
ix. Steps should be taken by the Government to improve communication network.
x. Average price range should be fixed by the Government to avoid extreme price fluctuation so that the farmers are able to obtain steady income.

BIBLIOGRAPHY

Biswas, P. K., & Rajib, D. (2017). Constraints faced by the Naga King chilli gowers in Mokokchung district of Nagaland. *Agriculture Update*, **12**(4), 578-580.

Dangore, U. T., Bahekar, A. K., Datarkar, S. B., & Darekar, A. S. (2015). Constraints faced by dry chilli growers in production and marketing of dry chilli in Wardha district of Maharashtra. *Agriculture Update*, **10**(3), 252-254.

Gaidhani, H. K. (1977). Production and marketing of chillies in selected area of Nagpur District. *M.Sc Thesis*, DR. PDKV, Akola.

Geetha, R., & Selvarani, K. (2017). A study of chilli production and export from India. *International Journal of Advance Research and Innovative Ideas in Education*, **2**, 205-210.

Geetha, R., & Selvarani, K. (2017). Constraints and Suggestions of chilli growers in Virudhnagar District. *International Journal of Advance Research and Innovative Ideas in Education*, **3**(1), 1493-1496.

George, D. (2016). King Chilli:The Pride of North East India. *Spice English India* , 14-16.

Giribabu, M. (2016). An Economic Analysis of Production and Marketing of Chilli in Mokokchung District of Nagaland. *Arthshastra Indian Journal of Economics & Research*, **5**(1), 31-49.

Hoq, M. S., M. A. Matin, T. M. B. Hossain, and M. I. Omar. (2014). "Production and Marketing of Green Chilli in Two Copious District of Bangladesh." *Asian Academic Research Journal of Multidisciplinary* **1**(18), 785-799.

Jagtap, P. P., Shingane, U. S., & Kulkarni, K. P. (2012). Economics of chilli production in India. *Afr J Basic Appl Sci*, **4**, 161-164.

Jorwar, R. M., Sarap, S. M., & Chavan, V. U. (2018). Economics of production and marketing of chilli in Amravati district. *Journal of Pharmacognosy and Phytochemistry*, **7**(2), 310-316.

Kaur, K. (2017). *Production and marketing of green chilli in Punjab* (Doctoral dissertation, Punjab Agricultural University, Ludhiana).

Khan, M. T. I., Qamar, A., Muhammad, A., & Muhammad, W. (2017). Economic analysis of open field chilli (*Capsicum annuum L.*) production in Punjab, Pakistan. *Journal of Experimental Biology and Agricultural Sciences*, **5**(1), 120-125.

Malangmeih, L., & Rahaman, S. Economics of fresh Naga King Chilli in Manipur, India–A Case Study.

MeenaN. K., Gawade.B. B., Dhage A. M., Sinde H. R., Kumar R. and Gurjar, G.N. (2017). A Study of marketing of green Chilli in Kolhapur district of Maharashtra. *International Journal of Agriculture Sciences*, **9**(9), 3958-3961.

Naik, D. S., Singh, A.K., Roy, H. & Padmaja (2019). Assessment of constraints encountered by the chilli growers of Khamman District in adoption of recommended chilli production technologies along with suggestions. *International Journal of Current Microbiology and Applied Sciences* , **8**(4), 2608-2613.

Parthasarathi, G.Senthilnathan, S. and Suresh, L.(2014). Marketing of Chillies in Thoothukudi district of Tamilnadu. *The International Journal of Science and Technology*, **2**(12).

Patel, V. K., Gupta, S. P., & Patel, K. L. (2015). Economics performance of chilli (*Capsicum annuum L.)* cultivation in Raigarh district of Chhattisgarh state. *International Journal of Agricultural Science and Research*, **5**(4), 363-368.

Prabhavathi, Y., & Kishore, N. K. (2013). Analysis of supply chain of Spices in India: A case study of Red chillies.

Prajapati, M. R., Patel, V. T., Choudhary, N. V., and Soni, M. C. (2002). Constraints experienced by growers in adoption of recommended chilli technology. *Gujarat Journal of Extension Education*, **12**(13), 32-34.

Rajur, B. C., Patil, B. L., & Basavaraj, H. (2010). Economics of chilli production in Karnataka. *Karnataka Journal of Agricultural Sciences*, **21**(2).

Ruchira, S. (2010). Economics of chilli cultivation in Jaipur district of Rajasthan. *International Journal of Commerce and Business Management*, **3**(2), 267-269.

Sabaritnathan, S. (2016). A Study on the Marketing of Chillies in Sivagangai district. *Indian Journal of research*, **5**(12).

Sharma, A. (2011). Economic and Constraints of King Chilli Growers in Dimapur District of Nagaland. *Journal of Interacademicia*, **15**(4), 710-719.

Sharma, L. K., & Gupta, V. (2010). Knowledge and constraints in scientific cultivation of chilli among the farmers. *Rajasthan Journal of Extension Education*, **17**, 60-64.

Singh, M. K. and Singh, S. K. (1998). Economic analysis of green chilli in Shikhar block, District Mirzapur. Bhartiya Krishi Unusandhan Patrika, **13**(3-4), 165-168.

Sowjanya, S. and Kumari, V. R. (2017). Constraints faced by the farmers in adoption of integrated crop management in chilli crop in Telangana. *International journal of pure Application Bioscience*, **5**(4). 1135-1140

Srikala, M., Devi, I. B., Subramanyam, V., & Ananda, T. (2016). Cost of cultivation and price spread of chillies in guntur district of Andhra Pradesh. *International Journal of Agriculture, Environment and Biotechnology*, **9**(2), 299.

Stephan, R., Gracy, C.P., and Kavya, V.H. (2016). A study on the marketing of Byadagi Chilli grown in Dharwad and Haveri districts of Karnataka. *International Journal of Sales and Marketing Management Research and Development*, **6**(1), 25-30.

Venkata, R., Wakle, P. K., Koshti, N. R. and Sonkamble, A.M. (2017). Constraints and suggestions of the chilli farmers in Bhiwapur Panchayt Samiti of Nagpur district. *Journal of Pharmacognosy and Phytochemistry*, 625-628.

APPENDIX-I

Per hectare planting material cost of different farm size

Farm size	Buy seedlings			Buy fresh King Chilli			Buy seeds		
	Quantity (No.)	Value (Rs/ plant)	Value (Rs)	Quantity (Kg)	Value (Rs/Kg)	Value (Rs)	Quantity (Kg)	Value (Rs/Kg)	Value (Rs)
Marginal	4405	2	8809	4.00	300	1200	0.00	15000	0
	526	2	1052	0.48	300	143	0.00	15000	0
Small	2127	2	4253	7.12	300	2135	0.23	15000	3417
	375	2	750	1.25	300	376	0.04	15000	603
Medium	1118	2	2235	7.92	300	2375	0.15	15000	2270
	400	2	800	2.83	300	850	0.05	15000	813
Large	530	2	1059	7.22	300	2167	0.16	15000	2408
	275	2	550	3.75	300	1125	0.08	15000	1250
All farms	2676	2	5352	6.04	300	2389	0.11	15000	1720
	430	2	861	1.51	300	453	0.03	15000	469

Figures in parentheses indicates per farm cost

APPENDIX-III

A schedule for collecting data on Economics of Production and Marketing of King Chilli in UBVZ of Assam

A. General information

Village : ……
District : ……
ADO circle : ……

Name of the king chilli grower	
Age	
Gender(M/F)	
Education level (Illiterate/Primary/Middle/Higher/Graduation and above)	
Family type: nucleus/joint	
Household size	
Main occupation	
Subsidiaryoccupation	
Contact number	

B. Land holdings:_____bigha/ha

Own land	Leased in land	Leased out land	Land under field crops	Land under horticultural crops	Land under King Chilli			Land under other plantation crops
					Own	Leased in	Leased out	

C. Area, production and productivity of the crops grown

Crops	Area	Production	Productivity
King chilli			
Rice			
Vegetables			
Others			

D. Do you have an irrigation system?
Type of irrigation
Number of irrigation
Cost per irrigation

E. Farm inventory
i) Major Farm Implements

Sl. No.	Item	No.	Year of purchase	Purchase value (Rs.)	Average life(years)	Annual repairs (Rs)
1	Iron plough					
3	Seed drill					
4	Hoes					
5	Harrows					
7	Cultivators					
8	Levelers					
9	Tractor					
10	Sprayer					
12	Pump set					
13	Rotovator					
14	Tractor trolly					
16	Others					

F. Details of cost of cultivation of king chilli

(I) General information
Variety :
Season :
Area (Bigha/ha) :
Source of seed : own / company/ university/others if any

(II) Input utilization pattern

Sl. No	Particulars	Unit	Quantity	Amount (Rs)
1	Seeds/planting materials			
3	FYM			
4	Chemicals – UREA DAP SSP MOP OTHER			
5	PPC			
6	Bio fertilizers			
7	Growth regulator			
8	Others, if any			

III) Labour utilization – operation wise

Operation	No. of times	Human labour		Machine labour		Total labour	Hired labour	Family labour
		Men	Women	Men	Women			
1.Ploughing								
2.Harrowing								
3. Seed bed preparation								
4. FYM operation -transportation -spreading								
5.Transplanting/ sowing								
6. Weeding								
7.PP Measures 1^{st} 2^{nd} 3^{rd}								
8.Harvesting 1^{st} 2^{nd} 3^{rd} 4^{th}								
9.Transporting								
10. Cleaning 11. 11. Drying/ bagging								
12. Miscellaneous								

G. Yield obtained and Returns realized:

Particulars	Quantity (q)	Price (per q)	Gross return (Rs)
1.Main products			
2.By products			
Total gross return			

H. Problems in production of King Chilli

Sl. No.	Constraints	Rank
1	Non-availability of quality seed materials	
2	Attack of pest and diseases	
3	Uneven rainfall	
4	Lack of knowledge on pest and disease management	
5	Instability in yield	
6	Non-availability of labour	
7	Non-availability of high yielding and pest resistance varieties	
8	Non-availability of adequate credit facilities for crop production	
9	High post-harvest loss	
10	High cost of pesticides and insecticides	

I. Marketing of King Chilli by farmers

I) Marketable surplus

Total production	Home consumption	Retention for seed purpose	Relatives as gift	Post harvest loss	Marketable surplus

II. Identification of marketing channel

Sl. No	To whom sold	Quantity sold (q)	Sale price (Rs/q)
	Trader		
	Wholesaler		
	Retailer		
	Any other		

III. Marketing cost

Sl.No	Items	Cost incurred(Rs/Q)
1.	Gunny bags	
2.	Packing	
3.	Loading	
4.	Transportation	
5.	Unloading	
6.	Weightment	
7.	Personal expenses	
8.	Any commission charges	
9.	Storage cost	
10.	Miscellaneous	
11.	Total cost	

III. Problems in marketing of King Chilli by farmers

Sl. No.	Constraints	Rank
1	Wide fluctuation in prices	
2	Poor transportation facility	
3	Lack of market information	
4	Lack of cooperative society	
5	Lack of government support price	
6	Non availability of bigger market nearby	
7	Exploitation of price by intermediate agencies	
8	High market charges/fees	

A Schedule for collecting data on "Economics of Production and Marketing of King Chilli in UBVZ of Assam" (for marketing agents)

A. General information

Type of intermediary: Trader/ wholesaler/ retailer/others	
Name of the intermediary	
District	
Village	
Contact number	

B. Marketing of King Chilli by _____

From whom purchased	Quantity purchased(q)	Purchase price (Rs/q)	To whom sold	Quantity sold (q)	Sale price (Rs/q)

C. Marketing cost of _____

Sl.No	Items	Cost incurred (Rs/Q)
1.	Gunny bags	
2.	Packing	
3.	Loading	
4.	Transportation	
5.	Unloading	
6.	Weightment	
7.	Personal expenses	
8.	Any commission charges	
9.	Storage cost	
10.	Miscellaneous	
11.	Total cost	

APPENDIX-II

Ranking of constraints given by the farmers faced during the production process

Production constraints	Ranks									
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**	**10th**
Non-availability of quality seed materials	0	0	6	3	10	13	22	21	18	27
Attack of pest and diseases	59	22	12	13	6	5	2	1	0	0
Uneven rainfall	0	19	20	22	8	23	17	11	0	0
Lack of knowledge on pest and disease management	20	22	18	10	2	17	9	6	11	5
Instability in yield	16	21	16	9	26	16	12	1	3	0
Scarcity of skilled labour in peak season	0	9	7	5	14	10	18	18	22	17
Non-availability of high yielding and pest resistance varieties	0	0	2	9	15	7	5	15	27	40
Non-availability of adequate credit facilities for crop production	0	6	8	7	19	20	15	24	15	6
High post-harvest loss	0	1	2	15	9	5	17	22	24	25
High cost of pesticides and insecticides	25	20	29	27	11	4	3	1	0	0

Percent position [100(Rij-0.5)/Nj] and Garret value

Rank	100[(Rij-0.5)/Nj]	Percent position	Garret value
1st	100(1-0.5)/10	5	82
2nd	100(2-0.5)/10	15	70
3rd	100(3-0.5)/10	25	63
4th	100(4-0.5)/10	35	58
5th	100(5-0.5)/10	45	52
6th	100(6-0.5)/10	55	48
7th	100(7-0.5)/10	65	42
8th	100(8-0.5)/10	75	36
9th	100(9-0.5)/10	85	29
10th	100(10-0.5)/10	95	18

Where Rij=1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th and10th rank

Nj= Total rank given by 120 respondents= 10

Calculation of Garret score of production constraints

Problems	Ranks										Total
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
Non availability of quality seed materials	0	0	378	174	520	624	924	756	522	486	4384
Attack of pest and diseases	4838	1540	756	754	312	240	84	36	0	0	8560
Uneven rainfall	0	1330	1260	1276	416	1104	714	396	0	0	6496
lack of knowledge on pest and disease management	1640	1540	1134	580	104	816	378	216	319	90	6817
Instability in yield	1312	1470	1008	522	1352	768	504	36	87	0	7059
Scarcity of skilled labour in peak season	0	630	441	290	728	480	756	648	638	306	4917
Non availability of high yielding and pest resistance varieties	0	0	126	522	780	336	210	540	783	720	4017
Non availability of adequate credit facilities for crop production	0	420	504	406	988	960	630	864	435	108	5315
High post harvest loss	0	70	126	870	468	240	714	792	696	450	4426
high cost of pesticides and insecticides	2050	1400	1827	1566	572	192	126	36	0	0	7769

Ranking of production constraints on the basis of obtained mean score

Sl. No	Production Constraints	Mean score	Rank
1	Non availability of quality seed materials	36.53	9th
2	Attack of pest and diseases	71.33	1st
3	Uneven rainfall	54.13	5th
4	Lack of knowledge on pest and disease management	56.81	4th
5	Instability in yield	58.83	3rd
6	Non availability of labour	40.98	7th
7	Non availability of high yielding and pest resistance varieties	33.48	10th
8	Non availability of adequate credit facilities for crop production	44.29	6th
9	High post harvest loss	36.88	8th
10	high cost of pesticides and insecticides	64.74	2nd

Ranking of constraints given by the farmers in marketing

Marketing constraints	Ranks							
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Wide fluctuation in prices	90	20	4	4	2	0	0	0
Poor transportation facility	0	10	16	10	12	28	23	21
Lack of market information	0	12	25	20	28	7	8	20
Lack of cooperative society	0	3	6	30	13	21	36	11
Lack of government support price	20	25	19	19	17	13	7	0
Non availability of bigger market nearby	0	10	20	20	30	23	12	5
Exploitation of price by intermediate agencies	10	40	25	13	9	12	8	3
High market charges/fees	0	0	5	4	9	16	26	60

Percent position [100(Rij-0.5)/Nj] and Garret value

Rank	100(Rij-0.5)/Nj]	Percent position	Garret value
1st	100(1-0.5)/8	6.25	80
2nd	100(2-0.5)/8	18.75	68
3rd	100(3-0.5)/8	31.25	60
4th	100(4-0.5)/8	43.75	53
5th	100(5-0.5)/8	56.25	47
6th	100(6-0.5)/8	68.75	41
7th	100(7-0.5)/8	81.25	32
8th	100(8-0.5)/8	93.75	20

Where Rij=1st, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th rank

Nj= Total rank given by 120 respondents=8

Ranking of marketing constraints on the basis of obtained mean score

Marketing constraints	Mean score	Rank
Wide fluctuation in prices	75.88	1st
Poor transportation facility	41.98	6th
Lack of market information	46.96	4th
Lack of cooperative society	41.65	7th
Lack of government support price	58.36	3rd
Non availability of bigger market nearby	48.14	5th
Exploitation of price by intermediate agencies	57.83	2nd
High market charges/fees	30.19	8th

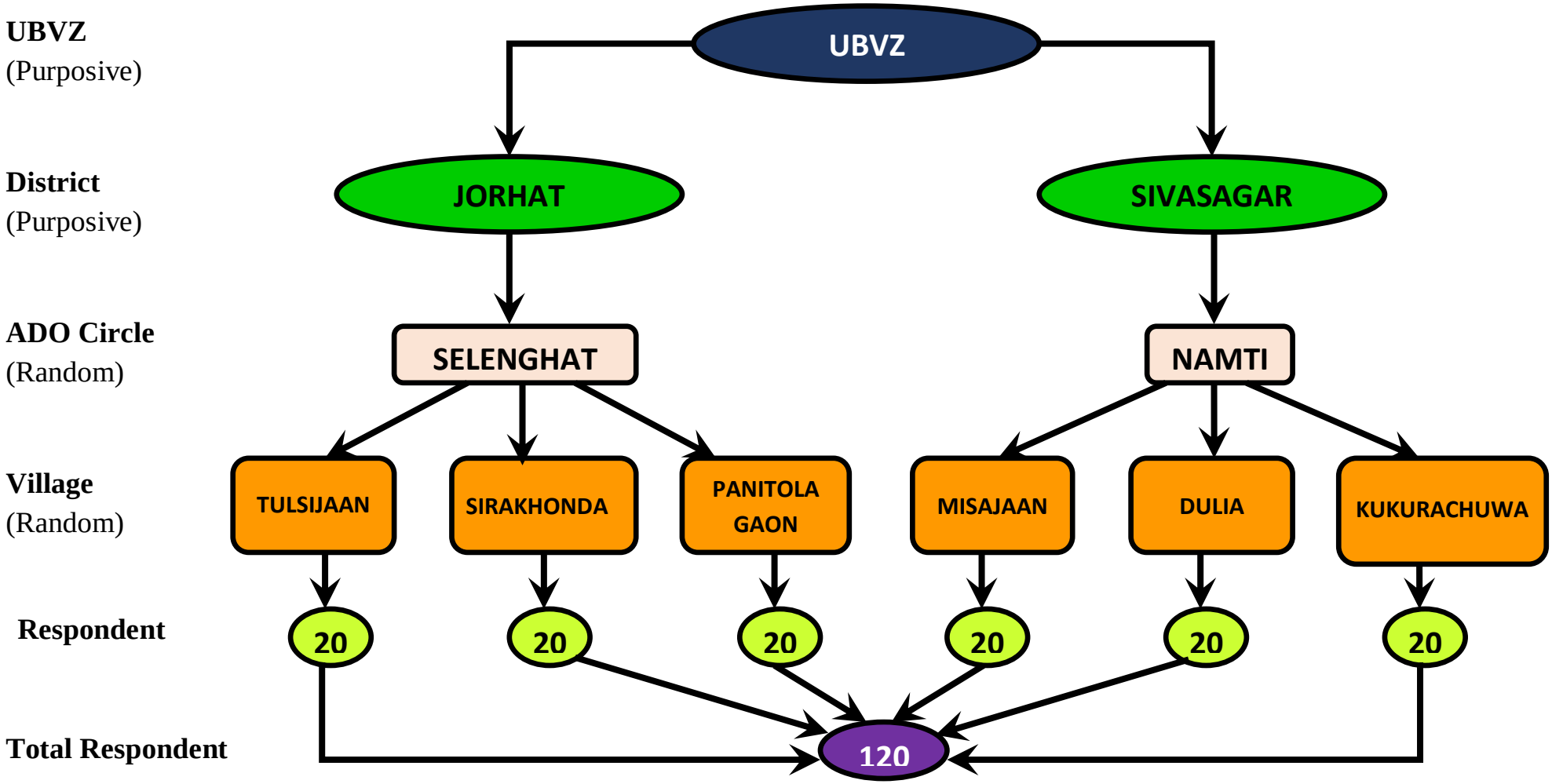

FIG. 3.1 SAMPLING DESIGN

Table 4.4 Distribution of respondents according to occupational status across farm sizes

Size group	No. of respondents	Primary			Secondary		
		Agriculture	Salaried job	Business &others	Agriculture	Salaried job	Business &others
Marginal	48 (100)	48 (100)	Nil	Nil	Nil	Nil	10 (20.83)
Small	36 (100)	33 (91.67)	Nil	3 (8.33)	3 (8.33)	Nil	8 (22.22)
Medium	24 (100)	18 (75)	Nil	6 (25)	6 (25)	Nil	5 (20.83)
Large	12 (100)	10 (83.33)	Nil	2 (16.67)	2 (16.67)	Nil	3 (25)
All farms	120 (100)	109 (90.83)	Nil	11 (9.17)	11 (9.17)	Nil	26 (21.67)

Figures in parentheses indicate the percentage of the respective population

Table 4.1 Family size of the selected respondents

Farm size	No. of household	Age						Total			Average family size
		Below 15 years		15-59 years		60 years and above					
		M	F	M	F	M	F	M	F	T	
Marginal	48	37	40	68	75	11	9	116	124	240	5
		(15.42)	(16.67)	(28.33)	(31.25)	(4.58)	(3.75)	(48.33)	(51.67)	(100)	
Small	36	32	38	58	48	15	11	105	97	202	6
		(15.84)	(18.81)	(28.71)	(23.76)	(7.43)	(5.45)	(51.98)	(48.02)	(100)	
Medium	24	20	19	39	40	10	13	69	72	141	6
		(14.18)	(13.48)	(27.66)	(28.37)	(7.09)	(9.22)	(48.94)	(51.06)	(100)	
Large	12	15	20	23	20	11	8	49	48	97	8
		(15.46)	(20.62)	(23.71)	(20.62)	(11.34)	(8.25)	(50.52)	(49.48)	(100)	
All farms	120	104	117	188	183	47	41	339	341	680	6
		(15.29)	(17.21)	(27.65)	(26.91)	(6.91)	(6.03)	(49.85)	(50.15)	(100)	

Figures in parentheses indicate the percentage of the respective population
M= Male
F= Female
T= Total

Table 3.1 Category wise distributions of sample farmers

Selected district of UBVZ of Assam	ADO circle	Village	Category wise number of sample farmers				Total sample farmers
			Marginal	Small	Medium	Large	
Jorhat	Selenghat	Tulsijaan	8	6	4	2	20
		Sirakhnoda	8	6	4	2	20
		Panitola Gaon	8	6	4	2	20
Sivasagar	Namti	Misajaan	8	6	4	2	20
		Dulia	8	6	4	2	20
		Kukurachuwa	8	6	4	2	20
Total			48	36	24	12	120