VALUE CHAIN ANALYSIS OF JHUM CROPS IN MIZORAM

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Submitted

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C E R T I F I C A T E

This is to certify that the Thesis incorporates K. Hmingthansangi's bonafide research and this has not been submitted for award of any degree in this or any other University or Institute of Learning.

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DECLARATION

I, **K.Hmingthansangi**, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to do the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other Universities/Institutions.

This is being submitted to the Mizoram University for the degree of Doctor of Philosophy in Rural Development.

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INTRODUCTION

1.1. Background of Mizoram

Mizoram is one among the eight North East Sister States situated in the North Eastern part of India. Aizawl is the largest city and capital of Mizoram. The State is flanked by Bangladesh on the west and Myanmar on the east of south sharing a total of 722 km international boundary with the two countries.

It also shares its boarders with three states- Assam, Tripura and Manipur.

The name of Mizoram is derived from Mi (people), Zo (lofty place, such as a hill) and Ram (land), thus, Mizoram implies *"Land of the hill people"*. (Mizoram.gov.in). World-renowned for their hospitality, Mizos are a close-knit society with no class distinction and no discrimination on grounds of sex. The entire society is knitted together by a peculiar code of ethics *"tlawmngaihna"* an untranslatable term meaning on the part of everyone to be hospitable kind, unselfish and helpful to others (Felfamkima, 2011).

Mizoram being the fifth smallest State in India became a new State in 20th February 1987. According to Census 2011, the population of Mizoram comprised of 10.97 lakhs (Male 555,339 and female 541,867) which is about 0.09 percent of the total population of India. The urban population constitutes 52.11 percentwhile the rural population accounts for 47.89 percent.

In 2019, three new districts were formed in Mizoram which make a total of 11 districts altogether. At present, there are 11 administrative districts, 26 Rural Development (RD) Blocks, 23 administrative sub –division and three Autonomous District Council. The literacy rate of Mizoram was 91.85 percent as per Census 2011.

1.1.1 Geography

Mizoram covers geographical area of 21,081 sq km, which is 0.64% of the geographical area of the country (Forest Survey of India Report, 2019). Mizoram lies between 21°58' N & 24°35' N latitude and longitude of 92°15'E to 93°29'E longitude.

1.1.2 Climate

The upper parts of the hills are, predictably cold, cool during the summer, while the lower reaches are relatively warm and humid. Storms break out during March-April, just before or around the summer. The maximum average temperature in the summer is 30^{o} C while in the winter the minimum average temperature is around 11^{o} C. The four months between November and February are winter in Mizoram which is followed by the spring. The storms come in the middle of April to herald the beginning of the summer. The mercury starts rising and the hills come under the cover of a haze. The three months from June to August are known as the rainy season. The climate as at its moderate best in the two autumnal months, September and October, when the temperature moves between 19° to 24°C (Felfamkima, 2011).

The State has a climate ranging from moist tropical to moist sub-tropical. The annual rainfall ranges between 2,100 mm to 3,500 mm and the annual temperature during winter, 11°C to 24°C and in summer between 18°C to 29°C. It rains heavily from May to September (Forest Survey of India report, 2019).

1.1.3. Soils

The soils of Mizoram are dominated mainly by loose sedimentary formations. They are generally young, immature and sandy. Derived soils with red, loamy texture is also found with high level of laterite. The soil acidity is high: low in potash and phosphorus. But in an uneroded soil, the content of Nitrogen is quite high fostered by accumulation of organic matters. The soils in the valleys are heavier as they were brought down by rain water from the high altitude (Pachuau, 1994).

Sanker and Nandy (1976) as cited by Pachuau (1994) have classified the soils of Mizoram into three orders of soil taxonomy, viz., 1) Entisols, 2) Inceptisols, and 3) Ultisols.

1.2 Jhum Cultivation

Jhum cultivation is considered to be the most primitive form of agricultural among all types of agriculture. This system of cultivation has been considered to be the most ancient and believed to be evolved during the Neolithic period between the years 13000 to 3,000.BC (FAO, 1985). Like in other parts of the world, shifting cultivation occupies a distinct place in the tribal economy of India. In India shifting cultivation is found largely in the States of Andra Pradesh, the hill districts of Assam, Arunachal Pradesh, Madhya Pradesh, Meghalaya, Mizoram, Nagaland, Odisha and Tripura. This system also exists in some parts of Bihar, Gujarat, Maharashtra, Karnataka and Kerala (Rath,2015). Shifting cultivation has different local names in different areas. It is called jhum in Northeast India, it is called jhum, *podu* in Andra Pradesh, *bewar* or *daihya* in Madhya Pradesh and *podu*, *dungarchasa*, *koman* or *bringa* in Orissa (Acharyya et al, 2010).

Shifting cultivation is the custom of cultivating clearings scattered in the reservoir of natural vegetation (forest or grass-woodland) and of abandoning them as soon as the soil is exhausted; and this includes the custom of shifting the homesteads in order to follow the cultivator's search for new fertile land (FAO, 1985).

Jhum cultivation, also known as slash and burn agriculture, is the process of growing crops by first clearing the land of trees and vegetation and burning them hereafter. The jhum crops are the corps gown under *jhum* cultivation. Families who are practicing jhum cultivation are called *jhumias*.

Major crops grown under the jhum cultivationin Mizoram are paddy, maize, oil seed crop, soyabean, frenchbean, potato, colocasia, pumpkin, brinjal, okura, cucumber, bitter gourd, mustard, cowpea, chilli, sweet potato, solanum and ginger etc. These crops are cultivated either for household consumption or for cash crop inorder to generate income for the households to meet end-needs.

1.3 Jhum Cultivation in Mizoram

Jhumlands are very common in Mizoram. They are classified variously as current jhumland, old jhumland and abandoned jhumland. Jhumlands are more prevalent in eastern Mizoram where extensive and intensive jhumming is practiced.

Similarly, the areas in western side in Lunglei district towards Bangladesh have also Jhumlands(forest.mizoram.gov.in).

The backbone of Mizo economy has been agriculture through jhuming, which made the Mizo till recent past a migrating tribe. They shifted from one village to another at regular intervals and this practice led them to possess very little property. Whatever they had was simple to replace and could be carried easily without the help of transport facility (Kabra, 2008).

In Mizoram, land is customarily cropped for a single year, after which it is allowed to remain fallow. The fallow period varies from village to village. The entire village cultivates land in or more large blocks, engaging in the same agricultural operations at the same time. Informal arrangements are arrived at to carry out activities such as sowing, weeding, or harvesting in groups. Every year the village council selects consolidated block of land to be jhummed, which may be located on one or more slopes. The announcement of the lottery (*lo pawh*) is followed by gathering of all heads of households for the draw of lots. This determines the order in which the families will go out and decide on the location and size of their field. The performance of crops, however, depends greatly on the individual choice of plots, which is like a gamble in the lottery system (Singh, 1996).

1.4 Defining Value Chain

1.4.1 Value

In competitive terms, value is the amount buyers are willing to pay for what a firm provides them. Value is measured by total revenue, a reflection of the price a firm's product commands and the units it can sell. A firm is profitable if the value it commands exceeds the cost involved in creating the product. Creating value for buyers that exceeds the cost of doing so is the goal of any generic strategy. Value instead of cost must be used in analysing competitive position since firms often deliberately rise their cost in or to command a premium price via differentiation.

The value chain displays total value, and concise of value activities and margin. Value activities are the physically and technologically distinct activities a firm creates a product valuable to its buyers. Margin it is the difference between total value and the collective cost of performing the value activities. Margin can be measured in a variety of ways. Suppliers and channels value chain also includes a margin that is important to isolate in understanding the sources of a firm's cost position, since suppliers and channel margins are part of the total cost borne by the buyers (Porter, 1985).

1.4.2 Value Chain

The first step in mapping the market is to delineate the value chain. The flow of seed to farmers and grain or tubers to the market occurs along chains. These can be referred to as value chains because as the product moves from chain actor to chain actor e.g. from producer to intermediary to consumer it gains value (Hellin and Meijer, 2006).

The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky and Morris, 2000).

The value chain concept entails the addition of value as the product progresses from input suppliers to producers to consumers. A value chain, therefore, incorporates productive transformation and value addition at each stage of the value chain. At each stage in the value chain, the product changes hands through chain actors, transaction costs are incurred, and generally some form of value is added. Value addition results from diverse activities including bulking, cleaning, grading, packaging, transporting, storing and processing (Anandajayasekeram and Gebremedhin, 2009).

Value chain analysis is the process of breaking a chain into its constituent parts in order to better understand its structure and functioning. The analysis consists of identifying chain actors at each stage and discerning their functions and relationships; determining the chain governance, or leadership, to facilitate chain formation and strengthening; and identifying value adding activities in the chain and assigning costs and added value to each of those activities (UNIDO, 2009).

1.4.3 Different Types of Value Chain

Gereffi (1999) as cited by Kaplinsky and Morris (2011) has made the very useful distinction between two types of value chains; producer – driven chain and buyer-driven chain. Producer-driven commodity chains are those in which large, usually transnational, manufacturers play the central roles in coordinating production networks (including their backward and forward linkages). This is characteristic of capital and technology-intensive industries such as automobiles, aircraft, computers, semiconductors, and heavy machinery.

Buyer-driven commodity chains refer to those industries in which large retailers, marketers, and branded manufacturers play the pivotal roles in setting up decentralized production networks in a variety of exporting countries, typically located in the third world. This pattern of trade-led industrialization has become common in labor-intensive, consumer goods industries such as garments, footwear, toys, housewares, consumer electronics, and a variety of handicrafts. Production is generally carried out by tiered networks of third world contractors that make finished goods for foreign buyers. The specifications are supplied by the large retailers or marketers that order the goods.

1.4.4 Importance of Value Chain

Value chain analysis provides researchers with a tool to ask important questions about the distribution of power and value across the chain and is therefore eminently capable of addressing the agency of workers and small producers. This analysis can identify the scope for improving incorporation into the market – increasing returns and reducing risks. It acknowledges the political and competitive nature of the relationships involved and explores the difference which the organization of poor producers or labourers can make. But addressing labour markets, social arrangements and vulnerability is required to get the poorest people onto trajectories where more advantageous incorporation into chains becomes possible.

While much of the value chain literature and policy prescriptions – such as export-led manufacturing growth – focus on global chains, it is local and regional chains and labour markets associated with all value chains which are often of greatest relevance to poor people (Coles and Mitchell, 2011).

1.5 Scope of the study

Various efforts have been made in Mizoram to do away with jhum cultivation and introduce permanent way of farming system. Some of such endeavors are jhum Control Programme, Mizoram Intodelhna Project (MIP) and New Land Use Policy (NLUP). In spite of the efforts, many farmers in the rural areas are still engaged in jhum cultivation. It is believed that the practice of this traditional way of farming will not be easily put to an end as many of the farmers in rural Mizoram are still inclined to it.

In the midst of practicing jhum cultivation, many of the crops grown under jhums are believed to have ability to generate nutrition, income and employment for individual *jhumia* families and the community at large. From review of literature, no much of study on value chain particularly of jhum crops has been conducted in Mizoram. The present study is therefore conceptualized with an interest of finding out the contributions of jhum crops towards the livelihoods of *jhumia* families and the larger community through value chain system. The study was confined to Mizoram with the particular focus in villages where jhum cultivation is being practiced. Jhum crops having comparatively high volume of productions and potentials for generating income and employment were selected for the value chain analysis.

1.6 Objective of the study

The overall objective of the present study is to analyze the value chain of *jhum* crops in Mizoram. Specifically, the study attempted to:

1) Identify the existing value chains and activities involved in different stages;

2) Assess the ability to generate nutrition and income for the family;

3) Find out options for sustainability of the production system; and

4) Identify opportunities for value added processing that can generate additional income and employment.

1.7 Organization of the Thesis

The thesis is organized into ten chapters in which each chapter consists of detail information based on the objectives of the research. The first and introductory chapter defines the meaning of jhum cultivation and value chain, highlights the different types of crops cultivated by the famers, scope of the study, objectives of the research and organization of the Thesis. Chapter two focuses on the review of literature related with the present study through the available resources. Chapter three defines the methodological tools comprising of the statistical methods and technique utilized for data analysis, technique selection for sample size and data collection.

Chapter four concentrates on the basic information on socio-economic profile of the sample respondents under the study such as age, gender, educational qualification, marital status, household size, household's annual income and annual expenditure etc. Chapter five contains the details information concerning with the agricultural land and farming activities performed by the sample respondents. Chapter six defines the activities operated from clearing of land to the disposal of crops. This chapter determines the existing marketing channel which is one of the main anticipated findings from the research conducted.

Chapter seven deals with the possible options for sustainability of production system of the selected crops. Chapter eight mainly concerns with the nutrition facts of each selected crops and the capacity of earning more income for the farming household through these selected crops. Chapter nine highlights value added opportunities for the selected crops that will raise the economic income of the farmers.

Chapter ten presents summary and conclusions of the findings and further presents recommendations derived from the study.

CHAPTER 2

REVIEW OF LITERATURE

This chapter attempts to elucidate certain concepts employed in the study based on reviewing the literature from the past research work relevance with the present study objectives for better understanding of the related subject.

2.1 Definition of Value Chain

According to Chua as cited by Ang (2012), a value chain is a whole range of activities and services required to bring a product or service from idea and input stage to the market. This includes different players with a wide range of technical, business and service providers starting with the farmers back in the rural areas leading to the bigger global market. Value is added to raw materials and they undergo varied processes to become a final product. The process aims to deliver maximum value at the least possible costs.

Value Links Manual defined Value Chain as a sequence of related business activities (functions) from the provision of specific inputs for a particular product to primary production, transformation, marketing, and up to the final sale of the particular product to consumers (GIZ, 2018).

2.2. Difference Between Agricultural Value Chain, Supply Chain and Value Chain

An agricultural value chain is usually defined by a particular finished product or closely related products and includes all firms and their activities engaged in input supply, production, transport, processing and marketing (or distribution) of the product or products (Anandajayasekeram and Gebremedhin, 2009).

A Supply Chain as a sequence of (decision making and execution) processes and (material, information and money) flows that aim to meet final customer requirements, that take place within and between different stages along a continuum, from production to final consumption. The Supply Chain not only includes the producer and its suppliers, but also, depending on the logistic flows, transporters, warehouses, retailers, and consumers themselves. In a broader sense, supply chains include also new product development, marketing, operations, distribution, finance and customer service (Silva,2007).

A food system is the total stages of production, distribution, consumption and disposal of food products, including inputs, infrastructure and outputs at each stage. Production is the process of growing and harvesting of crops, the rearing of animals and their processing into consumer products. Distribution includes marketing, packing and transporting to sales outlets. A food system is a specific manifestation of what economists call a value chain. This term "food system" emphasizes that in every stage of the chain value is added to the product (Ossewaarde, 2018).

2.3. Identified Value Chain:

Three importance channels were identified by Jha and Singh (2005) through which the certified wheat seed passes from contact growers in the selected Sunari market of Nepal. They are :

Channel -I: Contracted wheat seeds grower – Agricultural Inputs Corporation- Co-operative dealers-Consumer farmers.

Channel -II: Contracted wheat seeds – Agricultural Inputs Corporation – Retailer – Consumer farmer.

Channel- III: Contracted wheat seeds growers-Agricultural Inputs Corporation – Consumer farmer.

Krishnegowda and Nagaraj (2015) found out four stages in the value chain of paddy production process in Karnataka Viz. Farming, Harvesting, Drying and Storing and Hulling at Rice mill and selling to different customers.

The vegetable supply chain in Madhya district, Karnataka State as identified by Sagar et al (2015) were (a) Farmer- Commission Agent 1 – Commission Agent 2 – Retailer-Consumer (SC-1),

(b) Farmer- Wholesaler-Retailer-Consumer (SC- 11) and (c) Farmer- Retailers-Consumer (SC-111).

Devi (2020) identified two channels for fresh turmeric marketing viz. Channel 1: Producer-Wholesaler-cum-Commissioner Agent-Retailer-Consumer and Channel II: Producer-Local Trader-Consumer. It was further observed that producer earned higher income from selling fresh turmeric through channel- I.

Prabhavathi *et al* (2013) identified two major channels for red chillies in three major production centers in Andra Pradesh such as Supply chain-1 involves the movement of produce from producer to trader, wholesaler, retailer and lastly to final consumers. Supply Chain-II is where red chilli was purchased by the processor in Regulated market through open auction method from the producer. It was further found out that supply chain-II was more efficient than Supply Chain- I and that farmers having good quality of red chilli preferred Supply chain –II

Asha et al. (2019) from their study of sugarcane marketing in Visakhapatna District, Andra Pradesh Found two existing channels in the study areas namely

:channel -1: Producer-Sugar factory- Wholesaler-Retailer-Consumer and channel II- Producer-Processor (gur)- Wholesaler-Retailer-Consumer. It was further observed that channel II was more efficient than channel- I. The reason for channel I inefficient in marketing process than channel -II was due to low producers net price and higher marketing cost and margins in channel -I.

Arumugam and Ibrahim (2015) found out that three types of corn marketing channel in Terrenghanu, Malaysia. The marketing channels are classified as channel-1 Farmers – consumers, channel- 2 : farmers – middleman- retailer- consumers and channel-3 : farmers – middleman 1(Federal Agricultural Marketing Agency)- middleman 2- retailer-consumer. From the research it was learnt that farmers obtained the lowest margin and profit in all the three marketing channels.

Kumar and Raj (2020) through their research identified six existing channels for dry chilli in Tirunelveli district of Tamil Nadu viz. Channel 1 : Producer- Consumer, Channel II- Producer- Retailer- Consumer, Channel III : Producer- Commission agent—Retailer- Consumer, Channel IV : Producer- Wholesaler- Retailer-Consumer, Channel V: Producer- Pre harvest contracter- Wholesaler- Retailer- Consumer and Channel VI : Producer- Village Merchant- Commission agent- Wholesaler- Retailer- Consumer. It was found from the research that channel I was the most efficient channel followed by channel II, channel IV, channel III, channel VI and channel V respectively. This finding indicated that marketing channels with minimum intermediaries were the most remunerative for chilli farmers and also had the highest marketing efficiency.

Based on their study on marketing chilli production in Wokha District of Nagaland, Murry and Tsopoe (2019) observed two marketing channels in the study area. The two marketing channels are:- Channel -I : Produce-Consumer and Channel- II : Produce- Retailer –Consumer. It was found that the chill grower share in consumer rupee was higher in channel-I (80.00 %) where no intermediaries involved in the channel than channel-II (57.14%) and also by applying shepherd's formula, it was learnt that channel- I had higher marketing efficiency as compared to channel -II in the study area.

Adhikari *et al*. (2021) revealed the different marketing level for fresh ginger and dried ginger in Nepal. The market channel for fresh ginger began from the producer sold the ginger to the local collectors and the local collectors again sold it to the wholesaler or retailer. For the marketing of dried ginger (sutho) , farmers sold dried ginger to the local collector and the local collector supplied to the wholesalers. The wholesalers again supplied dried ginger to the consumer.

A study conducted in Sarada Municipality, Bagchaur Municiplaity and Siddhakumarkh (Rural Municipality) of Salyan district by Adhikari *et al*. (2020) revealed that dried ginger was mainly sold to the traders in Indian markets whereas ginger was sold to the local collectors by a large number of the farmers. Thereon, ginger produced in Salyan were transported to different domestic market in Nepal. Ginger was also transported to the traders, who operated as on a commission-basis, in Indian market.

Bett et al. (2020) identified eight soybean marketing channels in the study area namely Embu county, TharakaNithi county and Meru County in Kenya. The eight soybean marketing channels are- channel 1- farmer- consumer, channel 2: Farmer-assembler-processor-consumer, channel 3: Farmer-assembler-wholesaler- retailer-consumer, channel 4: Farmer-processor- 2nd retailer-consumer, channel 5:

Farmer-processor- consumer, channel 6: Farmer-wholesaler-processor-consumer, channel 7: Farmer-wholesaler-retailer-consumer and channel 8: Farmer-retailer-consumer.

Arunkumar *et al* (2012) identified three major marketing channel for jaggery- the channels were: Channel I: Producer- Commission agent- Wholesaler –Retailer-Consumer. Channel II: Producer-Wholesaler-Retailer-Consumer and Channel III: Producer- Retailer- Consumer. Among these identified channels, Channel II was more popular and producers were benefitted the most in this channel as well.

Thanga and Vanrammawia(2013) observed three marketing channels for ginger in Mizoram. In which, channel I consisted of Producer-Retailer(Local market)-Consumer. Channel II- Producer-Local Trader-Wholesaler/Traders(Cachar/Silliguri)- Exporter in Terminal market(Bangladesh & Calcutta &Azhadpur (Delhi) Consumer. Channel III- Producer-Local (Commission) agent-Itinerants dealers(Local and Outside)-Wholesaler/Traders (Cachar/Siliguri)/Exporter in Terminal market (Bangladesh & Calcutta and Azhadpur-Delhi)- Consumer.

2.4. Benefits of Actors in Different Levels of Value Chain:

Marketing channels had been found to be well established in Orissa state, particularly in the coastal areas. No major value addition is done by the players at any level. The existence of functional channels explains that production and marketing system of coconut in the state can manage both increased supply and increased demand. The study has observed a high ratio of vendors v/s farmers and aggregators v/s vendors in the channel. In spite of this high ratio, both vendors and aggregators were able to earn profit and were continuing the business. It is suggested that coconut based industries should be jointly promoted by state industry department, state agriculture department and Coconut Development Board. (Kapoor and Kumar, 2010).

2.5 Actors Involved in Value Chain:

Debebe (2010) observed direct chain actors involved in Selale's dairy value chain were Farmers (Producers), in this, there were two groups of dairy farmers, namely traditional farmers and commercial farmers. Local collectors, individual collectors, cooperatives/union, processor collectors, processors, cafes and restaurants, regional retailers, super markets, sales outlets , kiosks, consumers and institutional buyers.

Coles and Mitchell (2009) In value chains, primary actors performed a selectionof (primary) functions. These typically include input supply, production, processing, storage, wholesale (including export), retail and consumption. Actors who perform similar functions are regarded as occupying the same functional „node‟, for example the input supply node, production node, retail node and so on. Secondary actors, or ancillary workers, perform (secondary) service roles that support primary functions, such astransportation, brokerage and service processing. As goods in value chains are exchanged and transformed, they‚flow downstream‟, in a series of transactions that add value and costs.

Afari-Sefa et al., (2014)identified actors involved in traditional vegetables value chain in both Malawi and Mozambique were Middleman, retailers and input suppliers.

From the value chain analysis in Northern Uganda conducted by (Dalipagic and Elepu, 2014) value chain actors were identified for different crops. The value chain actors for Maize were, producers, local traders, small/medium scale millers and wholesalers. For rice, the value chain were producers, local traders, millers and wholesalers while the value chain actors for sesame were farmers, local traders and wholesalers.

In their book, Coles and Mitchell(2011)highlighted four types of actor such as chain actors, external actors, expelled actors and non- participants/excluded actors.

Arunkumar et al (2012) identified the following actors in marketing jaggery-producers, retailer, wholesaler, commission agent and consumer.

From the same study conducted, Devi (2020) observed four actors involved in fresh turmeric marketing, they were producer, wholesaler-cum-commission agent, local trader and consumer.
From the same studies conducted by Parajuli (2021) on ginger crop verified the major actors exist in the Solukhumbu district. The identified actors are the following: 1) Input suppliers, 2) farmers 3) local collector/village trader, wholesaler/Retailer and enablers and facilitators.

Asha et al. (2019) from their study of sugarcane marketing in Visakhapatna District, Andra Pradesh observed the main intermediaries involved were Producer, Sugar factory, Processor (gur), Wholesaler, Retailer and Consumer .

A study carried out by Adhikari*et. al* (2020) in Sarada Municipality, BagchaurMuniciplaity and Siddhakumarkh(Rural Municipality) of Salyan district revealed the main actors for ginger marketing channel viz. input supplier, ginger grower, collector, retailer and final consumer.

From the same studies, Arumugam and Ibrahim (2015) identified the different actors such as Farmers, consumers, middleman, retailer, FAMA.

Galtsa et al. (2022) revealed the main actors in maize marketing southern Ethiopia. The main actors were farmer/producer, farmer trader/local collectors, urban collector/urban assemblers, district wholesalers, retailers and consumers.

Khanal (2018) mentioned the major actors involved in the marketing channel of ginger (Fresh and processed) in Salyan District, Nepal, the actors were farmers, local traders, wholesalers, retailers and consumers.

Daly et al(2016) identified the main actors in the maize value chain in East Africa, they were input providers, farmers, traders/aggregators, processors(mills) and downstream participants in activities such as retail, food manufacturing, brewing and animal productions.

2.6. Nutritional Value of Different Crops:

Chakrabarty (2017) reviewed that fresh green and red chillies were a good source of vitamin C and contains good amount of other antioxidants such as vitamin A, B-complex group of vitamins namely- niacin, pyridoxine (vitamin B6), riboflavin and thiamin (vitamin B1) and flavonoids like β-carotene, α-carotene, lutein, zea- xanthin, and cryptoxanthin. Also, Chili carried different minerals like potassium, manganese, iron, and magnesium.

Lokuruka (2010) from reviewed that soyabean is a good source of protein infact Soy protein products can be good substitutes for animal products because soy offers a "complete" protein profile . Soybeans contain all the essential amino acids (except methionine) Soy protein products can replace animal-based foods-which also have complete proteins but tend to contain more fat, especially saturated fat-without requiring major adjustments elsewhere in the diet. Proteins and lipids, some vitamins and minerals, are the major nutritionally important components of soybeans. Whole soy foods are also good sources of dietary fibre, vitamins B, calcium, and omega-3 essential fatty acids, all important food components.

Tamang (2015) found that Kinema is an ethnic fermented soybean food of the Nepali community in the Eastern Himalaya. Kinema has many health-promoting benefits including antioxidant, digested protein, essential amino acids, vitamin B complex, low-cholesterol content (Phytosterols), etc. Kinema was considered to be a functional food and considered the cheapest source of plant protein compared to milk and animal products on the basis of protein cost per kilogram. There were various kinema-like sticky naturally fermented soybeans which were consumed by different ethnic communities residing in the northeastern part of India bordering with Bhutan, China, and Myanmar. The kinema-like naturally fermented soybeans were hawaijar in Manipur, bekang um in Mizoram, peruyaan in Arunachal Pradesh, aakhone in Nagaland, and tungrymbai in Meghalaya.

Patil (2021) stated that jaggery is a rich source of potassium, iron, sodium and vitamins.

Dasgupta *et al* (2018) found out from their studies that King chilli and its products were good sources of many nutrient and antioxidant properties like capsaicin, ascorbate, fat, fibre, protein, flavonoids, phenolics and carotenoids.

2.7. Health Benefits of Different Crops:

From the same reviewed Chakrabarty(2017) that chilli pepper can be used as anti-inflammatory, prevent stomach ulcers, stop the spread of prostate cancer, aromatherapy and cosmetic applications, boost immunity, prevents sinusitis and relieves congestion or anti-rhinitis agent, cardiovascular benefits, lower risk of type 2 diabetes and obesity and natural pain relief.

Patil (2021) highlighted that jaggery nourishes the skin with its property vitamins and minerals. Jaggery was benefitted for proper maintenance of digestive stystem, jaggery purifies blood, jaggery prevents blood diseases and disorders, boosts immunity, prevents anemia especially for pregnant women, prevents fatigue and weakness of the body , benefits for weight loss, boosts body metabolism, It removes the toxins and impurities from the body, thereby providing relief from constipation and other health problems and controls blood pressure

Bhowmik et al. (2009) stated a beneficial treatment of turmeric for Gallbladder problems, hepatitis, indigestion, infections, lack of appetite, scabies, Alzheimer’s disease, arthritis, asthma, athlete's foot, boils, bursitis, breast cancer, colon cancer, cataracts, colic, dermatitis, diarrhea, eczema, fibrosis, gallstones, hardening of the arteries, heart disease, high cholesterol, high triglycerides, inflammation, intestinal pain, irritable bowel syndrome, jaundice, lack of menstruation, lymph gland problems, menstrual pain, morning sickness, pain, psoriasis, sprains, ulcers, wounds, yeast infections. Turmeric was also used for the treatment of bruises, for childbirth, eye inflammation, epilepsy, fever, hemorrhage, hemorrhoids, itching, ringworm.

Ratini (2020) mentioned that ginger fights germs, ginger as an antibacterial, it helps in settle seasickness or nausea caused by chemotherapy, it soothes sore muscles, anti-inflammatory, ginger may slow down the growth of some cancers like colorectal, gastric, ovarian, liver, skin, breast and prostate cancer, it lowers blood sugar, lower cholesterol and ginger as an antioxidants.

2.8. Problems in a Value Chain:

The same study (Dalipagic and Elepu, 2014) identified in northern Uganda that there were common constraints or rather problems farmers raised or experienced such as high price of seed, poor quality seed, low availability of seed, use of rudimentary tools, poor access to extension services, poor access to credit, limited adoption of modern agricultural practices, pest, weeds, vermin diseases and soil exhaustion.

The same study Parajuli (2021) higlighted the major problems faced by ginger growers in Solukhumbu district. The majors problem being faced during production process were white grub infestation, Rhizome rot infestation, unavailability of quality seed rhizome and input unavailability. The major marketing problems are price fluctuation at the harvesting time, lack of marketing infrastructure, lack of roads for transportation, ginger price fixing domination by local collectors, lack of market information system and poor linkage between ginger growers and stakeholders. The various post-harvest problems faced by ginger growers based on severity are as follows lack of processing facility, lack of storage facility, lack of grading facility and lack of packaging materials respectively.

A study conducted in two municipalities (Sarada Municipality and Bagchaur Municipality) and Rural Municipality (Siddhakumarkh) of Salyan district by Adhikari et.al (2020) stated problems faced during the production and marketing of the crop by ginger growers in the study area. The problem encountered by ginger producers during the production were ranked from severity problematic as the following 1) Rhizome rot, 2) dry rot, 3) availability of quality rhizome, 4) Post-harvest loss and 5) input availability. The five different problems faced during marketing activity was also ranked as per severe problematic namely 1)low market price of ginger, 2) lack of storage facilities, 3) lack of transportation, 4) lack of processing facilities and 5) quality issues.

Kumar et al. (2015) found out in their studies that maize cultivators in Bihar had faced problems related with institutional and marketing like insufficient and irregular supply of electricity in the village, untimely credit availability in rural areas, lack of proper marketing facility, no direct metallic road connectivity from their village to the market place, lack of Kishan credit card, absence of any regulated market or government procurement agency due to this farmers had to sell their produced to the local traders with a terms and condition offered by the local traders. Further, it was noticed that this marketing channel was not remunerative for the maize growers.

Boothpathi et al. (2019) conducted a study on Maize in Mizoram revealed the constraints of maize production were acidity of the soil whereby, suitable cultivars of maize was required to be identified. Seed replacement with improved varieties is essential for the jhumias, availability of low cost farm machineries and implements for hilly terrains were still negligible as Mizoram hills are acute steep in nature, transport network in the Mizoram is still in a poor shape. In Mizoram, procurement, processing, value addition and storage infrastructure were still considered constrain.

Lalhriatpuii and Lalthantluangi (2022)found out that the main problems faced by chilli growers and ginger growers in Champhai District, Mizoram were lack of credit facilities, disease, and insects. Further, it was learnt that the ginger growers considered credit facilities as their primary problem while chilli growers reported 'diseases and insects' as the main problem in their cultivation. The study was conducted by adopting five-point Likert scaling technique.

Devi (2020) observed the production constraint faced by farmers who performed processing and non- processing activity. First, the production constraints faced by the farmers who carried out turmeric processing were shortage of labour, high cost of planting material, high cost of labourers, non-availability of quality planting material, lack of technical guidance, uncertainty in production etc. Furthermore, marketing constraints being reported were to have faced low price of the processed product, unavailable facility of curing /processing, lack of market information, lack of developed market for processed turmeric and high cost of processing. The problems faced by non-processed farmers were shortage of labour, high cost of planting material, quality planting material, high labour cost etc and in the case of marketing, the main constraints were prices of the produced was not remunerative and high transportation cost.

Khanal(2018) mentioned the constraints faced by ginger farmers in Salyan District, Nepal, they were weak bargaining power, lack of direct contact to market and limited accessibility to market.

2.9. Conceptual Framework:

Krishnegowda and Nagaraj (2015) suggested in their studies of paddy in Karnataka State aconceptual model using e-governance and Public Private Partnership(PPP) in managing the supply chain of paddy which ensures fool proof mechanism not only to control prevailing losses but also arrives at a unique wealth creation opportunity, which can redefine the face of agricultural developments in the state.

2.10. Sustainability of Production System:

Phatak (1992) found out that cover crops, living and dying mulches, relay cropping, companion cropping, crop rotations, green manuring, composting were an important components of sustainable agriculture for the farmers.

Sullivan(2003) stated the practiced for sustainable production for corn and soyabean were planting of cover crop reduce erosion, build soil and in the case of planting legumes crop, it fixes nitrogen for sub-sequent crops.

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C

HAPTER – 3

RESEARCH METHODOLOGY

Research Methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically (Garg and Kotari, 2014).

This chapter outlines the methodologies adopted in the study approach and data collection related with the tools and techniques applied for selection of sampling size, data collection and data analysis in order to achieve the objectives of the research.

3.1 Selection of Crops

For the purpose of the study, jhum crops with comparatively high volume of production in the State were selected. According to Agriculture Statistical Abstract 2013-2014 prepared by Department of Agriculture, Government of Mizoram, major jhum crops being produced are Rice, Maize, Sesamum, Soyabean and Sugarcane, Topioca, Cow Pea, French Bean, Potato etc. Among these, the jhum crops having comparatively high volume of production and income generation prospects for actors viz. Chilli, Ginger, Maize, Soyabean, Sugarcane and Turmeric were selected for the value chain study (see Table 3.1).

3.2 Selection of Study Sites

As in other parts of the northeastern region, jhum or shifting cultivation is widely practiced in Mizoram specifically in the rural areas. More than 50% of the total population depends on jhum cultivation for their livelihood.

The study made used of multi-stage sampling technique in selection of districts and villages. The selection of study sites was based on the volume of production of selected jhum crops. Firstly, the districts having highest volume of production of a

particular crops were selected. At the time of data collection, there were only eight districts in Mizoram wherefrom selection of sites was based. Out of which, a total of 6 districts viz. Aizawl, Serchhip, Lunglei, Champhai, Kolasib and Mamit were selected for the study (see Table 3.1).

Secondly, villages with high volume of production within a particular district were selected again. The focal villages in a particular district were furthermore narrowed down into three villages for each identified crop having comparatively high volume of production. Thus, a total of 18 villages (3 villages per crop x 6 crops) were selected for the study.

Table 3.1:Sample crop with selected areas

Sl.No.	Name of the Crop	District	Village
1	Chilli	Aizawl	Mualpheng
		Serchhip	Sailulak
		Lunglei	Thingsai
2	Ginger	Champhai	Chawngtlai
		Aizawl	Khawruhlian
		Mamit	Lungphun
3	Maize	Kolasib	North Kawnpui
		Aizawl	Sesawng
-	-	Aizawl	Sihfa
4	Soyabean	Serchhip	Chhingchhip
		Aizawl	Kepran
		Champhai	Ngopa
5	Sugarcane	Serchhip	Khawlailung
		Aizawl	North Lungleng
		Aizawl	Phulpui
6	Turmeric	Aizawl	Ratu
		Mamit	Reiek

	Mamit	West Phaileng

Location map of Mizoram and map highlighting the study areas are presented in Figures 3.1 and 3.2. The profile of the selected villages such as the population size, quantitative data on households in each selected village, the literacy rate and the number of growers of a particular crop are presented as follows:

3.2.1 Chawngtlai

Chawngtlai Village being under Khawzawl RD Block in Champhai District, Mizoram has a population of 1890 and 370 households. Chawngtlai village literacy rate was 93.44 percent as per Census 2011. There are more or less 300 households growing ginger in this village.

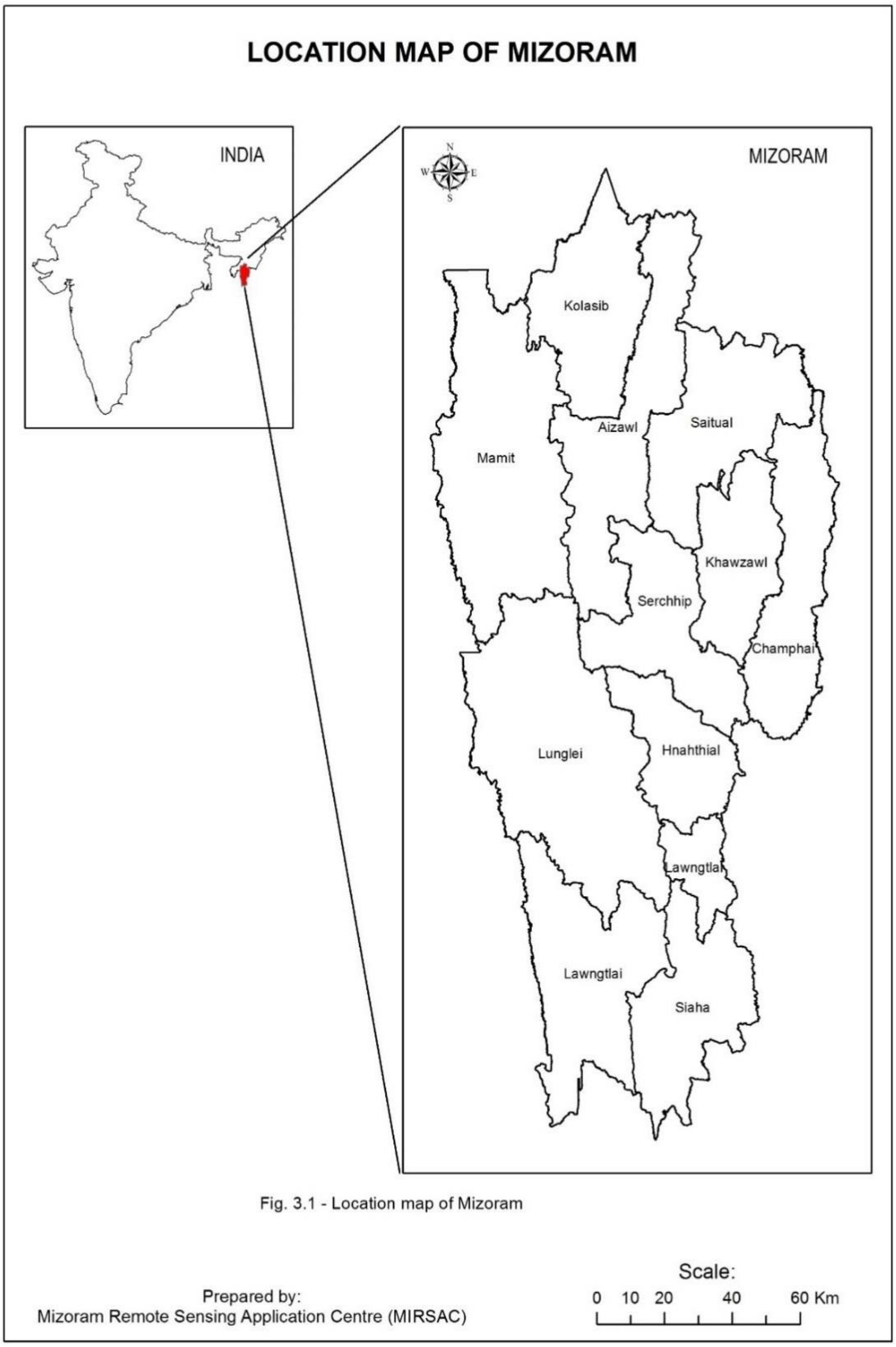

Fig. 3.1 - Location map of Mizoram

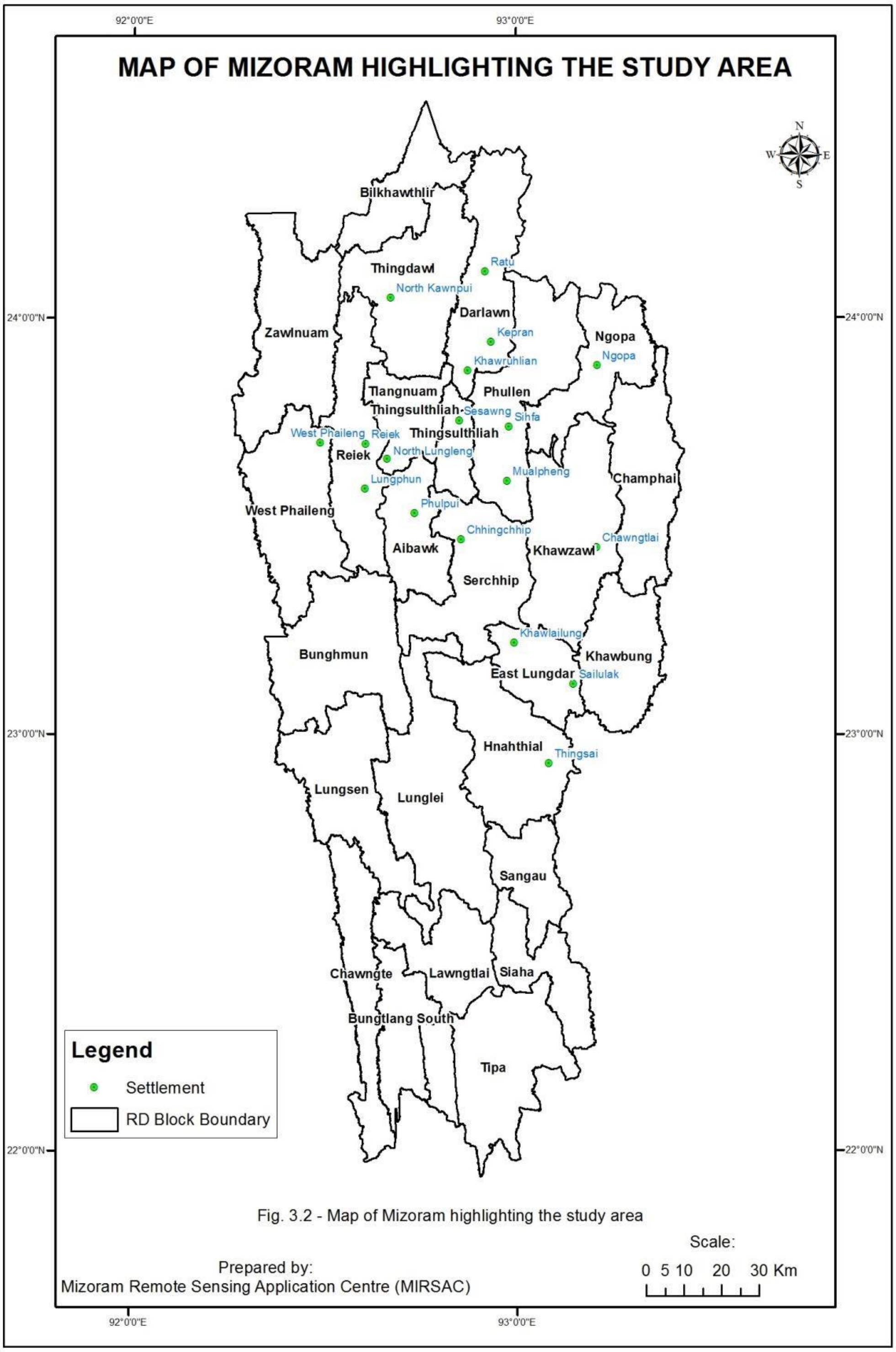

Fig. 3.2 - Map of Mizoram highlighting the study area

3.2.2 Chhingchhip

There are around 80 families growing soyabean in Chhingchhip Village. Chhingchhip is a village located under Serchhip RD Block in Serchhip District, Mizoram. Chhingchhip has a population of 2092 with total 750 households. Chhingchhip Village has one rural bank functioning in the village. The literacy rate of the village recorded by Census 2011 was 97.75 percent.

3.2.3 Kepran

Kepran village falls under Darlawn RD Block of Aizawl District, Mizoram. The literacy rate of Kepran as per Census 2011 is 94.83 percent. Kepran village has a population of 850 with 174 households. There areabout 40- 50 growers of soyabean in the village. Kepran is located 109 km away from the headquarter district Aizawl.

3.2.4 Khawlailung

The village of Khawlailung is situated under East Lungdar RD Block of Serchhip District, Mizoram. Khawlailung village consists of 2672 population and 562 households. There is one Rural Bank functioning in the village. Khawlailung village has around 150 household being engaged in sugarcane cultivation.According to Census 2011, the literacy rate of Khawlailung village is 95.05 percent.

3.2.5 Khawruhlian

According to Census 2011, Khawruhlian village has a high percentage of literacy rate of 97.68 percent. Khawruhlian village belongs to Darlawn RD Block of Aizawl District, Mizoram and there are a total of 564 households in the village. The village population is 2297 and there are approximately 30 ginger cultivators in the village.

3.2.6 Lungphun

Lungphun village has a population 435 with 97.26 percent literacy rate as recorded by Census 2011. Lungphun is a small village under Reiek RD Block in Mamit District, Mizoram. There are 106 households with about 105 families cultivating ginger.

3.2.7 Mualpheng

Mualpheng village belongs to Thingsulthliah RD Block of Aizawl District with a population of 875. There are 175 households in the village. Mualpheng village has a literacy rate of 99 percent. There are approximately 175 households cultivating chilli in the village.

3.2.8 Ngopa

Ngopa Village consists of 1060 households and 5701 population residing within the village. Ngopa Village comes under Ngopa RD Block in Champhai District, Mizoram. Families of 352 are engaged in jhum cultivation. It is believed that around 90 families have cultivated soyabean in the village. As per Census 2011, the village literacy rate is 91.33 percent. Ngopa village has one rural bank in the village.

3.2.9 North Kawnpui

North Kawnpui also known as Kawnpui III is a notified town of Kolasib District with about 200 maize growers. N.Kawnpui, one of the villages under Thingdawl RD Block is located 33 km away from the district capital Kolasib. As record maintained by the Village Council of North Kawnpui, there are 198 households with a population of 2600.Based on the records of Census 2011, the literacy rate of North Kawnpui is 97.35 percent.

3.2.10 North Lungleng

North Lungleng also known as Lungleng II is a village under Tlangnuam RD Block in Aizawl District. N.Lungleng has a population of 783 belonging to 171 households. It was reported that about 50 households are engaging in cultivating sugarcane crop. Based on the record provided by Census 2011, the village literacy rate is 98.37 percent.

3.2.11 Phulpui

Phulpui comes under Aibawk RD Block of Aizawl District, Mizoram. Phulpui is a small village having 1226 population with 13 families engaged in growing sugarcane crop. There are 270 households in Phulpui village and as per Census 2011,the literacy rate of Phulpui village is 99.77 percent.

3.2.12 Ratu

Ratu, a village consists of 3060 population is situated in Darlawn RD Block of Aizawl District, Mizoram. There are 512 households with approximately 30-40 growers of turmeric in the village. The distance between Ratu village and the headquarter district Aizawl is 140 km. The village literacy rate in accordance with Census 2011 is 93.39 per cent.

3.2.13 Reiek

Reiek village has population of 1851 with 98.13 percent of literacy rate as per Census 2011. Reiek village is the headquarters of Reiek RD Block of Mamit District, Mizoram with 504 households. There are about 270 Turmeric growers in Reiek.

3.2.14 Sailulak

Sailulak, one of the villages under East Lungdar RD Blocks of Serchhip District, Mizoram is located 184 km away from the district headquarters.

Sailulakvillage has a total population of 964 with about 170 chilli growers. There are

192 households with a literacy rate of96.29 percent as per Census 2011.

3.2.15 Sesawng

Sesawng village belongs to Thingsulthliah RD Block of Aizawl District, Mizoram. Sesawng is a comparatively large village having a population of 4448 and 919 households. In Sesawng Village, growers of maize ranges from 150-200 households. Based on Census 2011, Sesawng village has a literacy rate of 94.82 percent. There is one rural bank set up in this village.Sesawng village is situated 45 km away from the district headquarter Aizawl.

3.2.16 Sihfa

Sihfa village belongs to Thingsulthiah RD Block of Aizawl District, Mizoram. The total population of Sihfa village is 1118. There are 223 households with 190 families engaging in Maize cultivation. As per Census 2011, the literacy rate is 97.84 percent.

3.2.17 Thingsai

Thingsai village is located in Hnahthial RD Block of Lunglei District. Thingsai village has a population of 2536 with 503 households. It was reported that there are about 233 chilli growers in the village.According to 2011 census, the literacy rate of Thingsai village is 96.38 percent.

3.2.18 West Phaileng

West Phaileng village is the headquarters of West Phaileng RD Block which comes under Mamit District, Mizoram. The total population of West Phaileng is 2756 with 460 households.The literacy rate of West Phaileng as per Census 2011 is 96.4 percent. There used to be around 150 households cultivating turmeric in the village but the number of those who cultivated turmeric at the time of data collection was reported to be a little over 30 households.

3.3 Sample of the Study

Sample of the study was drawn from the sample villages using purposive sampling technique i.e. those who cultivated the selected crops were identified selected them as respondents of the study. As mentioned, three villages were selected for each of the selected crops which makes a total of 18 villages for six crops. A total of 10 farmers from each of the sample villages were identified as sample of the study. So, a total of 180 farmers (6 crops x 3 villages x 10 respondents) constituted sample of the study. The crops identified for the study with number of villages and respondents covered are presented in Table 3.2. In addition, information was also collected from selected actors who played important roles in various stages of the value chain to enrich the data collected from the respondents.

Table 3.2: Sample of the study

Sl. No.	Crops	No. of Villages	No. of Respondents
1	Chili	3	30
2	Ginger	3	30
3	Maize	3	30
4	Soyabean	3	30
5	Sugarcane	3	30
6	Turmeric	3	30
Total		18	180

3.4 Data Collection

The study relied on both primary and secondary sources of data to elicit information. Primary data was collected personally by the researcher from both the respondent farmers and other actors in the value chain using interview schedule. The interview schedule was developed with careful consideration of the objectives of the study and was pre-tested to a group of farmers who were not included in the sample of the study prior to the actual field of data collection. The duration of collecting primary data was from November 2016 to October 2017. Secondary data was also obtained from office documents, internet, books, census and journals.

3.5 Data Analysis

The data collected from the field were encoded and analysed using statistical tool viz. Statistical Packages for Social Science (SPSS). The study mainly relied on quantitative data and descriptive statistics such as frequency counts, percentage, mean, standard deviation and range were used.

3.6 Limitation of the Study

Whatever information generated from the study has its own limitations as the information collected was mainly based on simple recall of the respondents. Hence, the discussion and interpretations of the results may be understood in the light of this limitation.

3.7 Definition of the Concepts

- Jhum cultivation : Jhum cultivation or shifting cultivation involves clearing of trees and other vegetations, making firelines, burning of the debris and reburning the unburnt trees etc.

- Jhum Crops: Jhum crops are those crops cultivated in the land where jhum cultivation is practiced.

- Value chain- The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky and Morris, 2000).

- Value added – Value added products in general indicates that for the same volume of a primary product, a high price is realised by means of processing, packaging, upgrading the quality or other such methods (Kumar, 2014)

- Actors – Actors in value chains are those who involves in the marketing channels. A value chain actors include producers, rural agents, society, commissioners, wholesalers and retailers etc

- Rural agents/ Rural traders: Rural agents/ traders served as an intermediary between the farmers and the wholesalers/ agricultural commissioners.

CHAPTER 4

SOCIO-ECONOMIC PROFILE OF RESPONDENTS

This chapter presents the basic characteristics of the socio, demographic and economic of the 180 sample farmers including aspects like gender, age, marital status, ration card, educational qualification, household size, households' annual income and annual expenditure. The relevant information provided in this chapter will help in better understanding of the economic status and living conditions of the sample household thus help in drawing conclusion effectively.

4.1 Gender

It can be seen from table 4.1 that the sample respondents comprised of 72.78 per cent male and 27.22 per cent female. The only respondents where female respondents (63.33%) outnumbered male respondents (36.67%) was in Soyabean crop respondents. Overall, male respondents constituted larger portion against female respondents.

Table 4.1: Gender-Wise Distribution of the Respondents

Particular	Frequency			Percent		
	Male	Female	Total	Male	Female	Total
Chilli Farmers	29	1	30	96.67	3.33	100
Ginger Farmers	27	3	30	90.00	10.00	100
Maize Farmers	20	10	30	66.67	33.33	100
Soyabean Farmers	11	19	30	36.67	63.33	100
Sugarcane Farmers	25	5	30	83.33	16.67	100
Turmeric Farmers	19	11	30	63.33	36.67	100
Total	131	49	180	72.78	27.22	100

Source: Field Survey, 2016-2017

The sample respondents of male and female were not all male-headed and female-headed household. The collection of primary data on gender was based on two factors i.e. either 1) the availability of the respondent at the time of field visit or 2) a respondent who was considered to be more knowledgeable by the other family members. It was quite evident from the table that female share equal contribution of agricultural labour force with male in the same household. It is also important to note that unanimous decisions were normally taken on various issues especially related with farming activities in the household involving all the adult family members of the sample households.

4.2 Age

It is apparent from table 4.2 that the respondents' age ranges from 25 years to 75 years. The maximum age of the sample farmers was 75 years belonged to the Chilli growers while the minimum age was 25 years belonged to both Soyabean and Sugarcane producers. The standard deviation was 11.362. The active working mean age 49.54 years of the respondents indicated the presence of more economically active agricultural workforce in the household. High proportion of economically active members is a human capital, which can generate more income for the household (Ahmed, 2013).

Table 4.2: Age of the Respondents

Particulars	Minimum	Maximum	Mean	Std. Dev
Chilli Farmers	29	75	50.67	12.135
Ginger Farmers	27	66	49.1	12.147
Maize Farmers	27	71	50.6	11.388
Soyabean Farmers	25	73	50.17	11.618
Sugarcane Farmers	25	65	48.6	10.434
Turmeric Farmers	30	72	48.13	11.063
Total	25	75	49.54	11.362

Source: Field Survey, 2016-2017

Age is one of the important demographic features of the respondents which will influence on the decision-making style in farming practices (Thippeswamy, 2015). As presents in table 4.3 the largest respondents (31.67 %) were in the age group between 50-60 years followed by 22.78 per cent (60 and above), 21.11 percent (40-50 years), 20 per cent (30 to 40 years) and the lowest percentage was found in the age group of below 30 years (4.44%).

Table 4.3: Distribution of the Respondents According to the Age

Age	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	[illegible]
Below 30	2	3	1	1	1	-	8
30-40	5	6	5	5	6	9	36
40-50	6	4	6	6	7	9	38
50-60	9	9	9	11	13	6	57
60&Above	8	8	9	7	3	6	41
Total	30	30	30	30	30	30	180
Percent							
Below 30	6.67	10	3.33	3.33	3.33	-	4.44
30-40	16.67	20	16.67	16.67	20	30	20.00
40-50	20	13.33	20	20	23.33	30	21.11
50-60	30	30	30	36.67	43.33	20	31.67
60&Above	26.67	26.67	30	23.33	10	20	22.78
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

As presents in the above table, elderly people aged 60 years and above population were still found to be participating in farming activities, whether productively or unproductively. This is an implication of a condition that is existing in a household where shortage of human resources or poor economic condition are comparatively higher than a household with adequate manpower and monetary related.

Agricultural knowledge and skills in agriculture, such as production, operation, and management, increase with age. The accumulated knowledge and skills help farmers maximize the efficient use of agricultural input, such as pesticides and fertilizers, as well as labour input. The experience of older farmers leads to moreefficient combinations of input, which makes a unit of labour more effective (Guo,2015)

4.3 Marital Status

Marriage is an institutionalized pattern regulating the formation of a family which is the basic unit of every social structure. It is mainly the type of marriage and means of acquiring mates which determine the form of family and also the status of members constituting the family (Paul, 2005).

The marital status of the respondents was categorized into five groups viz. married, unmarried, divorced, widow and widower. Table 4.4 portrays that a large majority (87.22 %) of the respondents were found to be married followed by unmarried (7.78%) respondents. The respondents under the category of divorced, widows and widowers were negligible constituting 1.67 per cent each respectively.

Table 4.4:Marital Status of the Respondents

Particulars	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
Married	28	21	28	27	27	26	157
Unmarried	1	6	2	2	1	2	14
Divorced	-	1	-	-	-	2	3
Widow	-	2	-	-	1	-	3
Widower	1	-	-	1	1	-	3
Total	30	30	30	30	30	30	180
Percent							
Married	93.33	70	93.33	90	90	86.67	87.22
Unmarried	3.33	20	6.67	6.67	3.33	6.67	7.78
Divorced	-	3.33	-	-	-	6.67	1.67
Widow	-	6.67	-	-	3.33	-	1.67
Widower	3.33	-	-	3.33	3.33	-	1.67
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

One of the advantages that a married couple has is in good decision making. The decision taken by the two adults in a household can be made through personal experience, observation, listening or reading from any sources. All these will eventually help in obtaining a correct and better/ good decision making thus it can eliminate/limited error occurrence.

4.4 Educational Qualification

Education enhances the ability of farmers to see, decipher and make good use of information about production inputs, thus improving the efficient use of inputs. That is, an educated farmer has the capacity to understand and adopt improved technology that would shift his or her production frontier upwards (Ahmed and Geta, 2013).

In both theoretical and practical situations, education level plays an immense role in ensuring household access to basic needs such as food, shelter and clothing. Skills and education amplify the working efficiency resulting into more income and food security. Furthermore education is important to manage the business as well as in decision making (Kadigi, 2013).

The detail information of the educational qualification of the sample respondents is presented in Table 4.5. The level of education of the respondents in terms of literacy was high, constituting 97.78 per cent against 2.22 per cent of the respondents who did not have any form of education at all.

Table 4.5: Educational Qualification of the Respondents

Particulars	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
Graduate	-	-	-	-	-	3	3
HSSLC	1	1	-	1	3	1	7
HSS	4	4	6	6	9	13	42
Middle	17	8	13	10	11	9	68
Primary	8	15	10	12	7	4	56
No School	-	2	1	1	-	-	4
Total	30	30	30	30	30	30	180
Percent							
Graduate	-	-	-	-	-	10	1.67
HSSLC	3.33	3.33	-	3.33	10	3.33	3.89
HSS	13.33	13.33	20	20	30	43.33	23.33
Middle	56.67	26.67	43.33	33.33	36.67	30	37.78
Primary	26.67	50	33	40	23.33	13.33	31.11

No School	-	6.67	3.33	3.33	-	-	2.22
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

The high percentage of literacy is an indication of how the importance of educational system has sowed in the respondents' mind. It can be seen from the above table that 37.78 per cent have middle level education, followed by 31.11 percent with primary level education. A negligible percentage (1.67%) constituted a group of graduated from college category, however, this implied the limitation of employment opportunities prevalent in the State whereby engaging in farming activities became one of the sources of earning their livelihood.

There could be various possible reasons due to which most of the respondents did not pursue higher education such as finance constraint of the household or limited human resources which compels them to work in the farm at a young age or absence of proper education facilities availability in the village.

4.5 Household Size

Size and composition of family is another demographic feature that could influence on the farming practices (Thippeswamy,2015). As the size of the family increases the consumption expenditures will rise (Pradhan and Sethi 2012).

Out of the total 180 sample household, the smallest family size constituted only single-person member belonging to ginger cultivator while the largest family size is 14 members household (Table 4.6). The second smallest family household size constituted two members were found in all the respondents except for ginger farmers. The average family size of chilli farmers was 6, ginger farmers was 5.83, maize farmers was 5.6, soyabean farmers was 5.4, sugarcane farmers was 6.5 and turmeric farmers was 6.27. The overall mean household size was 5.93 with standard deviation of 2.186.

Table 4.6: Household Size of the Respondents

Particulars	Minimum	Maximum	Mean	Std. Dev
Chilli Farmers	2	11	6	2.034
Ginger Farmers	1	9	5.83	2.001
Maize Farmers	2	10	5.6	1.94
Soyabean Farmers	2	9	5.4	1.868
Sugarcane Farmers	2	14	6.5	2.776
Turmeric Farmers	2	12	6.27	2.348
Total	1	14	5.93	2.186

Source: Field Survey, *2016-2017*

The household size was classified into three groups viz. less than 5, 5 to 10 and 10 and above (Table 4.7). The demand of physical labour in Agriculture is quite intense therefore the advantage of having a large family size is the potentiality of higher contribution of manpower which can exempt the money required for hiring labour expenditure.

Table 4.7: Distribution of Respondents According to the HouseholdSize

Particulars	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
Below 5	6	9	9	9	2	8	43
5-10	22	21	20	21	24	20	128
10&above	2	-	1	-	4	2	9
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**
	Percent						
Below 5	20	30	30	30	6.67	26.67	23.89
5-10	73.33	70	66.67	70	80	66.67	71.11
10 &Above	6.67	-	3.33	-	13.33	6.67	5
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Field Survey, 2016-2017

Distribution of respondents as presented in Table 4.8 show that majority of the household (71.11 %) fall between 5 to 10 members while a meagre percentage (5%) comprised of 10 and above household members category. The size of the household is a crucial factor in determining the division of income between consumption and saving.

Table 4.8: Distribution of Respondents According to the Household Size

Particular	Frequency				Percent			
	Below 5	5-10	10 & above	Total	Below 5	5-10	10 & above	Total
Chilli Farmers	6	22	2	30	20	73.33	6.67	100
Ginger Farmers	9	21	-	30	30	70	-	100
Maize Farmers	9	20	1	30	30	66.67	3.33	100
Soyabean Farmers	9	21	-	30	30	70	-	100
Sugarcane Farmers	2	24	4	30	6.67	80	13.33	100
Turmeric Farmers	8	20	2	30	26.67	66.67	6.67	100
Total	43	128	9	180	23.89	71.11	5	100

Source: Field Survey,2016-2017

4.6 Household status of the respondents

Ration Cards are important documents issued by the government. It enables user to buy fuel, food, etc. at subsidised rates. These groceries are distributed to the eligible customers at Fair Price Shops (FPS). Ration cards are also as an identity proof. The existing system consists of a ration cards in book form for three categories. Three categories are based on the criteria given by the government (Awate *et al,* 2018).

The Indian ration card provides food for the poor people which is distributed by the government along with the fuel. It provides a distinct identity of person which is useful to update with the government record. The basic food items provided by government are rice, sugar, wheat. Ration Card is one of the most important documents which acts as identity proof for any individual (Bagul*et al,* 2017).

Table 4.9 reveals that a significant proportion of the farmers (65.5 %) were entitled to enjoy the benefits of Priority Householder (PHH) categorised as households belonging to ‘Below Poverty Line. ’The second highest (26.11 %) were under the category of Above Poverty Line (APL) card holders followed by

Antyodaya Anna Yojana (AAY) card holder (8.33%) who are categorized as ‘poorest of the poor.’

Table 4.9: Household Status of the Respondents

Particulars	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
AAY	-	5	1	5	-	4	15
PHH	17	16	26	21	19	19	118
APL	13	9	3	4	11	7	47
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**
	Percent						
AAY	-	16.67	3.33	16.67	-	13.33	8.33
PHH	56.67	53.33	86.67	70	63.33	63.33	65.56
APL	43.33	30	10	13.33	36.67	23.33	26.11
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Field Survey, 2016-2017

4.7 Annual Income of Household

The significance of income is the most important determinant of consumption. The rural households derive their income from various sources like agriculture, livestock and poultry, wages and other self-employed activities. Income gives people the ability to buy nutritious foods instead of eating only their own crops, to pay for motorised transport instead of walking, to pay for health care and education for their families, to pay for water from a tap instead of walking for many hours to collect it from a well (Pradhan and Sethi, 2012).

The annual income of households was found to be varied among the sample households. Table 4.10 reveals that minimum annual income of a family was ₹18984 while the maximum income was ₹1793646 per year. The mean annual income of the respondent household shaving an average household size of 5.98 (see Table 4.6) was

₹ 200000 with a standard deviation of ₹2144800.876. The highest annual income of the respondents belonged to Soyabean farmers while the lowest annual income belonged to Ginger farming households. From the field survey, the monthly incomeof the sampled households was found to be ₹ 16666.67.

Table 4.10: Annual Income of the Respondents

Particulars	Minimum	Maximum	Mean	Std. Dev
Chilli Farmers	26276	854776	258993.4	224649.733
Ginger Farmers	18984	673984	176549.7	182623.7
Maize Farmers	22768	949000	177868.833	175101.617
Soyabean Farmers	26242	1793646	174311.333	331998.033
Sugarcane Farmers	49240	725640	206430.33	12642.508
Turmeric Farmers	19232	719232	207987.8	167840.19
Overall	18984	1793646	200000	214800.9

Source: Field Survey, 2016-2017

Income is the major indicator of the economic status of an individual. Every individual's living style influenced to great extent by his/her income. Expenditure on farming, allied occupations and household matters are decided by the income earned by an individual. The income level influences the degree of farmer's prestige in the society and their contacts with the outside world. A low level of annual income hinders acquisition of new skills, knowledge and also the assets. A better financial position enables farmers to be more enterprising in taking risks involved in trying new and advanced farming techniques and motivates farmers to adopt new technologies (Hegde and Madhuri, 2013).

As shown in table 4.11, households with highest annual income group (₹ 200000 & above) forming the highest percentage i.e.34.44 followed by 23.89 percent

(₹ 50000-100000), 16.67 percent (less than ₹ 50000), 15.56 percent (₹100000-150000) and the lowest percentage was 9.44 (₹ 150000-200000).

Table 4.11: Distribution of Annual Income of the Respondents

Income	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
	Frequency						
Below 50000	4	9	1	11	1	4	30
50000-100000	3	7	12	8	6	7	43
100000-150000	8	2	3	3	10	2	28
150000-200000	1	3	6	1	2	4	17
200000 & Above	14	9	8	7	11	13	62
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**
	Percent						
Below 50000	13.33	30	3.33	36.67	3.33	13.33	16.67
50000-100000	10	23.33	40	26.67	20	23.33	23.89
100000-150000	26.67	6.67	10	10	33.33	6.67	15.56
150000-200000	3.33	10	20	3.33	6.67	13.33	9.44
200000 & Above	46.67	30	26.67	23.33	36.67	43.33	34.44
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Field Survey, 2016-2017

4.8 Annual Expenditure of household

As shown in table 4.12 the mean annual expenditure by the sample average household size 5.93 (see Table 4.6) was ₹ 104000 with minimum and maximum annual expenditure accounted for ₹ 14400 and ₹ 60000 respectively. Ginger farmers were found to spend the most with maximum expenditure of ₹ 600000.

Table 4.12: Annual Expenditure of the Respondents

Particulars	Minimum	Maximum	Mean	Std. Dev
Chilli Farmers	36000	240000	92400	60854.603
Ginger Farmers	14400	600000	111080	126420.258
Maize Farmers	2400	480000	99800	91558.687
Soyabean Farmers	18000	360000	76800	70999.951
Sugarcane Farmers	36000	390000	114000	84589.068
Turmeric Farmers	48000	300000	132000	73838.594
Total	14400	600000	104000	87821.26

Source: Field Survey, 2016-2017

The expenditure pattern of a household is highly determined by different factors such as income of the family, household size, nature of occupations, gender, level of education and age group of the household etc. The conspicuous major consumption expenditure of the total household were on food items like pulses, edible oil, sugar, salt, meat, eggs and vegetables etc. The sample farmers also purchased vegetables which were not home-grown by them. Among non-food items (NFIs) expenditure on tobacco, pan, intoxicants and khaini were quite high as these are consumed regularly by adult members of the respondent households. Non-food items (NFIs) such as furniture, electronics, mattresses and home appliances etc were not purchased on a regular basis.

The regular expenditure incurred by the sample families were on mobile, recharge vouchers, shampoos, bathing soap, detergent powder, education, transportation and utility expenses on electricity bills, water bill and television cable bill, etc. From the above table 4.13, 36.67 per cent accounted for the highest percentage of annual household expenditure ranging between ₹.50000 and 100000 followed by 29.44 per cent of households with less than ₹50000 yearly expenditure. There was 12.78 per cent household exceeding an annual household expenditure of ₹ 200000. The annual expenditure of the sampled households was lower as compared with the urban city. This could be due to the dissimilar living style of rural people from the residents in urban city.

Table 4.13: Distribution of Annual Expenditure of the Respondents

Frequency							
Particular	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
Below 50000	8	12	9	15	6	3	53
50000-100000	14	10	10	10	11	11	66
100000-150000	4	1	6	2	8	7	28
150000-200000	1	2	2	1	2	2	10
200000 & Above	3	5	3	2	3	7	23
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**
Percent							
Below 50000	26.67	40	30	50	20	10	29.44
50000-100000	46.67	33.33	33.33	33.33	36.67	36.67	36.67
100000-150000	13.33	3.33	20	6.67	26.67	23.33	15.56
150000-200000	3.33	6.67	6.67	3.33	6.67	6.67	5.56
200000 & Above	10	16.67	10	6.67	10	23.33	12.78
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Field Survey, 2016-2017

4.9 Expenditure percentage

Expenditure pattern is the most important indicator to understand the level of living. After satisfaction of demand for food, clothing and housing are the needs for which human beings make efforts to fulfil them. Other necessities like health, education, travel, fuel, ceremony etc. come later. (Paul, 2005).

Household expenditure varied according to the income of a household. Table

4.14 presents the annual expenditure percentile of each farmer. It is evident from the table that turmeric farmers spent the highest percentage (63.47) from their annual total income succeeded by ginger farmers (62.92 %), maize farmers (56.12 %), sugarcane farmers (55.22 %) and chilli farmers spent only 35.67% from their annual earnings.

Table 4.14: Annual Expenditure Percentile of the Respondents

Crops	Mean Expenditure	Mean Income	Percentage of Expenditure
Chilli Farmers	92400	258993.4	35.68
Ginger Farmers	111080	176549.7	62.92
Maize Farmers	99800	177868.83	56.12
Soyabean Farmers	76800	174311.33	44.06
Sugarcane Farmers	114000	206430.33	55.22
Turmeric Farmers	132000	207987.8	63.47

Source: Field Survey, 2016-2017

Household consumer expenditure is the total of the monetary values of consumption of various items, namely (i) food, pan (betel leaves), tobacco, intoxicants and fuel & light, (ii) clothing and footwear and (iii) miscellaneous goods and services and durable articles. (NSSO, 60th Round, 2005). It can be observed from the overall results that the respondents were able to manage their basic household requirements with the income they earned.

Chapter Summary:

The sample respondents comprised of 72.78 per cent male and 27.22 per cent female. The respondents' age ranges from 25 years to 75 years with mean age 49.54. Moreover, the largest respondents (31.67 %) were in the age group between

50-60 years whereas the lowest percentage was found in the age group of below 30 years (4.44%). A large majority (87.22 %) of the respondents were found to be married in the study areas. The level of education of the respondents in terms of literacy was high, constituting 97.78 percent against 2.22 percent of the respondents who did not have any form of education at all. The high percentage of literacy is an indication of how the importance of educational system has sowed in the respondents' mind. Among the 180 respondents, 37.78 per cent have middle level education, followed by 31.11 per cent with primary level education. A negligible percentage (1.67%) constituted a group of graduated from college category.

The overall mean household size was 5.93 with standard deviation of 2.186., the household size ranged from one to 14 households in the study areas. A significant proportion of the farmers (65.5 %) were entitled to enjoy the benefits of Priority Householder (PHH) categorised as households belonging to 'Below Poverty Line.' The second highest (26.11 %) were under the category of Above Poverty Line (APL) card holders followed by Antyodaya Anna Yojana (AAY) card holder (8.33%) who are categorized as 'poorest of the poor.'

The minimum annual income of a family was ₹ 18984 while the maximum income was ₹1793646 per year. The mean annual income of the respondent households of an average household size of 5.98 was ₹ 200000. The highest annual income of the respondents belonged to soyabean farmers while the lowest annual income belonged to Ginger farming households.

The mean annual expenditure by the sample average household size 5.93 was

₹ 104000 with minimum and maximum annual expenditure accounted for ₹ 14400 and ₹ 60000 respectively. The annual expenditure percentile of each farmers were turmeric farmers spent the highest percentage (63.47) from their annual total income succeeded by ginger farmers (62.92 %), maize farmers (56.12 %), sugarcane farmers (55.22 %) and chilli farmers spent only 35.67% from their annual earnings.

CHAPTER 5

CULTIVATION PRACTICES

Mizos have been agriculturist from the start of the 18th century when they made their western trek to the present Mizo Hills. They knew only the form of farming known as shifting cultivation which form the major activity of the Mizo economic life even today (Thangchungnunga, 1997). Jhum or shifting cultivation is the principal method of cultivation in Mizoram and its neighbouring hilly states (Pachuau, 1994).

Shifting cultivation, in Mizo called *Lo neih*, is practised throughout Mizoram with only slight modifications from place to place to accommodate different topography and climate (Lalnunmawia et al. 2018).

This chapter contains the details information concerning with the operational land for agriculture, farming experiences on crops and farming activities performed in a traditional jhum cycle by the sample farmers. The major components of activities involved in jhum cycle are: clearing of land, preparation of fire lines, burning, reburning, sowing, weeding, harvesting and post-harvest handling.

The description of the traditional farming system practiced by the sample respondents will elucidate the strategy utilized by the respondent farmers as and when appropriate. The delineate of traditional farming system followed in every stage by the sample farmers will further be useful to enlarge the knowledge on activities carried out by the Mizo community in general as jhum cultivation is the primary source of livelihood for most of the farming household.

5.1. Years of Experience

Woldesenbet(2013) cited from Ayelech (2011) mentioned that a household with better experience in vegetable farming is expected to produce more amounts of vegetables and, as a result, he is expected to supply more amounts of vegetables to market. Farmers with longer farming experience are expected to be more knowledgeable and skillful. Table 5.1 shows that the average experience of practicing farming was 16.99 years ranging from minimum 1 year to maximum 45 years with standard deviation of 10.109. The finding of farming experience reveals that jhum cultivation has been the principal source of livelihood and predominantly practiced over many years in Mizoram. Thus, with more experience gained from many years of engagement in farming, farmers are likely to generate knowledge from their practical experiences regarding suitability of soil with different crops, climatic condition ,different types of pest and diseases for different crops and how to controlit, ideal time of - clearing of forest, burning, sowing, weeding and harvesting etc.

Table 5.1: Distribution of Farming Experience by the Respondents

Particulars	Minimum	Maximum	Mean	Std. Dev
Chilli Farmers	1	37	19.6	9.328
Ginger Farmers	3	32	16.47	8.262
Maize Farmers	1	45	20.77	12.561
Soyabean Farmers	1	39	15.7	10.771
Sugarcane Farmers	2	37	18.13	11.085
Turmeric Farmers	5	22	11.3	4.489
Total	1	45	16.99	10.109

Source: Field Survey, 2016-2017

Furthermore, it can be seen in Table 5.2 thatfarmers who had witnessed ‘more than 20 years’ of farming experiences comprised the largest group (40.56 %) in the study areas.

Table 5.2: Years of Experience in Cultivating the Selected Crops

Particulars	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
Below 5	3	2	2	9	6	-	22
5-10	2	4	6	1	3	10	26
10-15	4	8	2	1	1	12	28
15-20	3	7	2	8	5	6	31
20&Above	18	9	18	11	15	2	73
Total	30	30	30	30	30	30	180
Percent							
Below 5	10	6.67	6.67	30	20	-	12.22
5-10	6.67	13.33	20	3.33	10	33.33	14.44
10-15	13.33	26.67	6.67	3.33	3.33	40	15.56
15-20	10	23.33	6.67	26.67	16.67	20	17.22
20&Above	60	30	60	36.67	50	6.67	40.56
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

The highest number of cultivators of chilli (60 %), ginger (30%)maize(60%),soyabean (36.67 %) and sugarcane (50 %) had more than 20 years of farmingexperiences in cultivating. Among the turmeric farmers, the share of farmers with 10-15 years of farming experience group in cultivating turmeric constituted thehighest number (40 %).

5.2. Jhum Area of Cultivation

Land is one of the natural resources that affects the level and pace of development in general and agricultural development in particular (Singh and Shishodia, 2016). In Mizo society, the basis of land allotment happens to be the family size. So, family size and holding size are likely to be highly correlated. The size-distribution of land is highly dependent on the size of the family (Vanlalvena, 2013). Table 5.3 reveals that the mean and standard deviation of the operational land holding size of the respondents in the surveyed area was2.3986 acres and 1.19025 respectively. The maximum and minimum acres of land ranged from 0.5 to 6.5 acreswas utilized for farming by the average household of 5.93 members (See Table 4.6) in the study areas.

Table 5.3: Jhum Area Distribution of Respondents

Particulars	Minimum	Maximum	Mean	Std. Dev
Chilli Farmers	0.5	6	3.0583	1.26914
Ginger Farmers	0.5	5	2.3	0.98786
Maize Farmers	0.5	4	1.9833	1.05441
Soyabean Farmers	0.5	5	1.95	1.06755
Sugarcane Farmers	1.5	6.5	3.3167	1.15582
Turmeric Farmers	1	3.5	1.7833	0.67828
Total	0.5	6.5	2.3986	1.19025

Source: Field Survey,2016-2017

The data pertaining to the jhum area of crop cultivation by the sample farmers are depicted in Table 5.4. In rural economy, land is one of the important socio-economic indicators. Size of landholding influences the cropping pattern, farming practices and adoption of modern technology (Thippeswamy, 2015). The land holding size of the farmers are classified into five categories namely ‘below 1 acre’, ‘1-2 acres’, ‘2-3 acres’ and ‘3 acres& above’. Among the sample households, the highest number (37. 78 %) carry out farming in an area of ‘3 acres and above’ followed by households (33.33 %) with an area of ‘2-3 acres’. There were only few respondents (3.89 %) operating jhum area of ‘below 1 acre’ (see Table 5.4).

Table 5.4: Distribution of Jhum Land Size by the Respondents

Tin	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
Below 1 acre	1	2	2	2	-	-	7
1-2 acre	3	3	12	13	1	13	45
2-3 acre	7	16	7	7	9	14	60
3 acre& Above	19	9	9	8	20	3	68
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**
Percent							
Below 1 acre	3.33	6.67	6.67	6.67	-	-	3.89
1-2 acre	10	10	40	43.33	3.33	43.33	25
2-3 acre	23.33	53.33	23.33	23.33	30	46.67	33.33
3 acre& Above	63.33	30	30	26.67	66.67	10	37.78
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Field Survey, 2016-2017

Desta (2004) as cited in Woldesenbet (2013) mentioned that in agriculture, land is one of the major factors of production. The availability of land enables the owner to earn more agricultural output which in turn increases the marketable supply.

5.3 Phases of Jhum Land

Table 5.5 shows that a huge majority (98.33 %) of the respondents reported that they cultivated crops for one year on the jhum plot while 1.11 per cent reported to have cultivated jhum crops for the second year in succession. Interestingly, 0.55 per cent of farmers cultivated crops for more than three consecutive years on the same jhum land. This finding indicated that the possibility of successive cultivation of crop on the same land for more than three years can be existed, wherein fertility and types of the soil also contribute an important factor for such practice.

Table 5.5: Phases of Jhum Cycle in the Study Areas

Month	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
One year	30	30	30	27	30	30	177
Two year	-	-	-	2	-	-	2
Three year	-	-	-	-	-	-	-
Above three year	-	-	-	1	-	-	1
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**
Percent							
One year	100	100	100	90	100	100	98.33
Two year	-	-	-	6.67	-	-	1.11
Three year	-	-	-	-	-	-	-
Above three year	-	-	-	3.33	-	-	0.56
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Field Survey, 2016-2017

Slashing of trees, bushes and forests etc. are not required for two year consecutive jhum land since it was already completed in the first cropping year. However, in the second year of cultivation, the activity of clearing the regrowth grass is necessary and this is generally performed using a hoe (*Tuthlawh*). For some farmers, burning is not carried out in the second cropping year for preparing new crop plantation.

5.4. Number of Jhum Plots Used for Farming Purposes

Information on number of plots engaged by the sample respondents are presented in Table 5.6. Out of the 180 jhumia households interviewed, it appeared that a vast majority (85.56 %) of the respondents practiced jhum cultivation in a single jhum land while farmers operating more than one jhum area for farming were also identified. The farming households engaging in two jhum areas accounted for 12.78 per cent in the selected villages. These farming households belonged to chilli cultivators (3.33 %), ginger cultivators (6.67 %), soyabean cultivators (20 %) sugarcane cultivators (23.33 %) and turmeric cultivators (23.33%).

A negligible percentage (1.67 %) was also found to have three plots of land for carrying farming activities in one year. These particular famers belonged to Chilli (3.33%) and ginger growing households (6.67%). Moreover, it is noteworthy that among the growers of chilli, ginger, maize, soyabean, sugarcane and turmeric, only all the respondents of maize growers (100 %) claimed to manage one plot ofland in one year.

Table 5.6: Number of Plots Used for Cultivation by the Farmers

Month	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	Total
One Plot	28	26	30	24	23	23	154
Two Plots	1	2	-	6	7	7	23
Three Plots	1	2	-	-	-	-	3
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**
Percent							
One Plot	93.33	86.67	100	80	76.67	76.67	85.56
Two Plots	3.33	6.67	-	20	23.33	23.33	12.78
Three Plots	3.33	6.67	-	-	-	-	1.67
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

Since farming is one of the main sources of food and income for the farming households, hence, the existence of such practiced signifies that the primary motive of a farmer is mainly to meet the growing requirement of farming household needs through the contribution made from having more than one plot of land.

5.5. Ownership of Land

In Mizo society land is owned by the community rather than the individual. There are two types of land ownerships, viz., Community lands and Private lands. The community land is mainly used for shifting cultivation. The proportion of this community land to the total geographical area of the region is much more than that of the private lands (Vanlalvena, 2013).

It is apparent from Table 5.7 that a little over one-third (37.44 %) of the jhum farmers cultivated crops in their owned land and often, these private lands are later converted into settled agricultural land for growing permanent crops. From the 180 sample households, it was recorded that 33.89 per cent carried out farming in a community land provided by the Village Council. There were 13.89per cent and 9.44 per cent of sample farmers who leased agricultural land from their relatives and friends for agricultural purpose respectively. The duration period of leasing the jhum land can be one year or even more. Also, in exchange to leasing fee, most of the farmers who leased either their relatives or friends land paid the rental charges in the form of cash, kind (mainly from their own production) or labour as per agreement made between the land owners and the tenants.

Table 5.7: Status of Land Ownership in the Study Areas

Particulars	**Frequency**						
	Chilli Farmers	**Ginger Farmers**	**Maize Farmers**	**Soyabean Farmers**	**Sugarcane Farmers**	**Turmeric Farmers**	**Total**
Owned land	-	11	12	4	20	20	67
Community land	28	16	4	13	-	-	61
Relatives	1	1	9	4	6	4	25
Friends	-	1	5	5	1	5	17
Owned land and relatives	-	1	-	1	1	-	3
Owned land and community Land	1	-	-	1	1	1	4
Owned land and friends	-	-	-	-	1	-	1
Community land and relatives	-	-	-	1	-	-	1
Relatives and friends	-	-	-	1	-	-	1
Total	30	30	30	30	30	30	180
	Percent						
Owned land	-	36.67	40	13.33	66.67	66.67	37.22
Community land	93.33	53.33	13.33	43.33	-	-	33.89
Relatives	3.33	3.33	30	13.33	20	13.33	13.89
Friends	-	3.33	16.67	16.67	3.33	16.67	9.44
Owned land and relatives	-	3.33	-	3.33	3.33	-	1.67
Owned land and community Land	3.33	-	-	3.33	3.33	3.33	2.22
Owned land and friends	-	-	-	-	3.33	-	0.56
Community land and relatives	-	-	-	3.33	-	-	0.56
Relatives and friends	-	-	-	3.33	-	-	0.56
Total	100	100	100	100	100	100	100

Source : Field Survey, 2016-2017

Since, there were farmers reported to have practiced jhum cultivation in more than one jhum area, it was noticed that a negligible and equal percentage of each .56 percent of farming household were identified to have grown crops under the categories of “own land and friends”, “community land and relatives” and “relatives and friends” respectively.

5.6. Distance of Jhum Lands

The measurement unit of distance is calculated in kilometers. Table 5.8 shows the distance of jhum land and homestead of the sample households. It is visible that some farmers (29.44 %) were residing more than six kilometers away from their jhum land whereas a household of 14.44 percent were found to be located between five and six kilometers away from their jhum land. There were 4.44 per cent of sample respondents reported to have resided less than one kilometer from their jhum land.

Table 5.8: Distribution of Home-Farm Distances in the StudyAreas

Distance	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	Total
Below 1	1	-	1	-	-	6	8
1-2	1	3	3	1	9	6	23
2-3	5	6	5	1	3	4	24
3-4	4	8	2	2	5	1	22
4-5	7	3	6	1	5	2	24
5-6	7	3	3	5	5	3	26
6&Above	5	7	10	20	3	8	53
Total	30	30	30	30	30	30	180
			Percent				
Below 1	3.33	-	3.33	-	-	20	4.44
1-2	3.33	10	10	3.33	30	20	12.78
2-3	16.67	20	16.67	3.33	10	13.33	13.33
3-4	13.33	26.67	6.67	6.67	16.67	3.33	12.22
4-5	23.33	10	20	3.33	16.67	6.67	13.33
5-6	23.33	10	10	16.67	16.67	10	14.44
6&Above	16.67	23.33	33.33	66.67	10	26.67	29.44
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

It can be postulated with plot located far away home consumes more time as farmers have to walk by foot especially in a place where there is no proper availability of transportation facilities and hence, there was a relationship between time and distance of farm from home in the study areas. McCall (1985) mentioned that distance between fields clearly effects on labour input and productivity and thus on yields and total production. He further mentioned that walking about 4 km to a plot reduces fieldwork time by about 25 per cent (even assuming a generous eight-hour day).

5.7. Mode of Transportation

The different transportation methods on how the sample farmers go to their farm are shown in Table 5.9. Based on the information gathered, out of 180 sampling households it was found that more than half (55.56 %) of the respondents stated that they walked to their farm whereas 14.44 per cent used their owned vehicles to reach their farm. Here, vehicles employed by the famers consist of different vehicles such as scooty/scooter, motor cycle, pick-up truck, car etc.

Table 5.9: Information on Mode of Transportation by the Respondents

Month	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric Farmers	Total
By foot	18	18	19	16	10	19	100
Owned vehicle	8	5	1	4	6	2	26
Hired motor	-	1	1	-	-	-	2
Motor service	-	1	3	2	-	-	6
Sumo Service	-	-	-	-	-	2	2
Available vehicle	-	-	-	1	-	-	1
By foot and owned vehicle	4	1	-	1	14	6	26
By foot and motor service	-	4	4	4	-	-	12
Owned vehicle and motor service	-	-	-	1	-	-	1
Owned vehicle and sumo service	-	-	-	-	-	1	1
Motor hired and motor service	-	-	1	-	-	-	1
By foot and hired motor			1				1
By foot, hired motor and motor service				1			1
Total	30	30	30	30	30	30	180
Percent							
By foot	60	60	63.33	53.33	33.33	63.33	55.56
Owned vehicle	27	16.67	3.33	13.33	20	6.67	14.44
Hired motor	-	3.33	3.33	-	-	-	1.11
Motor service	-	3.33	10	6.67	-	-	3.33
Sumo service	-	-	-	-	-	7	1.11
Available vehicle	-	-	-	3.33	-	-	0.56
By foot and owned vehicle	13.33	3.33	-	3.33	47	20	14.44
By foot and motor service	-	13.33	13.33	13.33	-	-	6.67
Owned vehicle and motor service	-	-	-	3.33	-	-	0.56
Owned vehicle and sumo service	-	-	-	-	-	3.33	0.56

Motor hired and motor service	-	-	3.33	-	-	-	0.56
By foot and hired motor	-	-	3.33	-	-	-	0.56
By foot, hired motor and motor service	-	-	-	3.33	-	-	0.56
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

Another 14.44 per cent of the farmers either walked or used their owned vehicles to reach their farm. There were also farmers who used motor services available in their village. It is imported to note that farmers also ride in either any available vehicles that crossed their path or ride in relatives/friends vehicles without paying any money in return.

5.8. Sources of Seeds

Seed is a critical and basic input for enhancing agricultural production and productivity in different agro-climatic regions (www.nmsadguru.org). In fact, it is

the most cost efficient means of increasing agricultural production and productivity. Seeds efficacy of other agricultural inputs in enhancing productivity and production, such as fertilizers, pesticides and irrigation is largely determined by the quality of the seeds (https://agricoop.nic.in).

The means of seeds procurement may vary with crops. From the data collected, it was observed that a larger population (80.56 %) used their own seeds during the planting season. From the field survey, it was known that the growers of chilli, maize and soyabean claimed that they saved seeds from their previous crops. The growers of ginger and turmeric also reported to dig their own productions of rhizomes and prepared for planting few days prior to cultivation take place. Also, sugarcane farmers cut their own production of cane stalk into section before planting it (Table 5.10).

Table 5.10: Sources of Seeds

Month	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
Own seed	27	27	23	22	24	22	145
Purchased	1	1	1	6	1	2	12
Received for free	-	1	4	-	1	4	10
Received from Society	-	-	-	-	-	1	1
Labour reward	-	-	-	-	4	-	4
Retained and Purchased	2	1	2	-	-	1	6
Retained and free received	-	-	-	2	-	0	2
Total	30	30	30	30	30	30	180
Percent							
Own seed	90	90	76.67	73.33	80	73.333	80.56
Purchased	3.33	3.33	3.33	20	3	7	6.67
Received for free	-	3.33	13.33	-	3	13.33	5.56
Received from Society	-	-	-	-	-	3.33	0.56
Labour reward	-	-	-	-	13	-	2.22
Retained and Purchased	6.67	3.33	7	-	-	3.33	3.33
Retained and free received	-	-	-	6.67	-	-	1.11
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

Bradbury (2010) stated that saving seed from one year to plant the next is an age-old tradition. Saving vegetable seeds can help preserve particular variety.

There were 6.67 per cent of sample farmers who purchased healthy seeds from other farmers while 5.56 percent received seeds at a free of cost from either relatives or friends or neighbours. The nature of free giving seeds to other farmers has been carried on for ages as Mizo's are a close knit society. A small number of farmers (2.22 %) were found to have acquired seeds through helping other sugarcane growers during harvesting period and as a reward, cane stalk were given to them.

5.9. Jhum Crops Cultivated

In jhum system, variety of crops are grown together; paddy as the staple crop, vegetables and other cash crops as supplementaries (Pachuau, 1994). Borah and Goswami (1997) as cited by Sachidananda (1989) mentioned that in shifting cultivation seeds are generally sown in a mixed pattern. The proportion and types of crop mixture depend, by and large, on traditional wisdom which conforms to the soil condition and climate. In Northeast India the minimum and maximum number of crops in the mixture are found to be three and ten respectively.

The crops cultivation pattern by the 180 sample farmers are displayed in Table 5.11. It is a common practiced of growingvegetables, herbs, leafy vegetables, spices, tubers, food grains and cereals etc. simultaneouslyon the same plot by the sample farmers.Growing multiple crops together by a farming household has an important contribution towards improving household dietary. From the field surveyed, the main cultivated vegetables was found to be Pumpkin (*Mai*) while Cowpea leaves (*Behlawihnah*) was cultivated the most under leafy vegetables. Maize (*Vaimim*) was also the mostwidely grown among cereals and in the case of spices, Mizochilli (*Hmarchate*) was found to have the largest growers. In conclusion, the overall eight dominant crops grown in the 18 study villages by the farmers were found to be Pumkin (86.67%) followed by Mizo chilli(84.44 %), Brinjal (80 %), Maize (76.11 %), Cowpea leave (75 %), Mock Tomato (74.44 %), Taro (71.11 %) and Rice (57.78 %).

Table 5.11: Details of Crops Cultivated in Jhum Land

Sl.No.	Crop	Total	
		Number	Percent
1	Rice (*Buh*)	104	57.78
2	Maize (*Vaimim*)	137	76.11
3	Brinjal (*Brinjal*)	144	80
4	Mock tomato (*Samtawk*)	134	74.44
5	Cowpea leave (*Behlawihnah*)	135	75
6	Pumpkin (*Mai*)	156	86.67
7	Okra (*Bawrhsaiabe*)	66	36.67
8	Wax gourd (*Maipawl*)	96	53.33
9	Taro (*Bal)*	128	71.11
10	Long hot pepper/Chilli Pepper (*Hmarchapui*)	94	52.22
11	Mizo chilli (*Hmarchate*)	152	84.44
12	Naga king chilli (*Saphmarcha*)	1	0.56
13	Pigeon Pea (*Behliang*)	6	3.33
14	Tomato	20	11.11
15	Banana (*Balhla/banhla*)	26	14.44
16	East Indian Glory Bower (*Phuhnam*)	21	11.67
17	Sesame *(Chhawhchhi)*	32	18.33
18	Coriander (*Dhania*)	33	18.33
19	Paracress (*Ankasa/Ansapui*)	45	25
20	Bamboo (*Mau*)	32	17.78
21	Cucumber (*Fanghma*)	65	36.11
22	Papaya (*Thingfanghma*)	16	8.89
23	Muskmelon (*Hmazil*)	19	10.56
24	Watermelon (*Dawngfawh*)	38	21.11
25	Bitter berry (*Tawkte*)	5	2.78
26	Sennaoccidentalis (L) (*Rengan*)	1	0.56

27	Ginger (*Sawhthing*)	108	60
28	Bittergourd (*Changkha*)	89	49.44
29	Peanut (*Badam*)	2	1.11
30	Climbing wattle (*Khanghu*)	7	3.89
31	Tobacco leaf (*Vaihlo*)	29	16.11
32	Welsh onion (*Mizo-purun*)	22	12.22
33	Snowflakearalia (*Kawhtebel*)	3	1.67
34	Bepui (*Indian bean*)	15	8.33
35	Winged bean (*Bepuipawr /Bepuithlanei*)	20	11.11
36	Rice bean (*Bete*)	54	30
37	Snake gourd (*Berul*)	101	56.11
38	Teak	3	1.67
39	Burmese coriander (*Pardi*)	53	29.44
40	Soyabean (*Bekang*)	51	28.33
41	Mustard leaves (*Antam*)	77	42.78
42	Alocasia fornicate (*Baibing*)	66	36.67
43	Elsholtziablanda (*Lengser*)	67	37.22
44	Tulsi (*Runhmui*)	17	9.44
45	Guava (*Kawlthei*)	1	0.56
46	Arrow root (*Thialbal*)	2	1.11
47	Roselle/Kenaf (*Anthur*)	34	18.89
48	Yam (*Bahra*)	7	3.89
49	Broom grass (*Hmunphiah*)	9	5
50	Pineapple (*Lakhuihthei*)	6	3.33
51	Berry (*Theihmu*)	2	1.11
52	Lemon (*Limbu*)	8	4.44
53	Kadambet/Callamusexuctus (*Zawngtur*)	2	1.11
54	Zawngtur	1	0.56
55	Orange (*Serthlum*)	14	7.78
56	Butterfruit/Avocado	5	2.78

57	Cabbage (*Zikhlum*)	5	2.78
58	Sword bean (*Fangra*)	11	6.11
59	Sugarcane (*Fu)*	38	21.11
60	Turmeric (*Aieng*)	34	18.89
61	Tapioca (*Pangbal*)	8	4.44
62	Mango (*Theihai*)	2	1.11
63	Hooker chives (*Purunsin)*	2	1.11
64	Culantro (*Bawhkhawr*)	6	3.33
65	Cape Yellow wood/Indian ivy rue (*Chingit*)	21	11.67
66	Stink bean/ bitter bean (*Zawngtah*)	11	6.11
67	Taro plant (*Dawl*)	2	1.11
68	Betel leaf (*Panhnah*)	2	1.11
69	African eggplant (*Satinrem*)	4	2.22
70	Betelnut/Areca nut(*Kuhva rah*)	4	2.22
71	Common bean (*Bean*)	2	1.11
72	Spiny gourd (*Maitamtawk*)	2	1.11
73	Jack bean (*Fangra*)	1	0.56
74	Jack fruit (*Lamkhuang*)	1	0.56

Source: Field Survey, 2016-2017

The crops grown under Jhum or shifting cultivation are usually for home consumption. Production of food is the primary motive behind this type of cultivation and hence primary emphasis is given on cultivation of food crops (Rath, 2015). Moreover, surplus production can be used for commercialization purposes

5.10. Jhum Cultivation Activities

The economic life of the Mizo's has always been centered around jhum or shifting cultivation. In pre-British days inter tribal or inter-village feuds kept the Mizos within the confines of certain areas. But they were nomadic in habit, moving from one village site to another every few years. This conformed to their shifting agricultural practice (Ray,2002). The practice was passed down from generation to generation. It continues today because of the transfer of knowledge and agricultural tools from earlier generations, providing the opportunity for the pursuit of agriculture with no initial cost. It involves the clearing of forest followed by burning, sowing and reaping. Traditionally, village elders select the sites in December and January, then allot the land to the jhumias for cultivation (Lalnunmawia, et al, 2018).

The essential features of jhum cultivation are thus-first, the rotation fields than crops, both short period of cropping alternatively with long period of natural fallows; second, the use of slash and burn method to clear vegetation for cultivation of crops; and third, the maintenance of fertility by allowing the vegetation to regenerate (Pachuau, 1994).

Farming activities was carried out manually using traditional agriculturalimplements by the respondent farmers. These agricultural tools are ordinarily local madeand were either purchased from the local market or the urban market (Aizawl market). Later, these tools are sharpened by the local thirchher (blacksmith) as per required. The price of these tools ranges between₹ 100 to ₹ 450 during the field surveyed.

The common implements employed for farming activity by the sample households were Axe (*Hreipui*), Dao/Sword (*Chempui*), Kodali (*Bawngtuthlawh*)and Hoe (*Tuthlawh*) and for carrying crops - Gunny bag/ Jute bag (Buara ip), Traditional bamboo basket (*Em*), Cloth sling bag (*Iptepui*) and Plastic sack.

5.10.1 Clearing of Forest

After the suitable area is selected for cultivation the jungle is cleared by felling the trees and lopping off the undergrowth, using simple tools such as the axe and dao. This operation is conducted during December and January (Sachchidananda ,1989). Of all jhum operations, clearing the forest is the only one exclusively carried out by men (Singh, 1996).

In shifting or jhum cultivation, the farmer chooses a patch of vegetated forest either primary and secondary; cut down some of the trees by an axe, leaving only the larger and economically useful trees; clears the undergrowth with a Chempui (knife), and exposed the debris (locally known as Chap) to be dried on the sun (Pachuau, 1994).

Clearing of forest locally known as *Lo vah* can be considered to be the first physical activity of the *jhum* cultivation. The different months of clearing forest performed by the respondent farmers as a process of land preparation is depicted in Table 5.12. It is evident from the table that clearing of forest was carried out between October and February in the selected villages. There were farmers (4.44%) found to have started clearing of forest as early as October. Although this constituted only a small number, however,this implied that the commencement month of clearing forest is highly determined by the farmers' decision. This decision may be based on different factors like previous farming experience, current climatic condition and jhum land location etc.

It was further noticed that there were slightly more than half of sample households (55 %) started clearing the vegetation from the month of January followed by 21.11 per cent in December and 12.22 per cent in November, respectively.

Table 5.12: Time of Clearing Forest by the Respondents

Month	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
Oct	6	1	1	-	-	-	8
Nov	9	5	3	4		1	22
Dec	7	3	8	7	5	8	38
Jan	6	19	18	15	25	16	99
Feb	2	2	-	4	-	5	13
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**
			Percentage				
Oct	20	3.33	3.33	-	-	-	4.44
Nov	30	16.67	10	13.33		3.33	12.22
Dec	23.33	10	26.67	23.33	16.67	26.67	21.11
Jan	20	63.33	60	50	83.33	53.33	55
Feb	6.67	6.67	-	13.33	-	16.67	7.22
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

The process of clearing the plots, which can take over a month, is labour intensive and undertaken almost entirely with indigenous and traditional equipment. Households remove useful biomass – big branches, trunks and boles – for house building, timber and fuel wood requirements, while the remaining debris is left to dry. (NIIT Aayog, 2018).

5.10.2. Preparation of Fireline

Fireline as defined by oxford dictionary– "It is a piece of land that has been cleared inorder to stop a fire from spreading".

In dry season, fire spreads easily over the dry forests and may thus destroy the next year's cultivation land. A fire line of several feet wide is cleared around the Jhum field before it is fired, and to this prevents the fire from spreading to adjacent forests (Thangchungnunga, 1997). The data furnished in Table 5.13 shows the construction period of fire lines by the farmers, whereby, it can be seen that the preparation of firelines was completed between December and March by the sample farmers.

Table 5.13: Time of Fireline Preparation by the Farmers

Month	Chilli Farmers	Ginger Farmers	Maize Farmers	Soyabean Farmers	Sugarcane Farmers	Turmeric Farmers	Total
	Frequency						
Dec	-	-	1	-	-	-	**1**
Jan	-	-	4	1	1	1	**7**
Feb	1	2	14	8	20	7	**52**
Mar	28	21	10	17	8	20	**104**
Total	**29**	**23**	**29**	**26**	**29**	**28**	**164**
	Percentage						
Dec	-	-	3.45	-	-	-	**0.61**
Jan	-	-	13.79	3.85	3.45	3.57	**4.27**
Feb	3.45	8.70	48.28	30.77	68.97	25	**31.71**
Mar	96.55	91	34.48	65.38	27.59	71.43	**63.41**
Total	100	100	100	100	100	100	100

Source: Field Survey (2016-2017)

From a survey conducted from a total sample of 180 respondents, 164 households reported constructing firelines during the surveyed period while the remaining 12 respondents did not required fireline preparation in their jhum land. Further, out of these164 respondents households, majority (63.41 %) had prepared firelines in the month of March followed by 31.71 per cent of farmers in February respectively. It was also noticed that there was a meager rate of 0.61 per cent farmers who prepared firelines in December.

It is note worthy that some jhummias operated the activities of both firelines construction and burning of dried debris on the same day.

5.10.3. Time ofBurning Period

Burning which is called "*Lo hal*" in local dailect is followed instantaneously after making fire line (Meikawngsial in local dialect).

Burning is a decisive factor which control future yield and work involved. The benefits effects from burning : it cleans the field making it thus accessible to planting crops. It eliminates many weed seeds and limits coppice growth. It makes the topsoil soft and friable so dibble planting is easy and the ashes from burning fertilize the soil (Rouw, 1991).

Burning is also a delicate work. Success depends on the correct timing of cutting activities, a proper use of the weather conditions and adequate firing techniques (Rouw, 1991). Burning must take place at a stage when the felled bamboos or tress are completely dry so that they burn well, but the surrounding standing vegetation is still green (Singh, 1996).

The shifting cultivators all over India can assume when rainfall will occur and accordingly select the date for firing. People in different regions of India, practicing shifting cultivation, have good practical knowledge of the local climate and they make a more or less correct speculation of the time the monsoon will break (Sachchidananda , 1989).

Generally, most plots are fired by the 15th or 20th of March, depending on local weather conditions. The village council declares a suitable day for burning each of the selected slopes where a consolidated block of plots is located (Singh, 1996). The burning is usually carried out in late afternoon or evening between 3 - 6 p.m. because the wind velocity is the least during this period and fire is more visible (Deb et al., 2013).

Based on the information collected from the selected respondents, most of the farmers (70.95 %) burnt the plot in March followed by 28.49 percent households in February while only a meager percent (0.56 %) performed the burning activity in January. Household cultivating on their own land were likely to burn the plot prior to

March as instruction given by the state government via each village councils (Table 5.14).

Table 5.14: Burning Period of the Respondents

Month	Chilli	Ginger Farmers	Maize Farmers	Soyabean	Sugarcane	Turmeric	Total
Frequency							
Jan	-	-	-	1	-	-	1
Feb	-	1	16	10	15	9	51
Mar	30	29	14	18	15	21	127
Total	30	30	30	29	30	30	179
Percentage							
Jan	-	-	-	3.45	-	-	0.56
Feb	-	3.33	53.33	34.48	50	30	28.49
Mar	100	96.67	46.67	62.07	50	70	70.95
Total	100	100	100	100	100	100	100

Source: Field Survey ,2016-2017

From the above table, it can be seen that one farming household from soyabean grower did not perform burning activity. The reason was because that particular farming household carried out farming for a second consecutive year, hence, successive burning is not always required for the second year of crop cultivation.

The dried slash as well as the standing tree trunks in the cleared area are set on fire between February and March, care being taken to ensure that fires do not spread out of control during firing operations and the ashes are then scattered over the ground (NIIT Aayog, 2018).

5.10.4. Time of Reburning Period

There may be some unburnt material left in the plots after firing; this is either gathered and re-burnt *(Mangkhawh*), or used as fencing material or supports for climbers (Singh, 1996). These left over pieces of tree branches are gathered and piled up in any convenient place and burnt again to be reduced to ashes. This work of clearing the pieces of wood may last for just a few days or longer if the fields are not adequately dried up (Thangchungnunga, 1997). As shown in Table 5.15, out of 180 sample respondents a larger population of the sample respondents i.e. 161 respondents repeated burning of the remaining unburnt or partly burnt tree branches, logs etc. Among those who performed reburning activity, more than one-third (70. 81 %) of the farmers carried out reburning in the month of March while a negligible percent (0.621 %) reburnt in January.

Table 5.15: Reburning Activity Performed by the Respondents

Month	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
Jan	-	-	-	1	-	-	1
Feb	-	-	11	3	10	7	31
Mar	22	22	17	20	17	16	114
April	3	5	2	2	-	3	15
Total	**25**	**27**	**30**	**26**	**27**	**26**	**161**
Percentage							
Jan	-	-	-	3.85	-	-	0.621
Feb	-	-	36.67	11.54	37.04	26.92	19.25
Mar	88	81.48	56.67	76.92	62.96	61.54	70.81
April	12	18.52	6.67	7.69	-	11.54	9.32
Total	100	100	100.0	100.00	100	100.00	100

Source: Field Survey, 2016-2017

5.10.5. Sowing

Planting is ordinarily preceded by the construction of infrastructures like the erection of Jhum house and the cutting of foot-path (Thangchungnunga, 1997). Crops are sown on the clearing or swidden with a minimum preparation and received only cursory attention during the growth (Pachuau, 1994).

Sowing period began immediately after clearing of the burnt jhum and before the advent of monsoon. The pattern of sowing crops was variable according to the variety/nature of the crops. Broadcasting, dibbling and planting were the main sowing methods applied in the study areas. Repetition of sowing was done by the farmers when necessary. According to Table 5.16,the activities of sowing were commenced from February and continued up to September. Out of 180 sample farmers, the two highest number i.e. 44.44 per cent and 30.56 per cent commenced planting activity from April and March respectively. The remaining number were distributed as the following: February (4.44 %), May (3.89%), June (8.33%), July (6.67%), August (1.11%) and September (0.56%) respectively. The duration of sowing can last for just a day or more than a week depending on the types of crops.

Table 5.16: Sowing Period of the Respondents

Month	**Frequency**						
	Chilli Farmers	**Ginger Farmers**	**Maize Farmers**	**Soyabean Farmers**	**Sugarcane Farmers**	**Turmeric Farmers**	**Total**
Feb	-	-	7	-	1	-	8
Mar	7	8	18	-	18	4	55
April	20	21	5	-	11	23	80
May	3	1	-	-	-	3	7
June	-	-	-	15	-	-	15
July	-	-	-	12	-	-	12
Aug	-	-	-	2	-	-	2
Sept	-	-	-	1	-	-	1
Total	30	30	30	30	30	30	180
Percent							
Feb	-	-	23.33	-	3.33	-	4.44
Mar	23.33	26.67	60	-	60	13.33	30.56
April	66.67	70	16.67	-	36.67	76.67	44.44
May	10	3.33	-	-	-	10	3.89
June	-	-	-	50	-	-	8.33
July	-	-	-	40	-	-	6.67
Aug	-	-	-	6.67	-	-	1.11
Sept		-	-	3.33	-	-	0.56
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

5.10.6. Weeding

After sowing, the shifting cultivators tend to the crops regularly by removing weeds. In some places the crop is protected from stray cattle and wild animals by fencing the fields with bamboo (NIIT, 2018). The burning destroys weeds in the Jhum to some extent. Weeds grow very fast in the rainfed areas in the tropics. The difficulty of getting the weeding done in time imposes a limit on the area which a family can cultivate. In Northeast India generally three to four weedings are done. In some cases, the fields are weeded three to five times depending on the irrigation received (Sachchidananda, 1989)

The first weeding which requires much labour and time is after twenty-five days of sowing the seeds. The rest are in mid June, August, September and in early November (Sachchidananda, 1989). Each round may last three to four weeks, and by then it is time to start the next round (Singh, 1996).

In Mizoram, generally three stages of weeding are performed fastidiously by the farmers, moreover, farmers may also carry out more than three normal rounds of weeding per year. One of the main reasons is that the affects that weed imposed can constrain the yielding of crops, whereby, the frequency of weeding operation necessity factor is largely determined by the farming households.

A distinct name is given to each stage of the weeding till the third round or even till the fourth round in some villages, however, these names given to each may be different depending on the areas. It was noticed in the study area that a larger sample farmers had given a name for the first, second and third of weeding round as the following"*Hnuhpui*" "*Hnuhhram*" and " *Hnuhthual/ hnuhthial*" respectively.

Thangchungnunga (1997) defined the first weeding "*Hnuhpuilak*" as weeding of the coarse weed, the second weeding "*Hnuhhram*" as bristly need and the last round of weeding "*Hnuhthual*/ *Hnuhthial*" as residual weed.

It can be clearly observed from Table 5.17 that the first weeding was performed by all the 180 sample households. Conversely, starting from the second round till the sixth round, it can be learnt that the number of weeding round operated was gradually decreasing round after round. The primary reason was due to the application of herbicides by some of the sample respondents.

Table 5.17 : Performance of Different Weeding Rounds

Particulars	Frequency							Percent						
	Chilli Farmers	Ginger Farmers	Maize Farmers	Soyabean Farmers	Sugarcane Farmers	Turmeric Farmers	Total	Chilli Farmers	Ginger Farmers	Maize Farmers	Soyabean Farmers	Sugarcane Farmers	Turmeric Farmers	Total
Feb	-	-	-	-	**1**	-	**1**	-	-	-	-	3.33	-	**0.56**
Mar	-	-	4	-	1	2	**7**	-	-	13.33	-	3.33	6.67	**3.89**
April	3	5	6	1	2	5	**22**	10	16.67	20	3.33	6.67	16.67	**12.22**
May	23	17	15	18	18	15	**106**	76.67	56.67	50	60	60	50	**58.89**
June	4	8	4	10	7	8	**41**	13.33	26.67	13.33	33.33	23.33	26.67	**22.78**
July	-	-	1	1	1	-	**3**	-	-	3.33	3.33	3.33	-	**1.67**
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
2nd Round														
April	-	-	1	-	-	-	**1**	-	-	3.33	-	-	-	**0.56**
May	2	3	4	2	-	3	**14**	6.67	10.34	13.33	6.90	-	10	**7.87**
June	17	14	15	7	6	11	**70**	56.67	48.28	50	24.14	20	36.67	**39.33**
July	11	10	8	15	11	13	**68**	36.67	34.48	26.67	51.72	36.67	43.33	**38.20**
Aug	-	2	2	4	9	3	**20**	-	6.90	6.67	13.79	30	10	**11.24**
Sept	-	-	-	1	4	-	**5**	-	-	-	3.45	13.33	-	**2.81**
Total	**30**	**29**	**30**	**29**	**30**	**30**	**178**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
3rd Round														
June	2	-	3	1	-	-	**6**	6.67	-	10.34	3.85	-	-	**3.77**
July	9	5	10	4	1	5	**34**	30	21.74	34.48	15.38	3.70	20.83	**21.38**
Aug	17	14	13	12	4	11	**71**	56.67	60.87	44.83	46.15	14.81	45.83	**44.65**

Sept	2	4	-	7	9	7	**29**	6.67	17.39	-	26.92	33.33	29.17	**18.24**
Oct	-		2	2	9	1	**14**	-	-	6.90	7.69	33.33	4.17	**8.81**
Nov	-		1	-	4	-	**5**	-	-	3.45	-	14.81	-	**3.14**
Dec	-		-	-	-	-	**-**	-	-	-	-	-	-	**-**
Total	**30**	**23**	**29**	**26**	**27**	**24**	**159**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
4th Round														
July	1	-	1	-	-	-	**2**	6.67	-	14.29	-	-	-	**4.76**
Aug	5	4	3	2	1	-	**15**	33.33	57.14	42.86	25	20	-	**35.71**
Sept	3	1	3	3	1	-	**11**	20	14.29	42.86	37.50	20	-	**26.19**
Oct	3	1	-	2	1	-	**7**	20	14.29	-	25.00	20	-	**16.67**
Nov	3	1	-	1	1	-	**6**	20	14.29	-	12.50	20	-	**14.29**
Dec	-	-	-	-	1	-	**1**	-	-	-		20	-	**2.38**
Total	**15**	**7**	**7**	**8**	**5**		**42**	**100**	**100**	**100**	**100**	**100**		**100**
5th Round														
Aug	-	-	-	-	-	-	**-**	-	-	-	-	-	-	**-**
Sept	1	1	-	-	1	-	**3**	50	50	-	-	50	-	**42.86**
Oct	1	1	1	-	-	-	**3**	50	50	100	-	-	-	**42.86**
Nov	-	-	-	-	1	-	**1**	-	-	-	-	50	-	**14.29**
Total	**2**	**2**	**1**		**2**		**7**	**100**	**100**	**100**		**100**		**100**
6th Round														
Oct	1	-	-	-	-	-	**1**	100	-	-	-	-	-	**100**
Total	**1**	-	-	-	-	-	**1**	**100**	-	-	-	-	-	**100**

***Source**: Field Survey, 2016-2017*

It is apparent that the first weeding was performed during February to July whereby more than half of the farmers (58.9%) weeded their plot in May. The second round of weeding was commencing between April to September in which the highest number (39.3 %) carried out weeding in June. The third round of weeding was identified to be performed during June to December wherein the highest number (44.7 %) operated weeding in the month of August. There was a negligible number of farmer performing the sixth round of weeding in October in one year jhum cycle. The affects that weed imposed is that it can constrained the yielding of crops whereby, the frequency of weeding operation necessity factor is largely determined by the farming households.

5.10.7. Harvesting

Harvesting of each crop was done at the maturity. Harvesting in Mizoram are done manually using local tools. Harvesting methods vary, some shifting cultivators pick cereal heads by hands, other reaps with sickles, while roots crops are dug out with iron sticks and hoes (Pachuau, 1994). The performance of the first harvesting month of each crop by the sample farmers are revealed in Table 5.18, the timing of harvesting was highly determined by the variety of crops. The result of the sample producers survey shows that, the highest number of the sample households (16.11 %) started their first harvesting fromthe month of October onwards. These farmers belonged to chilli growers, soyabean growers, sugarcane growers and Turmeric growers. There were also some farmers (15 %) who commenced harvesting crops from January onwards. An equal number i.e. 3.89 per cent of the farmers began harvesting their crops from March and May onwards respectively. Harvesting activities may be carried out more than eight times or even less per year subject to the crop, cash requirement by the farming household and soil and climatic condition of the jhum land.

Table 5.18. Time of Harvesting Crops

Month	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	
Jan	5	13	-	-	2	7	27
Feb	-	5	-	-	-	10	15
Mar	-	2	-	-	-	5	7
April	-	2	2	-	-	2	6
May	-	5	2	-	-	-	7
June	3	-	18	-	1	-	22
July	7	-	8	-	-	1	16
Aug	-	-	-	-	3	1	4
Sept	1	-	-	-	4	-	5
Oct	2	-	-	21	5	1	29
Nov	10	2	-	7	6	-	25
Dec	2	1	-	2	9	3	17
Total	30	30	30	30	30	30	180
Percentage							
Jan	16.67	43.33	-	-	6.67	23.33	15.00
Feb	-	16.67	-	-	-	33.33	8.33
Mar	-	6.67	-	-	-	16.67	3.89
April	-	6.67	6.67	-	-	6.67	3.33
May	-	16.67	6.67	-	-	-	3.89
June	10.00	-	60.00	-	3.33	-	12.22
July	23.33	-	26.67	-	-	3.33	8.89
Aug	-	-	-	-	10.00	3.33	2.22
Sept	3.33	-	-	-	13.33	-	2.78
Oct	6.67	-	-	70.00	16.67	3.33	16.11
Nov	33.33	6.67	-	23.33	20.00	-	13.89

Dec	6.67	3.33	-	6.67	30.00	10.00	9.44
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

After the harvest, the land is left uncropped and colonization by natural vegetation is allowed while another patch of land is cleared for fresh cultivation (Pachuau, 1994).

5.10.8. Mode of Transportation of Production

The agricultural produced were transported shortly after harvesting using different mode. The common mode of transportation of crops from farm to home employed in the study areas were motorized vehicle, human energy and animal power. Among motorized vehicles, sumo, pickup truck, motorcycle and scooter were the major means of motorized transport used in the selected villages. Horse was the only animal used for carrying harvesting crops from farm to home.

Human power is principally related to hand, arm, back and leg strength. Human power depends on physical constitution, gender, health, strength, age, climatic conditions, altitude and topography of the terrain (Chamen *et al*, 2009).

As displayed in Table 5.19 the highest number (25 %) used human power for carrying farm produce from the farm to home mentioned that for transport purposes, human power is based on head, back and pole loading. Head loading has a defined load which can be carried, normally around 20 to 25 kilograms, but there are exceptions. Back loading also offers the possibility of loading slightly more in terms of kilograms, but distance covered can be very much the same as head loading.

Table 5.19: Information on Mode of Transportation of Production

Month	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	Total
Human power	5	11	4	10	7	8	45
Human labour	2	1	1	-	-	-	4
Owned vehicle	7	1	2	6	12	1	29
Hired vehicle	5	6	3	2	2	15	33
Vehicle service	2	4	7	3	1	-	17
Owned horse	-	1	-	-	1	-	2
Owned tawlailir	-	-	-	1	-	1	2
Hired horse	-	4	-	1	-	-	5
Available vehicle	-	-	1	6	-	-	7
Human power and owned vehicle	-	-	-	-	2	-	2
Human power and motor service	1	-	3	-	-	-	4
Human power and hired vehicle	1	-	5	1	1	-	8
Human power and available vehicle	-	-	-	-	-	2	2
Human power and owned horse	-	-	-	-	1	-	1
Human power and agent collected at farm	-	-	4	-	-	-	4
Human labour and hired horse	-	1	-	-	-	-	1
Human labour and hired vehicle	2	-	-	-	-	-	2
Human labour and owned vehicle	-	-	-	-	-	1	1
Owned vehicle and motor service	5	-	-	-	-	-	5
Owned vehicle and owned tawlailar	-	-	-	-	-	1	1
Owned vehicle and hired vehicle	-	-	-	-	2	-	2
Horse hired and vehicle hired	-	1	-	-	-	-	1
Agents collected at farm	-	-	-	-	-	1	1
Human power, owned horse and		-	-	-	1	-	1

owned vehicle	-						
Total	30	30	30	30	30	30	180
	Percent						
Human power	16.67	36.67	13.33	33.33	23.33	26.67	25
Human labour	6.67	3.33	3.33	-	-	-	2.22
Owned vehicle	23.33	3.33	6.67	20.00	40	3.33	16.11
Hired vehicle	16.67	20	10	6.67	6.67	50	18.33
Vehicle service	6.67	13.33	23.33	10.00	3.33	-	9.44
Owned horse	-	3.33	-	-	3.33	-	1.11
Owned tawlailir	-	-	-	3.33	-	3.33	1.11
Hired horse	-	13.33	-	3.33	-	-	2.78
Available vehicle	-	-	3.33	20.00	-	-	3.89
Human power and own vehicle	-	-	-	-	6.67	-	1.11
Human power and motor service	3.33	-	10	-	-	-	2.22
Human power and hired vehicle	3.33	-	16.67	3.33	3.33	-	4.44
Human power and available vehicle	-	-	-	-	-	6.67	1.11
Human power and owned horse	-	-	-	-	3.33	-	0.56
Human power and agent collected at farm	-	-	13.33	-	-	-	2.22
Human labourand hired horse	-	3.33	-	-	-	-	0.56
Human labour and hired vehicle	6.67	-	-	-	-	-	1.11
Human labour and owned vehicle	-	-	-	-	-	3.33	0.56
Owned vehicle and motor service	16.67	-	-	-	-	-	2.78
Owned vehicle and owned tawlailar	-	-	-	-	-	3.33	0.56
Owned vehicle and hired vehicle	-	-	-	-	6.67	-	1.11
Horse hired and vehicle hired	-	3.33	-	-	-	-	0.56
Agents collected at farm	-	-	-	-	-	3.33	0.56
Human power, owned horse and owned vehicle	-	-	-	-	3.33	-	0.56
Total	100	100	100	100	100	100	100

Source: Field Survey, 2016-2017

About 18.33 per cent of the farmers hired vehicles as a means of transporting their crop production from the field to homestead. These hired vehicles consisted of auto rickshaw/tuktuk, pick-up truck, sumo and any available motor vehicles in the village. A small number (2.22 %) were found to have employed human labour for carrying harvested crops. Also, a meager number (1.11%) of the sample farmers reported using their owned local made wooden car called "*Tawlailir*" for transporting harvested crops. It is important to note that, there were farmers who used dual or more means of transportation for moving their farm produce from their own farm to their home.

5.10.9. Post-Harvest Handling

Post-Harvest handling is followed immediately after harvesting. It is an utmost important stage as it prepares the crop for household consumption and final quality of the crop for commercial purpose. Post-harvest handling involves a series of activities including sorting, cleaning, washing and processing etc. depending on the crop and marketing purposes.

Table 5.20: Post-Harvesting Handling Method

Month	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	Total
	Frequency						
Fresh	10	30	24	11	-	14	89
Processed	20	0	0	3	22	10	55
Fresh and Processed	0	0	6	16	8	6	36
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**
	Percent						
Fresh	33.33	100	80	36.67	-	46.67	49.44
Processed	66.67	-	-	10	73.33	33.33	30.56
Fresh and Processed	-	-	20	53.33	26.67	20	20
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Field Survey, 2016-2017

It could be inferred from the field survey display in Table 5.20thatpost-harvest handling activities performed by the sample farmers varied with crops. Out of 180 sample farmers, almost half of the respondents (49.44 %) only performed activities such as removal/ separation of damaged, rotten, diseased and soil adhered to the crop etc. as a way to made them suitable for marketing purpose. These fresh produces did not get any sort of further treatment as they were sold immediately in fresh form.

There were also some farmers (30.56%) who carried out the method of processing through which the quality of the products were improved in order to create value in the market. It can also be observed from the Table 5.20 that only few farmers (20 %) followed both techniques of the aforementioned of post- harvest handling.

The processed products produced at the farmers' level were as the following: Mizo chilli in whole dried form, Maize in dried on the cob form, soyabean as in *bekang um* and *bekangro/rep,* sugarcane in jaggery and turmeric in juice, powder and dried sliced.

5.10.10. Mode of Marketing

Among 180 respondents, it was observed that 64 respondents (see Table 5.21) marketed their produce (fresh or processed) outside their own village wherein transportation facility plays a pivotal role for such farmers. The regular vehicles used for commercialization purpose between village and village, village and urban markets etc. were sumo and pick-up truck. Taxi was hired mainly within *Aizawl* area for delivering the production as farmers were linking with different market agents in various markets located in different areas.

Table 5.21 : Information on Mode of Marketing Transportation Used by the Respondents

Month	Frequency						
	Chilli	Ginger	Maize	Soyabean	Sugarcane	Turmeric	Total
Owned vehicle	-	-	1	-	1	-	2
Sumo service	3	2	8	8	16	9	46
Hired pick- up truck	-	-	2	-	6	-	8
Any available vehicle	-	-	-	1	-	-	1
Sumo service and taxi service	5	-	1	-	-	-	6
Sumo service and pick- up truck	-	-	1	-	-	-	1
Total	8	2	13	9	23	9	64
Percent							
Owned vehicle	-	-	7.69	-	4.35	-	3.13
Sumo service	38	100	61.54	88.89	69.57	100	71.88
Hired pick- up truck	-	-	15.38	-	26	-	12.50
Any available vehicle	-	-	-	11.11	-	-	1.56
Sumo service and taxi service	62.50	-	7.69	-	-	-	9.38
Sumo service and pick –up truck	-	-	8	-	-	-	1.56
Total	100	100	100	100	100	100	100

-

Source: Field Survey, 2016-2017

It was learnt that out of the 64 respondents who marketed their production outside their own village, majority of the farmers (71.88 %) employed sumo vehicle for carrying their production. Sumo is a transportation facility that enables people to travel from village to village, village to urban areas etc. Likewise, sumo enables goods to move from one place to another and. Further, it was also observed that 12 per cent of the farmers hired pick-up vehicle in order to deliver their production to their various agents located in different areas. There were 9.38 per cent of farmers found to have used dual method of transportation i.e sumo service and taxi, wherein sumo was used for carrying their production from village to urban city whereas taxi was used for delivering their production to their different agents located within the urban city

Chapter Summary:

The average jhum landholding size where 180 farmers cultivated jhum crops was found to be2.3 acres of land in the 18 villages. Also, the minimum and maximum acres ranged between 0.5 acres to 6.5 acres of land respectively. The farming households that operated "more than 3 acres above" constituted the highest number (37.78%) in the selected villages.

In general, managing one plot of land by the farming household was observed to bevery common in the study areas (85.56 %). It was also noticed that there were farmers who managed two plots (12. 78 %) and three plots (1.67 %) of land respectively during the data collection. A larger proportion of the respondents (98.33 %)grown crops in the jhum land for one year while the remaining 1.11 per cent and 0.56 per cent cultivated crops for two consecutive years and more than three consecutive years respectively.

Among the selected farmers, the highest number (29.44 %) resided more than 6 kilometers from their farm and about 55.56 per cent of the farmers claimed that they go to their field by walking only.

Sample respondents in 6 villages had an average farming experience of 16.99 years with farming experienced ranged between minimum 1 to maximum 45 years.

Since, the method of farming system carried out in Mizoram is inter cropping system, the eight most cultivated crops found in the study villages are accordingly- Pumpkin (*Mai*) (86.67 %), Mizo chilli (*Hmarchate*) (84.44 %), Brinjal (*Bawkbawn*) (80 %), Maize (*Vaimim*) (76.17 %), Cowpea leave (Bawhlawihnah) (75%), Mock tomato (*Samtawk*) (74.40%) and Rice (*Buh*) (56%). It was identified that farmers cultivating crops in their own land constituted the highest number (37.22 %) whereas 33.89 per cent of farmers practiced farming in a community land.

The duration of land preparation for sowing of crops began from October and continued till early April. The process of land preparation, thus, involves clearing of forest, preparation of fireline, burning and reburning of land. It was observed that more than half (55 %) of the respondents started clearing of forest in January while a small proportion of the farmers (4.44 %) were also found to have begun the work of clearing of fresh patch in October .

Fireline was prepared prior to burning of the jhum area to avoid spreading of fire. Fireline was prepared between December to March by large majority of the sample respondents (91.11 %). Farmers completed the activity of burning from January to March, further, it was learnt that most of the farmers (70.95%) carried out burning in the month of March. After burning is completed, reburning was required for majority of the farmers and this was done between the month of January to April. Among those who required reburning of land, majority (70.81 %) carried out the activity in the month of March.

After land was prepared for cultivation of crops, farmers began their first sowing from February to September. Soyabean was cultivated from June to September whereas other crops such as chilli, ginger, maize, sugarcane and turmeric were cultivated between February to June. Overall, among the farmers, the highest number (44.44 %) carried out planting in the month of April. The timing and frequency of sowing may differ subject to the types of crops to be cultivated. It was recorded that majority of the farmers (80.56 %) used their own seeds from their pervious year’s harvesting for the following year planting while on the contrary, a few farmers (6.67 %) purchased seeds from either friends or relative or neighbours. It was also observed that a small number of farmers (5.56%) received seeds for free gift from other farmers in their village.

In the study villages, soon after sowing was completed, farmers began weeding the unwanted plants starting from February and continued till October. The first round was performed by all i.e. 180 (100%) of the sample respondents. However, starting from the second round onwards till the sixth weeding round, the number of cultivators carried out weeding activity was starting to decline round after round.

The highest number of cultivators (16.11 %) began to harvest from themonth of October onwards whereas some farmers (15 %) were identified to start harvesting crops from January onwards. It was observed from the data collection that harvesting was carried out in every month (from January to December) by the sample farmers. Harvesting methods was done manually in the study areas wherein chilli and maize were handpicked, ginger and turmeric were harvested using hoe (*Tuthlawh),* kodali (*Bawngtuthlawh*), matured soyabean was gathered using sickle and sugarcane harvesters reaped their production by employing dao/sword (C*hempui*). About 25 per cent of the farmers reported to have utilized human power for carrying harvested crops while 18.33 per cent hired vehicles for transporting the harvested crops from farm to home. In addition, it was observed that horse was used for carrying harvested crops in the study areas.

The post-harvest handling practiced by the farmers in the study areas may vary depending on the variety of crops. The common practiced of post-harvest handling include cleaning of removal damaged, rotten, diseased and soil adhered to the crop etc mainly for marketing purpose. It was reported that there are 49.44 percent of farmers who sold crops in fresh form while some farmers (30.56%) carried out the method of processing for value enhancement of the product. It was also identified that only a few farmers (20 %) practiced both methods of both post-harvest handling. The agricultural products being processed by the sample respondents were chilli into whole dried , maize into dried on the cob, soyabean into fermented soyabean (wet and dried form), sugarcane into jaggery and turmeric into powder, juice and whole dried form.

Sumo vehicle was the main transportation means used by a large population (71.88 %) for moving their production for marketing purposes to neighbouring villages and urban market mainly *Aizawl* city. About 12 per cent of the farmers were also found to have hired pick- up truck for delivering their product to their marketing agents.

CHAPTER 6

VALUE CHAIN OF JHUM CROPS

Both growth and development of agricultural value chain constitute an important component towards economic improvement for the farming household. The essence of this chapter is to present the value chain analysis of jhum crops and outline the different phases of farming activities, from clearing of land to the disposal of crops, and various actors involved in the value chain, identifies weak points in the chains, thus, recommend measure to strengthen the value chain so that value chain enables farmers to receive higher proportion of earnings derived from their own agricultural products.

6.1. Chilli

6.1.1 Origin

The "mother" of chile pepper is thought to have originated in the Andean region of Bolivia, Peru and Ecuador almost 10,000 years ago. Since 7000 B.C., chile peppers have been part of the diets of Mayans and Azetecs in Central Mexico and the Yucatan. They were widely cultivated when the Spanish first landed in the Americas. Chillies or chile peppers were taken to India by the Portuguese and to Southeast Asia by the Arabs, Indians and Portuguese. Chillies dominate the flavours of many cultures- South Indians, Sri Lankans, Southeast Asians, Latin Americans and the Caribbean islanders. (NIIRB Board of Consultants & Engineers, 2013). Chillies are cultivated mainly in tropical and subtropical countries, particularly Africa, India, Japan, Mexico, Turkey, the USA, etc. (Farooqi *et al*.,2005).

Globally, there are more than 3000 known varieties of chile peppers thatdiffer in shape, color, size, flavor and degree of pungency. Most chile peppers belong to the C. annum species, which are the principal chilies of Asia and other regions outside of Latin America and the Caribbean. New varieties of chile peppers are continually evolving (NIIRB Board of Consultants & Engineers, 2013).

6.1.2. Climate

Chillies are grown in both tropical and subtropical areas, ranging from sea level to 2000 m altitudes in Indian conditions. However, the pungent varieties suited for spices cannot be grown in higher altitudes. A warm humid climate favours growth while warm and dry weather enhances fruit maturity. A temperature range of 20-30 C is ideal. It can be grown successfully as a rain-fed crop in areas receiving an annual rainfall of 75-100 cm (Farooqi *et al.*, 2005).

6.1.3. Soil

Chillies are found to grow in a variety of soils provided they are deep, well drained, well aerated and fertile. An ideal soil for chilli is light loam or sandy loam, rich in lime and inorganic matter and having a pH range of 6.5-7.5 (Farooqi *et al.*,2005).

6.1.4. Area Under Chilli Cultivation

In the study areas, chilli was grown together with different crops like Brinjal, Rice, Pumpkin, Wax gourd, Taro, Mustard leaves, Cowpea leaves and Mock tomato etc on the same plot. From the data collected, it was observed that chilli was cultivated between 0.5 acre and 6 acres of land with an average 3.0083 acres of land.

As presented in Table 6.1, more than half (63 per cent) of the respondents grown chillies in an area “above 3 acres “of land followed by 23.33 per cent cultivated chilli in an area “between 2 to 3”, 10 per cent grown chilli “between 1 to 2 acre” of land and 3.33 per cent carried out chilli farming “below 1 acre” of land.

Table 6.1: Area Under Chilli Cultivation

Acre	Frequency	Percent
Below 1 Acre	1	3.33
1-2 Acres	3	10
2-3 Acres	7	23.33
3 Acres & Above	19	63
Total	30	100

Source: Field Survey, 2017

6.1.5. Mandays Engaged in Land Preparation for Chilli Cultivation

The various phases of land preparation include clearing of forest, preparation of firelines, burning and reburning. Land preparation was done manually in the study areas, household labor contribution was found to be the highest with mandays ranging from 8 to 94 working mandays, with 36.8 average mandays (Table 6.2). Further, friends and relatives were found to have participated but in a negligible number during land preparation in the study areas, hence, the mandays from these sources were included in the household family mandays.

It was learnt that the level of involvement of women members in the family in carrying out the activities of clearing of forest and burning in the study areas were low as these two activities were considered to be men’s work. However, women and men participated equally on activities like making firelines and reburning.

Table 6.2: Mandays Engaged in Land Preparation for ChilliCultivation

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	30	8	94	36.93	19.38
Hired labour	17	1	83	19.47	23.498
Exchange labour	5	3	15	10.22	5.07
Total	30	13	127	49.67	26.662

Source: Field Survey, 2017

From the table 6.2, it can be observed that hired human labour mandays also made contribution for land preparation wherein the average hired human labour mandays accounted for average mandays of 19.47. Hired human labourers were remunerated with cash while exchange labour mandays were reciprocated with mandays to mandays.

Overall, the minimum and maximum mandays used for land preparation ranged from13 to 127respectively with an average man-days spent was 49.67.

6.1.6. Quantity of Chilli Seeds Sown

Matured, healthy and well ripe chilli are mostly saved for the subsequent planting season. The farmers adopted the indigenious practices for storing chilli seeds. The local varieties of chilli cultivated in the areas were Long hot pepper/Chilli pepper (*Hmarchapui*) and Mizo chilli. Mizo chilli locally called "*Hmarchate*" have been allotted Geographical Identification (G.I) Tag in 2014.

The following are the steps used for preserving fresh chilli pepper seeds and Mizo chilli seeds by the farmers.

1) Fresh chilli pepper- Ripe chillies were cut in half and seeds were scraped out, after which, the seeds are left for sun drying usually for 2-3 days and

store ina cloth bag or any available container. Some farmers would directly sundried the ripe chillies for approximately 4 weeks. After that, the dried chillies werecrushedand winnowed the crush chilli in order to separate the skin and the seeds. Later, the seeds were wrapped in a cloth and placed it under the fireshelf.

2) For preservation of Mizo chilli- At first the farmers sundried the ripe seeds, the drying period may range from two weeks to four weeks. After that, the dried chillies were kept either inside nylon bag or in a tin container and beat/ground the chilli until the seeds and skin were separated. Once the dried chilli was nicely crushed, the crushed chilli skin and seeds were separated by the process of winnowing. The chilli flakes/skin was sold for household consumption while the seeds were kept in a nylon bag or wherever is convenient.

After separation of seeds and chilli skin, some farmers further washed the Mizo chilli seeds with water to reduce the pungency and again sundried it for 2 -4 days. Later, the seeds were stored inside a nylon bag for next planting season.

The average quantum of chilli seeds sown was weighing 16.9667 kilograms. The minimum and maximum chilli seeds sown weighed 1.5 kilogram and 75 kilogram respectively.

6.1.7. Mandays Engaged in Sowing for Chilli Production

Direct sowing was practiced by the sample farmers. After 30-40 days of sowing, chillies were transplanted for gap filling whereas thinning activity was carried out during weeding period. Repetition of sowing was also done by few farmers as per required. Based on observations in the field, man-days were calculated right from thefirst time of sowing to transplanting of chilli activity were carried out, hence, Table

6.2 shows mandays engaged in sowing activity.

Table 6. 3 : Mandays engaged in Sowing Chilli Seeds

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	28	1	13	4.46	3.786
Hired labour	3	1	15	6.33	7.572 -
Total	30	1	25	4.8	5.215

Source: Field Survey, 2017

Table 6.3 shows that household labour mandays contribution was an average of 4.46 while number of mandays generation by hired human labour on average was 6.33 mandays. The overall average man-days used for sowing an average maize seeds of 16.9667 kilograms was 4.8 man-days.

Chilli seeds were mainly sown by broadcasting manually in the study areas. It was noticed during the field survey that, the activity of sowing chilli was done majorly by women.

6.2.2. Mandays Engaged in Weeding for Chilli Cultivation

Due to slow growth at initial stages, chilli faces tough competition from weeds. Two to three hoeings and earthings-up at initial stages of flowering and fruiting are required (Dhaliwal, 2017). Weeds compete with chillies for water, space, sunlight and nutrients, thereby decreasing chilli yields. Weeds can also serve as a refuge for insects and diseases (https://pdf.usaid.gov). Chilli cultivars removed weed manually using hoe (*Tutlawh*). The total mandays used for weeding includes mandays used for applications of pesticides and chilli vitamins. Table 6.4 shows that the number of family labour contribution towards executing weeding was found to be the highest with an average mandays of 162.5. Also, family labour contribution performing weeding ranged from 45 mandays to 408 mandays.

Table 6.4: Mandays Used for Performing Weeding Activity

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	30	45	408	162.5	95.434
Hired labour	17	1	367	97.71	137.699
Exchange labour	11	2	113	33.55	36.181
Total	30	45	472	229.77	120.943

Source: Field Survey, 2017

Apart from family labour contribution, the number of hired human labour contribution was found to be minimum 1 manday to maximum 367 man-days with an average man-days of 97.71. These hired labourers were remunerated with cash. Exchange labour also contributed an average mandays of 33.55, unlike hired labourers, exchange labourers were remunerated in the form of reciprocated labour on mandays to mandays basis.

A meager number of relatives were observed to have participated during sowingactivity in the study areas, thus, the mandays used by the relatives were added to household family labour.

In general, weeding was performed actively by both male and female in the study areas.

6.2.3. Mandays Engaged in Chilli Harvesting

Green chillies were harvested at the green stage, therefore they are harvested earlier than Mizo chilli variety. Green Chilli is ready for the first harvest after 3 months of sowing. Mizo Chilli is consumed by the household starting from the green stage. The chilli meant for vegetable purposes is generally harvested at the fully-grown green stage, whereas for dried chilli, the fruits are harvested at the red, ripe stage. The ripe fruits are ready for picking at 1-2 weeks interval after the first harvest. The harvesting continues over a period of 3 months, depending on the cultivar, season and cultural practices. (Farooqi *et al*., 2005). As depicted in Table 6.5, the number of labour utilization for harvesting chilli was contributed the highest by 29 farming households with an average mandays of 67.79.

Table 6.5: Mandays Engaged in Chilli Harvesting

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	29	12	200	67.79	36.904
Hired labour	21	3	180	66.14	49.289
Exchange labour	4	2	19	6.5	8.347
Total	30	43	276	112.67	55.265

Source: Field Survey, 2017

Further, it was learnt that 21 chilli growing households had hired labourers to execute harvesting activity and this contribution made was on average of 66.14 mandays.

In the study areas, both men and women performed harvesting was performed manually by hand picking the crop. Further, a small number of mandays were contributed by relatives during harvesting period, thus, the mandays contributed by relatives were added to the family household labour mandays.

6.2.4. Mandays Engaged in Chilli Processing

Out of 30 chilli growers, 20 chilli growing households processed chilli and the mandays used for performing processing activity ranged from 5 to 12 mandays with mean average mandays of 7.6 mandays.

6.1.10.1: Method of Processing Chilli

The processing of Mizo chilli was done by following two drying methods 1) direct drying under the sun method and 2) blanching/cooking first treatment followed by sun drying method. It was observed from the study areas that the method of processing adopted by the farmers was also determined by the buyer’s preference.

In the first method, Mizo chillies were directly spread on a clean ground area and dried under the sun for 3 -4 weeks. During this drying period, the Mizo chillies were flipped usually two times a week to ensure uniform drying.

Under the second method of processing, before blanching/cooking chillies, freshly harvested chilllies were spread on a silpaulin and withered chillies under the sun probably for one week. After this, the withered chillies were blanched/cooked in boiling water for approximately 10-15 minutes in an aluminium dekchi.

The blanched chillies were scooped out from the boiling water using local made "*Em*" (traditional carrying) and spread uniformly again on a silpaulin for 3-7 days.

Intensity and duration of the drying process depend on air temperature, humidity and air circulation. Drying will be faster under high temperatures, low humidity and intensive air circulation (www.fao.org). The purpose of processing is to increase the shelf life of chilli.

During the drying process, the chillies were flipped when necessary toensure equal drying of chillies. In the study areas, some farmers followed direct drying method as they considered this method to be less time and labour requirement.

6.2.5. Overall Mandays Engaged in Chilli Cultivation

The pattern of labour used for cultivation of chilli is presented in Table 6.6. In the study areas, the overall average mandays of 86.22 was used in cultivation of chillies for an average jhum area of 3.001 acres (see Table 6.1). Among the different stages of chilli cultivation, the least mandays required for chilli cultivation was for sowing activity (7.6 mean mandays) whereas weeding required the highest labour mandays (229.77 mean mandays) since weeding is labour intensive and done manually.

Table 6.6: Overall Mandays Engaged in Chilli Cultivation

Particulars	N	Min	Max	Mean	Std
Land Preparation	30	13	127	49.67	26.662
Sowing	30	5	12	7.6	2.01
Weeding	30	45	472	229.77	120.943
Harvesting	30	43	276	112.67	55.265
Processing	20	5	12	7.6	2.01
Grand total	140	1	472	86.22	105.292

Source: Field Survey, 2017

The number of mandays required by household is associated with the plot of land used for growing crops by the farmers. It was learnt during the data collection that only a negligible number of mandays were involved for marketing chillies , nevertheless, mandays used for marketing was not calculated.

6.2.6. Quantity of Chilli Harvested .

The survey result presented in Table 6.7 reveals that the minimum and maximum yielded of fresh were 530 kg and 7500 kg with average fresh chilli yielded of 2053.4 kg.

The minimum and maximum yielded of processed chillies were 660 kg and 1600 kg respectively. The average yielded of processed chillies was 1020.8 kg

Fruit yielded in the chilli varies considerably depending on climatic conditions, incidence of pests and diseases, crop season, variety cultivated (Dhaliwal, 2008).

Table 6.7: Total Quantity of Chilli Production

in Kilogram

Particulars	N	Min	Max	Mean	Std. Dev
Fresh chilli	10	530	7500	2053.4	2002.208
Processed Chilli	20	660	1600	1020.8	228.364

Source: Field Survey, 2017

Harianto and Saidah (2020) mentioned that the success of red chilli production is strongly influenced by and determined by the quality of the seeds used. According to the calculation made by farmers, 1 kg of whole dry chillies can be obtained from an average 3 kg of fresh chillies.

6.2.7. Chilli Quantity Sold

Table 6.8 shows that from marketing of the average quantity of 1982.9 kg of fresh was sold by the Chilli growers. Also, the average quantity of 973.45 kg of processed Mizo chillies were sold by the chilli growers.

Table 6. 8: Total Sold Quantity of Chilli

in Kilogram

Particulars	N	Min	Max	Mean	Std. Dev
Fresh Quantity	10	496	7394	1982.9	1983.586
Processed Quantity	20	600	1505	973.45	216.656

Source: Field Survey, 2017

It was noticed that only healthy chillies were marketed by the farmers.

6.2.8. Income Generation from Chillies Production

As presented in Table 6.9 an average amount of ₹ 121000 was received from selling an average fresh quantity of 1982.9 while an average amount of ₹227000 was obtained from selling an average 973.45 kg of processed chillies

Table 6.9 : Income Generation from Selling Chillies

in Rupees

Particulars	N	Min	Max	Mean	Std. Dev
Fresh income	10	34491	460620	121000	124223.4
Processed income	20	140400	420000	227000	82261.26
Total	30	34491	460620	192000	108746

Source: Field Survey, 2017

6.2.9. Calculation of Economic Value of Labour in Each Farming Activities

The economic value of different phases of farming activities was calculated by multiplying mandays used on every stages of agricultural activities by family members, hired labour and exchange labour with the average prevailing rural wages for unskilled male and female.

The rural wage rates for agricultural labour may differ from villages to villages, stages of farming activities and gender wise etc, however, an average rate from ₹ 350, ₹ 300 ₹250, ₹200 is taken in order to calculate the economic value

Table 6.10indicates that the economic contribution by household human labour was the highest in activities such as land preparation (55.43 %) and weeding (55.24%) This finding indicated that household member participation in farming activities can mobilize in higher monetary savings.

Table 6.10: Economic Value of Labour for Chilli Cultivation

Particulars	Mandays (Averge)	Daily LabourRate (in Rupees)	Expenditure (in Rupees)	Percent
Land preparation				
Household labour	36.93	275	10155.75	55.43
Hired labour	19.47	275	5354.25	29.22
Exchange labour	10.22	275	2810.5	15.34
Total			18320.5	100
Sowing				
Household labour	4.46	275	1226.5	41.33
Hired labour	6.33	275	1740.75	58.67
Total			2967.25	100
Weeding				
Household labour	162.5	275	44550	55.24
Hired labour	97.71	275	26870.25	33.31
Exchange labour	33.55	275	9226.25	11.44
Total			80646.5	100
Harvesting				
Household labour	67.79	275	18642.25	48.27
Total labour	66.14	275	18188.5	47.10
Exchange labour	6.5	275	1787.5	4.63
Total			38618.25	100
Processing				
Household labour	7.6	275	2090	33.63
Total			2090	34
Grand total			146767.5	

Source: Field Survey,

2017

The average economic value on different tasks for chilli production were as the following: ₹ 18320.5 for land preparation,₹ 2967.25 for sowing, ₹80646.5 for weeding, and ₹38618.25 for harvesting and ₹ 2090 for processing activity. Further, the total economic value from all the farming activities was calculated to be ₹146767.5.

6.2.10. Expenditure Incurred on Other Activities

In addition to labour expenses, farmer also incurred cost on other activities whereby expenditure made on input cost was the highest while the lowest expenditure was incurred on marketing cost. The following were the average amount spent for chillies cultivation: ₹1518.89 for input cost,₹ 1220.88 for transportation expenditure, ₹ 1050 for processing expenditure and ₹ 415 for marketing purposes(Table 6.11).

Table 6.11: Expenditure Incurred on Other Activities

in Rupees

Particulars	N	Min	Max	Mean	Std. Dev
Input expenses	9	400	3000	1518.89	961.359
Processing expenses	2	950	1150	1050	141.421
Transportation expenses	17	100	5000	1220.88	1322.608
Marketing expenses	4	140	890	415	329.292
Total	23	390	5000	1660.22	116.92

Source: Field Survey, 2017

6.2.11. Overall Average Expenditure Incurred on Chilli Cultivation

The overall average chilli production expenditure as presented in Table 6.12 was ₹58448.52. For cultivation of chillies, the major shared of expenditure on average was incurred on hired labour (92.81%) while only 0.71 per cent was incurred on marketing expenses. The other expenditure made were on inputs cost (2.60 %), transportation vehicles for production (2.09 %) and processing activities (1.80%).

Table 6.12: Overall Average Expenditure incurred on Chillies Cultivation

in Rupees

Particulars	Expenditure	Percent
Inputs costs	1518.89	2.60
Hired labour expenses	54243.75	92.81
Processing activities	1050	1.80
Transportation expenses	1220.88	2.09
Marketing expenses	415	0.71
Overall	58448.52	100

Source: Field Survey, 2017

Chilli growers used their own vehicles for various agricultural activities, however, the expenditure incurred on such activities were not calculated.

6.2.12. Marketing Channel of Chilli

Chilli farmers in the study areas sold chilli through different channels. These channels were also determined by the selling form of chilli. The type of channel used has an influence in marketing cost, hence, farmers who sold their produce to the urban commissioner spend more as marketing cost for transportation etc has to be incurred.

From the data collection, it was learnt that the main actors involved in selling fresh chillies were farmers, Farmer's Association, rural traders, urban commissioners and consumers while the main actors identified for processing channels were – farmers, rural agents, wholesaler.

Further, it was learnt that farmers' Association was the main receiver of fresh chillies whereas wholesalers from Silchar, Assam were the main receiver of processed products.

Mobile communication was the main means of communication tool used in the marketing channels. For fresh chili payment, the duration of payment made to farmers was ranged from 1 day to 7 days. As for processed chillies, instant payment was made to the farmers by the rural agents. In most time, farmers sold fresh chillies at a price set by the rural traders and urban commissioners. Likewise, processed chillies were sold to the rural agent based on the rate fixed by the rural agents. With regards to this, farmers sold their processed product to the rural agents who offered the highest rate. This indicated that farmers also had the freedom to sell their produced to any rural agents.

Farmers: Farmers were the actor who carried out chilli production as well as an agent for chilli marketing. These farmers also transported their own produced to the urban market and sold it to other actors. Further, the practiced of selling chillies to more than 2 to 3 actors was prevalent.

During the data collection, it was learnt that farmers sold fresh chillies at ₹45 per kg directly to the customer while about ₹ 47 per kg and ₹ 40 was earned when selling it to the rural traders and urban commissioners respectively. Farmers sold fresh chillies to the Farmer's Association at a rate ranged from ₹40 to ₹125 per kg with an average rate of ₹71 per kg.

It was observed during the field survey that all the farmers sold Mizo chillies to the rural agent of the wholesalers. Moreover, the farmers from Sailulak village sold the dried Mizo chilli between ₹180 to ₹ 200. In contrast to that, the selling rate of Mizo dried chilli in Thingsai village was ranged from ₹250 to ₹ 300.The purchasing rate of dried Mizo chilli by the Assamese rural agents were influenced by the prevailing rate of Silchar market.

Rural Traders/agents: There were two types of rural traders in chilli marketing viz

1) The rural traders/ procured fresh chillies from the Farmer's Association in Mualpheng village as well as from the farmers. These rural traders sold the produced to the urban commissioner in Aizawl market and acted as a middleman between the producers and the urban commissioners. These rural traders resold fresh chilli at a profit ranged between ₹20 from ₹ 33 with an average profit of ₹ 18.5 to the urban

commissioners.

2) The other rural agents consisted of rural (local) agents and Assamese rural agents.These rural agents served as an intermediary between the farmers and the wholesalers, Silchar. Local rural agents and Assamese rural agents collected dried chillies from the farmers and traded it for ₹5 per kg to the wholesalers. In addition, these rural agents (local) were from the village itself.

3) Farmer’s Association: Farmer’s Association called ‘*Thlai Association*’ was formed in 2006 and all the chilli growers of Mualpheng village become the member of this association. All the members of this farmer group submitted their harvested produced to the Association ,whereby, the rural traders procured fresh chilli through the Association.

The selling and buying activities were mainly carried out in the form of aution, wherein, chillies were sold to the rural traders who can offer the highest price. Therefore, Farmer’s Association purchasing rate was highly determined by the rate offered by the rural traders. Again, the rate offered by the rural traders was determined by the prevailing rate at the Aizawl market. Additionally, this rural trader to whom chillies were sold to, can again resell the produced to other rural traders at a price fixed by her. It was further learnt during the field survey that the Farmer’s Association sold fresh chillies at a rate ranged from ₹40 to ₹125 per kg with an average rate of ₹71 per kg to the rural traders

Urban Commissioner: The urban commissioner consists of the commissionerselling fresh chillies in urban market, mainly *Aizawl* market. The urban commissioners having a selling place/seat at the urban market in different areas soldfresh chillies to the final consumers at a profit of ₹15, ₹50 and ₹ 70.

Wholesaler: Wholesalers were the actors who purchased dried whole chilli in a larger volume as compared to other actors in chilli marketing. These wholesalers were mainly from Silchar, Assam. In general, these wholesalers also collected whole dried Mizo chillies from different Mizo chilli producing villages through rural agents. The collected products were brought to the wholesaler, Silchar,thereon,whole dried Mizo chillies were resold and transported to Siliguri factory, Siliguri for further value addition. In addition, whole dried *Mizo* chillies were also resold to different retailers, located in different parts of India and added value along the process.

Consumers: Consumers were the last actor in chilli marketing chain. These final consumers consumed chilli in many ways such as in raw form, added to curry, prepared in chutney, *Mizo bai* (vegetable stew/ vegetables with meat stew etc)and make chilli pickle etc.

It was observed that five marketing channels were exhibited in the study areas (Figure 6.1). The five marketing channels recorded during the study were discussed below:

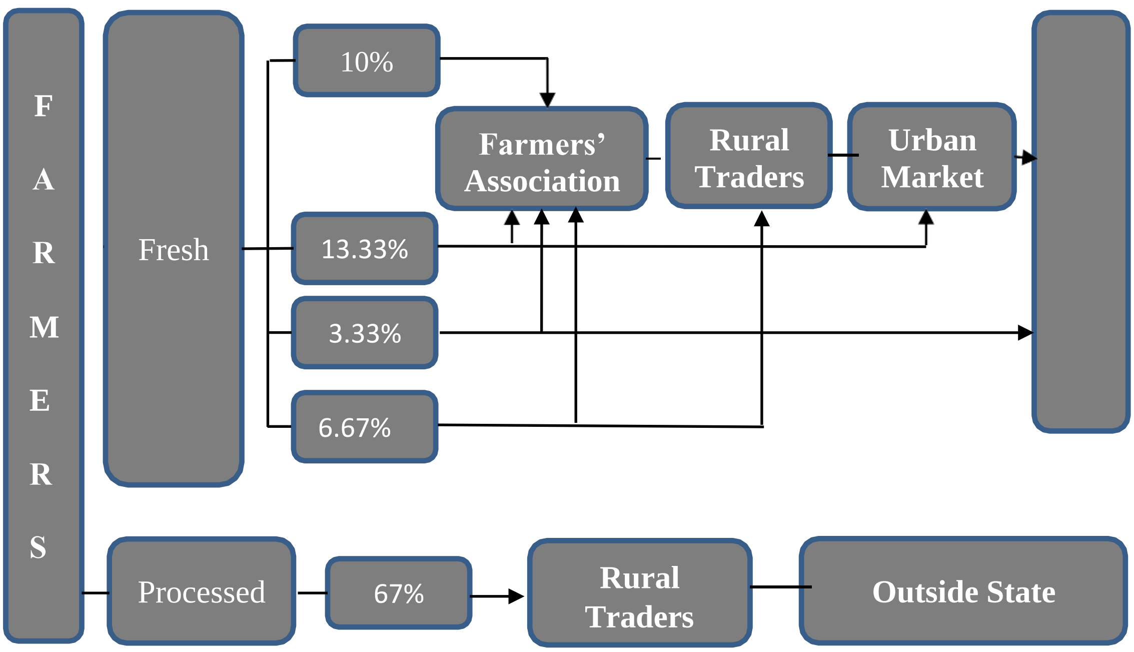

Figure 6.1: Value chain of chilli

Channel I: This channel was employed by 10 per cent of the farmers for selling their fresh chillies produced to the Farmer's Association.

Channel II: The farmers sold fresh chillies to two actors viz Farmers' Association and Urban commissioners at the urban market. This accounted for 13.33 per cent of the selected chilli growers.

Channel III: It was noticed from the field study that, 6.67 per cent of the farmers sold their fresh chilli production to both actors namely-Farmer's Association and Rural traders.

Channel IV: The identified actors in this channel were Farmers Association and consumers. It was observed that 3.33 per cent of the chilli growers utitized this channel to sell their fresh chillies produced.

Channel V: The highest number (67 per cent) of the respondents sold processed chilli solely to the rural agents.

6.2. GINGER

6.2.1. Origin

Cited by Arya (2001) from Purseglove et al. (1981) mentioned that ginger belonging to family Zingiberaceae, is believed to be native to South Eastern Asia. On the basis of available historical records, ginger was certainly known to a and high highly esteemed by the ancient Greeks and Romans who obtained this spice from Arabians traders via the red sea. It was introduced to Germany and France in the ninth century and to transported in a living state for long distances and have better shelf-life of 5-6 months if stored under proper conditions. It has been used as a spice and medicine in India and China since ancient time. It is not known in a wild state, nor in the country of origin known with certainty. It may have been India and it was certainly in China at an early dated (Arya, 2001).

6.2.2. Climate

Ginger is cultivated in almost all states in India. Ginger grows best in warm and humid climatic conditions. It is mainly cultivated in the tropics from sea level to an altitude of above 1500 m.a.s.l. in hilly areas where the climatic conditions are different than plains especially in terms of rainfall and temperature. For successful cultivation of the crop, a moderate rainfall at the time of sowing till the rhizomes sprout, fairly heavy and well distributed showers during the growth period and dry weather for about a month before harvesting are necessary (Arya, 2001).

6.2.3. Soil:

Ginger can be grown in all types of soils having 6-7 pH. But it thrives the best in well drained light sandy loam or clay loam, red loam, or lateritic loam soils. A friable loam rich in humus is ideal (Arya, 2001).

In the study areas, it was learnt that ginger was grown as a single crop or mixed/inter crop. When growing as a single crop, ginger was cultivated on a separate area within the same field at the same time. Also, ginger was grown solely on a separate plot of land. Farmers adopting inter-cropping system mixed ginger with other crops like Mock tomato,Taro, Mustard leaves, Bitter gourd, Mizo chilli, Maize, and Pumpkin etc.

6.2.4. Area Under Ginger Cultivation

The mean area where farmers carried out ginger cultivation constituted to be 1.9917 with standard deviation of 1.01388,whereby, the land holding size ranged from 0.25 to 5 acres in the study areas.

As demonstrates in Table 6.13, it can be seen that half of the respondents (50%) operated ginger cultivation in an area “between 2 to 3” acres of land followed by an equal number of 20 per cent practiced the aforesaid cultivation “between 1 to 2 acres” and “3 and above acres” of jhum area. The remaining 10 per cent carried out farming in “below 1 acre” of jhum land.

Table 6.13: Area Under Ginger Cultivation

Acre	Frequency	Percent
Below 1 Acre	3	10
1-2 Acres	6	20
2-3 Acres	15	50
3 Acres & Above	6	20
Total	30	100

Source: Field Survey, 2017

6.2.5. Mandays Engaged in Land Preparation for Ginger

Table 6.14 reveals the mandays engaged in land preparation for ginger cultivation. Land preparation is an important activity as it prepares the land suitable for ginger cultivation. According to Table 6.14, it can be observed that household labour mandays generated more labour for land preparation than hired human labour. Hence, the total average mandays contribution by household labour was 34.47, whereas, hired labour mandays mean contribution was found to be 15.35. A negligible mandays contribution was made from friends and relatives ,thus, their mandays were also added to household mandays contribution.

Table 6.14 : Mandays Engaged in Land Preparation for GingerCultivation

Particulars	N	Min	Max	Mean	Std
Household labour	30	3	92	34.47	25.314
Hired labour	17	1	47	15.35	12.772
Total	30	4	124	43.17	26.914

Source: Field Survey, 2017

The major four steps required for land preparation involved- clearing of forest, preparation of firelines, burning and reburing. Two activities such as clearing of forest and burning activity were dominated by men, therefore, women did not participate in these activities.

6.2.6. Quantity of Ginger Seeds Sown

There are three major varieties of ginger grown in Mizoram namely Thingpui, Thinglaidum and Thingria of which Thinglaidum is the most popular (Thanga and Vanrammawia, 2013). The two local varieties called Thingpui and Thinglaidum have been allotted a Geographical Identification (G.I) Tag in 2018.

Ginger farmers sown rhizomes from 200 kilograms to 5200 kilograms with mean 1361 kg of ginger. The quantity of the seeds sown was determined by the acreage of the land. In the study areas, no treatment was given to the seed rhizomes before sowing. The seed rhizomes that were matured, healthy and free from pests and diseases were used for sowing.

6.2.7. Mandays Engaged in Sowing Ginger Seeds

Ginger is sowed by dibbing technique where a farmer makes a small hole. As additional man-day is required for digging and cleaning of ginger rhizomes before carrying sowing activity, hence, mandays of sowing have been derived by adding mandays used for collecting and cleaning of ginger rhizomes prior to performing sowing activity.

From the table 6.15, family mandays contribution was the highest with mandays ranging from 4 to 212 during the field survey. On an average, household used 77.76 mandays for sowing ginger. Apart from household mandays contribution, hired human labour contributed an average of 44.8 mandays.

Table 6.15 : Mandays Engaged in Sowing Ginger Seeds (Rhizomes)

Particulars	N	Min	Max	Mean	Std
Household labour	29	4	212	77.76	52.675
Hired labour	20	2	121	44.8	42.907
Exchange labour	4	1	24	7.75	10.905
Total	30	4	309	106.07	71.535

Source: Field Study, 2017

Hired labor participation is the second highest wherein man-days was from 2 to 121 with average man-days of 44.8. Hired labor were remunerated with cash while exchanged labour were reciprocated with labor on man-days for man-days basis.

Sowing was equally done by men and women in the study areas. In sowing activity, a small number of mandays contribution by friends was observed, hence, these mandays were added to household family mandays contribution.

6.2.8. Mandays Engaged in Weeding for Ginger Cultivation

The ginger fields should be kept weed free as these harbor the nutrient/food material meant for the main crop of ginger and also compete with ginger plants for light, moisture, etc. these harmful weeds should be removed as soon as they are seen in the ginger field possibly after 40 and 70 days of planting (Arya,2001).

As evident from Table 6.16, the average mandays of 99.47 was spent by household labour followed by an average 55.27 mandays spend by hired human labour. Labour that required reciprocation on a strict mandays to mandays was noticed to be an average 12.25 mandays for ginger cultivation.

Table 6.16 : Mandays Engaged in Performing Weeding Activity

Particulars	N	Min	Max	Mean	Std
Household labour	30	3	224	99.47	56.95
Hired labour	11	7	147	55.27	49.48
Exchange labour	4	1	23	12.25	12.42
Total	30	3	250	121.37	60.358

Source: Field Survey, 2017

Weeding is done manually using a particular tool called hoe (*Tuthlawh*). The number of mandays used for spreading herbicides by very few farmers were included in calculation of weeding mandays. Equal involvement of men and women in weeding activity was also learnt during the field survey.

6.2.9. Mandays Engaged in Ginger Harvesting

Harvesting of ginger largely depends on market condition. It is usually done when traders from neighbouring states come to buy ginger. The peak harvesting season is January to April, even though it may start from as early as November and as late as May-June, depending on buyers' requirement. Harvesting is done by hand with the help of a small hand hoe called "*Tuthlawh"* (Rosanglura and Renthlei,2003). In Mizoram, ginger is also consumed before it reaches full maturity. The baby/young/immature ginger is ready for harvesting about four to six months of planting, while mature ginger takes 7-8 months to reach maturity. It can be observed from the table 6.17 that harvesting man-days were generated by family and hired laborers. Among the aforesaid mandays contributors, family human labor contributed higher man-days than hired labour man-days,in which, household human labour average man-days contribution was 35.4 man-days.

Table 6.17 : Mandays Engaged in Ginger Harvesting

Particulars	N	Min	Max	Mean	Std
Household labour	30	2	170	35.4	39.59415
Hired labour	14	3	150	55.3571	45.07021
Total	30	3	228	61.4	70.81671

Source: Field Survey, 2017

The overall man-days used for harvesting ginger was ranged from minimum 3 man-days and maximum 228 man-days while the average man-days spent for harvesting was 61.4 mandays (Table 6.17). The participation by men and women during harvesting period was found to be equal in the selected areas.

After harvesting activity was done, in general, immature and mature ginger were thoroughly cleaned so that the soil and dirt adhered to the rhizomes and in between fingerlines were removed. This was the single activity carried out when farmers had to sell their mature ginger to the rural traders. In addition to cleaning process at the initial stage, the matured rhizomes which are meant for selling in the urban market were further washed with water and let it tried under the sun. A negligible mandays were used for post-harvesting, thus, post-harvesting mandays were not calculated.

6.2.10. Overall Mandays Engaged in Ginger Cultivation

Table 6.18 shows that weeding activity required the highest mandays with an average 121.37mandays, followed by sowing activity that required an average 106.07 mandays, and harvesting with an average 61.4 mandays .

Table 6.18 : Overall Mandays Engaged in Ginger Cultivation

Particulars	N	Min	Max	Mean	Std
Land preparation	30	4	124	43.17	26.914
Sowing	30	4	309	106.07	71.535
Weeding	30	3	250	121.37	60.358
Harvesting	30	3	228	61.4	70.8167
Grand total	120	3	309	83	67.501

Source: Field Survey, 2017

It was further noticed that the lowest mandays was used on land preparation with an average 43.17 mandays. The overall average mandays spent for ginger production was accounted for 83. Mandays used for marketing ginger was not calculated as it did not use much labour to carry out the activity.

6.2.11. Details of Ginger quantity Yield and Sold

In the Table 6.19, it could be inferred that the total average ginger harvested was estimated to be 3419.87 kilogram from an average jhum area of 1.9917. In the study areas, an average of 3396.67 kilogram was sold by the ginger growers.

Table 6. 19 : Total Quantity of Ginger Harvested and Sold Quantity

in Kilogram

Particulars	N	Min	Max	Mean	Std. Dev
Ginger quantity harvested	30	330	15920	3419.87	4042.511
Ginger quantity sold	30	300	15900	3396.67	4032.346

Source: Field Survey, 2017

The yield of ginger is greatly influence by the time of sowing. Burning the surface soil and early planting with the receipt of good summer shower consistently gives higher yield and reduces the disease incidence (Arya, 2001).

6.2.12. Income from Selling Ginger

It was observed during the data collection, on an average the income earned from selling an average quantity of 3396.67 kg of ginger was estimated to be ₹ 32300 during the data collection. Further, the income received by the ginger growers ranged from ₹2600 to ₹186200.

6.2.13. Calculation of Economic Value of Labour in Each farming Stage for Ginger Production

The economic value of different phases of farming activities has been calculated by multiplying mandays spent on each phases of farming activities by family members, hired labour and exchange labour with prevailing total mean rural wages for unskilled male and female.

The rural wage rates for agricultural labour may vary from villages to villages, stages of farming activities and gender wise, therefore, an average rate of ₹300,₹ 250, ₹ 300 is taken from calculation of the economic value

It is evident from the Table 6.20, that the economic contribution by household human labour was the highest in various activities, such as land preparation (65.19 %), sowing(59.67%) and weeding (64.25%) This finding indicated that household member participation in farming activities can mobilize in higher monetary savings for households as it exempted additional money spending on hiring labour.

Table 6.20: Expenditure on labour mandays

Particulars	Mandays (Averge)	Daily Labour Rate (in Rupees)	Expenditure (in Rupees)	Percent
Land preparation				
Household labour	34.37	275	9451.75	69.00
Hired labour	15.35	275	4221.25	31.00
Total			13673	100
Sowing				
Household labour	77.76	275	21384	59.67
Hired labour	44.8	275	12320	34.37
Exchange labour	7.75	275	2131.25	5.94
Total			35835.25	100
Weeding				
Household labour	121.37	275	33376.75	64.25
Hired labour	55.27	275	15199.25	29.26
Exchange labour	12.25	275	3368.75	6.49
Total			51944.75	100
Harvesting				
Household labour	35.4	275	9735	39
Total labour	55.3571	275	15223.2025	61
Total			24958.2025	100
Grand total			1,26,411.2020	

Source: Field Survey, 2017

The average economic value for different activities were- ₹ 13673 for land preparation, ₹35835.25 for sowing, ₹51944.75 for weeding and ₹24958.2025 for performing harvesting activity. Thus, the overall average of economic value for ginger production was calculated to be ₹126411.2020.

6.2.14. Expenditure Incurred on Other Activities

Apart from spending money on hiring human labour, ginger growers spend money on various items for carrying out ginger cultivation. As depicted in Table 6.21 that, the highest mean expenditure was made on transportation expenses, accounting for ₹3902.06 while the average lowest expenditure was spent on marketing expenses , accounting for ₹ 275 during the field data collection.

Table 6.21: Expenditure Incurred on Other Activities

in Rupees

Particulars	N	Min	Max	Mean	Std. Dev
Input cost	16	350	7400	2318.12	2154.543
Farming expenses	6	1100	14840	6110	4668.734
Transportation expenses	17	200	14220	3902.06	4895.827
Marketing expenses	2	100	450	275	247.487
Total	21	100	19620	6658.81	6390.907

Source: Field Survey,2017

On average, the total expenditure incurred on other activities was ₹ 6658.81 by the farmers.

6.2.15. Overall Average Expenditure Incurred on Ginger Cultivation

In the study areas, it was found that the highest cost was incurred for hiring human labour at ₹46963.70, accounting for 78.84 per cent of the total expenses. It was further learnt that the amount spent on transportation facilities was ₹3902.06 with 6.55 per cent of the total expenses (Table 6.22).

Table 6.22 : Overall Average Expenditure Incurred for Ginger Cultivation

in Rupees

Particulars	Amount	Percent
Input cost	2318.12	3.89
Farming expenses	6110	10.26
Transportation expenses	3902.06	6.55
Marketing expenses	275	0.46
Hired labour expenses	46963.70	78.84
Total	59568.8825	100

Source: Field Survey, 2017

The expenditure incurred on purchasing inputs was ₹ 2318.12, constituting 3.89 per cent of the total expenses. The overall average expenditure used for ginger cultivation was calculated to be ₹59568.8825.Mandays spent on marketing activity for ginger was not calculated since only a meagre number was involved.

6.2.16. Comparison of Sole and Mixed cropping system

Table 6.23 highlights that there were two farming techniques practiced in the study areas -1) sole cropping system and 2) mixed cropping system. Further, it was understood that a huge majority (90%) adopted mixed farming system while the remaining number (10 %) followed single cropping system.

6.2.16.1. Jhum Area Under Sole and Mixed Cropping System of Ginger Cultivation

During the field survey, it was observed that the average land holding size for practicing single cropping system was 3.1667 acres of land and an average1.8611 acre of land was used for mixed cropping cultivation.

Table 6.23: Jhum Area Under Sole and Mixed Cropping System of Ginger Cultivation

in Acre

Particulars	N	Min	Max	Mean	Std. Dev
Single cropping system	3	3	3.5	3.1667	0.28868
Mixed cropping system	27	0.25	5	1.8611	0.9814

Source: Field Survey,2017

6.2.16.2. Jhum Area Under Sole Ginger cultivation

Table 6.24.shows that 100 per cent of the ginger sole cultivation system cultivated jhum in an area of “above 3 acre of land”.

Table 6.24: Single Area Under Ginger Cultivation

Acre	Frequency	Percent
Below 1 Acre	-	-
1-2 Acres	-	-
2-3 Acres	-	-
3 Acres & Above	3	100
Total	3	100

Source: Field Survey,2017

6.2.16.3. Jhum Area Under Mixed Ginger Cultivation

Table 6.25 shows that more than half (56 %) of the ginger growers carried out farming activities in an area “between 2-3 acres” of land. An equal number of 11 per cent practiced farming in an area “below 1 acre” and an area “above 3 acres” of land respectively.

-

Table 6.25: Mixed Area Under Ginger Cultivation

Acre	Frequency	Percent
Below 1 Acre	3	11
1-2 Acres	6	22.22
2-3 Acres	15	56
3 Acres & Above	3	11
Total	27	100

Source: Field Survey,2017

6.2.16.4. Quantity of Ginger Harvested from Sole and Mixed Cropping System

As revealed in Table 6.26, farmers practicing single cropping pattern yielded an average production 9179.67 kg from an average jhum area of 1.8611acres. Also, ginger farmers practicing mixed cropping system yield an average of 2779.89 kg from an average jhum area of 3.1667 acres.

Table 6.26: Total Production of Ginger Based on Cropping System

in Kilogram

Particulars	N	Min	Max	Mean	Std. Dev
Mixed Cropping Production	27	330	15920	2779.89	3726.97
Single Cropping Production	3	8009	10017	9179.67	1044.677

Source: Field Survey, 2017

6.2.16.5 Quantity of Sold Ginger from Sole and Mixed Cropping System

In the case of sole cropping system, farmers produced an average 9179.67 kilogram of ginger and sold an average quantity of 9166.67 kilograms. An average amount of ₹76500 was earned from the selling ginger products (Table 6.27)

Table 6:27: Total Sold Quantity of Ginger Based on Cropping System *in Kilogram*

Particulars	N	Min	Max	Mean	Std. Dev
Mixed Cropping sold quantity	27	300	15900	2755.56	3712.721
Single Cropping sold quantity	3	8000	10000	9166.67	1040.833

Source: Field Survey, 2017

6.2.16.6. Income Generation from Ginger from Sole and Mixed Cropping System

From the Table 6.28, it can be understood that farmers who adopted ginger as a sole crop obtained an average₹76500 income whereas ginger farmers who cultivated mixed cropping system earned mean ₹27400 income.

Table 6.28 : Income Generation from Sole and Mixed cropping System

in Rupees

Particulars	N	Min	Max	Mean	Std. Dev
Mixed Cropping income	27	2600	186200	27400	39763.76
Single Cropping income	3	64000	93000	76500	14908.05

Source: Field Survey, 2017

Overall, ginger cultivated with mixed cropping system produced and earned more income than ginger cultivated as sole cropping system.

6.2.17. Marketing Channel of Ginger

Availabilities of market avenues and price conditions generally determine the harvesting time of ginger in Mizoram which normally starts from November till May with January-April being the peak period. Market signals have been perceived by the farmers when some traders from neighbouring states started to come to the village in search of ginger (Thanga and Vanrammawia, 2013).

From the information gathered from the sampled farmers, six major marketing channels were identified in the study areas, wherein, fresh ginger was the only form of selling the produced in these channels. Further, Figure 2 shows the existing actors in the channels- they were farmers, rural agents/traders, CDAR (Society), wholesaler, urban commissioners and consumers.

Mobile communication was the main means of exchanging information between actor to actor. It was observed during the study that farmers received payment from crops procurement by the rural agents and urban commissioners only after one week or more. Majority of the products which farmers sold were based on the price set by rural traders/ rural agents and urban commissioner as well

Farmers: They were the actors who engaged in producing ginger. These farmers were found to have sold ginger to different actors like rural traders, urban commissioners and consumers.

Farmers sold ginger rhizomes for ₹10 directly to the consumers as well as sold baby ginger and rhizomes ginger at ₹ 80 per kg and ₹20 per kg respectively to the urban commissioner in the Urban market (Aizawl). Farmers sold fresh ginger at ₹10 to rural agents (CDAR) while farmers sold fresh ginger between ₹ 7 to ₹12 with an average rate of ₹9 to the rural traders/agents of wholesalers (Assam).

Rural Agents/traders: There were two kinds of rural agents who served as an agent for wholesaler (Silchar and Bagha) and Society (CDAR).These rural traders /agents were from the local village ,wherein, the rural traders/agents for wholesaler (Silchar and Bagha) were men while rural society agent was found to be woman.

Rural agents procured ginger from the producers and supply the produced to the wholesaler and Society, thereon, ginger was distributed to different areas within and outside of India. The rural agents earned ₹ .50 per kg for collecting ginger for the Society (CDAR) and rural agents of wholesaler (Silchar) obtained ₹ 1 per 1 kg from trading it while a ranged from ₹ .05 to ₹1 per kg with average income of ₹.05 can be earned from trading it to wholesalers (Bagha) .

In a different case, when the rural agents themselves transported the produced to Bagha and traded directly to the wholesaler (Bagha), the rural traders can earn between ₹3.5 and ₹ 10 per kg with an average income of ₹5.75 per kg.

Community Action Development and Reflection (CDAR): CDAR was formed in 2004 and carried out processing of ginger into flakes at their processing unit. CDAR partners with international exporting companies and the major exporter were Suminter India Organics in Mumbai, Phalada Agro Research Foundation (Pure and Sure) in Bangalore, and Sresta National Natural Bio-Products Pvt Ltd (24 Mantra) in Hyderabad and these exporters sold the product mainly to European Countries. The selling rate of processed ginger by CDAR to these exporters was between ₹ 220-₹250. The processing ratio from fresh to flake products was 7:1 per kilogram.

Wholesalers (Bagha and Silchar): These wholesalers were an important actor ,wherein, Thanga and Vanrammawia (2013) mentioned that marketing agents would, in turn, transport ginger to the wholesale traders operating in Assam, like Karimganj, Bagha, Silchar for further dispatch to terminal market via Siliguri to Kolkata, Azhadpur (Delhi), Amritsar, Mumbai etc and through Karimganj to Bangladesh.

However, the information on these wholesalers reselling rate of ginger was not able to collect.

Urban Commissioners: The urban commissioners were the one who resold ginger at the urban market (*Aizawl).* These urban commissioners were mostly men. The urban commissioners resold ginger (baby ginger and rhizomes ginger) at a profit ranged between ₹30 to₹40 per kg to the final consumers.

Consumers: Consumers were the final actor of the marketing chain for ginger. These consumers consumed ginger as in raw form, added in curry, chutney, etc

According to the data obtained from the field survey, four marketing channels identified were discussed below (Figure 6.2):

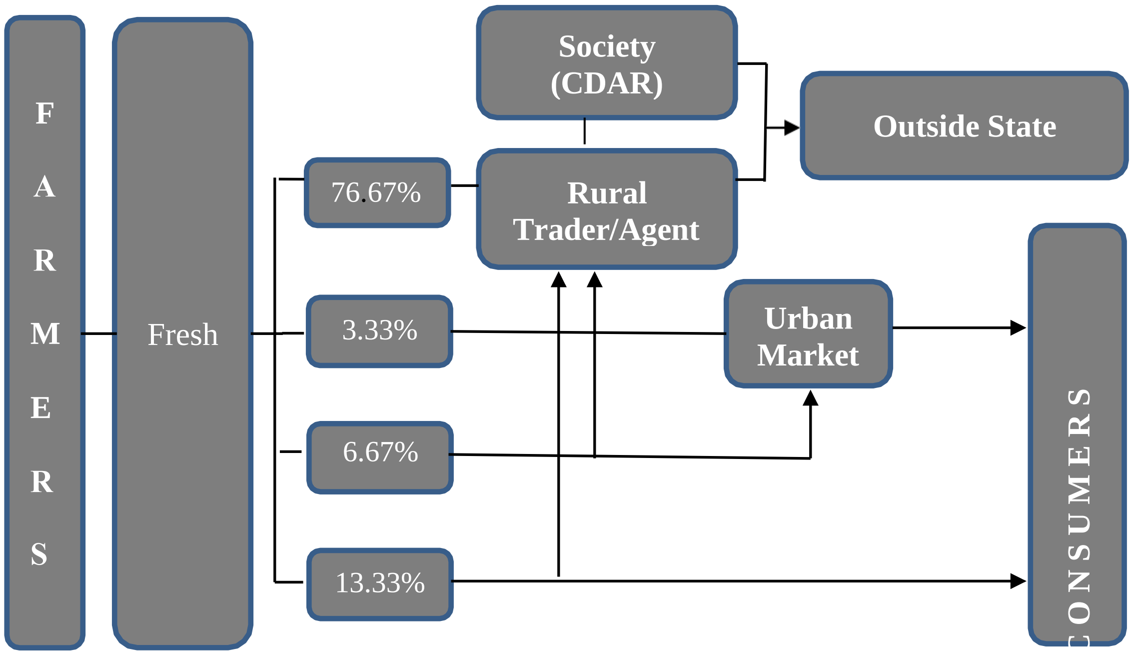

Figure 6.2: Value chain of ginger

Channel I: This is the shortest channel and was used by a small number (3.33 per cent)of the producer to sell ginger rhizomes directly to the consumer without any middlemen intervention in the study.

Channel II: In this channel, more than half (76.67 %) of the farmers sold ginger rhizomes to the rural agent/traders (outside state and Society).

Channel III: The components of actors involved in this marketing system were rural agents and final consumers. About 13.33 per cent of the sample respondents sold ginger to the rural agents and final consumers.

Channel IV: A small number (6.67 %) of the farmers sold the produce to two actors viz Rural traders/agents and urban commissioners.

6.3. MAIZE

6.3.1. Origin

Cited by Dayanand (2017) from weather wax and Randolph(1955) stated that Maize has been cultivated for thousand of years. During archelogical excavation in New Mexica, grains of maize and parts of maize ears were found in caves and rocks shelther, which are thought to be about 4,500 years old. Of even earlier origin, pollen grains of Zea tripsacurrm are said to be found at a depth of about 50 meters under Mexico city.

At the time of discovery of New world, maize was already cultivated in many parts of the American continent, especially in the more highly developed regions in Mexico, Central American and South America where it formed the staple diet of the indigeneous population. Christopher Columbus writes of the new Gramineace found in the inner region of Cuba described by two members of his crew. He named this new plant as maize. (Danayand, 2017).

6.3.2. Climate

Maize is a warm weather plant. It grows from sea level to 3000 metre altitude. It can be grown under diverse conditions. The most suitable temperature for germination is 21° C and for growth 32°. Extremely high temperature and low humidity during flowering damage the foliage, desiccate the pollen and interfere with proper pollination, resulting in poor grain formation. Maize is very sensitive to stagnant water particularly during its early stages of growth (Panda,2010).

6.3.3. Soil

Maize can be grown successfully in wide range of soils ranging from loamy sand to clay loam. However, soils with good organic matter content having high water holding capacity with neutral pH are considered good for higher productivity. Being a sensitive crop to moisture stress particularly excess soil moisture and salinity stresses, it is desirable to avoid low-lying fields having poor drainage and also the field having higher salinity (www.farmer.gov.in).

6.3.4. Area Under Maize Cultivation

In the study areas, Maize was cultivated as an intercropping system. The components of maize intercrops include Rice, Mizo chilli, Brinjal, Taro, Pumpkin, Cowpea leaves and Bittergourd etc was grown in an area ranging from 0.5 to 6 acres of land ,wherein, the average land holding size was 3.025 acres of land.

It was further observed that the highest number (40 %) of the farmers cultivated chilli in an area of “1 to 2 acres” of land, followed by a little less than one-third of the respondents (30 %) grown chillies in an area of “ 3 acres and above”. There were few farmers (6.67 %) cultivating chillies in an area of “below 1 acre” of jhum land.

Table 6.29: Area Under Maize Cultivation

Acre	Frequency	Percent
Below 1 Acre	2	6.67
1-2 Acres	12	40
2-3 Acres	7	23.33
3 Acres & Above	9	30
Total	30	100

Source: Field Survey, 2016-2017

6.3.5. Mandays Engaged in Land Preparation

In respect of mandays, maize growing household’s participation towards land preparation was reported to be the highest comparing to other contributor like hired human labour and exchange labour. Table 6.30, displays that the participation of household human member was an average of 36.37 mandays followed by average mandays of 20.28 and 5.5 from hired human labour and exchange labour respectively.

Table 6.30 : Mandays Engaged in Land Preparation for MaizeCultivation

Particulars	N	Min	Max	Mean	Std
Household labour	30	8	98	36.37	24.831
Hired labour	18	4	54	20.28	18.695
Exchange labour	2	4	7	5.5	2.121
Total	30	14	98	47.63	23.236

Source: Field Survey, 2016-2017

Land preparation constitutes different stages namely clearing, firelines preparation, burning and re-burning. Men's participation is the highest in clearing of virgin forest and burning of debris. In other activities like preparation of firelines and reburning the share of labour contribution was observed to be uniformed between men and women.

The participation of friends and relatives in a small number were also found during the data collection,hence, the contribution mandays were added to household family mandays.

6.3.6. Quantity of Maize Seeds Sown

The quantity of seeds used by the farmers varies from household to household. The quantity of seeds used is also determined by the size of maize cultivated area. The quantity of seeds used in the study areas ranged between 0.5kg to 15 kg, wherein the average quantity of maize sown constituted to be 25 kilograms in an average jhum area of 3.025.

Seeds that are free from pest, insects, diseases were sown by the farmers. Matured and healthy maize are usually kept for the next production cycle. In general, matured maize that are retained are dried under the sun or fireplace while the kernel are still on the cob.

Cited by Boopathi et al(2019) from Ratankumar et al . (2014) stated that locally, Mizoram maize are mainly classified into three groups based on taste and uses i.e. Mimban (sticky/ starchy), Mimpui (large cob/roasted/feed) and Puakzo (popcorn type).

6.3.7. Mandays engaged in Sowing for Maize Production

Maize was sown by dibble using a hoe (*Tuthlawh*). Labour invested by the household members was observed to be the highest during sowing period. The man-days contributed from household member on average was 5.38 mandays . Three farming household have hired human labour during the sowing period, in which, these hired labourers have contributed an average 7.33 man-days for sowing (Table 6.31).

Table 6.31 : Mandays Engaged in Sowing Maize Seeds

Particulars	N	Min	Max	Mean	Std
Household labour	29	2	18	5.38	3.416
Hired labour	3	6	10	7.33	2.309
Total	30	2	18	5.93	3.433

Source: Field Study, 2017

There were farmers who performed sowing activities twice or thrice in a year, whereby, sowing mandays were calculated by adding all the number of mandays spent on each sowing activity. Also, family friend mandays were contributed during sowing period and the mandays were added to household family labour contribution.

Additionally, both men and women involvement in performing sowing activity was equal during the data collection.

6.3.8. Mandays Engaged in Weeding For Maize Cultivation

Weeds are the serious problem in maize, particularly in monsoon season that competes with crop for nutrient, water and other resources and causes yield loss up to 35%. Therefore, timely weed management is needed for achieving higher yield (https://vikaspedia.in).If weeds are allowed to grow in maize field they roughly remove equal or even more amount of plant nutrients and water. Weeds generally have a better chance of growing in maize field due to lower competition offered by initial slow growth rate of maize plants and comparatively faster growth of weeds. This leads to almost complete failure of crop if the weeds are not taken care (Dayanand,2017). From Table 6.32, it can be observed that family labour had the higher average man-days participation (85.9) as compared to hired human labour (average 50.87 mandays).

Table 6.32 : Mandays Engaged in Performing Weeding Activity

Particulars	N	Min	Max	Mean	Std
Household labour	29	13	192	85.9	40.948
Hired labour	15	3	150	50.87	38.534
Total	30	33	240	108.47	54.068

Source: Field Study, 2017

Hand-weeding is the traditional practice of weeding by the sampled sugarcane growers using hoe (*Tuthlawh*). It is one form of controlling the weeds through non-chemical methods. An equal participation of men and women in performing weeding activity was witnessed during the data collection.

6.3.9. Mandays Engaged in Maize Harvesting

Maize is ready for harvesting when the plants stop growing and the kernels begin to harden. (Gibbs,1984). Maize is harvested at various stages of growth. Depending on the variety sown, the final output is ready in June, July-August, or October. (Singh,1996). Harvesting of Maize was done by hands and it was found from the field study that Maize requires usually 3-4 months to reach maturity. Table 6.33 portraits mandays engaged in maize harvesting, wherein, the average 25.97 mandays was used by the farming household while the average 19 mandays was used by hired labour.

Table 6.33 : Mandays Engaged in Maize Harvesting

Particulars	N	Min	Max	Mean	Std
Household labour	29	8	81	25.97	18.558
Hired labour	7	8	56	19	16.748
Total	30	8	86	29.53	20.634

Source: Field Study, 2017

Harvesting mandays were obtained from two time harvest a year. An equal participation from men and women for carrying out harvesting activity was witnessed during the field survey.

Processing of maize (popcorn variety) was simply drying out the moisture of maize by placing under the sun or near the fireshelf etc. therefore, mandays were not required as it was not labour intensive work. Hence, mandays used for processing was not calculated for the study.

6.3.11. Overall Mandays Engaged in Maize Cultivation

It is evident from the Table 6.34 that out of all the farming activities, weeding required the highest human labour (on an average 108.47 mandays) followed by land preparation (on an average 47.63 mandays), harvesting (on an average 29.53 mandays) and sowing (on an average 5.93 mandays).

Table 6.34: Overall Mandays Engaged in Maize Cultivation

Particulars	N	Min	Max	Mean	Std
Land preparation	30	14	98	47.63	23.236
Sowing	30	2	18	5.93	3433
Weeding	30	33	240	108.47	54.068
Harvesting	30	8	86	29.53	20.634
Overall	120	2	240	47.89	49.035

Source: Field Survey,2016-2017

The overall average mandays used for an average3.025 acrage of land was 47.89 by maize farmers during the data collection. The numbers of mandays involvement is highly determined by the size of the land and the type of soil of the land.

6.3.12. Quantity of Maize Harvested

It can be seen from the data collection in Table 6.35 that the overall average production of maize was 11000 cobs in which fresh maize production constituted an average of 10900 cobs whereas the processed production accounted for an average 438.33 cob.

Table 6.35 : Total Quantity of Maize Production

In Cobs

Particulars	N	Min	Max	Mean	Std
Fresh production	30	3040	30200	10900	5006.159
Processed production	6	200	1000	438.33	297.282
Overall	30	3040	30200	11000	5004.674

Source: Field Survey,2016-2017

The overall average harvested maize was 11000 cobs by the maize growers. The yielding of maize is determined by several factors like quality of the seeds, time of harvesting, occurrence of pests, and quick harvesting and application of organic fertilizers etc.

Table 6.3.13.Maize Quantity Sold

The Table 6.36 shows that the mean quantity of fresh maize sold from the total harvested was 9414 cobs with minimum and maximum produced cobs ranged from 2500 to 28000 respectively. The total average of processed maize sold was 400 cobs and the selling cobs ranged from 200 cobs to 1000 cobs during the field survey.

Table 6. 36 : Total Sold Quantity of Maize

in Cobs

Particulars	N	Min	Max	Mean	Std
Fresh sold	30	2500	28000	9414	4738.207
Processed sold	6	200	1000	400	316.228
Total	30	2500	28000	9494	4739.629

Source: Field Survey,2016-2017

In general, only healthy and good cobs were usually sold by the famers in the studyareas.

6.3.14. Income from Selling Maize

Table 6.37 reveals the total income earned by the farmers from selling their produce (fresh and processed). From the total average 9414 cobs produce of fresh maize, the farmers earned an average total income of ₹28400. Also, from the average processed produced sold (400 cobs) maize growers earned ₹ 1427.83 in the selected areas.

Table 6. 37: Income Generation from Selling Maize

in Rupees

Particulars	N	Min	Max	Mean	Std
Fresh income	30	9500	55000	28400	12100.79
Processed income	6	400	3000	1427.83	927.647
Total	30	10167	55000	28700	11960.860

Source: Field Survey,2016-2017

6.3.15. Calculation of Economic Value of Labour in Each Farming Activity

The monetary value of each farming activity has been determined by multiplying mandays spent on each phases of farming activities comprised of family members labour, hired farm-labour and exchange labour with prevailing average local wages for unskilled male and female. The prevailing rural wages may vary from villages to villages, stages of cultivation activities and gender wise ,hence, an average rate from different local wage rate (₹300 and ₹250) is taken for calculation of the economic value.

It can be inferred from Table 6.38 that the monetary contribution made by household human labour was the highest in various activities, such as land preparation, weeding and harvesting. This finding indicated that household member involvement in farming activities contributed in household financial savings.

Table 6.38 : Economic Value of Labour for Maize Cultivation

Particulars	Mandays (Average)	Daily Labour Rate (in Rupees)	Expenditure (in Rupees)	Percent
Land preparation				
Household labour	36.37	275	10001.75	58.52
Hired labour	20.28	275	5577	32.63
Exchange labour	5.5	275	1512.5	8.85
Total			17091.25	100
Sowing				
Household labour	5.38	275	1479.5	42.33
Hired labour	7.33	275	2015.75	57.67
Total			3495.25	100
Weeding				
Household labour	85.9	275	23622.5	62.81
Hired labour	50.87	275	13989.25	37.19
Total			37611.75	100
Harvesting				
Household labour	25.97	275	7141.75	57.75
Total labour	19	275	5225	42.25
Total			12366.75	100
Grand total			70565	

Sources: Field2016-Survey, 2017

The mean economic value on different tasks for Maize production were as the following: ₹ 17091.25 for land preparation,₹ 3495.25for sowing, ₹37611.75 for weeding, and ₹12366.75 for harvesting, hence, the total economic value from all the farming activities incurred was ₹ 70565.

Table 6.3.16 Expenditure Incurred on Other Activities for Maize Cultivation

The expenditure incurred on other activities for maize calculation presented in Table 6.39 shows that farmers also spend money on different items such as input cost, farming expenses, transportation expenses and marketing expenses. The highest mean expenditure was incurred on daily farming expenses accounted for ₹1928.64 and the lowest mean expenditure was incurred on input, constituting to be ₹373.33.

Table 6.39:Expenditure Incurred on Other Activities for Maize Cultivation

in Rupee

Particulars	N	Min	Max	Mean	Std. Dev
Input cost	3	20	1000	373.33	544.181
Farming expenses	10	2020	12000	6264	3782.084
Transportation expenses	19	200	6000	1701.58	1532.932
Marketing expenses	11	150	4035	1928.64	1350.289
Total	25	20	15720	4688.2	4956.63

Source: Field Survey, 2016-2017

The overall average expenditure incurred on other activities other than labour expenditure was ₹4688.2.

6.3.17. Overall Average Expenditure Incurred for Maize Cultivation

It is revealed from Table 6.40 that for the cultivation of maize, the highest cost was incurred for hiring farm-worker (72.31 %), followed by farming activities (16.90 %), marketing expenses (5.20 %), transportation expenses (4.59 %) and inputs cost (1.01%)

Table 6.40 : Overall Average Expenditure Incurred on Maize Cultivation

in Rupees

Particulars	Amount	Percent
Input cost	373.33	1.01
Farming expenses	6264	16.90
Transportation expenses	1701.58	4.59
Marketing expenses	1928.64	5.20
Hired labour cost	26807	72.31
Total	37074.55	100

Source: Field Survey, 2016-2017

The overall average expenditure spend by maize growers was estimated to be ₹37074.55. In the study areas, farmers utilized their own vehicles for different agricultural purposes, from going to the farm to transportation of harvested maize, however, the expenditure made on such activities were not calculated.

6.3.18. Marketing Channels of Maize

In the marketing system of maize, the identified actors were farmers, rural traders, urban commissioner and consumers. The most common tool which was widely used by various actors was mobile phone. This mode of communication allows different actors in the channel to pass information to one another.

Farmers sold maize directly to consumers at a price control by the him/her, however, farmers sold maize to rural traders and urban commissioners most likely based on the price set by the aforementioned actors. Rural traders also resold maize according to the price offered by the urban commissioners.

The price of maize fluctuates during the harvesting season. The determinants of price fluctuation of maize in the selected villages were majorly influenced by the quantity of supply at the urban market and maize selling site

The duration of payment made by rural traders and urban commissioners to the farmers was between one day to seven week or even more.

Farmers: Farmers were the only actor who involved both in production and marketing activities. They sold their produced to three actors namely- consumers, rural traders and urban commissioners.

It was learnt during the data collection that farmers who sold maize directly to the consumers can set their own rate, thus, the farmers sold maize between ₹8 to ₹14 per cob with an average earning of ₹10 per cob during the early harvesting season. During the peak harvesting season maize was sold for ₹5-₹7 per cob by the maize produces.

In respect to processed marketing, the processed maize was sold for ₹ 6 per cob when the farmers sold straight to the final consumers while ₹3 per cob was the selling rate to the rural trader.

Famers sold fresh maize to the rural traders between ₹ 5-₹6 per big size cob and ₹3-4 for medium to small size cob for the first harvesting week. During the peak harvest season big size cob was sold between ₹3-4 and small/ medium cob was sold between ₹1-₹2.

Farmers sold maize to the urban commissioner between ₹4- 8 per big size cob during the first week of harvesting and between ₹2-1 per small/medium size cob.

Rural Traders: Rural traders were from the local village and they consist of 1) a person collecting maize at the local area from the farmers and resold it to the urban commissioner (*Aizawl*) at a profit between ₹ 1 to ₹ 2 per cob (big and small) and 2) a rural trader who resold at the local market at a profit between ₹ 4 to ₹ 6 per big cob and ₹2 to ₹5 per small/medium cob.

Urban Commissioner- Urban commissioner were those commissioners selling maize at the urban market (*Aizawl*) such as commissioner who resold at the *Aizawl* main market , peddlers who resold fresh maize by going house from house in *Aizawl* city, roadside vendors selling roasted maize and boiled maize (*Aizawl* city).

Consumers: This actor purchased maize for household consumption. Maize was consumed as simple boiled and roasted maize on the cob. Also, fried kernels was consumed by the consumers.

The existing six marketing channels for maize were discussed as follows:-

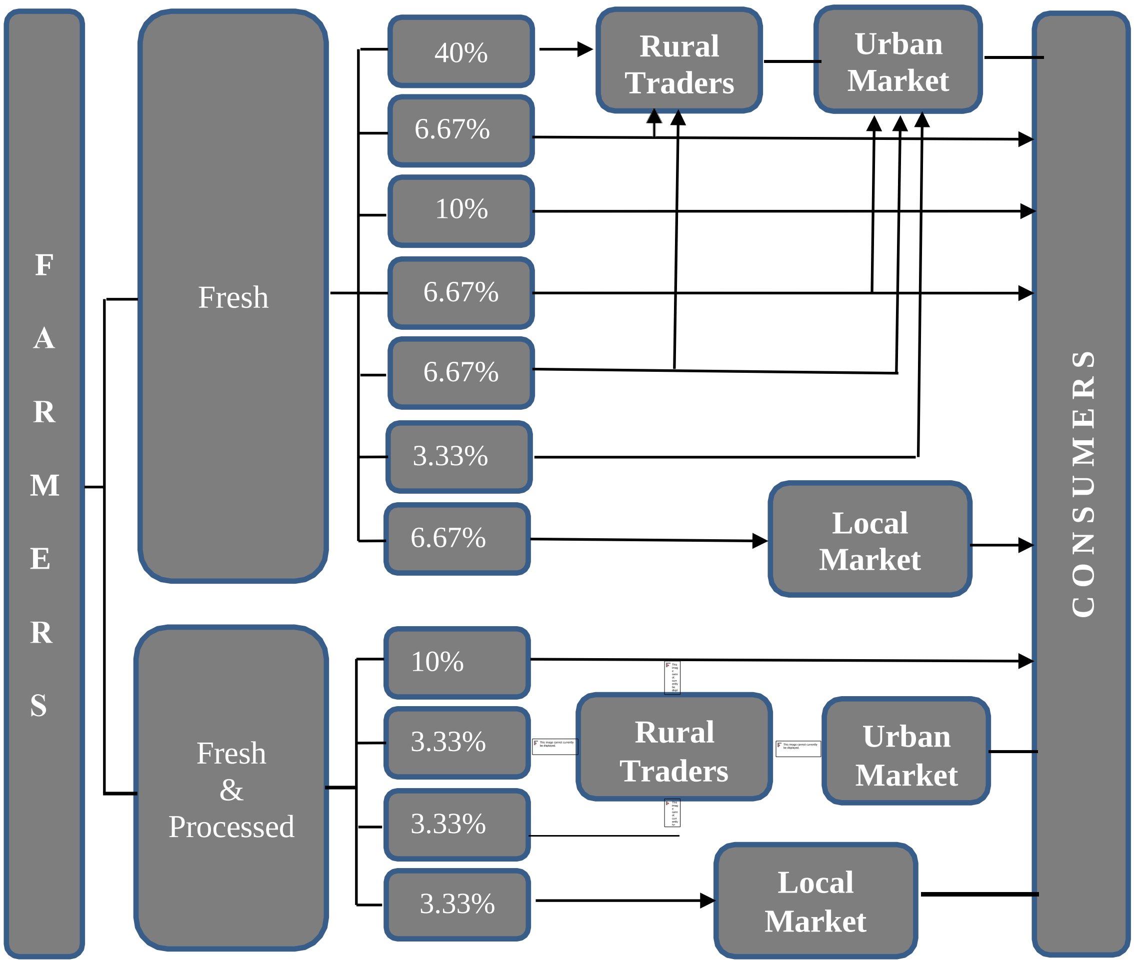

Figure 6.3: Value chain of maize

Channel I: Direct channel enables farmers to earn steady income since the farmers were able to control the price of the produce. Channel I was used by 10 per cent of the farmers to sell fresh maize directly to the consumers without any intermediaries intervention.

Channel II: Of all the 30 respondents, the highest number (40 per cent) of the maize growers sold their fresh produce through this marketing route to the rural traders. And 3.33 per cent also used this channel to sell both of their productions (fresh and processed) to the rural traders.

Channel III: 6.67 per cent and 10 per cent sold fresh maize and both produces (fresh and processed) respectively through rural traders and directly to the final consumers.

Channel IV: Another 6.67 per cent of the producers sold fresh maize by selling it straight to the consumer and urban commissioner.

Channel V: In this channel, urban commissioners and rural traders were the two middlemen involved in the marketing system wherein 6.67 per cent and 3.33 per cent had sold their fresh maize produce and both production namely fresh and processed respectively to the aforementioned middlemen.

Channel VI: This marketing system was used by 6.67 per cent of the maize producers in order to sell their fresh produce. The identified actors were middleman (local market) and final consumers.

Channel VII: Among the 30 sample maize growers, 3.33 of the growers sold their fresh produced to the urban commissioners.

Channel VIII: Another 3.33 per cent were also observed to have sold their fresh and processed produce to the rural traders(local market).

6.4. SOYABEAN

6.4.1. Origin

Soy is a subtropical plant. native to southeastern Asia. Soy has been a dietary staple in Asian countries for at least 5000 years, and during the Chou dynasty in China (1124- 246 B.C). Soy was introduced in Europe in the 1700s and to the United States in the 1800s. Large Scale soybean cultivation began in the United States during World War II (Panda, 2014).

6.4.2. Climate

Soybean is cultivated in warm and moist climate and grown in monsoon season from June- October. Temperature of 15-32 C is required for germination. Optimum temperature required for its growth and yield is 30-33 C. Soybean can be grown in an area receiving 600-650 mm rainfall (Rathore,2017).

6.4.3. Soil

Soybean is grown on variety of soils ranging from light to black cotton soils in different pockets of India. Well drained fertile loams soils are ideal for its cultivation. Soils should be loose and well aerated. Highly compacted soils are harmful for root nodule development. Crop is sensitive to both saline and acidic conditions and can be grown with pH range of 6.0-7.5 (Rathore,2017).

6.4.4. Area Under Cultivation of Soyabean Cultivation

Soyabean was grown both as a sole crop or inter/mixed cropped by the farmers. Soyabean was cultivated Okra, Maize, Cucumber, Rice, Pumpkin and Brinjal etc. Soyabean was also popular with intercropping with only two items of crops like *Tobacco* and *Rice.* If soyabean was grown as a single crop, it is either cultivated in a separate area on the same plot at the same time otherwise, soyabean is grown solely on a separate land. During the data collection, it was learnt that soyabean farmers cultivated soyabean in an area ranged from 0.25 to 3 acres with mean jhum area of 0.5083.

Table 6.41 displays that a large majority of the farmers (90%) cultivated soyabean in an area “less than one acre”, and 6.67 per cent of farmers cultivating “between 1 to 2 acres” of jhum plot. There was negligible number (3.33 %) of farmers growing soyabean in an area of “3 acres and above”.

Table 6.41: Area Under Soyabean Cultivation

Acre	Frequency	Percent
Below 1 Acre	27	90
1-2 Acres	2	6.67
2-3 Acres	-	-
3 Acres & Above	1	3.33
Total	30	100

Source: Field Survey, 2017

6.4.5. Mandays Engaged in Land PreparationFor Soyabean Cultivation

From the 30 soyabean growing household, the average household human mandays used for cultivating soyabean was constituted to be 10.3 mandays whereas hired labour average contribution for land preparation was 2.89 mandays (Table 6.42). Land preparation includes a series of activities namely clearing of forest, preparation of firelines, burning of debris and reburning of unburnt logs etc. Further, the activities of clearing of virgin land and burning of debris are considered to be men’s work, therefore, women’s participation were found to be very low in these two activities.

Table 6. 42: Mandays Engaged in Land Preparation for SoyabeanCultivation

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	30	3	42	10.3	8.388
Hired labour	9	1	9	2.89	2.804
Total	30	3	42	11.17	8.334

Source: Field Survey, 2017

In carrying out activities of firelines preparation and reburning, household member of both men and women involvement was found to be equal during the data collection.

6.4.6. Quantity of Soyabean Seeds Sown

Soyabean seeds were retained for the next planting season. The seeds are stored inside the refrigerator or inside a tin in order to prevent the seeds from diseases, pests etc. Soyabean seeds were not given any treatment in the selected study areas. The quantity of seeds sown may be influenced by the area of soyabean cultivation. The mean quantity of soyabean sown by the farmers was 2.853 kilograms in an average area of 0.5083 acre.

From the data collection, it was noticed that the quantity of seeds sown by the farmers ranged from 1 kilogram to 5.3 kilograms of soyabean seeds. Healthy and free from infection soyabean seeds were used for cultivation.

The method of soyabean seeds preservation practiced by the 30 farmers was different. The different ways of soyabean preservations were 1) direct sun drying, 2) application of ash after sun-drying the seeds, 3) directly stored inside the refrigerator, 4) application of both oil and ash after sun-drying the seeds, 5) stored inside the refrigerator after sun-drying the seeds, 6) direct application of ash to seeds and 7)application of oil first, thereafter sundried it.

6.4.7. Mandays Engaged in Sowing Soyabean Production

Sowing of soybean soon after onset of monsoon rains is best as compared to its earlier or later sowings (Rathore,2017). Planting was done manually by the farmers. From the Table 6.43, it can be understood that the level of household family labour involvement was higher than hired human labour contribution. The average mandays spent by the farming household was 3.4 while the average mandays contribution made by the hired human labour was 2 mandays.

Table 6.43 : Mandays Engaged in Sowing Activity

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	30	1	9	3.4	2.01
Hired labour	8	1	3	2	0.756
Total	30	1	9	3.93	2.132

Source: Field Survey, 2017

It can be seen in Table 6.43 that sowing of soyabean did not consumed large mandays. It was reported that soyabean farming household participation in carrying out sowing activities was observed to be equally shared between men and women.

6.4.8. Mandays Engaged in Weeding for Soyabean Cultivation

Weed removal is necessary as they take in nutrient from the soil which are crucial for crops to yield better. Soybean, being a rainy season crop is heavily infested with many grassy as well a broad leaf weeds. Yield loss in soybean range from 25-70 percent depending upon intensity and infestation of weeds (Rathore,2017).

In the study areas, it was found out that there were only two main contributors of mandays for weeding activities, in which, household family in performing weeding constituting an average mandays of 20.97 while hired human labour contribution was on average of 7.67 mandays (Table 6.44).

Table 6.44: Mandays Engaged in Performing Weeding Activity

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	30	4	127	20.97	23.68
Hired labour	12	2	18	7.67	4.942
Total	30	4	127	24.03	23.668

Source: Field Survey, 2017

The mandays of weeding also included the mandays used for application of herbicides for soyabean production. In the selected villages, the participation of men and women was found to be in an equal manner in executing weeding activities.

6.4.9. Mandays Engaged in Soyabean Harvesting

At maturity soyabean plant shed the leaves. The leaves turn yellow. The seed in pod is hard and dough. Preferably the crop should be harvested in the morning to avoid losses of shattering. Harvesting is done by uprooting the plants or by cutting with sickle. (Rathore,2017). The best time of harvesting of the soybean crop is when pods turn pale-yellow (www.nfsm.gov.in). The maturity period ranges from 90-140 days depending on the varieties (https://kvkwestkhasihills.nic.in).

From the information collected,the main mandays contributors for harvesting soyabean were found to be household human labour and hired human labour, whereby, household human labour participation was observed to be higher than hired human labour contribution. Friends and relative’s small number of mandays contribution were noticed during the field survey, nevertheless, the mandays contribution made by them were added to the household mandays contribution.

Table 6.45: Mandays Engaged in Soyabean Harvesting

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	30	1	15	5.2	3.178
Hired labour	7	1	11	4.14	3.934
Total	30	1	15	6.17	3.611

Source: Field Survey, 2017

On average, household labour contributed 5.2 mandays while hired labour contribution was 4.14 mandays towards harvesting of soyabean (Table 6.45). In the study areas, some farmers performed threshing and winnowing activities together on the same day of performing harvesting activity while others performed harvesting, threshing and winnowing in a separate day,hence, the total mandays contribution on harvesting was calculated by adding all the mandays involved in carrying out harvesting, threshing and winnowing.

6.4.9.1. Post-harvesting Activities

Soyabeans are harvested, threshed and winnowed simultaneously by using locally made tools. Threshing consists of separating the beans from the portion of the plant that holds them (www.fao.org). Threshing was done manually using wooden stick and manual winnowing was done using an indigenous winnowing tray (*Thlangra*), in order to separate the husk from soyabean cover. Fasuar was also used for winnowing purpose, but this is optional.

Fasuar is constructed for the purpose of threshing and for this a circular bamboo bin is fixed at a platform which is constructed about 7 or 8 feet from the ground (Lalrindika, 2020). Fasuar required 2 to 3 days to finish constructing.

It was learnt from the field survey that there were farmers who performed all the three activities viz. harvesting, threshing and winnowing simultaneously on the same day. There were also some farmers who performed harvesting and threshing activities on the same while manual winnowing was carried out on a different day.
After completion of post-harvesting activities, the seeds were stored inside gunny bag, nylon bag, or any other available bag. In addition, some farmers sold soyabean immediately to the consumer while some farmers further added value to soyabean.

6.4.9.2. Method of Processing Soyabean

First and foremost, raw soyabeans were cleaned and soaked in water for 10-12 hours overnight. Excess water is drained off/removed and soyabeans were cooked in a pressure cooker until the beans were properly cooked and soft. Again, excess water was drained off/removed and this cooked soyabean water was consumed by few farmers. The quantity of soyabean cooked at one time ranged from 1 kg to 2.5 kg. The quantity of soyabean cooked at one time depend on the farmer's preference/decision.

The cooked soyabean were spread uniformly on a hnahkiah leaves (*Callicarpa arborea Roxb*.) or any available leaves, which was placed over the sieve (locally called *thlangra*) or inside a bamboo basket and cover it with hnahkiah leaves again. Some farmers spread ashes from fireplace over the cooked soyabean, however, this addition of ash is optional.

The bamboo basket or sieve were placed unopened in the sun or over the fireplace for natural fermentation approximately for three days. Again, this already fermented soybean can further be given value by sun-drying for 4-5 days or until the moisture content was low. The dried fermented soybean (*Bekang rep/ro*) is stored for further consumption.

6.4.11. Overall Mandays Engaged in Soyabean Cultivation

Table 6.46 displays the overall mandays engaged in soybean cultivation. For cultivation of soyabean, the highest average mandays used was on weeding activities which accounted for 24.03 mandays, followed by average mandays of 11.17 spent on land preparation. Harvesting labour and sowing labour requirement were reported to be lower than other activities and these two activities accounted for average mandays of3.73 and 3.93 respectively (Table 6.46).

Table 6.46: Overall Mandays Engaged in Soyabean Cultivation

Particulars	N	Min	Max	Mean	Std
Land Preparation	30	3	42	11.17	8.334
Sowing	30	1	9	3.93	2.132
Weeding	30	4	127	24.03	23.668
Harvesting	30	1	15	6.17	3.611
Post-harvesting	26	1	8	3.73	2.442
Grand total	146	1	127	9.97	13.755

Source: Field Survey, 2017

The overall mandays consumed in order to cultivate soyabean ranged from 1 manday to 127 mandays. Also, it was learnt that an average mandays of 9.97 was invested to cultivate soyabean crop on an average of 0.5803 acre of jhum land. Mandays used for processing was not calculated as it did not require much labour to perform the activity.

6.4.12. Quantity of Soyabean Harvested

It was observed that the average mean yield of 114.37 kilogram of soyabean was obtained from an average jhum area of 0.5083. Also, the quantity of soyabean yield was ranged from 38.5 to 300 kg.

In order to maximize soyabean yield, the following factors are to be considered- planting time, variety seeds selected for cultivation, proper weed management, suitability of the soil, climatic condition, right time of harvesting, occurrence of pests and diseases and application of organic fertilizers etc.

6.4.13. Soyabean Quantity Sold

It was difficult to measure the processed product of soyabean (wet and dried form) in kilogram, therefore, the sold quantity of processed was measured in terms of fresh form.

As highlighted in Table 6.47, the total average quantity sold was found to be 83 kilogram whereas the total average of processed sold accounted for 47.39 kilogram.

Table 6.47: Total Sold Quantity of Soyabean

in Kilograms

Particulars	N	Min	Max	Mean	Std. Dev
Fresh sold	27	5	230	83	54.416
Processed sold	19	1	168	47.39	48.72

Source: Field Survey,2017

6.4.14. Income from Selling Soyabean

As presented in Table 6.48, on an average, the family income earned from selling an average fresh quantity of 83kg of soyabean was estimated to be ₹7053.33 whereas the average income earned was ₹ 7029.1 from selling an average processed quantity of 47.3 during the data collection.

Table 6.48: Income Generation from Selling Soyabean

in Rupees

Particulars	N	Min	Max	Mean	Std. Dev
Fresh income	27	400	17550	7053.33	4268.55
Processed income	19	300	25125	7029.21	7111.902
Overall	30	2900	29380	10800	6237.408

Source: Field Survey, 2017

6.4.15. Calculation of Economic Value of Labour in Each Farming Activities during Soyabean Cultivation

The economic value of labour consumed in various stages of farming activities is calculated by multiplying mandays spent on each phases of farming activities with prevailing local wages for unskilled male and female. These labour mandays were contributed by family members labour, hired farm-labour and exchange labour. Since, the prevailing rural wages varied from villages to villages, stages of cultivation activities and gender wise, thus, an average rate from different local wage rate (₹350, ₹300, ₹250 and ₹200) is taken for calculation of the economic value to ensure consistency.

As presented in Table 6.49, it can be seen that there are two major contributors of mandays in performing different task of cultivating soyabean. Among the two sources of labour mandays, the monetary value contribution made by household human labour was found to be higher than hired human labour in all the farming activities like land preparation (78.09 %), sowing (62.96 %), weeding (73.21%), harvesting (55.67%) and post-harvesting (100 %).

Utilizing more number of household family labour over hired human labour will help farming household in saving money from family expenses.

Table 6.49: Economic Value of Labour for Soyabean Cultivation

Particulars	Mandays (Average)	Daily Labour Rate (in Rupees)	Expenditure (in Rupees)	Percent
Land preparation				
Household labour	10.3	275	2832.5	78.09
Hired labour	2.89	275	794.75	21.92
Total			3627.25	100
Sowing				
Household labour	3.4	275	935	62.96
Hired labour	2	275	550	37.04
Total			1485	100
Weeding				
Household labour	20.97	275	5766.75	73.21
Hired labour	7.67	275	2109.25	26.78
Total			7876	100
Harvesting				
Household labour	5.2	275	1430	55.67
Hired labour	4.14	275	1138.5	44.33
Total			2568.5	100
Post- Harvesting				
Household labour	3.73	275	1025.75	100
Total			1025.75	100
Grand total			16582.5	

The average economic value of various stages of soyabean production were as the following: ₹3627.25 for land preparation, ₹1485 for sowing, ₹7876 for weeding, ₹2568.5 for harvesting activity and ₹ 1025.75 for post- harvesting. Thus, the overallaverage economic value on soyabean production was ₹16582.5.

6.4.16. Expenditure Incurred on Other Activities for Soyabean Cultivation

As shown in Table 6.50, in soyabean cultivation, expenditure made on other activities for soyabean cultivation was also necessary. Of all the expenses, the highest cost incurred was on transportation facilities used for going to farm, this constitutes an average cost of ₹1077.14. The second highest expense was incurred on purchasing input viz. with an average expenditure on ₹975. The least expenditure was spent on marketing expenses with an average expenditure of ₹127.5.

Table 6. 50: Expenditure Incurred on Other Activities

Particulars	N	Min	Max	Mean	Std. Dev
Input	9	120	5440	975	1709.177
Farming	7	300	1640	1077.14	550.688
Transportation	11	40	500	144.18	160.899
Marketing	8	40	250	127.5	73.046
Total	22	40	6020	860.05	1293.22

Source: Field Survey, 2017

On average, the total expenditure incurred on other activities was found to be ₹ 860.05 in the study areas.

6.4.17. Overall Average Expenditure Incurred on Soyabean Cultivation

Data provided in Table 6.51 shows that pattern of overall expenditure incurred for soyabean cultivation,wherein, the highest proportion cost was incurred for hiring farm-worker (66.40 %), followed by transportation facilities used for going to jhum land (15.57 %), purchasing of inputs (14.10 %), transportation facilities used for transporting soyabean production (2.09 %) and transportation used for carrying soyabean products for marketing (1.84%).

Table 6.51: Overall Expenditure Incurred on Soyabean Cultivation

in Rupees

Particulars	Amount	Percent
Input cost	975	14.10
Farming expenses	1077.14	15.57
Transportation expenses	144.18	2.09
Marketing expenses	127.5	1.84
Hired labour expenses	4592.5	66.40
Overall	6916.32	100

Source: Field Survey, 2017

On average, the overall mean expenditure incurred on six items was estimated to be ₹6916.32 from the field data collection (Table 6.51). Farmers incurred expenditure on their own vehicles in order to go to the farm, carried own production from jhum land to home and marketing purposes etc.were not calculated.

6.4.17. Comparison Between Mixed and Sole Cropping System

From the information gathered, it was noticed that the soyabean farmer adopted two method of farming system namely sole cropping system and mixed cropping system. Moreover, 50 per cent farmers reported to have practiced single cropping system whereas the equal number (50 %) adopted mixed/intercropping system.

6.4.17.1. Jhum Area Under Sole and Mixed Soyabean Cultivation

The data shown in Table 6.52 reveals that the average area of carrying out mixed cropping system of soyabean was 0.6333 whereas sole cropping system of soyabean was practiced in an average jhum area of 0.3833.

Table 6.52 : Jhum Area Under Sole and Mixed Soyabean Cultivation

in Acre

Particulars	N	Min	Max	Mean	Std. Deviation
Mixed cropping system	15	0.25	3	0.6333	0.69991
Sole cropping system	15	0.25	1	0.3833	0.20845

Source: Field Survey, 2017

Under the cultivation area of sole cropping system of soyabean, a large majority of soyabean farmers (93 %) operated in an area of "below 1 acre" of land whereas the remaining number i.e. 6.67 per cent carried out farming 'between 1 and 2" acre of land.

Table 6.53: Area Under Sole Soyabean Cultivation

Acre	Frequency	Percent
Below 1 Acre	14	93
1-2 Acres	1	6.67
2-3 Acres	-	-
3 Acres & Above	-	-
Total	15	100

Source: Field Survey, 2017

Table 6.54 shows that most of the soyabean growers (80 %) practiced farming activities in an area "below 1 acre" followed by 13.33 per cent operated "between 1-2 acres" of jhum land and 6.67 per cent in an area "above 3 acres" of jhum land.

Table 6.54: Area Under Mixed Soyabean Cultivation

Acre	Frequency	Percent
Below 1 Acre	12	80
1-2 Acres	2	13.33
2-3 Acres	-	-
3 Acres & Above	1	6.67
Total	15	100

Source: Field Survey, 2017

6.5.17.2 Quantity of Soyabean Harvested from Sole and Mixed Cropping System.

In Table 6.55, we can see that farmers practicing sole cropping system yield an average production of 92.67 whereas soyabean growers who adopted mixed cropping system yield an average of 136.13 kg

Table 6.55: Quantity of Soyabean Harvested from Sole and Mixed Cropping System

in Kilogram

Particulars	N	Min	Max	Mean	Std. Devi
Sole cropping system	15	55	143	92.67	24.97
Mixed cropping system	15	39	300	136.13	79.94

Source: Field Survey, 2017

6.4.17.3. Quantity of Soyabean Sold from Sole and Mixed Cropping System

As revealed in Table 6.56, the average quantity of fresh soyabean sold by farmers who grown soyabean as sole cropping accounted for 63.07 kilogram whereas the quantity sold from farmers who cultivated soyabean as mixed cropping systems was found to be 104.46 kilograms.

Table 6.56 : Total Sold Quantity of Fresh Soyabean

in Kilogram

Particulars	N	Min	Max	Mean	Std. Dev
Sole cropping system	14	5	120	63.07	36.14
Mixed cropping system	13	30	230	104.46	63.55

Source: Field Survey, 2017

Table 6.57 highlights the total quantity of soyabean processed sold. It was difficult to calculate the exact measurement of processed soyabean, therefore, the quantity of fresh soyabean used for processing soyabean was taken for this calculation. It can be observed from Table 6.57 that the average processed quantity sold from cultivating soyabean as a monocropping system was 37.41 kilogram while farmers who carried out mixed cropping system sold an average quantity of 61.12 kilogram in the study areas.

Table 6.57: Total Sold Quantity of Processed Soyabean

in Kilogram

Particulars	N	Min	Max	Mean	Std. Dev
Sole cropping system	11	3	65	37.41	22.962
Mixed cropping system	8	1	168	61.12	70.558

Source: Field Survey, 2017

6.4.17.4. Income Generation from Selling of Fresh Soyabean from Sole and Mixed Cropping System.

Table 6.58 shows that soyabean growers who cultivated soyabean as a sole crop obtained an average income of ₹5647.86. Also, soyabean farmers who practiced mixed cropping system earned an income of ₹8566.92.

Table 6.58: Total Income From Fresh Production

in Rupees

Particulars	N	Min	Max	Mean	Std. Dev
Sole cropping system	14	400	10260	5647.86	3056.907
Mixed cropping system	13	2900	17550	8566.92	4956.604

Source: Field Survey, 2017

From the Table 6.59, it can be understood that farmers who cultivated soyabean as a sole crop obtained an average income of ₹6795.45 from selling soyabean in a processed form while soyabean farmers who adopted mixed cropping system earned an average income of ₹7350.62.

Table 6.59: Total Income From Processed Production

in Kilogram

Particulars	N	Min	Max	Mean	Std. Dev
Sole cropping system	11	580	22000	6795.45	5919.887
Mixed cropping system	8	300	25125	7350.62	8932.657

Source: Field Survey, 2017

6.4.18. Marketing Channels of Soyabean

In the selected villages, soyabean growers sold their produced through direct and indirect channels. It was also observed that farmers sold soyabean in two forms, namely fresh and processed form (wet and dried). The main measuring units used by the farmers for measuring processed products were- spoons for wet processed product and glass cup and steel cup were for measuring the dried processed product.

The key actors in the marketing system were farmers,rural traders and urban commissioners and consumers (Figure 6. 4). In addition, it should be noted that the processing activities of soyabean was not only carried at the farmers level. The rural traders also added value to the crop and sold it in a processed form to different areas.

Mobile phone was the main communication tool used for exchanging information between the various actors. It was also noticed during the data collection that farmers controlled the selling price of their produce, fresh and processed, when sold to consumers. rural traders and urban commissioners. Soyabean farmers received instant payment from selling most of their produced from consumers, rural traders and urban commissioners.

Farmers–Farmers were an important actor who cultivated soyabean and participating in marketing as well. Farmers sold their produced to the consumer, rural traders and urban commissioners. Soyabean farmers sold their fresh produced between ₹70 to ₹95 per kg to both the final consumer and rural traders.

The farmers also sold processed soyabean to the urban commissioners with a price raged from ₹ 180 to ₹200 from 1 kilogram of soyabean. It was estimated roughly with the farmers that ₹200 and ₹180 can be obtained from one kilogram of fresh soyabean when selling in wet (*Bekang um*) and dried (*Bekang rep/ro*) processed soyabean respectively

.Rural Traders: Rural traders, mostly women, were from the local village. They procured fresh soyabean from the farmers and processed into wet and dried form. Rural traders sold the processed soyabean directly to the final consumer who resided within the village and to its neighboring villages as well as sold processed soyabeanto the urban commissioners in urban market (*Aizawl*) for a profit between ₹ 105- ₹130.

Urban Commissioners: Urban commissioners, by and large being women, were commissioners from different areas in *Aizawl* District. These women commissioners were 1) one whohad a market seat at the Market 2) one who resold processed products going from door to door.Urban commissioners obtained a profit of ₹80 to ₹100 from reselling soyabean processed products to the final consumers.

Consumers: Consumers were the final actor of the marketing chain for soyabean. They purchased soyabean (Fresh and processed) for household consumption purposes. Fresh soyabean were further processed for household consumption. The processed product purchased were consumed as it is, added in a Mizo bai, prepared as a chutney etc.

The six marketing channels identified in Figure 6.4 were discussed below:

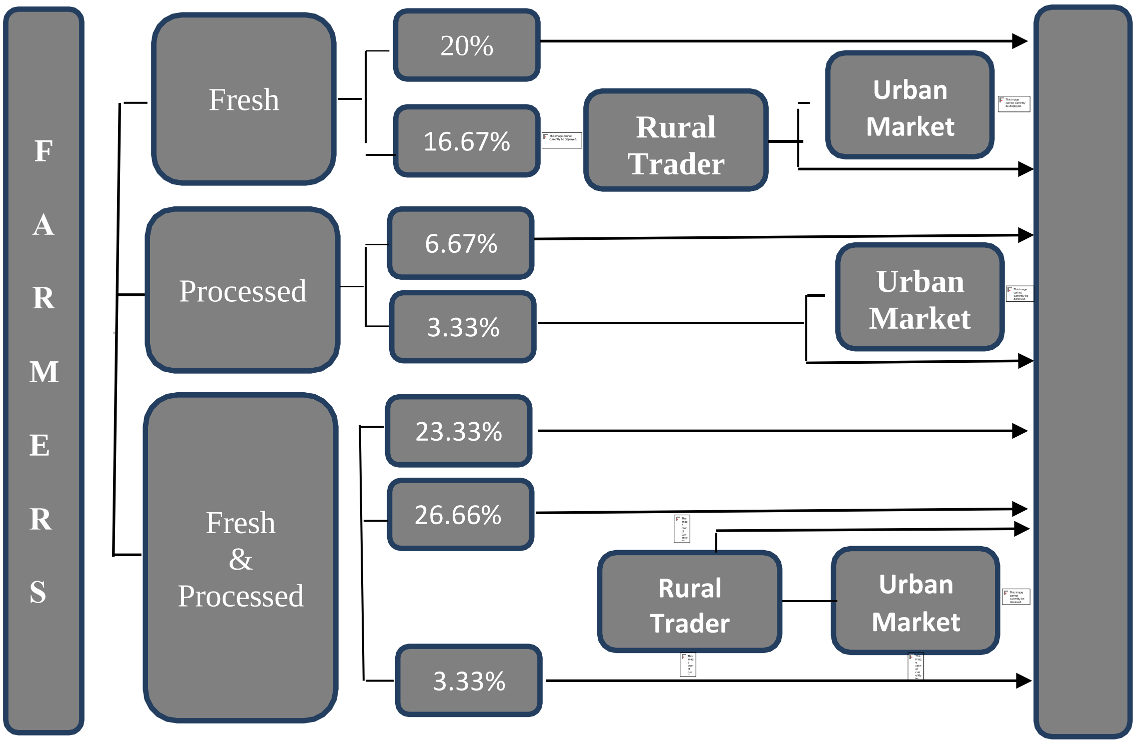

Figure 6.4: Value chain of soyabean

Channel I: This channel was used by 20 per cent and 6.67 per cent of the respondents to sell their fresh produce and processed products respectively. Also it was further learnt that, 23.33 per cent of the farmers sold their fresh and processed products directly to the consumers.

Channel II: This channel involved three actors, namely farmers, rural traders and consumer. In this channel, the farmers sold their products to both rural traders and final consumers. Among the 30 selected farmers, 16.67 per cent and 26.67 per cent sold their fresh produced and fresh and processed products respectively.

Channel III: This channel was used by only a negligible number (3.33 %) of the selected farmers wherein two actors viz. urban commissioner and consumers were identified in this channel. This channel was only used for selling the processed product by the respondents.

Channel IV: 3.33 per cent of the farmers were found to have employed this channel in order to sell their fresh and processed products through the three actors such as final consumers, rural traders and urban commissioner.

6.5. SUGARCANE

6.5.1. Origin

Sugarcane originates from New Guinea and the South Pacific, where it was mainly used for chewing. From there it progressed westwards, especially under the form of the hybrids *Saccharum sinense* (in China) and *S. barberi* (in India). During the conquest of India by Alexander's army in 326 BC sugar from cane was reported as "honey produced from reeds". By 500 BC *S. barberi* had reached Persia and the Mediterranean region, where it took its mark as a source of sugar and food sweetener in Syria, Cyprus, Crete, Sicily, etc. The Arabs introduced it in AD 641 in Egypt, in Morocco and in Spain (introduced in AD 714), and by AD 1150 there were 30,000 ha of sugar cane under cultivation in Spain (Mwasinga,2011).

6.5.2 Climate

Sugarcane being a tropical plant, grows best in hot, sunny areas. However, it is extensively cultivated both in the tropical and sub tropical climates. Optimum can growth is achieved in temperatures between 24 and 30 C. Fluctuations in temperature have great influence on enrichment of sucrose, so does the daily amount of sunshine. For obtaining high yields, a rainfall of 2000 to 25000 mm per annum, evenly distributed is ideal (Sundara,2017).

6.5.3. Soil

Well drained loamy soils, neutral in reaction (pH 6.5 to 7.5) are the most ideal for sugarcane cultivation. However, it is grown in soil types ranging from heavy clays to extremely sandy ones and under wide variations in the soil reaction (Sundara,2017).

It was learnt during the data collection that there were few famers whose sugarcane crop had remained in the same field exceeding 10 years. This revealed that the longevity of sugarcane crop remaining in the field can be influenced by various factors like the soil nutrient of the field, proper crop management by the farmers and climatic condition etc.

It was learnt from the field survey that sugarcane growers extend the cultivation area of sugarcane yearly or every 2/3alternate years. Therefore, the data on jhum area, was gathered based on the present jhum area operated by the farmers. Information on activities on mandays used for performing weeding, harvesting and processing were also collected based on the present activities performed during the data collection. In the same manner, the total yield of sugarcane (Fresh and processed) were calculated on the basis of the present year yield during the data collection as well. In contrast to all, mandays used for land preparation and sowing related activity were calculated by combining all the mandays used on the present jhum area operated. Likewise, the quantity of seeds setts planted were calculated by adding all the quantity of seeds setts used on the present jhum area operated.

6.5.4. Area Under Sugarcane Cultivation

Sugarcane was cultivated intercropped with other crops such Cowpea leaves, Brinjal, Mizo chilli, Pumpkin leaves, Maize and Rice etc in the first year of jhum cultivation. After one year of jhum cultivation, sugarcane remained as sole cropping.

In the selected villages of sugarcane growers, the land holding size ranged from 1.5 to 5.5 acre of land. Moreover, the mean area for cultivating sugarcane was 3.0667 acre of land.

Further, it was noticed that more than half (60 %) of the respondents practiced sugarcane cultivation in an area “3 acres and above”. The remaining number consisting of 30 per cent practiced cultivation of sugarcane in an area “between 2 to 3 acres” and 10 per cent of sugarcane growers carried out farming in an area “between 1 to 2 acre” of land.

Table 6.60: Area Under Sugarcane Cultivation

Acre	Frequency	Percent
Below 1 Acre	-	-
1-2 Acres	3	10
2-3 Acres	9	30
3 Acres & Above	18	60
Total	30	100

Source: Field Survey, 2017

6.5.5. Mandays Engaged in Land Preparation for Sugarcane Cultivation

Land preparation for sugarcane involved a sequence of field operations such as clearing, firelines, burning and reburning. In the study areas, clearing of virgin forest usually demand a higher labour as compares to other system. Also, clearing of forest is regarded as more of men’s work. As for the other activities, equal share of labour between men and women was existed. Table 6.61 shows that household human labour contribution was highest (57.17 average mandays) while the lowest labour was generated by labour that required reciprocation (10 average mandays). Hired human labour also contributed an average mandays of 29.75 in the selected areas.

Table 6.61: Mandays Engaged in Land Preparation for SugarcaneCultivation

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	30	8	124	57.17	35.745
Hired labour	16	2	83	29.75	25.556
Exchange labour	15	2	28	10	7.569
Total	30	22	204	79.27	42.776

Source: Field Survey, 2017

A small number of manday was contributed by family friend and the mandays contribution was added to household family mandays generation for land preparation.

6.5.6. Quantity of Sugarcane Seeds Sown

Sugarcane stalks were cut into pieces or small sections called sett. Cane-seed-setts are wet and sugary, therefore, while in soil, before sprouting into new plant, these are mostly damaged by insects (termites) and fungus (Kumar and Sanghera, 2020). In the study areas, the cane setts planted in an average area of 5.6 sugarcane land was 12500 average cane setts. The cane sett planted also ranged from 2000 to 46000 setts.

It was further notice that in order to prevent from rotting and infection with the disease, few farmers gave treatment to cane setts by dipping setts in a D.D.T before planting. The duration of dipping in a D.D.T can be from 1 -2 hours or all through the night.

6.5.7 Mandays Engaged in Sowing for Sugarcane Setts

It was learnt from the field survey that the farmers adopted two methods of sowing in the study areas. These methods were followed depending upon factors like previous planting experience, climatic condition etc. The methods were: 1) Farmers completed digging pit at first and cane setts were dropped in the pit on another day and2) The second method was that pits making and cane setts dropping inside the pits were done together at the same day by the farmers. In addition, farmers were also found to have carried out planting activities whenever necessary without clearing and burning the vegetation.

As displays from Table 6.62, sowing man-days were contributed the highest by household labour with average 68.3 mandays followed by average hired labour of 30.6 man-days and average exchange labour of 15.23 mandays. A negligible number of man-days were contributed by family friends and relatives, thus, the mandays contribution were added to household family mandays generation for land preparation. Hired labour were remunerated with cash while exchange labourers mandays were reciprocated with mandays on a basis of manday to manday.

Table 6.62: Mandays Engaged in Sowing Cane Setts

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	30	12	200	68.3	52.431
Hired labour	10	7	145	30.6	40.964
Exchange labour	13	1	54	15.23	15.706
Total	30	18	366	87.03	71.363

Source: Field Survey, 2017

Additional man-days were used by some farmers in order to gather and cut cane stalk prior to performing planting activity. Therefore, mandays were calculated from any mandays spent which is related with sowing activities.Gender participation in planting sugarcane setts was equal in the selected villages.

6.5.8. Mandays Engaged in Weeding for Sugarcane Cultivation

Weeds causes 12 to 72 per cent reduction in cane yield. The row spacing adopted, the initial slow growth of sugarcane coupled with irrigation and manorial practices encourage abundant weed growth. Hand weeding and hoeing is still the most common method of weed control in sugarcane. (Sundara,2017). Hand weeding and hand hoeing operations are very effective in controlling weeds in early stages of crop growth (Kumar and Sangher, 2020).

In the study areas, the number of mandays engaged by household labour was the highest, this accounts for an average mandays of 122.37. Exchanged labour generated an average 53.29 mandays (Table 6.63). Additionally, hired laborers were remunerated with cash while exchanged labour were reciprocated with labor strictly based on man-days for man-days.

Table 6.63: Mandays Engaged in Performing Weeding Activity

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	30	17	471	122.37	103.683
Hired labour	14	18	130	46.93	29.906
Exchange labour	14	10	90	53.29	25.263
Total	30	52	500	171.27	95.395

Source: Field Survey, 2017

Hired labour participation was found to be the lowest with average contribution of 46.93 mandays for weeding activity. Mandays used for spreading fertilizer were included in this calculation of mandays. In addition, weeding was uniformly performed by men and women during the field survey.

6.5.9. Mandays Engaged in Harvesting and Processing of Sugarcane

In general maturing is judged by (1) the gradual withering up of lower leaves (2) Mature cane if cut across reflects slight sparkling in the flesh. (3) Metallic sound on striking with finger (Kumar and Sangher, 2020).

Sugarcane does not exhibit any specific and reliable visible symptom of maturity. Therefore harvesting should be decided based on crop age and more scientifically in conjunction with maturity test. The early, mid late and late varieties reach peak maturity at 10-11, 12 and 14 months respectively (Kumar and Sangher, 2020). In India, the normal period of harvesting sugarcane is from November to April for its processing as sugar or gur. A special season is also present in tropical India from July to September. In some cases it is also harvested in October but only for manufacture of gur (Kumar and Sangher, 2020).

According to the data collection, it was observed that harvesting and processing of surgarcane was commonly done together on the same day by the farmers. And as for the farmers selling fresh sugarcane, man-days were used as per the demand made from their urban agents. Hence, the details of mandays used by the farmers are presented in Table 6.64. The mean household labour involvement in performing both harvesting and processing activity was 204.7 against the average 60.13 mandays contribution of hired labour.

Table 6.64: Mandays Engaged in Sugarcane Harvesting andProcessing

Particulars	N	Min	Max	Mean	Std. Dev
Household labour	30	30	565	204.7	135.815
Hired labour	16	2	170	60.13	48.537
Total	30	60	565	236.77	130.225

Source: Field Survey, 2017

Sugarcane was harvested manually using a dao tool (*Chempui*). In harvesting activity, participation of family friend at a negligible number was observed, thus, these mandays were added to family mandays contribution.

6.5.9.1. Method of Processing Sugarcane

After harvesting, sugarcane should be crushed within 24 to 48 hours. Delay leads to cane deterioration and thus loss of sugar (Sundara,2017).

It was estimated with the farmers that a an average 25 or even less, good and healthy sugarcane stalk can extract 10-16 litres of sugarcane juice. It was also calculated that an average 179 litres of cane juice can produce 30 to 35 kilogram of jaggery. The quantity of jaggery production may be less during monsoon season. It was also observed that baggase was also used as a biofuel for jaggery preparation.

After crushing sugarcane, the juice is directly flowed in the iron pan or collected directly in a tin through a pipe line and transferred the extracted juice in an iron pan having a capacity of between 150 to 192 litres with an average capacity of 179 litres. A piece of cloth was wrapped around the bottom of the pipe for filtration.

Matured sugarcanes were crushed by diesel engine operated crushers. A negligible number of farmers were found to have utilized animal (cow) to crush sugarcane juice. After juice extraction is completed, the juice is boiled for an average 4 hours during monsoon season and average of 3 hours during summer and autumn season. During boiling, the juice is continuously stirred using a self made long-handled wooden stick to ensure that there is no lump or burning in this stage. Also, in this stage dexterity is highly required to get the ideal result. Once boiling stage is completed, the boiling juice is left to lower the temperature cool down in order to form jaggery blocks. It normally takes one hour in autumn and 1 hour and 10 minutes in winter to cool down.

While cooling the temperature down, in order to solidify the liquid, one has to stir in a circular motion for about half an hour to 1 hour during monsoon season whereas it requires 10 minutes to 20 minutes during summer and autumn season.

It was learnt during the survey that, majority of the Khawlailung farmers usually boiled the juice before going home about one to two hours and continue the boiling process in the next morning for one hour again. This finding indicated that the practice of processing activity adopted by the farmers may vary according to village to village and farmers to farmers.

6.5.10. Overall Mandays Engaged in Sugarcane Cultivation

The behaviour of labour spent on different sugarcane cultivation activities provided in Table 6.65 reveals that the most labour demanding operations was a combine of harvesting and processing activity (an average mandays of 236.77), followed by weeding (average mandays of 171.27), sowing(87.03 average mandays) and land preparation (average mandays of 79.27).

Table 6.65: Overall Mandays Engaged in Sugarcane Cultivation

Particulars	N	Min	Max	Mean	Std
Land Preparation	30	22	204	79.27	42.776
Sowing	30	18	366	87.03	71.363
Weeding	30	52	500	171.27	95.395
Harvesting and processing	30	60	565	236.77	130.225
Grand total	120	18	565	143.58	110.764

Source: Field Survey, 2017

Further, the overall average labour requirement for sugarcane cultivation on an average 3 acre of land was average mandays of 143.58. In addition, not many mandays were required under marketing activity, therefore, it was not calculated.

6.5.11. Quantity of Harvested and Sold Sugarcane

For higher sugarcane yields, providing optimum soil environment is an essential pre-requisite since the crop remains in the field for about 5 to 6 years due to the practice of raising several ratoon crops (Kumar and Sanghera, 2020). Harvesting either under-aged or over-aged cane with improper method of harvesting leads to loss in cane yield, sugar recovery and poor juice quality (Kumar and Sanghera, 2020).

It was observed during the data collection that the average total production of jaggery was 2946.43 kg and out of this, an average of 2996.33 kg was sold by the sugarcane growers (Table 6.66).

Table 6.66 : Total Quantity of Cane Processed Production and Sold Quantity.

in Kilogram

Particulars	N	Min	Max	Mean	Std. Dev
Processed sold quantity	30	950	9360	2946.43	1701.198
Processed total production	30	1055	9406	2996.33	1697.331

Source: Field Survey, 2017

The average production and sold quantity of fresh cane stalk was 7207.14. The fresh cane stalk harvested and sold sugarcane growers sold whatever cane stalk was harvested for marketing purposes.

6.5.12. Income from Selling Fresh and Processed Produced

The different pattern of income received from the selling of cane stalk and jaggery is shown in Table 6.67. In the table 6.67, it was learnt that a total average income of ₹157000 was obtained from by the farmers from selling an average quantity of 2946.43 kg of jaggery.

Table 6.67 : Generation of Income from Selling Fresh Cane and ProcessedProduct

in Rupees

Particulars	N	Min	Max	Mean	Std. Dev
Fresh income	7	6000	120000	46500	40478.31
Processed income	30	12400	468000	157000	88108.56
Total	30	12400	470000	168000	91035.1

Source: Field Survey, 2017

In respect to income received from selling cane stalk, it was learnt that an average of ₹46500 was earned from selling of total average 7207.14 cane stalks. Moreover, the average overall mean income earned by the farmers was ₹168000 during the data collection.

6.5.13. Calculation of Economic Value of Labour in Each Farming Stages

The economic value of different phases of farming activities was derived by multiplying mandays spent on each phases of farming activities by family members, hired labour and exchange labour with prevailing rural wages for unskilled male and female. The rural wage rates for agricultural labour may vary from villages to villages, stages of farming activities, season to season and gender wise, hence, an average rate of the local wage rate(₹ 300, ₹250 and ₹200) is taken for calculation of the economic value.

The data depicted in Table 6.68 highlights that the major share of household human labour was the highest in all activities, such as land preparation, sowing weeding. This finding indicated that household member participation in farming activities can mobilize in higher monetary savings as it exempt farmers from spending more money for hiring human labour.

Table 6.68: Economic Value of Labour in Sugarcane Cultivation

Particulars	Mandays (Average)	Daily Labour Rate (in Rupees)	Expenditure (in Rupees)	Percent
Land Preparation				
Household labour	57.17	250	14292.5	59.99
Hired labour	29.75	250	7437.5	30.70
Exchange labour	10	250	2500	10.32
Total			24230	
Sowing				
Household labour	68.3	250	17075	59.84
Hired labour	30.6	250	7650	26.81
Exchange labour	15.23	250	3807.5	13.34
Total			28532.5	100
Weeding				
Household labour	122.37	250	30592.5	54.98
Hired labour	46.93	250	11732.5	21.08
Exchange labour	53.29	250	13322.5	23.94
Total			55647.5	100
Harvesting and processing				
Household labour	204.7	250	51175	77.29
Hired labour	60.13	250	15032.5	22.71
Total			66207.5	100
Grand total			1,74,617.5	

Source: Field Survey,

2017

The average economic value of various stages of sugarcane production were as the following: ₹ 24230 for land preparation, ₹ 28532.5 for sowing, ₹55647.5 for weeding and ₹66207.5 for harvesting and processing. The total value of labour from all the farming activities was estimated to be ₹ 174617.5.

6.5.14. Expenditure Incurred on Other Activities for Sugarcane Production

Table 6.69 reveals the expenditure incurred on other activities for Sugarcane Production. Apart from money incurred on hiring human labour, farmers also spend expenditure of other activities. Among the various expenditure incurred upon, the highest expenditure was incurred on marketing purpose which accounted for ₹6110.62 whereas the lowest cost was incurred on inputs cost (₹1624.74).

Table 6.69: Expenditure Incurred on Other Activities for Sugarcane Production

Particulars	N	Min	Max	Mean	Std. Dev
Inputs cost	19	120	5980	1624.74	1853.652
Processing expenses	28	1220	9633	3204.61	1942.566
Transportation expenses	7	300	15400	3285.71	5472.485
Marketing expenses	8	700	32700	6110.62	10824.8
Total	30	1624	38510	6505.8	7150.03

Source: Field Survey, 2017

The total average expenditure spend on other activities was estimated to be ₹6505.8 in the selected villages.

6.5.15. Overall Average Expenditure Incurred on Sugarcane Cultivation

Table 6.70 highlights the percent distribution of expenditure incurred for sugarcane cultivation. The most cost incurred was for hiring human labour to perform the work (74.63 %) followed by marketing expenses (10.90 %), transportation expenses (5.86%), processing(5.71%) and purchasing of inputs (2.90%).

Table 6.70: Overall Average Expenditure Incurred on Sugarcane Cultivation

InRupees

Particulars	Expenditure	Percent
Inputs cost	1624.74	2.90
Hired labour expenses	41852.5	74.63
Processing expenses	3204.61	5.71
Transportation expenses	3285.71	5.86
Marketing expenses	6110.62	10.90
Total	56078.18	100

Source: Field Survey, 2017

On average, a total of ₹ 56078.18 was incurred on sugarcane cultivation for one season. There were farmers who used their own vehicles for different farming activities, hence, the expenses spent on own vehicles were not calculated.

6.5.16. Marketing Channel for Sugarcane

Jaggery was the final product prepared at the farmer's level while juicing of sugarcane was carried out at the urban market. Indirect marketing system was the only route used to reach the final consumers.

The major actors in the marketing system were found to be farmers, rural traders and urban commissioners and consumers. It was observed during the data collection that the rate of selling jaggery and cane stalk fluctuates with season to season. Farmers set the price of jaggery and cane stalk when sold directly to the consumers while most of the products (jaggery and cane stalk) were sold based on the rate set by rural traders and urban commissioners.

The main mode of communication used was mobile communication between actors. Supply of jaggery and fresh cane stalks were made as per the demand place by the urban commissioner. Payment was made to the farmers probably after 2- 6 days.

Farmers sold jaggery directly to the consumer at their own rate ,otherwise ,jaggery and cane stalks were sold according to the rate offered by the rural traders and urban commissioners.

Farmers: Farmer's were the actor who engaged in sugarcane production. Farmers sold jaggery and cane stalk to three actors namely- final consumers, rural traders and urban commissioners. The practice of selling the produced to more than two or more actors by one farmers was prevalent in the study areas.

When farmers sold jaggery directly to the consumer, they usually sold it at a rate ranged from ₹45 to ₹70 per kilogram, however, when selling jaggery through rural traders and urban commissioners, the farmers sold it at a price ranged between ₹ 40 to ₹ 60 respectively.

As for selling fresh cane stalk, the farmers sold cane stalk at ₹ 7-8 per cane stalk directly to the urban commissioner (sugarcane juice seller). However, when selling it through rural traders, farmers sold it for ₹5-6 per cane stalk .

Rural Traders: Rural traders acted as middlemen for farmers and urban commissioners. Rural traders include both- 1) Rural traders who collected the produced (jaggery and cane stalk) from the producers and then resold it in the urban market and 2) rural traderwho resold jaggery at the local market as well as supplied jaggery to urban market (*Aizawl*city).

These rural traders resold jaggery to the urban commissioner at a profit of ₹5 to ₹ 10 per kilogram and rural traders resold fresh cane stalk at a profit of ₹2.5-3.5 per cane stalk to urban commissioner who sells sugarcane juice.

Urban Commissioners: Urban commissioners resold jaggery in the urban markets. These urban markets were located in *Aizawl* city,*Serchhip* town, *Kolasib* town, *Champhai* town, *Lunglei* town and *Vairengte* town. Urban commissioner resold jaggery at a profit of ₹ 20 to ₹40 per kilogram to the final consumer.

Urban sugarcane juice sellers in *Aizawl* city purchased cane stalk at a rate between ₹7-10 per cane stalk. With rough calculation with the urban surgarcane juice sellers, approximately, 400 ml to 800 ml of sugarcane juice can be extracted froma healthy one cane stalk. Moreover, a 200 ml of cane juice was sold for₹ 10 by the sugarcane juice sellers.

Consumers: The final actor of the value chain of sugarcane was the consumers. Jaggery was the only product that was purchased directly by the consumers for household consumption. Jaggery was consumed commonly with tea by the final consumers.

According to Figure 6.5 it can be observed that there were 10 marketing channels that were utilized by farmers to earn their living. Farmers sold their produce through indirect channels only. The following are the discussion of the channels:

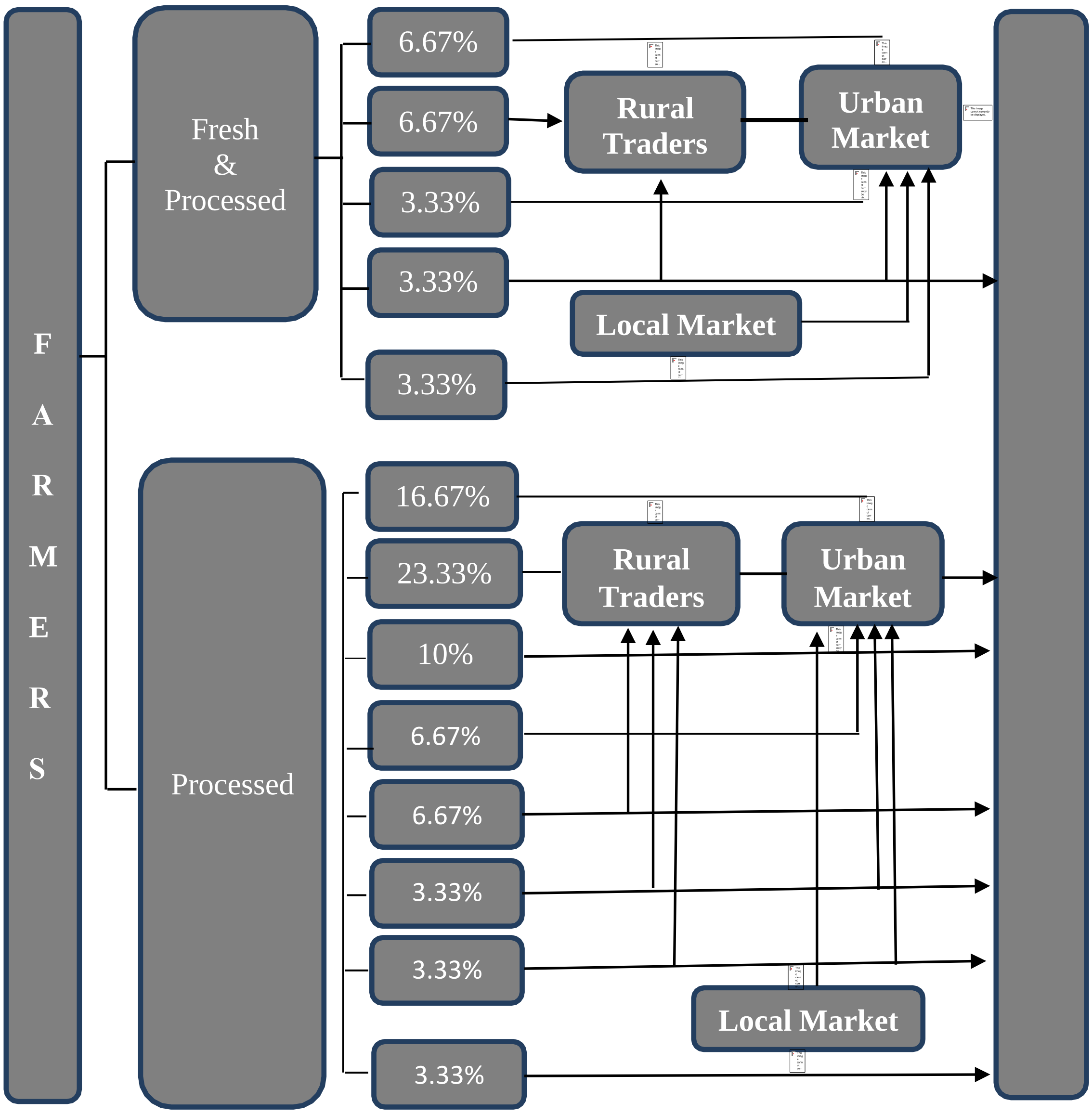

Figure 6.5: Value chain of sugarcane

Channel I: It was noticed that 23.33 per cent and 6.67 per cent of the producers sold jaggery and both of their productions (jaggery and fresh stalk) respectively through rural traders only.

Channel II: Two intermediaries viz. rural traders and urban commissioners involvedin this channel. Out of 30 respondents, 16.67 per cent and 6.67 per cent of the farmers sold jaggery and both production (jaggery and fresh cane stalk) respectively to the rural traders and urban commissioners.

Channel III: The components of two actors in this channel were urban commissioner and consumers. Through this marketing channel,10 per cent of the respondents sold jiggery to the aforementioned actors.

Channel IV: Producers constitutingboth6.67 per cent and 3.33 per cent sold jaggery and both production (jaggery and fresh sugarcane stalk) respectively to the urban commissioner.

Channel V: Another 6.67 per cent and 3.33 per cent sold jaggery and both production (jaggery and fresh cane stalk) respectively to both rural traders and final consumers through this marketing channel.

Channel VI: Three marketing actors were identified in this channel, namely- rural traders, urban traders and consumers. There were 3.33 per cent found to have used this channel to sell their produced of both production (jaggery and fresh cane stalk) respectively.

Channel VII: There were three major actors observed in this channel wherein the actors include consumers and two intermediaries such as rural traders and urban commissioner. A very small number (3.33 %) utilized to sell jaggery through this channel.

Channel VIII: There were three marketing actors involved in this channel, namely- rural traders (local market and urban market), urban traders and consumers. Out of 30 respondents, 3.33 per cent were found to have used this channel to sell jaggery in order to earn their livelihood.

Channel IX: Farmer using this channel was negligible in number (3.33 %). Jaggery was the main product sold in this channel whereby rural trader (local market) and consumers were the existing actors in this channel.

Channel X: Both products namely- jaggery and fresh cane stalk were sold in this channel by very small number (3.33 per cent). Two actors identified were – rural traders (local market) and urban commissioner. Jaggery was sold to the rural traders while the fresh cane stalks were sold to the urban sugarcane juice seller.

6.6. TURMERIC

6.6.1. Origin

The name ‘tumeric’ may came from the Latin terra merita meaning ‘ merit of the earth’ (Hartvig, 2016). Cited by Nair (2019) from watt (1972) Turmeric, also known as “Indian saffron,” has been in use dating back to 4000 B.C.

Turmeric, originating from India, reached the coast of China in 700 AD and reached East Africa 100 years later and West Africa 500 years later. Arab traders were an instrumental in spreading the plant to the European continent in the thirteenth century. The exact location in India where turmeric originated is still in dispute, but all the available details points to its origin in western and southern India. Turmeric has been in use in India for more than 5000 years now (Nair,2019).

6.6.2. Climate

Turmeric prefers a warm and humid climate and can be cultivated in most of the tropics and subtropics (Farooqi *et al*,2005). Turmeric can be grown in diverse tropical conditions from sea level to 1500 m in the hills, at a temperature range of 20 to 35 C with a rainfall of 1500 to 2250 mm per annum (Kumar,2017).

6.6.3. Soil

It is grown in different types of soil from light black, sandy loam and red soils to clay loams, but it thrives best in a well drained sandy loams rich in humus content with a pH range of 4.5 to 7.5 (Kumar, 2017).

6.6.4. Area Under Turmeric Cultivation

In the study areas, Turmeric was grown together simultaneously with other crops like rice, brinjal etc on the same land. The jhum area where farmers operated turmeric was ranged from 0.5 to 3.5 acreas of land. The average land used for turmeric production was 1.7167 acre.

Table 6.71 shows the area under which turmeric was cultivated by the farmers. It was learnt from the field survey that an equal number (43.33 %) of turmeric growers operated an area of “ between 1 to 2” and “between 2-3” acres of land respectively while a few number (10 %) cultivated turmeric on an area of “ 3 acres and above” .

Table 6.71: Area Under Turmeric Cultivation

Acre	Frequency	Percent
Below 1 Acre	1	3.33
1-2 Acres	13	43.33
2-3 Acres	13	43.33
3 Acres & Above	3	10
Total	30	100

Source: Field Survey, 2017

A negligible number (3.33 %) of farmers was also found to have cultivated turmeric in an area of “below 1 acre” of land.

6.6.5. Mandays Engaged in Land Preparation for Turmeric

The task of land preparation for turmeric cultivation include different phases of activities viz, clearing of forest, preparation of firelines, burning of debris and reburning. Men's participation level was higher in operation like clearing of forestand burning activities than women.

It was learnt during the data collection that on average, household human labour used average 24.2 mandays and hired labour contributed an average 13.88 mandays for land preparation (Table 6.72).

Table 6.72: Mandays Engaged in Land Preparation for TurmericCultivation

Particulars	N	Min	Max	Mean	Std
Household labour	30	1	95	24.2	17.205
Hired labour	24	2	27	13.88	8.253
Total	30	10	106	35.3	17.709

Source: Field Survey, 2017

Overall, the quantity of mandays used in an average was 35.3mandays and the mandays used ranged from 10 to 106 mandays in the study areas. A very small number of relatives mandays participation was noticed during the field survey, wherein, mandays contributed by relatives were added to the household mandays contribution.

6.6.6. Quantity of Rhizomes (Seeds) Sown

Turmeric seeds rhizomes that were free healthy and free from infestation were used for planting. The average quantum of Turmeric rhizomes (seeds) sown in an average area of 1.76 was764.4 kg of rhizomes. The sown quantity was ranged from 52 kg to 2000 kg.

In Mizoram, the main variety of crop grown is "Lakadong" and more than 50 percent of the area grown is covered under this variety (Sharma and Vanlalhumi,2013)

6.6.7. Mandays Engaged in Sowing Turmeric Rhizomes

The quantity of human labour spent in sowing operation is presented in table 6.89Turmeric is sowed manually after reburning is completed. Planting of rhizomes involved digging a small hole in the soil and drop the rhizomes into the hole and covered the hole with a soil again. An additional labour is required for collecting, cleaning, separation of mother and finger turmeric before starting planting activities, therefore, the total mandays used for sowing was calculated by adding mandays used for aforementioned activities.

For sowing seeds, the average proportion of family labour contribution was 26.4 mandays, which was higher as compared to hired human labour. Moreover, the average contribution of hired labour accounted for18.52 mandays (Table 6.73).

Table 6.73: Mandays Engaged in Sowing Turmeric Seeds

Particulars	N	Min	Max	Mean	Std
Household labour	30	5	64	26.4	17.371
Hired labour	21	2	54	18.52	14.607
Total	30	8	86	39.37	22.732

Source: Field Survey, 2017

Most probably, the utilization of human labour in turmeric production was based on the size of the jhum land. It was found from the data collection that participation of men and female in sowing operation was equally shared between them.

6.6.8. Mandays Engaged in Weeding of Turmeric Cultivation

Turmeric is a long duration crop (280 days) (Deshmukh et.al, 2018) therefore, timely removal of weed is important. Weeding may be done thrice at 60,120 and 150 days after planting depending upon weed intensity (www.indiaagronet.com)

Cited by Deshmukh *et.al* (2018) from Krishnamurty and Ayyaswamy (2000) mentioned that though, India leads in production of turmeric with 78 % of global production, its average productivity is quite low, mainly due to the competition offered by weeds. Weed competition is one of the limiting factor for low yield of crop. Due to improper weed management, 30-70% yield losses have been reported.

Table 6.74 shows the mandays spent for weeding turmeric growing areas. The total mandays used for weeding is also derived from the mandays used for application of fertilizers and rock salt carried out by a meager number of respondents. The share of household labour mandays contribution was an average 63.62 mandays, which is higher than the mandays contribution made by hired human labour (37.47 average mandays).

Table 6.74 : Mandays Engaged in performing Weeding Activity

Particulars	N	Min	Max	Mean	Std
Household labour	29	2	231	63.62	46.372
Hired labour	19	3	96	37.47	26.995
Total	30	10	231	85.4	47.485

Source: Field Survey, 2017

It was further understood from the study that there was no division of work between men and women in performing weeding activity as weeding consumed more time, therefore, men and women were equally and actively participated in carrying out weeding activity.

Relatives mandays engaged for weeding activity was negligible, however, these mandays were added to the household labour participation.

6.6.9. Mandays Engaged in Turmeric Harvesting

Depending upon variety, turmeric crop becomes ready for harvest in 7-9 months after planting. Early varieties mature in 7-8 months, medium varieties in 8-9 months and late varieties after nine months. Harvesting at proper maturity results in the highest yield of cured turmeric (Nybe *et al*, 2021)

Harvesting of turmeric was done manually by digging/ ploughing out the rhizomes using an impediment called big hoe/ kodali (*Bawngtuthlawh)* or hoe (*Tuthlawh*) and the rhizomes were collected by hand-picking.

Family household members of both men and women had shared an equal involvement in operating Turmeric harvesting. On an average, family labour participation was 22.46 and hired farm-worker mandays contribution was 31.39 mandays (Table 6.75).

Table 6.75 : Mandays Engaged in Turmeric Harvesting

Particulars	N	Min	Max	Mean	Std
Household labour	28	2	180	22.46	33.782
Hired labour	18	2	150	31.39	36.202
Total	30	3	180	39.8	42.494

Source: Field Survey, 2017

In weeding process, a meager number of relatives mandays contribution was added to the number of household family labour.

6.6.10. Mandays Engaged in Post Harvesting Activity for Turmeric Production

Under post harvesting activity, the following are the steps involved: cleaning off mud adhered to the rhizomes, sorting of turmeric roots, separation of mother and fingers, curing and drying of the harvested rhizomes. According to Table 6.76, household human labour participation was found to be higher that hired human labour, wherein household labour generated an average mandays of 24.78 and 12.4 mandays were contributed by the hired labour mandays.

Table 6.76: Mandays Engaged in Turmeric Post Harvesting

Particulars	N	Min	Max	Mean	Std
Household labour	23	3	125	24.78	28.436
Hired labour	5	1	30	12.4	11.675
Total	23	5	125	27.48	28.748

Source: Field Survey, 2017

6.6.10.1. Method of Processing Turmeric

During the information gathered, there were farmers found to have performed only two post-harvesting activities namely-cleaning and sorting of turmeric roots. It was also learnt during the data collection that a very small number of relatives mandays was used for post harvesting activity, wherein, relatives mandays were added to family labour generation.

In the study areas, it was learnt that there were two types of processing method adopted during the data collection- 1) Direct sun-drying and 2) Boiled rhizomes first followed by sun-drying method. The first method adopted by some farmers was less time consuming. In this method,the cleaned rhizomes were slicedusing a mechanic slicer and spread the sliced rhizomes on a silpaulin or any clean area that will allow to dry them under direct sunlight for 4-10 days depending upon the humidity and heat of the sun.

The second method adopted was at first, the cleaned and healthy fingers and mother rhizomes were separated and cured separately as the mother rhizomes required a little longer time to cook. Water was boiled for 40 minutes to one hour approximately in a galvanized iron vats or pans or other containers of a suitable size. About 20 – 25 kg of whole turmeric rhizomes were put into the boiling water at one time. Here, finger rhizomes were cooked normally between 5 - 15 minutes while mother rhizomes were cooked from 10-25 minutes. After boiling the rhizomes for the specified time, the cooked rhizomes were taken out of the pan/cooking drum and drained off the excess water. It was reported that the process of curing was in order to remove/destroys the raw odour, extend its shelf-life, reduce the drying time and yields uniformly coloured products.

The cooked whole fingers were sliced with knives or turmeric cutter and spread under the sun t on a silpauline for 4-6 days on a good sunshine. During the night, the rhizomes were covered to protect them from dew. The dried rhizomes were winnowed again using locally made sieve (*Thlangra*) in order to remove unwanted particle.

According to the calculation with the local farmer, 3 litres of turmeric juice can be extracted from one kg. Juicing of turmeric was done using a grinder. At first, rhizomes were cleaned and cut into different small pieces and put inside the grinder. This was followed by mixing small amount of water with rhizomes and blend together until the rhizomes were completely crush/broken. The juice pulp was filtered using a clean cloth in order to get the juice.

6.6.11. Overall Mandays Engaged in Turmeric Cultivation

The Pattern of the human labour spent on different farming stages is presented in Table 6.77. Among the various stages, weeding consumed the highest mandays which constituted an average mandays of 231 whereas processing activity required the lowestmandays accounting for an average 27.48 mandays. Therefore, the overall mandays spent on an average 3. 4 acre of land ranged from 3 to 231 mandays with an average 46.35 mandays .

Table 6.77: Overall Mandays Engaged in Turmeric Cultivation

Particulars	N	Min	Max	Mean	Std
Land preparation	30	10	106	35.3	17.709
Sowing	30	8	86	39.37	22.732
Weeding	30	10	231	85.4	47.485
Harvesting	30	3	180	39.8	42.494
Post-harvesting	23	5	125	27.48	28.748
Total	143	3	231	46.35	39.394

Source: Field Survey, 2017

Mandays used on marketing activity was negligible wherein it was not included in this calculation of overall mandays for turmeric cultivation.

6.6.12. Quantity of Turmeric Harvested

The average yield of turmeric was observed to be 3392.33 kg from an average jhum area of 1.796. Also the yield production of turmeric ranged from 174 kg to 13100 kg in the selected areas. The yield quantity of turmeric was highly determined by the quality of the soil, time of harvesting, occurrence of pests and disease and climatic condition etc. According to the calculation of farmers, the yield rate of turmeric on average of 7 fresh kg yields 1 kg of dried sliced rhizomes whereas an average 8 kilograms of fresh rhizomes can yield 1 kg of turmeric powder.

6.6.13. Turmeric Sold Quantity

As inferred from Table 6.78, the sold quantity of fresh turmeric ranged between 160 kg to 13000 kg wherein the average quantity sold accounts for 2350 kilograms.

Table 6.78: Total Sold Quantity of Turmeric

-

in Kilogram

Particulars	N	Min	Max	Mean	Std. Dev
Fresh turmeric	20	160	13000	2350.45	3351.289
Processed turmeric	16	15	1200	377.13	329.122

Source: Field Survey, 2017

Furthermore, it was observed that the sold quantity of processed turmeric ranged from 15 kg to 1200 kg with an average sold quantity of 377.13 kg.

6.6.14. Income from Selling Turmeric

The income received from selling of fresh and processed products of turmeric are depicted in Table 6.79. It can be seen that from the average sold quantity of fresh turmeric ,the farmers earned an average income of ₹ 15800 while from the average sold quantity of processed, the farmers can obtained ₹60700.

Table 6.79:Generation of Income from Selling Turmeric

in Rupees

Particulars	N	Min	Max	Mean	Std. Dev
Fresh income	20	1280	110500	15800	23537.7
Processed income	16	1800	285540	60700	69148.98
Total	30	1280	285540	48300	62583.1

Source: Field Survey, 2017

The total average income earned from selling turmeric production was estimated to be ₹ 48300 during the data collection.

6.6.15. Calculation of Economic Value of Labour in Each Farming Stages

The economic value of different series of farming activities has been calculated by multiplying mandays spent on each phases of farming activities by family members, hired labour and exchange labour with prevailing average rural wages for unskilled male and female. The wage rates for agricultural labour differ from villages to villages, stages of farming activities, season to season and gender wise, therefore, an average rate from the prevailing wage rate of ₹300, ₹250 and ₹200 is taken from calculation of the economic value.

Table 6.80: Economic Value of Labour for Turmeric Cultivation

Particulars	Mandays (Average)	Daily Labour Rate (in Rupees)	Expenditure (in Rupees)	Percent
Land preparation				
Household labour	24.2	250	6050	63.55
Hired labour	13.88	250	3470	36.45
Total			9520	100
Sowing				
Household labour	26.4	250	6600	58.77
Hired labour	18.52	250	4630	41.23
Total			11230	100
Weeding				
Household labour	63.62	250	15905	62.93
Hired labour	37.47	250	9367.5	37.07
Total			25272.5	100
Harvesting				
Household labour	22.46	250	5615	41.71
Hired labour	31.39	250	7847.5	58.29
Total			13462.5	100
Post harvesting				
Household labour	24.78	250	6195	66.65
Hired labour	12.4	250	3100	33.35
Total			9295	100
Grand total			68780	

Source: Field Survey, 2017

The average economic value of different phases of turmeric production were as the following: ₹ 9520 for land preparation, ₹ 11230 for sowing, ₹ 25272.5 for weeding, and ₹13462.5 for harvesting and ₹9295 for post harvesting, therefore, the total value of labour from all the farming activities was estimated to be ₹ 68780 (Table 6.80).

6.6.16. Expenditure Incurred on Other Activities for Turmeric Cultivation

Table 6.81 displays the expenditure incurred on other activities by the turmeric farmers. It is evident that the highest mean expenditure was incurred on processing activities, accounting for ₹ 4204.58 followed by input cost with average expenditure of ₹3460, farming expenses with average expenditure of ₹1680 and transportation expenses with average expenditure of ₹1241.18. Therefore, the average totalexpenditure constituted to be ₹ 3920.6.

Table 6.81:Expenditure Incurred on Other Activities for TurmericCultivation

in Rupees

Particulars	N	Min	Max	Mean	Std. Dev
Input cost	5	500	6400	3460	2465.36
Farming expenses	3	1000	2240	1680	628.649
Transportation expenses	17	100	3200	1241.18	983.018
Marketing expenses	6	10	1500	300	589.847
Processing expenses	12	600	21000	4204.58	5918.824
Total	24	100	21000	3920.63	4863.97

Source: Field Survey, 2017

6.6.17. Overall Average Expenditure Incurred on Turmeric Production

The different components of cost for turmeric cultivation are shown in Table 6. 82. In the study areas, the largest cost was spend on hiring human labour, followed by expenses incurred on processing activities, purchasing input and transportation expenditure. The lowest expenditure cost was incurred on marketing purposes.

Table 6.82: Overall Average Expenditure Incurred in Turmeric Cultivation

in Rupees

Particulars	Amount	Percent
Input cost	3460	8.80
Farming expenses	1680	4.27
Transportation expenses	1241.18	3.16
Marketing expenses	300	0.76
Processing expenses	4204.58	10.70
Hired labour expenses	28415	72.30
Total	39300.8	100

Source: Field Survey, 2017

In variable cost, hired human labour, processing expenses, input cost, farming expenses, transportation expenses and marketing expenses were72.30 per cent (₹28415), 10.70 per cent (₹ 4204.58), 8.80 per cent (₹ 3460), 4.27 per cent (₹1680), 3.16 per cent (₹1241.18) and 0.76 per cent (₹300) respectively. It is important to note that the expenditure incurred on their own vehicle in order to go to the farm, carry own production from jhum land to home and marketing purposes etc.was not calculated along with other expenditures.

6.6.18. Marketing Channel for Turmeric

The main turmeric marketing actors were farmers, rural traders, society (Reiek Multifarming Co-operative Society and Reiek Block Turmeric Grower

Society), urban commissioner and consumer were existed in the marketing system of turmeric.

Mobile was the main mode of communication used by the actors between them. Ordinarily, turmeric growers get instant payment when selling their produced to other actors. It was observed from the data collection that turmeric growers can set their own rate when selling their own produced. However, when selling fresh and processed turmeric to rural traders, Society and urban traders, farmer had to comply with the rate offered by the aforementioned actors at most times.

Farmers: Farmers were the main grower of turmeric. The practice of farmers selling their produced to two actors in the study areas was prevalent.

In the study areas, farmers sold turmeric powder at a rate of ₹ 120,₹210, ₹230 and turmeric juice for ₹ 80 per litre to the final consumers respectively. Also, the selected farmers sold fresh and powder to the rural traders. It was observed that fresh rhizomes were sold between ₹ 7 -9 per kilogram while powder form was sold for ₹ 170 per kg respectively to the rural traders

Reiek Multi-farming Co-operative Society: The Society was formed in the year 2001. It was also learnt that Reiek Multifarming Co-operative Society procured driedsliced turmeric for ₹ 135 per kilogram from the farmers while fresh rhizomes from the rural traders for ₹ 13- 15 per kg The Reiek Multifarming Co-operative Society further dried the fresh soyabean and later processed the dried sliced turmeric into a fine powder at its processing unit. Packaging of turmeric powder was done by the society at the society level as well. The processed powder was supply to the urban agent at a rate of ₹210 per kilogram. From the urban agents the turmeric powder was distributed in different areas in Mizoram.

Reiek Block Turmeric Grower Society: Reiek Block Turmeric Grower Society was established in 2017 under Mission Organic Mizoram (MOM), State Government. This Society procured fresh rhizomes at ₹ 15 per kilogram from the farmers and again distributed the rhizomes to its society member for turmeric production.

Rural Traders: Rural traders were from the local village. There were three types of rural traders in marketing turmeric-1) Rural Trader sold fresh turmeric directly to the Reiek Multi-farming Co-operative Society at a profit ranged between ₹4 to 6 to the Society as well. 2) The other rural traders further processed turmeric into a powder and sold it to the urban commissioner in Aizawl with a price ranged between ₹100 - ₹150 and 3) this rural trader procured powered turmeric from the farmer at ₹170 per kg and resold it to the final consumer at a rate of ₹250. There were rural traders who engaged with both Reiek Multi-farming Co-operative Society and urban commissioners.

Urban Commissioner: The urban commissioners have a market seat at the urban market(*Aizawl*). The urban commissioner sold the powder at a profit of ₹ 50-100 per kilogram to the final consumers.

Consumers: Consumers purchased only processed product of turmeric for household consumption. Consumers were the final actor for this value chain of turmeric. The processed powder were mostly used in curry, fried vegetable and the juice was consumed as a medicinal purpose.

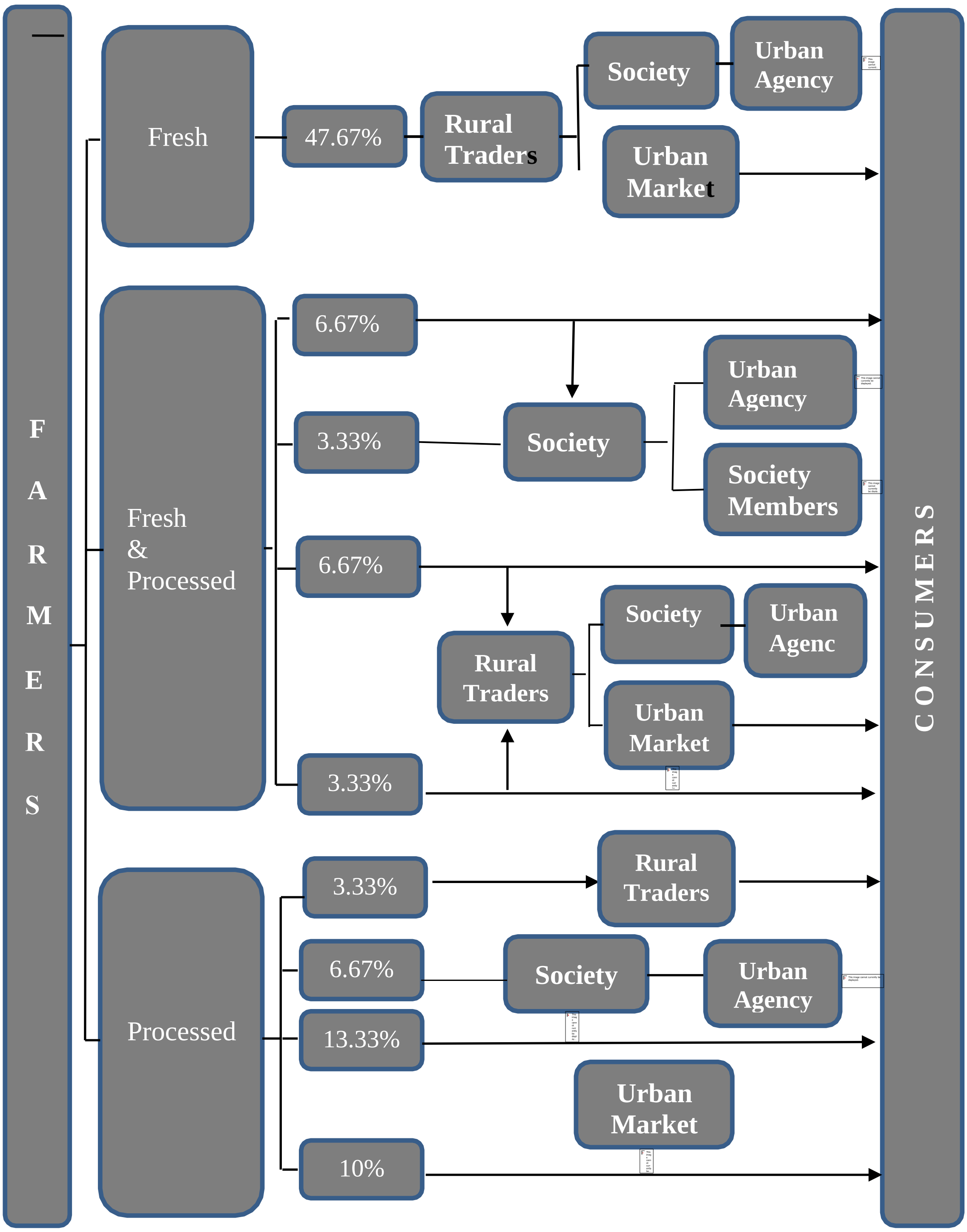

Figure 6.6: Value chain of turmeric

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Channel I: Almost half of the respondents (46.67 %) sold fresh turmeric to the rural traders while 3.33 per cent of the farmers sold turmeric powder to the rural traders.

Channel II: In the study areas, 13.33 per cent and 6.67 per cent of the respondents managed to sell their processed products and both products (fresh and powder) to two actors viz. Society and final consumers respectively.

Channel III: Among the 30 respondents, 10 per cent of the turmeric growers sold processed turmeric to both urban market and directly to the consumer. Hence, two actors were found in this particular channel.

Channel IV: Turmeric growers of 6.67 per cent and 3.33 sold their dried sliced of turmeric and both productions (fresh and dried sliced) respectively to the Society only in this channel.

Channel V: It was learnt during the field survey that, the two major actors consisted of rural traders and final consumer in this channel. Another 6.67 per cent of the selected respondents sold processed and fresh rhizomes directly to the consumers and rural traders.

Channel VI: The actors involved in this channel constituted of rural traders, urban commissioner and final consumers. A small number (3.33 %) were found to have employed this channel to earn their livelihood from selling processed turmeric and both products of fresh and processed products.

Chapter Summary:

The summary of each crop value chain are discussed as the followings:

Chilli

In the study areas, chilli was cultivated as intercropping with other crops like brinjal, chilli was cultivated in an average jhum area of 3.0083 wherein, more than half (63 %) carried out chilli cultivation in an area of “3 acres and above”. The average seeds sown was found to be 16.9667 kilograms. During the data collection, it was observed that household human labour on average constituted the highest labour (60.04 mandays) in chilli cultivation followed by hired human labour (57.88 mandays) and exchange labour (22.3 mandays). The overall average mandays used for chili cultivation was accounted for 86.22 mandays and of all the farming activities, weeding required the highest mandays (229.77 average mandays) while the lowest mandays were used on sowing activities (4.8 mean mandays).

It was further learnt that, the average total production of fresh and processed chilli were 2053.4 kg and 1020.8 kg respectively, whereby, 1982.9 kilograms of fresh produce and 973.45 kilograms of processed produced were sold.On average, ₹ 121000 and ₹ 227000 were earned from selling fresh green chillies and processed Mizo chillies respectively. There were five items where farmers incurred for chilli farming, such as input cost, farming expenses, transportation expenses, processing expenses, transportation expenses and hired labour expenses. The mean total expenditure was observed to be ₹58448.52wherein92.81 per cent (₹54243.75) of the average total expenditure was incurred on hired human labour cost while the lowest number i.e 0.71 per cent (₹415) was spent on marketing expenses.

From the data collection, it was learnt that the main actors involved in selling fresh chillies were farmers, farmer’s association, rural traders, urban commissioners and consumers while the main actors identified for processing channels were – farmers, rural agents, wholesaler.

Farmers: Farmers were the actor who carried out chilli production as well asan agent for chilli marketing. These farmers also transported their own produced to the urban market and sold it to other actors. Further, the practiced of selling chillies to more than 2 to 3 actors was prevalent.

During the data collection, it was learnt that farrmers sold fresh chillies at ₹45 per kg directly to the customer while about ₹ 47 per kg and ₹ 40 was earned when selling it to the rural traders and urban commissioners respectively. Farmers sold fresh chillies to the Farmer's Association at a rate ranged from ₹40 to ₹125 per kg with an average rate of ₹71 per kg.

It was observed during the field survey that all the farmers sold Mizo chillies to the rural agent of the wholesalers. Moreover, the farmers from Sailulak village sold the dried Mizo chilli between ₹180 to ₹ 200. In contrast to that, the selling rate of Mizo dried chilli in Thingsai village was ranged from ₹250 to ₹ 300. The purchasing rate of dried Mizo chilli by the Assamese rural agents were influenced by the prevailing rate of Silchar market.

Rural Traders/agents: There were two types of rural traders in chilli marketing viz

1) The rural traders/ procured fresh chillies from the Farmer's Association in Mualpheng village as well as from the farmers. These rural traders sold the produced to the urban commissioner in Aizawl market and acted as a middleman between the producers and the urban commissioners. These rural traders resold fresh chilli at a profit ranged between ₹20 from ₹ 33 with an average profit of ₹ 18.5 to the urban commissioners.

2) The other rural agents consisted of rural agents and Assamese rural agents.

These rural agents served as an intermediary between the farmers and the wholesalers, Silchar. Local rural agents collected dried chillies from the farmers and traded it for ₹5 per kgto the wholesalers.

3) Farmer's Association: Farmer's Association called '*Thlai Association*' was formed in 2006 and all the chilli growers of Mualpheng village become the member of this association. All the members of this farmer group submitted their harvested produced to the Association ,whereby, the rural traders procured fresh chilli through

the Association.

The selling and buying activities were mainly carried out in the form of auction,wherein, chillies were sold to the rural traders who can offer the highest price. Therefore, Farmer's Association purchasing rate was highly determined by the rate offered by the rural traders. Again, the rate offered by the rural traders was determined by the prevailing rate at the Aizawl market. Additionally, this rural trader to whom chillies were sold to, can again resell the produced to other rural traders at a price fixed by her. It was further learnt during the field survey that the Farmer's Association sold fresh chillies at a rate ranged from ₹40 to ₹125 per kg with an average rate of ₹71 per kg to the rural traders

Urban Commissioner: The urban commissioner consists of the commissionerselling fresh chillies in urban market, mainly Aizawl market. The urban commissioners having a selling place/seat at the urban market in different areas soldfresh chillies to the final consumers at a profit of ₹15, ₹50 and ₹ 70.

Wholesaler: Wholesalers were the actors who purchased dried whole chilli in a larger volume as compared to other actors in chilli marketing. These wholesalers were mainly from Silchar, Assam. In general, these wholesalers also collected wholedried Mizo chillies from different Mizo chilli producing villages through rural agents. The collected products were brought to the wholesaler, Silchar, thereon, whole dried Mizo chillies were resold and transported to Siliguri factory, Siliguri for further value addition.

In addition, whole dried Mizo chillies were also resold to different retailers, located in different parts of India and added value along the process.

Consumers: Consumers were the last actor in chilli marketing chain. These final consumers consumed chilli in many ways such as in raw form, added to curry, prepared in chutney, and make chilli pickle etc.

It was observed that five marketing channels were exhibited in the study areas. Channel V was used by more than half (67%) of the farmers to sell their processed product to the rural agents.

Also, the traditional practice of open air sun drying method was popular in the study areas.

Ginger

Ginger was cultivated as a sole cropping and intercropping crop in the study areas. The average cultivated area for ginger cultivation was 1.9917 whereby the highest number which is half of the respondents (50%) carried out farming in an area "between 2 to 3 acres" of jhum area. The average seed rhizomes planted was 1361 kilogram in the study areas. The total average production by the farmers was 3419.87 kilogram and an average quantity of 3396.67 kilogram was sold by the farmers through which ginger growers earned ₹ 32300.

Among the different phases of ginger cultivation, weeding required the highest mandays (121.37) while the lowest average mandays of 61.4 was used for harvesting ginger . For the cultivation of ginger, the average total labour contribution by household human labour was the highest (61.64 mandays) followed by hired human labour (40.97 mandays) and exchange labour (10 mandays), therefore, the overall average mandays used for an average jhum area of 1.9917 was 83 mandays.

Further, it was noticed that the farmers expenditure were made on five items namely- input cost, farming expenses, transportation expenses, marketing expenses and hired human labour expenses. The total average expenditure incurred was accounted for ₹ 59568.8825 ,whereby, the highest cost was incurred on hired human labour (78.84 %) (₹4963.70) and the lowest cost was incurred on marketing expenses constituting 0.46 (₹275) of the total average expenditure.

Farmers: They were the actors who engaged in producing ginger. These farmers were found to have sold ginger to different actors like rural traders, urban commissioners and consumers.

Farmers sold ginger rhizomes for ₹10 directly to the consumers as well as sold baby ginger and rhizomes ginger at ₹ 80 per kg and ₹20 per kg respectively to the urban commissioner in the Urban market (Aizawl). Farmers sold fresh ginger at ₹10 to rural agents (CDAR) while farmers sold fresh ginger between ₹ 7 to ₹12 with an average rate of ₹9 to the rural traders/agents of wholesalers (Assam).

Rural Agents/traders: There were two kinds of rural agents who served as an agent for wholesaler (Silchar and Bagha) and Society (CDAR).These rural traders /agents were from the local village ,wherein, the rural traders/agents for wholesaler(Silchar and Bagha) were men while rural society agent was found to be woman.

Rural agents procured ginger from the producers and supply the produced to the wholesaler and Society, thereon, ginger was distributed to different areas within and outside of India. The rural agents earned ₹ .50 per kg for collecting ginger for the Society (CDAR) and rural agents of wholesaler (Silchar) obtained ₹ 1 per 1 kg from trading it while a ranged from ₹ .05 to ₹1 per kg with average income of ₹.05 can be earned from trading it to wholesalers (Bagha) .

In a different case, when the rural agents themselves transported the produced to Bagha and trade directly to the wholesaler (Bagha), the rural traders can earn between ₹3.5 and ₹ 10 per kg with an average income of ₹5.75 per kg.

Community Action Development and Reflection (CDAR): CDAR was formed in 2004 and carried out processing of ginger into flakes at their processing unit. CDAR partners with international exporting companies and the major exporter were Suminter India Organics in Mumbai, Phalada Agro Research Foundation (Pure and Sure) in Bangalore, and Sresta Natural Bio-Products Pvt Ltd (24 Mantra) in Hyderabad and these exporters sold the product mainly to European countries. The selling rate of processed ginger by CDAR to these exporters was between ₹ 220-₹250 per kg. The processing ratio from fresh to flake products was calculated as 7:1 per kilogram.

Wholesalers (Bagha and Silchar): These wholesalers were an important actor ,wherein, Thanga and Vanrammawia (2013) further mentioned that marketing agents would, in turn, transport ginger to the wholesale traders operating in Assam, like Karimganj, Bagha, Silchar for further dispatch to terminal market via Siliguri to Kolkata, Azhadpur (Delhi), Amritsar, Mumbai etc and through Karimganj to Bangladesh.

However, the information on these wholesalers reselling rate of ginger was not able to collect.

Urban Commissioners: The urban commissioners were the one who resold ginger at the urban market (Aizawl). These urban commissioners were mostly men. The urban commissioners resold ginger (baby ginger and rhizomes ginger) at a profit ranged between ₹30 to ₹40 per kg to the final consumers.

Consumers: Consumers were the final actor of the marketing chain for ginger. These consumer consumed ginger as in raw form, added in curry, chutney, etc

According to the data obtained from the field survey, there were four marketing channels through which famers sold their produced. Among those existed marketing channels, channel I was utilized by 76.67 per cent of the respondents to sell ginger. In this channel farmers sold ginger to the rural agents/traders.

Since, there were farmer adopting two cropping method: sole and mixed cropping system, the following are the comparison between the two cropping system:-

In the selected villages, 27 household practiced mixed cropping system whereas three household carried out sole cropping system. The average area of farmers practicing sole cropping system and mixed cropping system were 3.1667 and 1.8611 jhum areas respectively whereby sole cropping system was carried out by 100 per cent in an area of “ above 3 acre” jhum land whereas more than half (56%) of the respondents carried out mixed cropping system on an area “between 2 to 3 acres”. It was also learnt that, the average total production of 9179.67 kilograms and 2779.89 kilograms were produced from farming system practicing sole cropping and mixed cropping system respectively. An average of 9166.67 kilograms and 2755.56 kilograms was sold from the sole cropping and mixed cropping jhum areas respectively and earned an income of ₹ 76500 and ₹27400 from sole cropping and mixed cropping farming system.

Maize

Maize was calculated as a mixed cropping system in the selected villages wherein an average 3.025 acres of jhum land was used for carrying out maize cultivation. It was observed that the highest number (40 %) of the sampled maize growers operated an area of “between 1 to2 acres” of land for maize cultivation and mean average of 3.8583 kilograms of maize seeds were sown by the farmers.

For the cultivation, weeding required the highest mandays, accounting for 108.47 average mandays and the lowest average mandays (5.93) was used for carrying out sowing activity. On average, the overall mandays used for maize cultivation was 47.89, in which, household human labour contribution made was the highest (38.38) followed by hired human labour (29.84) and the lowest average mandays used was from exchange labour (5.5).

Further, an expenditure was incurred on five items such as input cost, farming expenditure, transport expenses, marketing expenses and hired labour expenses. The average expenditure incurred was estimated to be ₹ 37074.55 whereby the highest expenditure was made on hired labour (72.31%) (₹26807) and lowest cost was incurred on input cost (1.01%) (₹373.33).

The overall average production yield from an average area of 3.025 acres of land was found to be 10900 fresh cobs and 438.33 processed cobs. From the total average production, the total average sold quantity of fresh maize was 9414 cobs, wherein, an average amount of ₹ 28400 was obtained. From the average total processed harvested, an average 400 cobs were sold and an average amount of ₹ 1427.83 were earned from selling it.

In the marketing system of maize, the identified actors were producers (farmers), rural traders, urban commissioner and consumers. There were six main marketing channel identified for maize. Among the channels, channel II was used by 40 per cent and 3.33 per cent of the maize growers to sell their fresh produces and both production(fresh and processed) respectively. In this channel, the farmers sold their produced to the rural traders.

Farmers: Farmers were the only actor who involved both in production and marketing activities. They sold their produced to three actors namely- consumers, rural traders and urban commissioners.

It was learnt during the data collection that farmers who sold maize directly to the consumers can set their own rate, thus, the farmers sold maize between ₹8 to ₹ 14 per cob with an average earning of ₹10 per cob during the early harvesting season. During the peak harvesting season maize was sold for ₹5-₹7 per cob by the maize produces.

In respect to processed marketing, the processed maize was sold for ₹ 6 per cob when the farmers sold straight to the final consumers while ₹3 per cob was the selling rate to the rural trader.

Famers sold fresh maize to the rural traders between ₹ 5-₹6 per big size cob and ₹3-4 for medium to small size cob for the first harvesting week. During the peak harvest season big size cob was sold between ₹3-4 and small/ medium cob was sold between ₹1-₹2

Farmers sold maize to the urban commissioner between ₹4- 8 per big size cob during the first week of harvesting and between ₹2-1 per small/medium size cob.

Rural Traders: Rural traders were from the local village and they consist of 1) a person collecting maize at the local area from the farmers and resold it to the urban commissioner (*Aizawl*) at a profit between ₹ 1 to ₹ 2 per cob (big and small) and 2) a rural trader who resold at the local market at a profit between ₹ 4 to ₹ 6 per big cob and ₹2 to ₹5 per small/medium cob

Urban Commissioner- Urban commissioner were those commissioners selling maize at the urban market (*Aizawl*) such as commissioner who resold at the *Aizawl* main market , peddlers who resold fresh maize by going house from house in *Aizawl* city, roadside vendors selling roasted maize and boiled maize (*Aizawl city*)

Consumers: This actor purchased maize for household consumption. Maize was consumed as a simple boiled maize on the cob.

Soyabean

Soyabean was grown as sole cropping and mixed cropping system in the selected villages and an average area of 0.5083 was operated for cultivating soyabean Moreover, a large majority (90 %) of the respondents cultivated soyabean in an area "below 1 acre" of jhum land during the data collection. An average of 2.853 kg seeds were sown by the farmers. The overall average mandays used was 9.97 wherein household labour contribution was found to be higher (8.86) than hired human labour average mandays (4.53). In addition, the average proportion of mandays required for weeding was the highest (24.03) as compared to other farming activities.

It was difficult to convert and calculate the processed quantity, therefore, the calculation of the total production and total sold quantity were taken in fresh form.

The total average production was accounted for 114.37 kilograms wherein fresh average quantity of 83 kilogram and processed quantity of 47.39 kilogram were sold. An income of ₹ 7053.33 and ₹ 7029.21 were earned from selling fresh and processed products.

It was estimated with the local farmers that a fresh soyabean of one kilogram when processed into wet fermented soyabean, ₹ 200 can be obtained from selling the produce. Also, from one kilogram of fresh soyabean when processed into dried fermented product, ₹180 can be obtained.

In the study areas, the major share of expenditure were made on five items like input cost, farming expenses, transportation expenses, marketing cost and hired human labour cost. The total mean expenditure was calculated to be ₹6916.32. Of all the aforementioned items, the expenditure spent on hired labour cost was the highest

(66.40 %) (₹45925) while the lowest cost was incurred for marketing cost (1.84%). (₹127.5)

The identified actors in the marketing channel of soyabean were producers, rural traders, urban commissioners and final consumers. Channel I was used by 20 per cent, 6.67 per cent, 23.33 per cent to sell their produced such as- fresh soyabean, processed and both production (fresh and processed) respectively. In channel I, farmers sold their produced directly to the final consumers.

Farmers – Farmers were an important actor who cultivated soyabean and participating in marketing as well. Farmers sold their produced to the consumer, rural traders and urban commissioners. Soyabean farmers sold their fresh produced between ₹70 to ₹95 per kg to both the final consumer and rural traders.

The farmers also sold processed soyabean to the urban commissioners with a price raged from ₹ 180 to ₹200 from 1 kilogram of soyabean. .

Rural traders: Rural traders, mostly women, were from the local village. They procured fresh soyabean from the farmers and processed into wet and dried form. Rural traders sold the processed soyabean directly to the final consumer who resided within the village and to its neighboring villages as well as sold processed soyabean to the urban commissioners in urban market (*Aizawl*) for a profit between ₹ 105-₹130.

Urban commissioners: Urban commissioners, by and large being women, were commissioners from different areas in *Aizawl* District. These women commissioners were 1) one who had a market seat at the Market 2) one who resold processed products going from door to door. Urban commissioners obtained a profit of ₹80 to ₹100 from reselling soyabean processed products to the final consumers.

Consumers: Consumers were the final actor of the marketing chain for soyabean. They purchased soyabean (Fresh and processed) for household consumption purposes. Fresh soyabean were further processed for household consumption. The processed product purchased were consumed as it is, added in a Mizo bai, prepared as a chutney etc.

Comparsion Between Single Cropping System and Mixed Cropping System of Soyabean

According to the data collection, it was noticed that the soyabean farmer adopted two method of farming system namely intercropping system and sole cropping system. Moreover, 50 per cent farmers reported to have practiced single cropping system whereas the equal number (50 %) adopted mixed/intercropping with other crops.

The average area of carrying out mixed cropping system of soyabean was 0.6333 whereas sole cropping system of soyabean was practiced in an average jhum area of 0.3833.

Under the cultivation area of sole cropping system of soyabean, a large majority of soyabean farmers (93 %) operated in an area of "below 1 acre" while most of the soyabean growers (80 %) practiced farming activities in an area "below 1 acre"

Farmers practicing sole soyabean yielded an average production of 92.67 kg wherein an average 63.07 kilogram of fresh soyabean and an average of 37.41 processed soyabean were sold. Further, an amount of ₹ 5647.83 and ₹ 6795.45 were obtained from selling it fresh and processed soyabean respectively.

It was difficult to calculate the exact measurement of processed soyabean, therefore, the quantity of fresh soyabean used for processing soyabean was taken for this calculation. Soyabean growers who adopted mixed cropping system, yielded an average of 136.13 kg wherein an average fresh quantity of 104.46 kilogram and processed quantity of 61.12 kilogram were sold, hence, an income of ₹ 8566.92 and ₹ 7350.621 were generated from selling fresh and processed form respectively.

Sugarcane

In the sampled villages, sugarcane was cultivated as intercropping with other crops. Sugarcane was cultivated in an average jhum area of 3.667 wherein, more than half (60 %) practiced sugarcane cultivation in an area of “3 acres and above”. The average cane setts planted was found to be 12500 setts. During the data collection, it was understood that household human labour on average participation was the highest labour (113.13 mandays) in sugarcane cultivation followed by hired human labour (42. 87 mandays) and exchange labour (26.05 mandays). The overall average mandays used for sugarcane cultivation was accounted for 143.58 mandays. Among the different phases of farming activities, combine activities of harvesting and processing demanded the highest mandays (236.77 average mandays) while the lowest mandays were used on land preparation activities (79.27 average mandays).

The average total production of processed sugarcane were 2996.33 kg and an average quantity of 2946 kilograms were sold, whereby, ₹ 17000 was earned from selling jaggery by the farmers. Also, the average total production and sold quantity of fresh sugarcane stalks were 7207.14. In general, fresh stalk of sugarcane were sold based on the demand of the agents. An amount of ₹ 46500 was obtained from the selling of cane stalk .

There were five items incurred by the farmers, namely- input cost, farming expenses, transportation expenses, processing expenses, transportation expenses and hired labour expenses. The average total expenditure for the cultivation of sugarcane was ₹ 5678.98 and it was further learnt that 74.63 per cent of the average total expenditure was incurred on hired human labour cost (₹41852.5) while the lowest expenditure spend was on inputs cost (2.90%) (₹1624.74).

The major actors in the marketing system were found to be farmers, rural traders and urban commissioners and consumers. It was learnt from the data collection that there were ten marketing channels that were utilized by farmers to earn their living. Channel I was utilized by the 23.33 per cent and 6.67 per cent famers to sell their produce of jaggery and both production (fresh and processed) respectively to the rural traders.

Farmers: Farmer's were the actor who engaged in sugarcane production. Farmers sold jaggery and cane stalk to three actors namely- final consumers, rural traders and urban commissioners. The practice of selling the produced to more than two or more actors by one farmers was prevalent in the study areas.

When farmers sold jaggery directly to the consumer, they usually sold it at a rate ranged from ₹45 to ₹70 per kilogram, however, when selling jaggery through rural traders and urban commissioners, the farmers sold it at a price ranged between ₹ 40 to ₹ 60 respectively.

As for selling fresh cane stalk, the farmers sold cane stalk at ₹ 7-8 per cane stalk directly to the urban commissioner (sugarcane juice seller). However, when selling it through rural traders, farmers sold it for ₹5-6 per cane stalk.

Rural Traders: Rural traders acted as middlemen for farmers and urban commissioners. Rural traders include both- 1) Rural traders who collected the produced (jaggery and cane stalk) from the producers and then resold it in the urban market and 2) rural trader who resold jaggery at the local market as well as supplied jaggery to urban market (Aizawl city).

These rural traders resold jaggery to the urban commissioner at a profit of ₹5 to ₹ 10 per kilogram and rural traders resold fresh cane stalk at a profit of ₹2.5-3.5 per cane stalk to urban commissioner who sells sugarcane juice.

Urban Commissioners: Urban commissioners resold jaggery in the urban markets. These urban markets were located in *Aizawl* city, *Serchhip* town, *Kolasib* town, *Champhai* town, *Lunglei* town and *Vairengte* town. Urban commissioner resold jaggery at a profit of ₹ 20 to ₹40 per kilogram to the final consumer.

Urban sugarcane juice sellers in *Aizawl* city purchased cane stalk at a rate between ₹7-10 per cane stalk. With rough calculation with the urban surgarcane juice sellers, approximately, 400 ml to 800 ml of sugarcane juice can be extracted from a healthy one cane stalk. Moreover, a 200 ml of cane juice was sold for ₹ 10 by the sugarcane juice sellers.

Consumers: The final actor of the value chain of sugarcane was the consumers. Jaggery was the only product that was purchased directly by the consumers for household consumption. Jaggery was consumed commonly with tea by the final consumers.

Turmeric

Turmeric was cultivated as intercropping crop in the study areas. Turmeric cultivation was carried out in an average jhum area of 1.7167 acre of land. Among the 30 respondents, the highest and an equal number (43.33 %) of farmers operated jhum areas of “between 1 to 2 acre” and “between 2 to 3 acre” respectively. An average of 764.4 kg turmeric rhizomes was sown in the selected villages. For the cultivation of turmeric, different activities were involved and among the various activities, the highest average mandays was used for weeding activities (85.4) while the lowest average mandays was used for carrying out processing activity (27.48). On average, the overall mandays used for turmeric cultivated accounted for 46.35 mandays.

The total average expenditure incurred by the turmeric growers was estimated to be ₹ 39300.8 and these expenditure were made on five items like input cost, daily farming expenses, transportation expenses, marketing expenses, processing expenses and hired human labour cost. Among these items, the highest expenditure was made on hired labour cost, constituting an average number of 72.30 per cent (₹28145) whereas the lowest expenditure was spent on marketing of turmeric products i.e. 0.76 per cent (₹300).

From the average 1.7167 acre of jhum land , the overall average production, which was calculated in fresh form, was 3392.33 kilogram. Some rhizomes turmeric further processed by the farmers, wherein, the average quantity of processed turmeric sold was 377.13 kilograms and earned ₹ 60700. With calculation one dried kilogram of turmeric can be obtained from an average fresh eight kilograms of turmeric rhizomes. The average fresh rhizomes quantity sold was 3392.33 kilograms and generated an income of ₹15800 from marketing the rhizomes.

The main turmeric marketing actors such as producers, rural traders, Society (Reiek Multifarming Co-operative Society and Reiek Block Turmeric Grower Society), urban commissioner and consumer were involved in the marketing system of turmeric.

Farmers: Farmers were the main grower of turmeric. The practice of farmers selling their produced to two actors in the study areas was prevalent.

In the study areas, farmers sold turmeric powder at a rate of ₹ 120 ,₹210 and ₹230 and turmeric juice for ₹ 80 per litre to the final consumers respectively. Also, the selected farmers sold fresh and powder to the rural traders. It was observed that fresh rhizomes were sold between ₹ 7 -9 per kilogram while powder form was sold for ₹ 170 per kilogram respectively to the rural traders.

Reiek Multi-farming Co-operative Society: The Society was formed in the year 2001. It was also learnt that Reiek Multifarming Co-operative Society procured driedsliced turmeric for ₹ 135 per kilogram from the farmers while fresh rhizomes from the rural traders for ₹ 13- 15 per kg The Reiek Multifarming Co-operative Society further dried the fresh soyabean and later processed the dried sliced turmeric into a fine powder at its processing unit. Packaging of turmeric powder was done by the society at the society level as well. The processed powder was supply to the urban agent at a rate of ₹210 per kilogram. From the urban agents the turmeric powder was distributed in different areas in Mizoram.

Reiek Block Turmeric Grower Society: Reiek Block Turmeric Grower Society was established in 2017 under Mission Organic Mizoram (MOM), State Government. This Society procured fresh rhizomes at ₹ 15 per kilogram from the farmers and again distributed the rhizomes to its society member for turmeric production.

Rural Traders: Rural traders were from the local village. There were three types of rural traders in marketing turmeric-1) Rural Trader sold fresh turmeric directly to the Reiek Multi-farming Co-operative Society at a profit ranged between ₹4 to 6 to the

Society as well. 2) The other rural traders further processed turmeric into a powder and sold it to the urban commissioner in *Aizawl* with a price ranged between ₹100 - ₹150 and 3) this rural trader procured powered turmeric from the farmer at ₹170 per kg and resold it to the final consumer at a rate of ₹250. There were rural traders who engaged with both Reiek Multi-farming Co-operative Society and urban commissioners.

Urban Commissioner: The urban commissioners have a market seat at the urban market(Aizawl). The urban commissioner sold the powder at a profit of ₹ 50-100 per kilogram to the final consumers.

Consumers: Consumers purchased only processed product of turmeric for household consumption. Consumers were the final actor for this value chain of turmeric. The processed powder were mostly used in curry, fried vegetable and the juice was consumed as a medicinal purpose.

Among the marketing channels identified, channel I was used by almost half of the respondents (46.67 %) to sell their fresh produced to the rural traders.

CHAPTER 7

SUSTAINABILITY OF JHUM FARMING

The economic profitability obtain through their production is of utmost necessary for the farmers in Mizoram. The practice of traditional form of farming with limited resources such as manpower, financial, farming knowledge and technology etc. cannot contribute much to profit maximization, thereby, this chapter is largely descriptive and addresses more on exploring the possible prospects of maintaining sustainability of production, sustainability of value chain, sustainability of environment and sustainability of marketing, particularly on the selected crops, for the welfare of the farmers without hampering the environment for both present and future generation

7.1. Sustainability of Environment

As already mentioned in the previous chapters, the farmers of Mizoram are engaged in jhum cultivation which includes slashing and burning of vegetation. This type of agricultural system is also practiced widely around the world such as Nepal, Philippines, Mexico and Myanmar etc. Jhum cultivation can be considered as one among the easiest to adapt and economic form of farming in the world particularly in hilly areas. In Mizoram, ordinarily, jhum land is later either left for fallow after one or two jhum farming cycle to be used again for cultivation purposes or convert this land into settled cultivation.

Though jhum cultivation has been practiced since time immemorial by our ancestors yet, recently, jhum cultivation is considered to be a major instrument/contributor towards environment deterioration. However, this section will not deal with the ecological consequences caused by such farming system but rather focus more on how production can become more sustainable/ improve for the farmers without disturbing the environment.

Earth is the only planet so far known to have an environment that can sustainlife. Environment has been defined as the sum total of all conditions and influences that affect the development and life of organisms (Asaithambi *et al*, 2008). Environment conditions are not merely given but also created by the human beings themselves. It is therefore, essential to conceive of environment in a holistic manner as the sum total of all conditions and influences-physical, biological, social and cultural- which affects the development and life of organisms on this planet. The environment is to be viewed as a dynamic system in which the sub-systems are in constant interaction with each other and undergoing continuous change (Asaithambi *et al*,2008).

The possible ways of improving jhum cultivation are discussed below:

1) Extend Cropping Period: The traditional period of cultivating on the same jhum field is generally for one to two years in Mizoram. However, with the accused potential adverse effect that shifting cultivation can cause to the environment lately, increasing the cropping phase from one or two years to

>3 years could be a way for improving shifting cultivation practices. It is because maximization of cropping period will lower the frequency of burning the jhum land, thereby, limiting harmful effect caused by farming practice and also regeneration of soil period for the abandoned plot will be longer. Meanwhile, it is of key importance to maintain efficient water and soil conservation incorporating with organic manure, mulching with organic materials and practicing crop rotation system etc to make it suitable forcontinuous cropping.

2) Practicing Alder Farming System: Alnus Nepalensis (Hriangpuii in local dialect)is native to the Burmese hills, the Himalayas to China's Yunnan, Szechuan and Kweichow provinces, and to Indochina. It has been planted extensively in the hills of northern India (West Bengal, Kashmir, and Himachal Pradesh) and Hawaii (National Research Council, 1980).Alnusnepalensis D. Don is a deciduous or semi-deciduous tree, typically about 30 m tall and with a diameter of 60 cm but on good sites it can reach 35 m and a diameter of 2 m (Joke ,2000). Though Alnus is not a legume, it is a nitrogen-fixing species and is suitable for soil improvement and rehabilitation of degraded lands (Joke,2000). Karuna karan *et al*. (2010) stated that many of the farmers in Nagaland, Kohima, Phek district have developed and practiced Alder based farming system. And this indigenous farming system like Alder based farming hold good promises, where crops are grown along with Alder and regular pruning of Alder leaf biomass in the soil for nutrient enrichment is being done. This indigenous intervention is showing good effect in increasing the yield of jhum crops.

3) Slash and Mulch: A study conducted in 2019 through project demonstration plots by

CODARD in Myanmar revealed that the practice of slash and mulch techniques has increased 40 percent of production on average. All the farmers reported the following experienced:

i) Soil quality improvement, control soil erosion, higher soil moisture content, easy land preparation (soft soil) compare to hard soil in slash and burn following technique plot.

ii) Less/fewer weed compare to slash and burn technique and easy to pull out the weed as well.

iii) Rapid crops growth and crop establishment, stronger stems, larger cobs, heavier grains, full cobs, deeper green leaves.

iv) Gender friendly especially for woman as slash and mulch technique is less work load, easy to apply and to understand, less risky, no firing involved and risk associated when individual is firing.

v) An important finding is that in the first year of application of Slash and Mulch technique, the farmers could observe a lower yield or slightly higher but after repeating the application in the next years, they could see a steady increase of the yield and soil is more humid and darker slightly after 2 years than the previous year.

4) Conversion of Community Land to Private Land: When cultivating on a community land, the cultivating period last from one to two years only. And if community land is converted into private land ownership, farmers can continue to carry farming without burning the land for many years thus, minimize the negative impact that burning of land can cause to both ecology and environment. Also, farmers can adopt any farming methods appropriate to them pertaining to man power and financial etc. availability in the household.

5) The following are some of the approaches that can be practiced as per suitability and preference of the farmer. These approaches have their own objectives and principles and even shared some common objectives like aiming for sustainable agriculture and sustainable environment :

a) Organic farming

b) Conservation agriculture

c) Agroecology

d) Low external input agriculture

e) Ecological intensification

f) Natural farming

7.2. Sustainability of Production

Improved productivity of agricultural resources through sustainable intensification plays a key role in increasing food availability and improving food security and nutrition. (FAO, IFAD and WFP, 2015). The unsustainability of Indian agriculture is caused by the modern farming methods which have badly affected/damaged production resources and the environment (Narayanan, 2005). Sustainability of production and sustainability of marketing are interlinked as production cannot be sustained without effective and efficient marketing channels. Several keys that could be able to sustain the selected crops production are mentioned below:

1) Information Dissemination through ICT: Reviewed by Duan et al. (2016) from Duan et al.(2015) to improve agriculture productivity, farmers have an ever increasing demand for information because accessing information and knowledge is essential for improving their productivity and income. Farmers could obtain agricultural related information like production technique, availability of inputs, market information, information on crops, expert advice and weather forecast etc. In addition, farmers can find solution through conventional media via internet, mobile phone, radio, television and other channels. And for this, the state government must be prompt whenfeeding information to farmers when utilizing these resources.

2) Combining Traditional Farming Practices with Modern Technology: Traditional

farming system is less costly, easy to adapt and has been practicing for many years whereby, farmers accumulate knowledge and experience in the process as well. Therefore, incorporating traditional farming practices with latest means of farming techniques into jhum farming practices could minimize the production cost, reduce farming risk and increase crop productivity.

3) Integrating Nutrient Management: The primary nutrients for plant growth are nitrogen, phosphorus and potassium. In addition to the primary nutrients, less intensively used secondary nutrients (sulfur, calcium and magnesium) are necessary as well. A number of micro nutrients but in a small amount such as chlorine, iron, manganese, zinc, copper, boron and molybdenum are required for proper functioning of plant metabolism. Organic matter content is important for the proper management of soil fertility. To achieve healthy growth and optimal yield levels, nutrients must be available not only in the correct quantity and proportion, but in a usable form and at the right time (Reddy and Shankar, 2008). Fertilizers enhance the natural fertility of the soil or replace the chemical elements taken from the soil by previous crops (www.Britanica.com). Therefore, Proper fertilization with adequate quantity is required to promote improvement of plants to grow healthy, faster, bigger, and become more productive.

4) Improving the Soil Through Organic Fertilizers: Organic matter content is important for the proper management of soil fertility. Organic matter in soil helps plants grow by improving water-holding capacity and drought – resistance. Moreover, organic matter permits better aeration, enhances the absorption and release of nutrients, and makes the soil less susceptible to leaching and erosion (Reddy and Shankar, 2008). Growing leguminous vegetables like cowpea, pea, French bean etc with heavy nutrient feeder crop like ginger and turmeric proved beneficial for maintaining the fertility of the soil (Alone et al, 2017). An important note to remember is that crops like ginger and turmeric when harvesting, soil are opened/dugged up and this soil must be covered quickly to prevent from soil erosion and nutrient loss. An identified promising organic matter sources are green manures, animals manure, vermi compost, microbial fertilizers, oil cakes and mineral fertilizers etc.

5) Efficient Pest and Disease Management: The most effective system for controlling pests can be derived only after understanding the principles responsible for the population fluctuation in the ecosystem (www.niphm.gov.in). The pest and diseases attack on crops may vary according to the crops, hence, having knowledge on the pests and diseases that attack each crops and treating the symptoms is of prime importance. In addition, using natural pesticides is more appropriate and should be encouraged and promoted as it will be less harmful for human beings. The natural fertilizers can be prepared from neem leaves, chili pepper, garlic and pyrethrum etc.

6) Managing According to the Crop: One of the most effective systems for sustainable production can be having in-depth knowledge about each crop in terms of the soil requirement, amount of nutrients required, pests population, the harmful cause by weeds, ideal sowing and harvesting period, etc ,thereby, taking care of each crop accordingly whenever is necessary as different crops need different treatments.

7) Proper Water Supplementation/Management: With the climate changing and unpredictable water availability, eventually, the soil moisture will be insufficient for the crops. And also when cultivation on the same plot for more than one jhumming cycle is practiced, water recharge will also be gradually decreased. Wherefore, it would be wise to conserve water through rain- water harvesting, collecting water from different water resources and store in a water tank or any storage system and use whenever it is required.

8) Conservation of Soil through SALT Method:

Sloping Agricultural Land Technology (SALT) otherwise known as contour hedgerow intercropping agroforestry technology (CHIAT), is a system in which dense hedgerows of fast growing perennial nitrogen-fixing tree or shrub species are planted along contour lines thus creating a living barrier that traps sediments and gradually transforms the sloping land to terraced land. SALT main objectives are to improve and maintain the soil fertility and reduce soil erosion (www.icimod.org)

Majority of the farmers in Mizoram carried out cultivation in a hilly and mountain terrain. Soil erosion is one of the problems that is being faced as the to player of soils are easily washed off due to heavy rain or blown away by wind and this can be quite challenging for farmers to cultivate crops. A project conducted by Food and Agriculture Organization (FAO) and MZU research team on MiSALT (Mizoram Sloping Agriculture Land Technology) during 2015-2017 witnessed a favourable result among the selected farmers. Wherefore, the practice of SALT is highly recommended for farmers carrying out jhum cultivation especially in hilly areas throughout the world.

9) Using Good Seeds: Small, unhealthy and misshapen seeds are short-lived and are likely to produce poor fruits. Planting only mature, diseases free and clean seeds could ensure higher yielding and healthy production of crops.

   The primary survey results shows that the sample respondents used good and quality seeds for sowing crops and continuation of such practice is further recommended.

10) Use of proper sanitation measures: Remove infected plant parts viz leaves and fruits from the ground and eliminating residues of infected plants after harvesting to prevent the disease from spreading (FAO, 2015).

11) Monitoring Management: Careful and continuous monitoring of pest and disease levels during critical times of growth of a crop is the key to successful management. This can be done through regular scouting of the field by the farmer. It helps the farmer to intervene early enough before the pest and/or disease cause significant damage (FAO, 2015).

12) Practicing Integrated Farming System: Integrated farming system (IFS) approach not only fulfills the household needs but also ensures nutritional security for both human as well as animals being. It also generates employment and earning to the rural masses specially the marginal and small farm holders, which in turn ensures a better livelihood opportunity. Integrated farming system approach not only increases income and employment opportunity but also protect the environment through recycling of the crop and animal wastes at farm itself (Arif *et al*., 2017). According to Kumar et.al(2018)the components of IFS include –

1) Agriculture – Horticulture, Forestry, Dairy, Fish farming, Duck rearing.

2) Mushroom cultivation – Sericulture, Azolla farming, Kitchen gardening, Fodder production, Nursery.

3) Seed Production- Vermiculture, Pigeon rearing, Apiary, Goat rearing,Poultry.

4) Sheep rearing- Piggery, Rabbitry, Value addition.

Das et al. (2010) reported a success story of a Tribal farmer named M. Majish Gomago from Talajang village in Tarangada G.P. of Gumma Block in Gajapati district, Orissa State. MajishGomago adopted integrating farming system and earned 7 times higher net monetary return (NMR) as compared to traditional method in 2008-09. The integrated farming system model consists of field crops (Rice, groundnut, maize, pigeonpea and ragi), horticultural crops (Yam, banana, tapioca and vegetables), vermi-composting and poultry (Banaraja breed). Integrating all these components enhanced the productivity as well as the profitability as compared to the conventional farming system.

7.3. Sustainability of Value Chain

Creation of value in every stage is vital for higher returns of remunerative for the Jhumiya people. However, value creation must not only aim for profit maximization rather it must focus on satisfying the needs of the customer through environment and social sustainability. Moreover, environment and social sustainability could also lead to financial sustainability in the long term.

The following are the potential ways of sustaining value chain:

1) Production; Strengthening production system with minimal environment impact/effect is among many factors that can sustain value chain.

2) Good Marketing Channels: Effective and improved marketing system are among factors that could sustain value chain for the farmers. Furthermore, weak market channel will lead to disappointment and compels farmers to sell off their produce to

middlemen at a lower price or even without any benefit.

3) Monetary Assistance: Financial support from the government is essential inorder to stabilize farm incomes and to cover for the yield loss due to crop failure, diseases and pests outbreak, natural calamities etc. The financial support by the government will also enable farmers to purchase input required for the farm.

4) Imparting Farming Knowledge: Providing training, demonstration and workshop to farmers related with food processing, value addition, farming with modern technology, handling diseases and pest etc will impart knowledge and skill required for strengthening the value chain. Educating the farmers with basic knowledge on how to improve the value of crop is important so that the final products are made with quality, hence satisfies customer needs and expectations.

5) Collaboration with State Government: Farmers linked with government is the best path for effective action to take place as the state government is the only large stakeholder that would currently provide better and wider marketing facilities for the farmers in Mizoram.

6) Setting Policies and Regulation: Specific polices and regulation set by the state government protecting each actor in the marketing channel is important for value chain to be strengthened and each actor can also receive fair return from their own labour especially, the producers who usually receive the least benefits from their produce.

7) Participating in Government Provided Digital Platform: Though it might not be possible to take initiate step immediately at the moment yet, nevertheless, farmers should be encouraged, guided and trained to participate in digital platform like e-NAM provided by the central government or any government recognized platform. National Agriculture Market (eNAM) is a pan-India electronic trading portal which networks the existing APMC mandis to create a unified national market for agricultural commodities (ww.enam.gov.in). Participating in such

platform will eliminate middlemen and facilitate farmers to connect better in the competitive market to earn higher return from their own crop production.

7.4. Sustainability of Marketing

From the field surveyed, it was found out that100 percent of the interviewed farmers were willing to grow a larger quantity of crops if consistent marketing channel existed. It can be understood that insofar, the monetary value is highly acknowledge by the farmers that it even compels them to strive for earning double of their productions.

To many, marketing is synonymous with advertising yet others view marketing as the act of merely selling raw commodities. Marketing may be a combination of functions involved in transferring title and moving goods from producer to consumer, including, among others, buying, selling, storing, transporting, standardizing, financing, bearing risk and supplying market information. In essence, marketing can be thought of as planning and executing a set of objectives related to bringing buyers and sellers together so that a sale can take place (Dalton et al., 2007).

One of the prerequisites for agricultural development is an efficient marketing system. Unless the farmer is able to sell his produce at a remunerative price, he will have no incentive to adopt better farm practices to increase agricultural output (Kapila 2007).

The means of maintaining the sustainability of marketing are outlined as

below:

1) Proper Cold Storage Infrastructures: Most farm products are perishable in nature: but the period of their perishability varies from a few hours to a few months (Singh and Lekhi, 2018). The farmer has to sell his produce immediately after harvesting because of the lack of storage facilities (Chhina,2009). Therefore, these selected crops require proper cold storage facilities to increase their shelf life which will enable the farmers to earn more income during on and off season. And also helps farmers to eliminate crop spoilage, wastage and avoids farmers either from selling their produce at alow price or bearing huge post-harvest loss.

2) Proper Transportation Facilities: Transport is an important factor for efficient agricultural marketing. From the primary data collected, it was noticed that the common transportation vehicles employed for transporting harvested crops from the farm to home were motorcycle, scooter and motor in the study areas. Further, it was also learnt that only few farmers were found to have owned motor vehicles while some farmers owned either motorcycle or scooter in the study areas. Due to a limited carrying capacity that these common vehicles can offer, a large portion of the farmers were compelled to hire transportation facilities like available pick-up in the village for bulk transport and marketing to home and to different areas. As a result, transportation cost directly or indirectly reduced their earnings from their own crop productions. Thus, it is desirable that the state government would arrange transportation facilities with minimum charges to make an easier farming life for the farmers.

3) Good Road Condition: Poor road condition effects farmer's ability to collect crops from their farm particularly during harvesting period in some selected villages. Also, during monsoon season, due to poor road condition and natural calamities mainly landslides, roads are often blocked. This interrupt the movement of goods to other places for marketing purposes thus, farmers bear loss due to high perishability of the crops. Hence, better road infrastructure would help farmers to achieve optimum production and can also act as a goodincentive for producer to grow more crops.

4) Less Intermediaries: Middlemen usually offer lower prices to farmers and consequently, reduce the return of the farmers. Multiple middlemen involvement in marketing impedes the privilege that a farmer will receive from their production. Therefore, minimizing intermediaries interference will provide more financial benefits to the producers.

5) Formation of Effective Farmers Society: Producers organization group are mainly formed to pursue/achieve common interest to harness technical and economic / related with agricultural activities. Furthermore, creation of farmer society will enable farmers to have a better bargaining/ negotiation power to obtain a better price from their own production to middlemen and will also be less prone to malpractices

and exploitation from the intermediaries.

From the primary field survey, it was understand that chilli grower society of Mualpheng village sold their production mostly as per the price set by the local middlemen. This indicates that the grower society has weak bargaining power against the local middlemen. Therefore, it is important that a grower society is adamant in price fixation against intermediaries and it must also seek any other possible profitable channels so that it can generate more income and make a better and effective society for its members.

6) Prioritizing Human and Environmental Health: Of late, end user of crops are becoming health concern and the demand for organic crop is increasing. Therefore, it is important to practice organic farming so as to meet thecustomer needs and stay in the competitive market for a much longer period as well.

7) Good Quality of Production: Good quality of crops attracts customer even ifthe price of the product is high. Hall and Palma (https://aggie-horticulture.tamu.edu) stated that marketing does not begin after a crop is produced. Instead, marketing alternatives need to be considered even before production takes place. Factors like good quality seeds, using organic nutrients to the soil, control pest regularly, control unwanted weeds growth regularly etc can contribute towards attaining good quality of production.

8) Efficient Function of Marketing: Crops are perishable in nature and are more prone to price fluctuation, therefore, efficient marketing system is required for the producers. The marketing system may be different according to the crops, however, the involvement/ intervention of the state government in marketing such produce is crucial as it is the only agent which can create sustainable linking channels with other agents (Acharya and Agarwal,2016) stated that marketing is not only an economic link between the producers and the consumers; it maintains a balance between demand and supply. The objectives of price stability, rapid economic growth and equitable distribution of goods and services cannot be achieved without the support of an efficient marketing system.

Chapter Summary:

The various possibility of Sustainability of environment are through practicing Alder farming system, slash and mulch farming system, organic farming system, conservation agriculture system, agroecology farming system, low external input farming system, ecological intensification also natural farming system. Also extending the cropping jhum period and conversion of community land to private land will contribute to sustainability of environment.

Sustainability of production can be achieved from information dissemination through ICT, combining traditional farming system with modern technology, integrating nutrient management, improving soil through application of organic fertilizers, efficient pest and disease management, management of crops according to the various requirement of nutrients, right time of sowing and right time of harvesting, proper water management, conversion of soil through SALT method, using good seeds, using proper sanitation measures, proper monitoring management and practicing integrating farming system.

Value chain can be sustained by strengthening production system, good marketing channels, monetary assistance from the state government, imparting farming knowledge, collaboration with state government, setting policies and regulation by the government and participating in Central government provided digital platform.

Agricultural marketing is essential for farmers as it is the primary source of income for majority of the selected farming households. Therefore, the different possible ways of making marketing sustainable for the farmers are providing proper cold storage infrastructure by the state government, arrangement of good transportation facilities for the farmers, providing good road condition, involvement of less intermediaries, formation of effective farmers society, prioritizing human and environmental health, good quality of production and efficient function of marketing.

CHAPTER 8

NUTRITIONAL INFORMATION OF THE CROPS UNDER STUDY

Proper nutrition contributes to human development; it helps people realize their full potential (FAO,IFAD and WFP, 2015). Jhum cultivation is the main source of food and nutrition that helps to maintain a balanced diet for jhum practicing households (Rath, 2015). Farming in Mizoram is labour intensive and hence, it is important that farming men and women who actually carry out manual work must meet their nutritional requirement so as to be able to perform farming task at hand energetically. This chapter will provide related information on both the component of nutrition and uses of the selected crops thus, help us to learn about the nutrition received by farming households through their consumption of each cultivated crops.

8.1. Introduction

Man's basic drive is for food to satisfy his hunger. Food is intimately woven into the physical, economic, psychological, intellectual and social life of man. It is a part of his culture and is filled with many different meanings and symbolisms for all individuals at various ages and stages of their maturity. Agricultural produce, such as cereals, pulses, fruits and vegetables, and reared animals for slaughter, milk, eggs, etc., are foods or food raw materials. Food is a more basic need of man than shelter and clothing. It provides adequately for the body's growth, maintenance, repair and reproduction. Food furnishes the body with the energy required for all human activities—it provides materials required for the building and renewal of body tissues and the substances that act to regulate body processes (Manay and Shadaksharaswamy,, 2021).

Roday (2018) Food does much more than keeping us alive and healthy. It adds pleasure to life. We enjoy the flavours, aromas, colours, and textures of different cuisines. The kind of food that people eat, varies widely from one country to another and also within the country. This may be because of geographic reasons affecting the availability of certain foods. The difference in what people consume depends on a number of reasons such as geographic reasons, economic reasons, religious reasons, customs, education, social reasons, health and other factors.

8.2. Definition

Food is fundamental to life, as vital as the air we breather and the water we drink (SAPEA,2020). Food is a more basic need of man than shelter and clothing. It provides adequately for the body's growth, maintenance, repair and reproduction. Food furnishes the body with the energy required for all human activities- it provides materials required for the building and renewal of body tissues and the substances that act to regulate body processes (Manay and Shadaksharaswamy,, 2021).

8.3. Food

Food can be defined as anything solid or liquid which when swallowed, digested and assimilated, nourishes the body (Srilakshmi, 2018).

Food can also be defined as any substance which nourishes the body and is fits to eat. It may be solid or liquid (Roday, 2018).

8.4. Nutrition

Harbolic Betty Kovacs (www.emedicinehealth.com) cited from Council on Foods and Nutrition (1963) defined that Nutrition is the science of food, the nutrients, and other substances therein, their action, interaction, and balance in relation to health and disease and the processes by which the organism ingests, digests, absorbs, transports, utilizes, and excretes food substances.

It is a combination of processes by which the human body receives and utilizes nutrients which are necessary for carrying out various functions and for the growth and renewal of its components (Roday, 2018).

8.5. Importance of Nutrition

Nutrition plays a critical role in human resource development since deficiencies in essential nutrients lead to malnutrition, which affects an individual's mental and physical state, resulting in poor health and poor work performance (www.fao.org)

8.6. Nutrients

Nutrients are the constituents in food that must be supplied to the body in suitable amounts. These are proteins, carbohydrates, fates, minerals, vitamins, water and roughage (Education Planning Group, 1993).

Nutrients are the chemical substances present in food, which the body needs to carry out is functions. Nutrients are the essential constituents of food that are required by the body in suitable amounts. Food is the source of all nutrients, except vitamin D (Roday,2018).

8.7. Classification of Nutrient

Roday (2018) mentioned in his book that based on their requirement in the body, nutrients are divided into two major groups- The *macronutrients* and the *micronutrients*. Most of the wight of the food we eat is that of proteins, carbohydrates, fats, and water. These are the macronutrients. Vitamins and minerals are required in minute amounts and are also present in food in very small quantities. They are classified as micronutrients. Both macronutrients and micro-nutrients are equally important for good health, and one cannot enjoy good health without including all nutrients in the diet. The requirement for macronutrients is in grams, while the requirement for micronutrients is in milligrams and micrograms.

8.8. Household Consumption and Nutritional Information

An overall picture of Household consumption of crops in percentage by the sample respondents is presented in Table 8.1.

It is apparent from Table 8.1 that out of 180 sample respondents most of the farmers (63.33 %) have reported to consumed “between 1 to 2 per cent” of their own production, while 26.7 per cent consumed “less that 1 per cent” of their crop production. Another 23 per cent were consuming “between 4 to 5 percent” of their total crop production. Moreover, the lowest number belonged to the category of farming household consuming “between 4 to 5 percent” of their annual production.

Table 8.1: Household Consumption of Crop Production

Particulars		Chilli Farmers	Ginger Farmers	Maize Farmers	Soyabean Farmers	Sugarcane Farmers	Turmeric Farmers	Total
		Frequency						
< 1	%	8	27	2	12	4	19	72
1-2	%	19	1	8	14	17	9	68
2-3	%	3	1	4	3	6	1	18
3-4	%	-	-	3	1	2	1	7
4-5	%	-	-	4	-	-	-	4
>5	%	-	1	9	-	1	-	11
Total		30	30	30	30	30	30	180
		Percent						
< 1	%	26.67	90	6.67	40	13.33	63.33	40
1-2	%	63.33	3.33	26.67	46.67	56.67	30	37.78
2-3	%	10	3.33	13.33	10	20	3.33	10
3-4	%	-	-	10	3.33	6.67	3.33	3.89
4-5	%	-	-	13.33	-	-	-	2.22
>5	%	-	3.33	30	-	3.33	-	6.11
Total		100	100	100	100	100	100	100

Source: Field Survey , 2016-2017

From the field survey, it was learnt that crops such as sugarcane, turmeric and soyabean were regularly consumed more in a processed product whereas ginger and maize were consumed more in a fresh form. Among the selected crops, chilli can be considered as the only crop which was both widely and equally consumed in the form of both fresh and processed in the study areas.

The intake of all the selected crops can be as regular as a daily basis to even just a one time consumption in a week ,therefore, the frequency of consumption of the selected crops may vary from crop to crop and household to household.

8.8.1. Chilli

8.8.1.1 Nutritional Value

Chillies are very high in vitamins A and C, E, K and B6, and contain capsaicin (in varying amounts), carotenoids and steroidal and saponins (Hartvig, 2016). Dehydrated green chilly is a good source of vitamin 'c' (www.indianspice.com). Chilli is a rich source of vitamin A and C. The crude fibre content varies from 22.9 to 31.0 % (Nybe *et al*., 2021) . The vitamin C content depends on the variety, locality and stage of maturity of the fruits. The green chillies contain 111 mg and dry chillies 50 mg of the vitamin per 100 g. The vitamin A content of green and dry chillies are, respectively, 454 and 576 IU per 100 g (Manay and Shadaksharaswamy,2021).

Green chilli fruits contain slightly lesser vitamin C than the red ones. Chilli is also a rich source of folic acid. One green chilli fruit has approximately 10 micograms of folic acid, which is one-tenth of the daily requirement (Dhaliwal, 2017).

8.8.1.2. Health Benefits

Chilli is sharp, hot, stimulating, and helps in digestion. It develops blood and causes the formation of bile in the body. It is a recommended diet in cholera. It also eliminates worms in the intestines and causes inflammation. It destroys phlegm, and gives relief from pain. It is beneficial in loose motion. Dry chilli is considered to be an eliminator of flatulence.(NIIR Board of Consultants and Engineers, 2013).

As a medicine it is used as an counter irritant in Lumbago, Neuralgia, and Rheumatic disorders. Capsicum has a tonic and carminative action. Taken inordinately it may cause gastro-enteritis. The enzyme isolated from chilly is used in the treatment of certain type of cancers. Oleoresin capsicum is used in pain balms and vaporubs (www.indianspice.com). Medicinal uses of chilli also include treatment of asthma, coughs and sore throats. Oleoresin, comprising both the red colouring pigment and the pungency compound, is a strong antioxidant and are used by the pharmaceutical industry. Capsaicin is used as a counter-irritant balm for external application. Non-conventional uses of chilli are in self-defense especially by the military and paramilitary personnel for temporarily immobilizing the enemy (Dhaliwal, 2017).

8.8.1.3. Uses

As mentioned by NIIR Board of Consultants and Engineers (2013) the four uses of chilli are shown as under:

1. If powdered red chilli is applied to the part affected by a dog bite, immediately it minimizes the affect of the poison. It also acts as an antiseptic by preventing the information of puss in the wound.

2. Boil water, mixed with one spoonful of powdered chilli and one spoonful of salt in it. If this hot solution is drunk, it is beneficial in cholera.

3. Boil water, in which powdered red chilli has been mixed, sprinkle this water on those areas where bed bugs are present, bed bugs will be eliminated.

4. When seeds of chillies are swallowed with hot water, then the stomach ache due to cold, gets vanished.

8.8.1.4. <u>Respondents' Consumption Pattern</u>

Table 8.2 indicates the difference household consumption pattern of their own production of chilli.

From the field survey, it was identified that chilli consumption percentage constituted only three groups viz. "less than 1 per cent", "between 1 to 2 per cent" group and " between 2 to 3 percent group". The highest number accounted for 63.33 per cent farming households with consuming percentage between 1 to 2 followed by less than 1 per cent consuming own household production (26.67 %) and between 2 to 3 consuming household production (10 %)

Table 8.2: Household Consumption of Chilli Crop Production

Particulars	Frequency						
	< 1 %	1-2 %	2-3 %	3-4 %	4-5 %	> 5 %	Total
Mualpheng	6	3	1	-	-	-	10
Sailulak	1	9	-	-	-	-	10
Thingsai	1	7	2	-	-	-	10
Total	8	19	3	-	-	-	30
Percent							
Mualpheng	60	30	10	-	-	-	33.33
Sailulak	10	90	-	-	-	-	33.33
Thingsai	10	70	20	-	-	-	33.33
Total	**26.67**	**63.33**	**10**	**-**	**-**	**-**	**100**

Source: Field Survey, 2016-2017

Chillies were consumed both in raw/fresh and processed form in the study areas. Moreover, it was learned that fresh chillies were more frequently consumed during the harvesting period as compare to processed chilli. Chillies are pretty much a necessity and are regularly included in every meal by majority of the cultivating households. Chillies (fresh and dried ground) are commonly added to chutney, Mizo bai (vegetable stew/ vegetables with meat stew etc), curry etc in order to give spicy flavor to food. Chillies were also consumed as itself in fresh form in the study areas.

8.8.2. Ginger

8.8.2.1. Nutritional Value

The nutrient composition of fresh ginger are Protein (2.3%), Fat (0.9%), carbohydrates (12.3%), mineral (1.2%), fiber (2.4%) and moisture (80.9%). Minerals like phosphorous, calcium, and iron present in ginger are iron, calcium and phosphorous. It also contains vitamins such as thiamine, riboflavin, niacin and vitamin C (Bag, 2018). Raw ginger is also rich in volatile oil and contains phenols, vitamin C and B6, magnesium, potassium and copper (Hartvig,2016).

Ground ginger contains calcium, potassium, phosphorus, magnesium, sodium, niacin, vitamin A and manganese (NIIR Board of Consultants and Engineers, 2013)

8.8.2.2. Uses

Few uses of ginger mentioned by NIIR Board of Consultants and Engineers (2013) are given below:

1. Dry ginger is mainly used as spice in the preparation of vegetables of called to increase the flavor of the tea.

2. If dry ginger is crushed in water and given to children suffering from loose motion after mixing some honey into it they get relief from loose motions and pains in the stomach.

3. A mixture made of dry ginger, cassia leaves and sugar cures cold.

4. If a solution of dry ginger is taken daily it increases the radiance, gives nourishment to the body.

5. If three grams of dry ginger crushed in goats milk is given to a pregnant woman, it cures her unstable and uneven fever.

6. Dry ginger paste mixed with turmeric powder and raw sugar cures the emanation of uncontrolled semen and also emanation through urine.

8.8.2.3. Health Benefits

For centuries, ginger has been taken to ease rheumatic complaints and modern evidence confirms that it has an anti-inflamatory effect and may also lower blood pressure. It can aid slimming if taken as a hot drink with food because, as well as giving a sense of fullness, it enhances the thermic effect of food, reducing feelings of hunger. Widely used as a digestive aid, ginger can also be effective for motion sickness and nausea, it makes a warming drink and is thought to improve circulation (Hartvig , 2016).

Traditional ayurvedic practitioners refer dry ginger as “medicine for stomach”. Dry ginger eliminates phlegm, gives relief from stomach ache and cures broken voice due to sore throat (NIIR Board of Consultants and Engineers, 2013). Ginger is an effective home remedy for cough, cold and sore throat. It has anti-histamine property which helps in treating allergies. Also, ginger is known to inhibit airway contraction and help stimulate the secretion of mucus (thehealthsite.com).

8.8.2.3. Respondent’s Consumption Pattern

The sample households consumption of ginger according to the category is revealed in Table 8.3.The details of household consumptions percentage of Ginger from Table 8.3 illustrates that vast majority (90 %) consumed “less than 1 per cent” of their total household production whereas an equal percentage of only 3.33 were found to have consumed “between 1 to 2 per cent” and “above 5 per cent” respectively of their own ginger production.

Table 8.3: Household Consumption of Ginger Crop Production

Village	Frequency						
	< 1 %	1-2 %	2-3 %	3-4 %	4-5 %	> 5 %	Total
Lungphun	8	-	1	-	-	1	10
Khawruhlian	9	1	-	-	-	-	10
Chawngtlai	10	-	-	-	-	-	10
Total	27	1	1	-	-	1	30
Percent							
Lungphun	80	-	10	-	-	10	33.33
Khawruhlian	90	10	-	-	-	-	33.33
Chawngtlai	100	-	-	-	-	-	33.33
Total	**90**	**3.33**	**3.33**	**-**	**-**	**-**	**100**

Source: Field Survey, 2016-2017

Itcan also be highlighted that 100 per cent of Chawngtlai village respondents consumed “less than 1 per cent” of their household production.

From the field survey, it was found that ginger was consumed right from blooming of the green flower till maturity of the ginger by the selected farming households. Ginger was used in cooking so as to enhance the flavor and give aroma. Green ginger flower, baby ginger and matured ginger are mostly mixed with different vegetable or leafy vegetables to prepare what is known as “*Mizobai*”i.e vegetables stew/ vegetables with meat. Baby/ young and matured ginger were also added to curry, chutneys etc and also consumed as itself by slicing into smaller form.

8.8.3. Maize

8.8.3.1. Nutritional Value

Huma et al (2019) cited from chaudhary Maize grains have great nutritional value as they contain 72% starch, 10% protein, 4.8% oil, 8.5% fibre, 3.0% sugar and 1.7% ash. Maize contains 8–11% of protein that is made from different components like albumin, globulin, non nitrogen substance, prolamin, etc (Bathla et al, 2019). Maize is a good source of carotene. It also contains thiamine and folic acid in appreciable amounts. Maize is like any other cereal, rich in calories and is used in supplementary nutrition programmes and integrated Child Development Services programmes to feed malnourhised children (Srilakshmi, 2018).

Cited by Kumar and Jhariya (2013) from Breadley (1992) Maize serves as a good source of carbohydrates and contains vitamin A, vitamin C, vitamin K, vitamin B1 (thiamine), vitamin B2 (niacin), vitamin B3 (riboflavin), vitamin B5 (pantothenic acid) and vitamin B6 and selenium. Maize has higher content of protein and fat as compared to other cereals. Corn silk contains maizeric acid, fixed oils, resin, sugar, mucilage, salt and fibres essential for our diet.Phytochemical secondary metabolites such as saponin, allantoin, sterol, stigmasterol, alkaloids, hordenine and polyphenols are found in leaves, seeds and corn silk.

8.8.3.2. Health Benefits

Cited by Kumar et al. (2016) from Kumar and Jhariya (2013) mentioned that Maize has various health benefits. The B-complex vitamins in maize are good for skin, hair, heart, brain, and proper digestion. They also prevent the symptoms of rheumatism because they are believed to improve the joint motility. The presence of vitamins A, C, and K together with beta-carotene and selenium helps to improve the functioning of thyroid gland and immune system. Potassium is a major nutrient present in maize which has diuretic properties. Maize silk has many benefits associated with it. In many countries of the world such as India, China, Spain, France and Greece it is used to treat kidney stones, urinary tract infections, jaundice, and fluid retention. It also has a potential to improve blood pressure, support liver functioning, and produce bile. It acts as a good emollient for wounds, swelling, and ulcers. Decoction of silk, roots, and leaves are used for bladder problems, nausea, and vomiting, while decoction of cob is used for stomach complaints.

8.8.3.3. Respondent's Consumption Pattern

As the field survey presented in Table 8.4, about 30 per cent of the total maize respondents noted to have consumed "more than 5 percent" of their own maize production while 26.67 per cent reported having consumed "between 1 to 2 per cent" from their total maize production.

Table 8.4: Household Consumption of Maize Crop Production

Village	Frequency						
	< 1 %	1-2 %	2-3 %	3-4 %	4-5 %	> 5 %	Total
Sesawng	-	4	2	-	1	3	10
Sihfa	-	1	1	1	1	6	10
N.Kawnpui	2	3	1	2	2	-	10
Total	**2**	**8**	**4**	**3**	**4**	**9**	**30**
Percent							
Sesawng	-	40	20	-	10	30	33.33
Sihfa	-	10	10	10	10	60	33.33
N.Kawnpui	20	30	10	20	20	-	33.33
Total	**6.67**	**26.67**	**13.33**	**10**	**13.33**	**30**	**100**

Source: Field Survey, 2016-2017

An equal percentage of 13.3 consumed “between 2 to 3 per cent” and “ between 4 to 5 per cent” from their household maize crop production respectively.

Boiled, roasted, fried were the main formed widely consumed by the farming households in the study areas viz. Sesawng village, N. Kawnpui Village and Sihfa village. A few respondents also consumed maize as in popcorn. Among the 30 respondents, there were 6.67 percent using maize as poultry and piggery feeds. The frequency of consumption varies greatly from household to household. It was also found out from the surveyed that, some of the maize producing households did not consume much of what they produced perhaps mainly due to abundant availability of the crop in the household.

8.8.4. Soyabean

8.8.4.1. Nutritional Value

Soyabean oil has considerable nutritional importance. It has both n-6 and n-3 fatty acids. It is a good source of vitamin E (Srilakshmi, 2018).Soya bean can be considered as one of the best sources of plant-based protein. Soyabean composed of high protein, fiber, fat, sugar, carbs, vitamins and minerals.

Hassain (2011) cited from Liu (1997) mentioned that dry soybean contain 36% protein, 19% oil, 35% carbohydrate (17 % of which dietary fiber), 5% minerals and several other components including vitamins.

8.8.4.2. Health Benefits

Soy is used for high cholesterol, high blood pressure and preventing diseases of the heart and blood vessels. It is also used for type 2 diabetes, asthma, lung function and all type of cancers (lung cancer, endometrial cancer, prostate cancer and thyroid cancer) as well as preventing weak bone (osteoporosis) slowing the progression of kidney diseases. Other uses of soyabean includes treating constipation and diarrhea, as well as decreasing protein in the urine of people with kidney disease, improving memory and treating muscle soreness caused by exercise. Women use soy for breast pain, preventing breast cancer, preventing hot flashes for breast cancer, menopausal symptoms and premenstrual syndrome (PMS). Soy foods are rich source of high quality protein. Soy provide the some quality protein as meat, milk and eggs. Often with less saturated fat and bad cholesterol. When chose in place of animal based proteins, soy offers other health advantages as well (Bolla , 2015).

8.8.4.3. Respondent's Consumption Pattern

As provided in Table 8.5, Soyabean sampled households of 47 percent were reported that they had consumed between "1 to 2 per cent" of their own crop production. However, there were only 3.3 per cent, constituted by Kepran Village respondent, reported to have consumed "above 5 per cent" of their total annual production.

Table 8.5: Household Consumption of Soyabean Crop Production

Village	Frequency						
	< 1 %	1-2 %	2-3 %	3-4 %	4-5 %	> 5 %	Total
Kepran	1	6	2	1	-	-	10
Ngopa	2	7	1	-	-	-	10
Chhingchhhip	9	1	-	-	-	-	10
Total	12	14	3	1	-	-	30
Percent							
Kepran	10	60	20	10	-	-	33.33
Ngopa	20	70	10	-	-	-	33.33
Chhingchhhip	90	10	-	-	-	-	33.33
Total	**40**	**46.67**	**10**	**3.33**	**-**	**-**	**100**

Source: Field Survey, 2016-2017

On the basis of data from field survey, it was noted that soyabean was consumed more in a processed form among theinterviewed farmers. These processed product are mainly of two types viz.*bekang um* and *bekangro/rep*. *Bekang um* is an indigenous fermented product of soya bean and bekang rep/ro is the again value added product of *bekang um*. In the study areas, these processed products were commonly added to chutney, mizo bai or can be consumed as itself as a side dish in each meal. Another way of consuming soyabean by the farmers was preparing soyabean into curry form. Cooked soyabean water was even consumed as per desire in the study areas.

8.8.5. Sugarcane

8.8.5.1. Nutritional Value

1) Sugarcane Juice

Mahata 2020) cited from Mahata (2019) stated that sugarcane contains high amount of Vitamin B1, Vitamin B2, Vitamin B6, Vitamin C and inorganic salts such as iron, phosphorus, calcium and organic acids such as fumaric acid, succinic acid, citric acid and malic acid.

Sugarcane juice also comprises high concentration of magnesium, potassium and manganese, vitamin A, vitamin B1, vitamin B2, vitamin B3, vitamin B5, vitamin B6, vitamin C, and E. About 100 ml of sugarcane juice contains 39 calories of energy and 9 g of carbohydrates (Chinnadurai,2017).

2) Jaggery

Singh and Shrivastava (2020) cited from Ghosh et al. (1998) have described the chemical composition of jaggery made from sugarcane. A 100 g of jaggery, having a pH around 5.8–6.4, contains 65–80 g sucrose, 9–12 g reducing sugars, 0.705 g fats, 0.35–0.40 g proteins and 0.5–1.0 g ash contents. Among nutrients, it contains 390–400 mg Ca, 80 mg Mg, 340 mg of chlorides, 500 mg of sulphates and 45 mg of phosphates. It contains 570 mg of N (which contains 14 mg protein N). Among micronutrients, it contains iron (Fe) and copper (Cu) to the tune of 11.06 and 0.767 mg/100 g, respectively. Among vitamins, it contains 280, 20 and 1 μg of vitamins A and B and nicotinic acid, respectively.

Also cited by Dutta el al. (2015) from Sahu and Paul (1998)mentioned that Jaggery is rich in important minerals like Calcium-40-100 mg, Magnesium-70-90 mg, Potassium-1056 mg, Phosphorus-20-90 mg, Sodium-19-30 mg, Iron-10-13 mg, Manganese-0.2-0.5 mg, Zinc-0.2- 0.4 mg, Copper-0.1-0.9 mg, and Chloride-5.3 mg per 100 g of jaggery), vitamins (viz., Vitamin A-3.8 mg, Vitamin B1-0.01 mg, Vitamin B2- 0.06 mg, Vitamin B5-0.01 mg, Vitamin B6-0.01 mg, Vitamin C-7.00 mg, Vitamin D2-6.50 mg, Vitamin E-111.30 mg, Vitamin PP-7.00 mg), and protein-280 mg per 100 g of jaggery, which can be made available to the masses to mitigate the problems of mal nutrition and under nutrition. The micronutrients present in the jaggery possess antitoxic and anti-carcinogenic properties.

8.8.5.2. Health Benefits

1) Sugarcane Juice

Mahata (2020) cited from Mahata (2019) sugarcane can be consumed as an energy drink, prevent cancer-especially prostate and breast cancer as flavonoids in sugarcane juice inhibits the growth of cancer cells in the milk glands and safe against pregnancy.

It is proven that regular consumption of sugarcane juice is effectively fighting against cancer, especially prostate and breast cancer. Studies established that sugarcane juice protects against tooth decay and bad breath due to its high mineral content. Deficiency of nutrients in the body can easily be recovered by including sugarcane juice in our diet. Febrile disorder is quite common in infants and children resulting in fevers, which can lead to seizures and loss of proteins in the body. Sugarcane juice helps in compensating the lost protein and helps in recovery. Alpha hydroxy acids help fight acne, reduce blemishes, prevent ageing, and keep the skin hydrated. One of the most effective alpha hydroxy acids is glycolic acid and is present in sugarcane and considered as one of its few natural sources. Even though sugarcane juice has many advantages, it is also important to consume the juice as soon as it is extracted because it tends to get oxidized within 15 min. As it is rich with medicinal values, sugarcane juice is considered as a miracle drink (Chinnadurai, 2017).

Mahata (2020) said that sugarcane is used to prevent several diseases mainly jaundice, constipation and stomach burn, heart and kidney diseases and also use as digestive tonic. Apart from the above benefits, in COVID 19 Pandemic situation, the most important benefits of sugarcane juice consumptions are:

1. Improve immunity: As it is rich in antioxidants, sugarcane juice is very important in boosting immunity. This drink works against diseases such as digestive diseases and liver problems. In addition, these antioxidants are also useful for neutralizing bilirubin.

2. Treating Sore Throat: Feeling itchy in the throat, you can drink a glass of sugarcane juice that has been mixed with black salt. The high vitamin C content is a strong reason for treating sore throats.

2) Jaggery

Dutta et al. (2015) Jaggery has moderate amount of calcium, phosphorous and zinc, so it helps to optimum health of a person along with all its benefits, purifies the blood and prevents rheumatic afflictions and bile disorders and thus helps to cure jaundice.

Mahata G (2020) Jaggery is popularly known as the “Medicinal Sugar”. It has been used as a sweetener in Ayurvedic medicine for 3000 years. Indian Ayurvedic medicine considers jaggery to be beneficial in treating throat and lung infections. Since Jaggery is rich in many vital vitamins and minerals, jaggery boosts immunity, keeps the body warm, helps treat cold and cough and controls the temperature of the body. Jaggery consumption is helpful to prevents constipation, anaemia and boosts intestinal health and controls blood pressure and many more. Apart from the mentioned benefits, in COVID 19 Pandemic situation, the most important benefits of jaggery consumptions are:

1. Treats flu-like symptoms: Fight symptoms of a cold and cough with the help of gur. All you need to do is mix it with warm water and drink up, or even add it in your tea instead of sugar to reap the benefits. Jaggery produces heat in the body, which is why generally people consume it in winters. The warming effect in jaggery makes it an amazing sweet that can treat cold and flu.

2. Boosts immunity:Jaggery is loaded with antioxidants and minerals such as zinc and selenium, which in turn help prevent free-radical damage and also boost resistance against infections. Jaggery also helps increase the total count of haemoglobin in the blood.

3. Prevents respiratory problems: By consuming jaggery regularly, you can prevent many respiratory problems such as asthma, bronchitis, etc. Experts recommend eating this natural sweetener with sesame seeds for wonderful benefits for the respiratory system.

8.8.5.3. Respondent’s Consumption Pattern

Distribution of the sample sugarcane households according to their own household consumption is presented in Table 8.6.

Table 8.6 reveals that more than half (56.67 %) of the survey respondents had reported to have consumed between “1 to 2 per cent” of their total household crop production while 20 per cent producers reported having consumed between “2 to 3 per cent” of their production.

Table 8.6: Household Consumption of Sugarcane Crop Production

Village	Frequency						
	< 1 %	1-2 %	2-3 %	3-4 %	4-5 %	> 5 %	Total
N.Lungleng	-	8	1	-	-	1	10
Phulpui	2	3	3	2	-	-	10
Khawlailung	2	6	2	-	-	-	10
Total	4	17	6	2	-	1	30
Percent							
N.Lungleng	-	80	10	-	-	10	33.33
Phulpui	20	30	30	20	-	-	33.33
Khawlailung	20	60	20	-	-	-	33.33
Total	**13.33**	**56.67**	**20**	**6.67**	**-**	**3.33**	**100**

Source: Field Survey, 2016-2017

Only 3.3 percent, belonged to N. Lungleng respondent, was found to consume "more than 5 per cent" of total production.

Jaggery is the main form of consumption by the selected farming household viz N. Lungleng village, Phulpui village and Khawlailung village. Sugarcane juice is also consumed by the farmers but at a lower rate.

The frequency of consuming jaggery is daily, especially in winter season. Jaggery is usually served with unsweetened red/black tea or milk teain the study areas. In the case of sugarcane juice consumption, the juice was consumed mostly at the first stage of processing i.e. during the crushing of sugarcane for juice extraction for preparing jaggery.

8.8.6. Turmeric

8.8.6.1. Nutritional Value

Turmeric contains high levels of curcumin, as well as sterols, resins and volatile oils. It is rich in vitamins C, B3 and B6, and also magnesium, manganese, potassium, copper, iron zinc and omega-6 fatty acids (Harvig, 2016) sodium, phosphorus and calcium (NIIR Board of Consultants and Engineers, 2013). Stated by Aggarwal and Prasad (2011) from Balakrishnan (2007) Nutritional analysis showed that 100 g of turmeric contains 390 kcal, 10 g total fat, 3 g saturated fat, 0 mg cholesterol, 10 mg sodium, 2500 mg potassium, 47.5 mg iron, 0.9 mg niacin, 50 mg ascorbic acid, 69.9 g total carbohydrates, 21 g dietary fiber, 3 g sugars, and 8 g protein.

8.8.6.2. Health Benefits

The medicinal value of turmeric is recognized since time immemorial in the Indian system of medicine. It is an ingredient in the preparation of medicinal oils, oinments and: poultices. A decoction of turmeric is considered an excellent cooling eye wash to relieve catarrh. Turmeric is considered a carminative, tonic, blood purifier, vermicide and an antiseptic. It prescribed for the treatment diabetes and leprosy and to relieve sore throat and common cold. The juice of the raw rhizomes is used as an anti-parasitic against many skin infections. Burnt turmeric used as tooth powder relieves dental troubles. The essential oil of turmeric is antiseptic. It is used in treating gall stones and gall complaints. The antimicrobial properties of essential oil from turmeric are reported against pathogenic, bacteria and fungi (Kandiannan and Parthasarathy,2007).

Turmeric is ubiquitous in Ayurvedic cooking. It contains the flavonoid curcumin, which is known to have anti-inflammatory properties. This all-around

wonder spice helps detoxify the liver, balance cholesterol levels, fights allergies, stimulate digestion, boost immunity and enhance the complexion. It is also an antioxidant. Ayuveda recognizes it as a heating spice, contributing bitter, pungent and astringent tastes. It combines well with other spices such as cumin, coriander, cayenne pepper and cinnamon (NIIR Board of Consultants and Engineers, 2013). Turmeric is used in the preparation of medicinal oils, ointments and poultice. It is stomachic, carminative, tonic, blood purifier, vermicide and an antiseptic. It is used in cosmetic preparations. Curcumin is an antioxidant and finds application in modern drugs for cancer therapy (Nybe *et al*, 2021).

8.8.6.3. Uses

Several uses of turmeric highlighted by NIIR Board of Consultants and Engineer (2013) are the following:

1. Turmeric powder mixed with powdered black pepper dissolved in hot milk, cures malaria.
2. Heat the mixture of turmeric powder and milk and then add a pinch of salt and sugar and give it to the children suffering from cough.
3. Turmeric powder and ghee mixed in hot milk, cures cough by clearing out the phlegm.
4. Honey and turmeric powder mixed in the juice of *Emblicamyrobalan* (amla) cures the emanation of puss through urine.
5. Twelve grams of turmeric powder mixed with 48 grams of curd, if taken for few days, cures jaundice. It is also beneficial in liver problems.
6. A paste made of turmeric powder and limestone, if applied on swelled part of the body caused by severe hurt or blow, gives relief from pain.
7. Applying heated turmeric powder could reduce the swelling and the pain

from scorpion stung.

8.8.6.4. Respondent's Consumption Pattern

It is noted from table 8.7 that the highest consuming group (63 %) was found to have consumed "less than 1 per cent" of their total production.

Table 8.7: Household Consumption of Turmeric Crop Production

Village	Frequency						
	< 1 %	1-2 %	2-3 %	3-4 %	4-5 %	> 5 %	Total
Ratu	2	6	1	1	-	-	10
Reiek	7	3	-	-	-	-	10
West Phaileng	10	-	-	-	-	-	10
Total	19	9	1	1	-	-	30
Percent							
Ratu	20	60	10	10	-	-	33.33
Reiek	70	30	-	-	-	-	33.33
West Phaileng	100	-	-	-	-	-	33.33
Total	6.33	30	3.33	3.33	-	-	100

Source : Field Survey, 2016-2017

Further, a noteworthy observation was that all thesample respondents of West Phaileng consumed "below one per cent" of their household production. There were 30 per cent turmeric growing household that consumed "between 1 to 2 per cent"of their household production followed by an equal number of 3.33 percent with "between 2-3 per cent" and "between 3-4 per cent" consumption from their total production.

Majority of the respondents of Reiek village, Ratu village and West Phaileng village consumed Turmeric in a powder form. The powder is regularly used primarily in cooking to give color, aroma or flavor. There were also respondents found to have used turmeric juice as a medicinal purpose.

Chapter Summary:

Chili comprises of vitamin A, vitamin C, vitamin E and vitamin K. Also, chilli is a good source of folic acid. Chilli helps in digestion and loose motion. It is used in treatment of cancer, asthma, cough and sore throats. Chilli is also used for external purposes such as pain relieving balms and vaporubs. In the study areas, more than half (63.33 percent) of the chilli growers consumed chilli “between 1 to 2 percent” from annual production. Chilli can be consumed after 2 months of sowing.

Ginger contains vitamin C, magnesium, potassium, copper, iron, calcium and phosphorous etc. Ginger is commonly used for treating digestive problems, motion sickness, cold, cough and nausea. Ginger also helps in lowering blood pressure and manages to help pain and inflammation. It was noticed that a large majority (90 %) of the ginger growers consumed “less than 1 percent” of their annual production. There were 10 percent of farming households that consumed “more than 5 percent” of ginger from their total production. Ginger was consumed from time of blooming of the green flower till the ginger becomes mature in the study villages.

Maize is a good source of carbohydrates, carotene and vitamin A, vitamin B, vitamin C and vitamin K. Maize has numerous benefits such as it helps in improving the functioning of thyroid gland and immune system. Maize silk is also used for the treating kidney stones, urinary tract infection, jaundice and fluid retention. The decoction of silk, roots, and leaves are used for bladder problems, nausea, and vomiting, while decoction of cob is used for stomach problems. It was found from the field survey that the highest number (30 percent) of the farming household consumed “ more than 5 percent” of their annual maize production. There was an equal number of 13.33 percent that consumed maize “between 1 to 2 percent” and “between 4 to 5 percent” from their total production respectively. Maize was mainly consumed as boiled on the cob and roasted on the cob using charcoal. There were also farmers who transformed the processed dried on the cob into popcorn. The frequency of consumption was on an average between 3- 4 times a week during the harvesting period.

Soyabean is rich in vitamin E and can be considered as one among the best sources of plant-based protein. Soyabean components are protein, oil, carbohydrates, vitamins and minerals. Soyabean is used for different purposes such as treating type 2 diabetes, asthma, lung function, cancers, constipation, diarrhea and improving memory etc. Soyabean is also used by women specifically for breast pain, preventing from breast cancer, preventing hot flashes for breast cancer, menopausal symptoms and premenstrual syndrome (PMS). It was observed from the information gathered that almost half of the respondents (46.67 %)had consumed “between 1 to 2 percent” of soyabean from their total production. More than one third (40 %) of the sample farmers consumed soyabean “ less than 1 percent” of their production. Soyabean was commonly consumed in fermented form (wet and dried form) by vast majority of the selected farmers.

Sugarcane juice contains magnesium, potassium, manganese, iron, phosphorus, calcium, organic acids, vitamin A, vitamin B, vitamin C and vitamin E. Sugarcane juice prevents cancers, particularly, prostate and breast cancer, jaundice, constipation, stomach burn, heart diseases and kidney diseases. Cane juice is also good for Covid- 19 patients as it boosts immunity and treats sore throat. Jaggery also comprises of calcium, sulphates, magnesium, potassium, iron, protein, phosphate, sodium, copper, vitamin A, vitamin B, vitamin C and vitamin E. Jaggery helps in curing jaundice, purifies the blood, prevents constipation, anaemia, boosts intestinal health, controls blood pressure, treats cold, cough, throat and lung infections etc.

Jaggery consumption is also benefitted for Covid- 19 patients as it helps in treating cold and cough, it helps to increase the total count of haemoglobin in the blood and boost resistance against infections. Jaggery also prevents problems related to respiratory problems such as asthma and bronchitis, etc. In the selected villages, more than half (56.67 %) of the respondents consumed “between 1 to 2 percent” from their total production. There were 3.33 percent of farmers found to have consumed “more than 5 percent” of their total production. The consumption form of sugarcane is mainly in a processed form .i.e. jaggery.

Turmeric consists of curcumin, sterols, resins and volatile oils. Turmeric is rich in vitamins C, B3 and B6, magnesium, manganese, potassium, copper, sodium, phosphorus, calcium, iron, zinc and omega-6 fatty acids. Turmeric is considered a carminative, tonic, blood purifier, vermicide and an antiseptic. Turmeric is used for the treatment of diabetes and leprosy, gall stones and gall complaintsand to relieve sore throat and common cold. Raw rhizomes of turmeric is used as an anti-parasitic against many skin infections. Turmeric helps to detoxify the liver,balance cholesterol levels, fights allergies, stimulates digestion, boost immunity, purifies blood and enhance the complexion. It is also an antioxidant, stomachic, carminative, tonic, vermicide and an antiseptic. Turmeric is used in the preparation of medicinal oils, ointments and poultice. It is stomachic, carminative, tonic, blood purifier, vermicide and an antiseptic. It was observed from the field survey that more than half of the respondents (63.33 %) had consumed “less than 1 percent” of turmeric from their total production. A respondent of 30 percent consumed turmeric“between 1 to 2 percent” from their annual production. An equal number of 3.33 percent were noticed consuming turmeric “between 2-3 percent” and “between 3-4 percent” from their total production respectively. Generally, turmeric was consumed in the form of powder by all the respondents.

The overall household consumption was that the highest number constituting 40 percent of the farmers consumed “less than 1 percent” of their production, followed by 37.78 percent consumed ‘between 1 to 2 percent” from their annual production. The third highest number (10 %) fell under the category of consuming “between 2 to 3 percent” of their annual production. There were few farmers (6.11%) who consumed “more than 5 percent” of their total production.

CHAPTER 9

OPPORTUNITIES FOR VALUE ADDITION OF THE SELECTED CROPS

Enhancing the production, competiveness and efficiency of agricultural value chain are of great significant income contributor for the farming households in Mizoram. It is everyone's knowledge that in Mizoram only minimal value addition of agricultural productions are performed at the farmer's level. Consequently, this chapter will describe the opportunity available for improvement and stabilization of the farming household economic condition through value addition from the selected crops such as Chilli, Ginger, Maize, Sugarcane, Soyabean and Turmeric. Increase in earning of farm household through value addition of the products would also relief farmers from the need of pursuing on other enterprises to enhance their income.

9.1. Value Addition

Nations with agriculture driven economies heavily depend on value addition to utilize the full potential of agriculture to their GDP (Stewart, 2020). Value added is a term frequently mentioned when discussing the future profitability of agriculture. Its popularity rose substantially during the 1990s to the point that it has become one of today's buzzwords. Many raw commodities have intrinsic value in their original state. Adding value is the process of changing or transforming a product from its original state to a more valuable state that is preferred in the marketplace (Barton et al., 2000).

Cited by Barton et al. (2000) from Tilley (1989) adding value to products can be accomplished through innovation and/or coordination. Innovation focuses on improving existing processes, procedures, products, and services or creating new ones. Industrial innovation is processing traditional food products into non-food uses. Market forces have led to greater opportunities for product differentiation and added value to raw commodities because of increased consumer demands regarding health, nutrition, and convenience, efforts made by food processors to improve their productivity and technological advances that enable producers to produce what consumers and processors desires (www.agmrc.org). Adding value requires knowledge, access to technology, infrastructure and other input (UNCTAD, 2019).

Value of a product has three phases- Value Creation, Value Enhancement andValue Capture. Value Creation is an activity that can originate only at the farm level,Value Enhancement being the intermediate processes added through variety of skilled methods and practices and, finally, Value Capture, being the stage of end consumption that fulfils individual needs (Khosla, 2011).

An intensive study of fourteen farmers in the Southern U.S.conducted by ATTRA and the Southern Sustainable Agriculture Working Group identified 13 keys to success in pursuing value added agricultural enterprise/ business. The identified keys are categorised into short run and long run in which success in the short run requires: starting small and growing naturally; making decisions based on good records; producing/ creating a high-quality product or services; following demand-driven production; getting the whole family or partners involved; keeping informed; planning for the future; continuing evaluation; persevering and having adequate capitalization. Keys to success in the long run includes: focusing; establishing a loyal customer base; and choosing something you love to do and something that fits your personality and goals (Born, 2001).

Merriam Webster dictionary has defined value-added as- of, relating to or being a product whose value has been increased especially by special manufacturing, marketing, or processing.

Value added is to economically add value to a product by changing its currentplace, time, and form characteristics to characteristics more preferred in the marketplace (Barton et al, 2000).

Value added products in general indicates that for the same volume of a primary product, a high price is realised by means of processing, packaging, upgrading the quality or other such methods (Kumar, 2014)

9.1.1. Valued Addition in Agriculture

Value addition in agriculture context has to do with the process of adding economic value to agriculture produce by processing, packaging, branding or generally transforming to a suitable and acceptable food/goods for a certain society of people (Stewart, 2020).

Value addition in agriculture is a portfolio of agricultural practices that enable farmers to align with consumer preferences for agricultural or food products with form, space, time, identity, and quality characteristics that are not present in conventionally-produced raw agricultural commodities. Value-added agriculture canbe characterized by farmers changing their position on the supply chain, creating closer or direct linkages between themselves and consumers, or changing production processes to alter or preserve certain intrinsic characteristics of their farm/ranch products (Dudensing and Lu, 2015)

Value addition in agricultural products can be brought about by: processingof the product; packaging, branding and grading of the product; developing innovative uses of the product; and developing fast-food technologies (Agarwal and Arcarya, 2016).

Value addition in agriculture entails changing a raw agricultural product into something new through packaging, processing, cooling, drying, extracting or any other type of process that differentiates the product from that original raw commodity (Matthewson, 2007).

The definition of a value addition in agricultural product includes – in addition to one that has been processed, segregated, produced or marketed with inherently value-added characteristics, and/or is a source of farm or ranch-based renewable energy – an agricultural commodity or product that is aggregated and marketed as a locally-produced agricultural food product or one that is part of a mid- tier value chain (NSAC, 2013).

9.1.2 Packaging as Element for Value Addition

Many marketers have called packaging a fifth P, along with price, product, place, and promotion. Packaging includes the activities of designing and producing the container for a product. The container is called the package, and it might include up to three levels of material (Kotler, 2000)

Packaging is an art and science. Packaging is an art of presenting a product. Scientific and technological advances have brought revolutionary change in packaging. Packaging has become as important as inside material (Srilakshmi, 2018).

Cited by Agariya et al (2012) from Kotler (2000)Packaging can be defined as the wrapping material around a consumer item that serves to contain, identify, describe, protect, display, promote, and otherwise make the product marketable and keep it clean. Packaging is the outer wrapping of a product. It is the intended purposeof the packaging to make a product readily sellable as well as to protect it against damage and prevent it from deterioration while storing. Furthermore the packaging is often the most relevant element of a trademark and conduces to advertising or communication.

9.1.3. Function of Packaging

A product whether it is factory made or farm produce has to reach its destination, the ultimate consumer in the same condition without any deviation from the original characteristics, one requires packaging (Srilakshmi, 2018).

The safety of food contact material is of high importance as the food which is prepared hygienically can get contaminated when it comes in contact with unsafe/contaminated packaging material (Roday, 2018).Packaging serves three major functions-protection, preservation and promotion. 1) *Protection* of the product can be from climatic hazards and mechanical hazards. Climatic hazards would include atmospheric moisture, oxygen, light, heat, cold and microbial attack. 2) *Product preservation* means the extent of time a product could be preserved in a packaging system. The better the packing the better the preservation of the qualities of the product. 3) *Promotion* is to attract the consumer towards the product. Packaging is astrategy to arouse curiosity, stimulate interest and promote sales. The package is a silent salesman (Srilakshmi, 2018).

9.2. Different Levels of Processing

Drying, canning, chemical preservation, refrigeration (including chilling and freezing), and nutrient conservation and fortification were the significant advances of the 19th and 20th centuries and permitted population growth in more developed countries (Foros, 2010).

The main objectives of food processing on a home scale, institutional scale, or in the food industry are similar. The objectives mainly include removal of unwanted matter from the food, making food safe for consumption, increasing digestibility, enhance flavour, colour and taste, improving texture and consistency, minimizing nutrient loss, extending shelf life, increasing acceptability through fabricated foods (Roday, 2018).

Patil et al (2018) identified various levels of processing such as: primary products, first processing low value added, first processing high value added, second processing and third processing. The following are the details of various levels of processing.

9.2.1. Primary Products

These food products are consumed as is produced without processing. The activities like grading, sorting, washing, etc. are not considered as processing. Examples are fresh fruits and vegetables, eggs, fluid milk at the farm,etc.

9.2.2 First Processing Low Value Added

Such food products that undergo a minimal level of processing such as shelling, milling, drying and grinding For such type of processing the input is a “primary product” and the extent of value addition is minimal (0-5%). Examples are rice, flour, pulses, spices, dry fruits, etc.

9.2.3 First Processing High Value Added

These products undergo a sophisticated level of processing resulting in relatively higher value addition (5-15%). The processing includes pasteurizing, heating, fermenting, and crushing. Examples are butter, curd, meat, fish and sugar.

9.2.4 Second Processing

The commodities which are inputs for such processed products are “first processed product” which could be mixed with other products including “primary products”. Examples are biscuits, bread, ghee, ice cream, jams etc.

9.2.5 Third Processing

The type of food products coming under this class are ready to eat food, prepared and packed meals, take out type meals. Examples are ready to cook meals, pizzas, lasagnes, frozen prepared meals, etc.

9.3 Benefits of Value Addition

Value addition in agriculture comes with so many socio-economic benefits for a nation. When a value is added to agriculture produce, it pleases the eyes and attracts more currency than when it is sold in its original form or appearance (Stewart, 2020). Value addition at each stage will add to the consumer satisfaction. Value addition in the agrarian sector has brought the option of alternate income opportunities along with the risk minimization, better share in consumer's price,more shelf life of products and so on (Kumar at el, 2017).

High level of food loss reduce the incomes of producers, especially smallholders farmers, which negatively impacts their household’s well- being, making them more vulnerable/less resilient (Mahmound,2018). Therefore, value addition reduces post harvest losses of production since crops are highlyperishable in nature and also value addition empowers and creates profitable jobs opportunities for the farmers and a large weaker section of the society which areboth needed at the time for a better living condition of rural community/society. Value addition transforms, converts, enhances or modifies raw agricultural product/food from its original form

into more edible, safer, usable and palatable forms for the consumers to enjoy and satisfy.

Value addition is made by processing and processing thus widens the market as the same product is available to the consumer in different forms such as flour, noodles, bread, starch etc (Singh and Lekhi, 2018). Certain processing techniques can increase the nutrient content of food and raise the bioavailability of nutrients, including through fermentation, germination and roasting (FAO, IFAD and WAFP, 2020).

Processing adds the value in the product thereby making it more valuable than the original goods. Processing increases the profit margin of the producer/seller and these processed goods/products can also be transported to the far off places for their sale and exported some of the goods to other countries (Chhina, 2009). Processing function also makes it possible to store both perishable and semi-perishable agricultural commodities which would otherwise be wasted and facilitates the use of the surplus produce of one season in another season or year (Acharya and Agarwal, 2016).

9.4 Scope for Value Addition in Mizoram

Creating value by adding value to the product is rarely found at the farmers' level in Mizoram. Even if value is added, only minimal processing is usually done by the farmers. The general practiced of value addition by the framers aforesaid can be supported from the field surveyed findings conducted on 180 farmers particularly on crops of Chilli, Ginger, Maize, Soyabean, Sugarcane and Turmeric.

To have higher return of income from selling their productions is one of the reasons for cultivating the crops by the selected farming households. Farmer satisfaction with their income situation is thus vital for meeting the household end needs. Other than the potentiality to produce numerous products from each selected crops itself, these selected crops can again be processed together with different by- products, crops or ingredients to create several different food products for consumer satisfaction.

9.4.1 Value Addition of Chilli

Chilli is valued for its pungency and colour. In India, no dish is complete without chillies. It is used as whole dry chilli, chilli powder, chilli paste, chilli sauces, chilli oleoresin and as mixed curry powder (Nybe *et al*.,2007). Chillies aremajorly used as condiment or culinary. It is specially used for its pungency, spicytaste, besides the appealing colour it adds to the food. It is used in pickles, sauces, ketchup, essences

(Kishore *et al*., 2013). Chillies have anti-microbial property and also act as preservative (Srilakshmi, 2018).

In Mizoram, there is not much value added to the product at the farmer level. Sorting chillies into good and poor quality of the product, storage of fresh and processed produce in a grower's house, transporting from farm to home through head load, motor vehicles etc, weighing the product using weighing scale and processing into whole dried product were the main activities undertaken by the Chilli growers inthe study areas.

It was further learnt that green chilli was sold in its original form soon after harvesting by 33.33 per cent of the chilli growers (see Table 5.20). This indicated that these farmers undertaken four value added activities, while Mizo chilli growers(66.66 %) see table 5.20) carried out all the value addition activities since, Mizo chilli was given minimal processing i.e. whole dried chilli form. Hence, scope for developing chilli product in order to add value can be widened into a product likered/ greenchilli powder, green/ red chilli paste, green/red chilli pickle, red chilli flakes, chilli oil, chilli sauce, whole dried green chillies, canned chilli, brined/pickled, fermented chilli etc..

9.4.2 Value Addition of Ginger

The dried ginger or ginger powder is generally used in manufacturing of ginger brandy, wine and beer in many western countries. Ginger oil is primarily used as a flavouring agent in confectionary and for soft drinks. The ginger is also used for several medicinal purposes (Rai *et al*, 2004). Fresh ginger, dry ginger powder, oleoresin and oil are used in food processing. It is indispensable in the manufacture of ginger bread, confectionary, ginger ale, curry powders, certain curried meats, table sauces, in pickling and in the manufacture of certain cordials, ginger cocktail, carbonate drinks, liquors etc (www.indiaspices.com). Ginger oil also fids limited use in perfumery (Manay and Shadaksharaswamy,2021)

From the field surveyed, 100 percent of the selected ginger growers in Mizoram only sold fresh ginger (see Table 5.20). The main activities carried out were sorting between good and poor products, transporting from farm to home, washing and cleaning the soil adhered to harvested ginger at the initial level. There were some farmers who performed all the three value addition activities, whereas, few farmers were also found to undertake a combination of two or three of the value addition activities. Since, all the farmers did not sell any processed food, the scope for more value addition in ginger production is vastopened. Hence, ginger can be processed into ginger pickle, dried ginger, ginger powder, ginger paste, ginger beer, ginger candy, ginger tea, ginger coffee, ginger wine, salted ginger, ginger oil, encapsulated ginger, ginger oleoresins, etc.

9.4.3 Value Addition of Maize

In India, maize is consumed in the form of boiled or roasted as pop corn. In countries like South America, Central America and Africa, it is converted into food products by grinding, alkali processing boiling, cooking and fermentation (Srilakshmi, 2018).

Maize is increasingly used as the carbohydrate, source in beer, either as a dry adjunct or as a liquid adjunct. Maize is also used to manufacture whiskey and vodka. The ferment ability of maize starches and sweeteners has also made maize as important feedstock for ethanol (ethyl alcohol). Ethanol is being used both as a complete fuel substitute in gasoline engines or in a mixture of 10% ethanol and 90 % gasoline, called gasohol (Panda, 2010).

All the varieties of Maize grown by the farmers in Mizoram are usually sold in its original form except for popcorn variety which is given a little processing by sun-drying method. Sorting of good and poor quality of the product, transporting and processing were the common activities performed by the farmers. A sizeable proportion of the farmers performed sorting and transportation activities of maize for selling while few farmers carried out all the three activities of value addition in the study areas. Further, the activity of processing was done by giving a little processing by sun-drying method.

From the field survey, it was found that processing of maize products canopen tremendous opportunity for doubling farmer's income through adding more value to maize. Value addition for maize can be developed into more products like maize flour, maize oil, rolled maize, animal feed, maize syrup, oil cake, cornflakes, boiled/cooked maize cob etc.

9.4.4 Value Addition of Soyabean

Soybeans are one of the most valuable crops in the world not only as the staple food in most Asian countries, providing a good source of protein for human diet, but also as an oil seed crop, feed for livestock and aquaculture, and biofuel feedstock (Chen *et al*., 2012). Soyabean oil is used in vanaspati, salad oil, mayonnaise, sandwich spreads, baby food, cake mixes and non-dairy creamer (Manay and Shadaksharaswamy, 2021).

Soy foods have become more familiar to consume worldwide and have become a popular choice of many health conscious valued for their Versatility, Taste, Nutritional Content, Environmental Advantages and Health Benefits. Soy available in Boiled Soybeans, soy flour, soy oil, soy sauce, soy milk, soy tofu, soy curd, fried soy curd, fortified soy products for infants and women, fermented soybeans and other (Bolla,2015).

Many food manufacturers recognize soy protein as a versatile food ingredient with functional and nutritional properties that greatly enhance the value of finished foods in every consumer category. Soy protein is used in the manufacturing of breads, cookies, crackers and other baked goods. Soy protein improves texture; holds moisture; creates cake richness; whitens breads; extends shelf-life; reduces breakage and crumbling; enhances nutrition; improves manufacturing, handling and machine ability; and improves mouth feel and overall quality as perceived by the consumer (Panda, 2014).

The common activities undertaken by the sample respondents of soybean were separating the shell from soyabean seeds, transporting from farm to home usinghead load and motor vehicles, packing using banana leaves and processing wherein the two major processing products of soyabean currently used for commercial purpose by the farmers in Mizoram are ethnic fermented soyabean i.e. bekang um and bekangro/rep.

There were farmers who were found to undertake all the four activities while few farmers followed all the above mentioned value addition activities.

There is still a huge scope for making value-added products from soyabean as in soyabean oil, cake, soyabean feed, soya chunk, powder, soya meat substitute, soya flour, soya sauce, soya bean papad, soyabean milk, soyabean paneer/tofu, soyabean yogurt/curd, fortified soyabean products for infants and women, fermented soya beans and other direct food uses of soya bean in the form of soya-fortified cereal/legume flour, soya-based sattu, roasted/fried/fermented soya-snacks, soya millet based extruded/baked food products, soya mayonnaise, soya biscuit, soya noodles, soyabean paste, soya candles, soya biodiesel, soya supplements, soya crayons, soya ink, biodiesel, tempe/ tempeh and natto etc.

9.4.5 Value Addition of Sugarcane

Very small percentage of sugarcane is used in unprocessed form, and that too mainly for planting material. Some small part is used for consumption as juice, which also requires minimum processing. A major part of sugarcane (about 85%) is processed for conversion into sugar. Remaining 12 percent is used for production of jaggery and khansari (Achara and Agarwal, 2004). Cane Jaggery is a traditional unrefined non-centrifugal sugar consumed in Asia, Africa, Latin America and the Caribbean.

Jaggery can be used to sweeten savour dishes, to balance the spicy, salty, sweet and sour flavour of a dish. It is also great for desserts, cakes, confectionery, chutneys, cream and drinks, and can be used to make alcoholic beverages (Hartvig, 2016).

Liquid jaggery is an intermediate product obtained during concentration of purified sugarcane juice during jaggery making, and is semi liquid syrup like product. The process of making granular jaggery is similar up to concentration. The concentrating slurry is rubbed with wooden scrapper, for formation of grains. The granular jaggery is then cooled and sieved (Singh, 2015).

Sucrose is used as a sweetening agent for foods and in the manufacture of cakes, candies, preservatives, soft drinks, alcohol and numerous other foods. Molasses is used primarily as animal feed but can also be sold as syrup, to flavor rumand other foods or as an additive for ethyl alcohol (Huntrods, 2018). Pressmud is the by-product of sugar industry and can be used as organic manure (Chogatapur et al.,2017).

Bagasse is the fibrous residue of the cane stalk left after crushing and extraction of the sugarcane juice. It consists of fibres, water and relatively small quantities of soluble solids - mostly sugar (Paturau,1988). Transforming all by- products obtained from sugar mills (bagasse, filter mud, fly ash and molasses) into value-added products will minimize the pollution to a large extent. Treating sugar industry effluent for reuse in agriculture and other applications is another strategy to reduce the environmental impacts (Adelaet al., 2017). Bagasse has properties suitable for a range of highly value-added renewable products such as pulp and paperproducts, polymers, building materials and renewable fuels (Rainey, 2009).

Solid jaggery is the principal post harvest product undertaken at the farmers level by all the sample respondents (100 percent) (see Table 5.20) in Mizoram. Further, jaggery is mainly taken along with red tea in the study areas. The only packaging material used by the farmers for Jaggery was wrapping in newspaper, therefore, good packaging material will also add value to jaggery as well.

In Mizoram, there are various opportunities opened so as to increase sugarcane value by converting sugarcane into sugarcane beer, rum, ethanol, sugarcane whitesugar(Sucrose),sugarcane brown sugar, packed sugarcane juice, jaggery syrup/powder, liquid jaggery, granular jaggery, blackstrap molasses,bagasse papers, bagasse disposal plate, bagasse disposal cup, sugarcane vinegar etc.Jaggery could again be used for preparation of various products like- reori, gazak, chikki, patti and ramdana, etc.

9.4.6 Value Addition of Turmeric

Turmeric is used to give an attractive vibrant yellow colour to curries, sauces and condiments. It is a key ingredient in many South Asian and Middle Eastern savoury dishes and plays a featuring role in most curry powder mixtures. In West, turmeric is mostly valued as a dry spice for its characteristic rich, bright yellow colouring and mellow flavor. It is added to drinks, ice creams, cheeses, butter, margarine, yogurts, confectionery, icings, breads, cakes, mustards, stocks and sauces, often in the guise of E100, the code applied to turmeric when it is used as a food colouring agent (Hartvig,2016). Turmeric is used for dyeing wool, silk and cotton. It is an anti-oxidant due to its phenolic character. Turmeric is an auspicious article in all religious observances of Hindu households. It is also used as a cosmetic and for the preparation of *kumkum* which is used by Hindu women. Like other spices, it finds a number of uses in the indigenous systems of medicine (Manay and Shadaksharaswamy, 2021)

The major value addition activities carried out by the cane growers were sorting dried slice, powder and extraction of turmeric juice were the major turmeric value added products in the study area. Other products that can be obtained from turmeric through value addition in Mizoram are capsule, face pack, turmeric drops, dietary supplement, turmeric essential oil, turmeric oleoresin, turmeric oil, turmeric herbal tea etc.

Chapter Summary:

Value addition contributes to reducing agriculture production loses, enabling to raise greater income for producers through making the product looks better, tastes better, channelizing to access to new market and helps in improving packaging

From the data collection, it was learnt that the common activities of value addition performed by the sample farmers were sorting into good and poor quality of products, cleaning and washing off the adhered soil and roots, transporting from farm to home to market using head load, motor vehicles etc, packing the harvested raw products in a gunny bag, nylon bag or cloth bag and processed products in a newspaper, banana leaf, polythene, storing of both fresh and processed produce in a farmer’s house, weighing/measuring of fresh and processed produce using weighing scale, spoon, glass cup. The value addition activities undertaken by the farmers may vary from producers to producers.

The study showed that processing of chilli was done minimally at the producer's level. Whole dried form was the most common processed product prepared by the 66.66 percent sample chilli growers (see Table 5.20). Thus, in Mizoram,the opportunities of marketing chilli is wide open through enhancing chilli into red/ green chilli powder, green/ red chilli paste, green/red chilli pickle, red chilli flakes, chilli oil, chilli sauce, whole dried green chillies, canned chilli, brined/pickled, fermented chilli etc .

Ginger was not sold in any processed form by the all the farmers (100%) (see Table 5.20),wherefore, in Mizoram, many products can be manufactured from gingersuch as ginger pickle, dried ginger, ginger powder, ginger paste, ginger beer, ginger candy, ginger tea, ginger coffee, ginger wine, salted ginger, ginger oil, encapsulated ginger, ginger oleoresins, etc.

The only processed form done by the maize growers (see Table 5.20) was dried on cob. This is again prepared into popcorn by the end users. Therefore, the scope of expanding maize market through processing of raw maize into maize flour, maize oil, rolled maize, animal feed, maize syrup, oil cake, cornflakes, boiled/cooked maize cob etc. is opened in Mizoram.

Soyabean was processed into traditional fermented food called *bekang um* and *bekang rep/ro*. These two are the main processing activities performed by the sample farmers. Hence, the opportunities of adding value to soyabean was found to be wide open as soyabean can be prepared into numerous products like soyabean oil, soya cake, soyabean feed, soya chunk, powder, soya meat substitute, soya flour, soya sauce, soyabean papad, soyabean milk, soyabean paneer /tofu, soyabean yogurt/curd, fortified soyabean products for infants and women, fermented soya beans and other direct food uses of soya bean in the form of soya-fortified cereal/legume flour, soya-based sattu, roasted/fried/fermented soya-snacks, soya millet based extruded/baked food products, soya mayonnaise, soya biscuit, soya noodles, soyabean paste, soya candles, soya biodiesel, soya supplements, soya crayons, soya ink, biodiesel, tempe/ tempeh and natto etc

Jaggery is the onlyprocessed product practiced in the selected villages (100%). This implied that the scope of creating different by-products from sugarcane is possible. Therefore, jaggery can be transformed into various products such as sugarcane beer, rum, ethanol, sugarcane white sugar(Sucrose),sugarcane brown sugar, packed sugarcane juice, jaggery syrup/powder, liquid jaggery, granular jaggery, blackstrap molasses, bagasse papers, bagasse disposal plate, bagasse disposal cup, sugarcane vinegar etc. In addition, jaggery can be further processed combining with other products and create several products like- reori, gazak, chikki, patti and ramdana, etc. Good packaging material will also add value to jaggery as the only packaging material used by the farmers for Jaggery was wrapping in newspaper.

The general processed products of turmeric undertaken by the turmeric growers were dried slice, powder and juice. Apart from these three value added activities, there are several ways of adding value to turmeric in Mizoram such as in the form of capsule, face pack, turmeric drops, dietary supplement, turmeric essential oil, turmeric oleoresin, turmeric oil, turmeric herbal tea etc.

CHAPTER 10

SUMMARY, CONLUSIONS AND RECOMMENDATIONS

This chapter presents summarization about the research, draw conclusionfrom the findings and add recommendations in favour of the farmers.

10.1. Summary

The study on "Value Chain Analysis of Jhum Crops in Mizoram" was carried out with the following objectives:

The overall objective of the present study is to analyze the value chain of

jhum crops in Mizoram. Specifically, the study will attempt to:

1) Identify the existing value chains and activities involved in different stages;
2) Assess the ability to generate nutrition and income for the family;
3) Find out options for sustainability of the production system; and
4) Identify opportunities for value added processing that can generate additionalincome and employment.

A value chain on six crops viz. Chilli, Ginger, Maize, Soyabean, Sugarcane and Turmeric were collected from 18 villages whereinthree villages were selected for each of the selected crop. A total of 10 farmers from each of the sample villages were identified as sample of the study. Therefore, 180 farmers were interviewed for this study.

Interview Schedule was employed to gather primary information from both the respondent farmers and other related actors. Secondary data were also obtained fromvarious sources such as office documents, internet, books, census and journals.

10.1.1. Socio-Economic Profile

The respondents constituted of 72.78 percent male and 27.22 per cent female. The mean age of the respondents was 49.54 years. The largest respondents (31.67 %) were in the age group between 50-60 years. Majority (87.22 %) of the respondents were married. The literacy rate of the respondents was high, constituting 97.78

percent against 2.22 percent of the respondent. The highest number of the respondents completed middle school level education. The overall mean household size was 5.93 with the household size ranged from one to 14 households. More than half of the respondent's household belonged to Priority Householder (PHH).

The mean annual income of the respondent households was ₹ 200000/-. The mean annual expenditure by the respondent's households was₹ 104000/-. The annual expenditure percentile of each farmers were Turmeric farmers spent the highest percentage (63.47) from their annual total income followed by Ginger farmers (62.92 %), Maize farmers (56.12 %), Sugarcane farmers (55.22 %) and Chilli farmers spent only 35.67% from their annual earnings.

10.1.2. Cultivation Practices

The average jhum landholding size was 2.3 acres of land.The highest number operated "more than 3 acres above". More than one-third of the farming household cultivated crops in their own land whereas 33.89 per cent of farmers practiced farming in a community land provided by the Village Councils.

Majority of the household managed one plot of jhum land. Farmers who managed two plots (12. 78 %) and three plots (1.67 %) of land respectively were also observed. A larger proportion of the respondents grown crops in jhum land for one year while the remaining 1.11 per cent and 0.56 per cent cultivated crops for two consecutive years and more than three consecutive years respectively.

The highest number resided more than 6 kilometers from their farm and more than half of the farmers reported that they go to their field by walking only.

More than one third of the farmers had experienced 'more than 20 years' in practicing shifting cultivation with an average farming experienced of 16.99 years. The eight most cultivated crops in the study villages were accordingly- Pumpkin (*Mai*) (86.67 %), Mizochilli (*Hmarchate*) (84.44 %), Brinjal (*Bawkbawn*) (80 %), Maize (*Vaimim*) (76.17 %), Cowpea leave (Bawhlawihnah) (75%), Mock tomato (*Samtawk*) (74.40%) and Rice (*Buh*) (56%).

The duration of land preparation commenced from October and continued till early April. The process of land preparation involved clearing of forest, preparation of fireline, burning and reburning of land. More than half of the respondents started clearing of forest in January while a small number began clearing of forest in October.

Fireline was prepared prior to burning of the jhum area to avoid spreading of fire. Fireline was prepared between December to March by large majority of the respondents. Most of the farmers carried out burning in March. Reburning was required for majority of the farmers. Among those who required reburning of land, majority carried out the activity in March. Farmers began their first sowing from February to September. Soyabean was cultivated from June to September whereas other crops such as chilli, ginger, maize, sugarcane and turmeric were cultivated between February to June. Overall, among the farmers, the highest number (44.44 %) carried out planting in the month of April. The timing and frequency of sowing may differ subject to the types of crops to be cultivated. Majority of the farmers used their own seeds from their previous year's harvesting for the following year planting while a few farmers purchased seeds from either friends or relative or neighbours.

Farmers commenced weeding from the month of February and continued upto October. The first round was performed by 100 per cent of the sample farmers. However, starting from the second round onwards till the sixth weeding round, the number of farmers performing weeding activity was starting to decline round after round.

The highest number of farmers began to harvest from the month of October. Moreover, harvesting was carried out in every month (from January to December) by the sample farmers. Harvesting methods was done manually in the study areas wherein chilli and maize were handpicked, ginger and turmeric were harvested using hoe (*Tuthlawh),* kodali (*Bawngtuthlawh*), matured soyabean was gathered using sickle and sugarcane harvesters reaped their production by employing dao/sword (C*hempui*). About 25 per cent of the farmer utilized human power for carrying harvested crops while 18.33 per cent hired vehicles for transporting the harvested crops from farm to home. Horse was also used for carrying harvested crops by the farmers.

In general, post-harvest handling include cleaning of removal damaged, rotten, diseased and soil adhered to the crop etc mainly for marketing purpose. Almost half of the farmers sold crops in fresh form while 30.56 per cent processed crops. The agricultural products processed were chilli into whole dried , maize into dried on the cob, soyabean into fermented soyabean (wet and dried form), sugarcane into jaggery and turmeric into powder, juice and whole dried form.

Majority of the farmers used sumo vehicle as the main transportation means for transporting their production for marketing purposes to neighbouring villages and urban market (*Aizawl* city). Few farmers have hired pick- up truck for delivering their product to their marketing agents.

10.1.3. Value Chain

In value chain, mobile phone is the main mode of communication used by the actors in order to exchange any information. In respect to price, it was learnt during the study that in all marketing channels of crops, farmers sold their produced to the final consumer at the rate set by them whereas in other channel where other actors involved, farmers have to comply with the price offered by other actors. Further, it was observed that majority of the f production were sold to the rural trader/rural agents.

10.1.3.1. Chilli

Chilli was cultivated as intercropping with other crops in an average jhum area of 3.0083 wherein, more than half carried out chilli cultivation in an area of “3 acres and above”. The average seeds sown was 16.9667 kilograms. The overall average mandays used for chili cultivation was for 86.22 mandays. The economic value of household human mandays participation for the cultivation of chilli was the highest. Weeding activity demanded the highest mandays (229.77 average mandays) while the lowest mandays were used on sowing activities (4.8 mean mandays).

The average total production of fresh and processed chilli were 2053.4 kg and 1020.8 kg respectively, whereby, 1982.9 kilograms of fresh produce and 973.45 kilograms of processed produced were sold. On average, ₹ 121000 and ₹ 227000 were earned from selling fresh chillies and processed Mizo chillies respectively.

There were five items where farmers incurred for chilli farming, such as input cost, farming expenses, transportation expenses, processing expenses and hired labour expenses. The mean total expenditure was ₹58448.52 wherein 92.81 per cent (₹54243.75) of the average total expenditure was incurred on hired human labour cost while the lowest number i.e 0.71 per cent (₹415) was spent on marketing expenses.

The main actors involved in selling fresh chillies were farmers, farmer's association, rural traders, urban commissioners and consumers while the main actors identified for processing channels were: farmers, rural agents, wholesaler.

Farmers: Farmers were the actor who carried out chilli production as well asan agent for chilli marketing. These farmers also transported their own produced to the urban market and sold it to other actors.

Farmers sold fresh chillies at ₹45 per kg directly to the customer. Farmers also sold fresh chillies at ₹ 47 per kg and ₹ 40 to the rural traders and urban commissioners respectively. Farmers sold fresh chillies to the Farmer's Association at a rate ranged from ₹40 to ₹125 per kg with an average rate of ₹71 per kg.

Farmers sold Mizo chillies to the rural agent who has a connection with wholesalers. Moreover, the farmers from Sailulak village sold the dried Mizo chilli between ₹180 to ₹ 200. The selling rate of Mizo dried chilli in Thingsai village was ranged from ₹250 to ₹ 300. The purchasing rate of dried Mizochilli by the Assamese rural agents were influenced by the prevailing rate of Silchar market.

Rural Traders/agents: There were two types of rural traders in chilli marketing viz

1) The rural traders/ procured fresh chillies from the Farmer's Association in Mualpheng village as well as from the farmers. These rural traders sold the produced to the urban commissioner in Aizawl market and acted as a middleman between the producers and the urban commissioners. These rural traders resold fresh chilli at a profit ranged between ₹20 from ₹ 33 with an average profit of ₹ 18.5 to the urban commissioners.

2) The other rural agents consisted of rural agents and Assamese rural agents.

These rural agents served as an intermediary between the farmers and the wholesalers, Silchar. Rural agents collected dried chillies from the farmers and traded it for ₹5 per kg to the wholesalers (Assam).

3) Farmer’s Association: All the members of this farmer group submitted their harvested produced to the Association, whereby, the rural traders procured fresh chilli through the Association.

The selling and buying activities were mainly carried out as in the form of auction, wherein, chillies were sold to the rural traders who can offer the highest price. Therefore, Farmer’s Association purchasing rate was highly determined by the rate offered by the rural traders. Again, the rate offered by the rural traders was determined by the prevailing rate at the Aizawl market. Additionally, this rural trader to whom chillies were sold to, can again resell the produced to other rural traders at a price fixed by her. Farmer’s Association sold fresh chillies at a rate ranged from ₹40 to ₹125 per kg with an average rate of ₹71 per kg to the rural traders.

Urban Commissioner: The urban commissioner consists of the commissionerselling fresh chillies in urban market, mainly Aizawl market. The urban commissioners having a selling place/seat at the urban market in different areas soldfresh chillies to the final consumers at a profit of ₹15, ₹50 and ₹ 70.

Wholesaler: Wholesalers were the actors who purchased dried whole chilli in a larger volume as compared to other actors in chilli marketing. These wholesalers were mainly from Silchar, Assam. In general, these wholesalers also collected wholedried Mizo chillies from different Mizo chilli producing villages through rural agents. The collected products were brought to the wholesaler, Silchar, thereon, whole dried Mizo chillies were resold and transported to Siliguri factory, Siliguri for further value addition.

In addition, whole dried Mizo chillies were also resold to different retailers, located in different parts of India and added value along the process.

Consumers: Consumers were the last actor in chilli marketing chain. These final consumers consumed chilli in many ways such as in raw form, added to curry, prepared in chutney, and make chilli pickle etc.

It was observed that five marketing channels were exhibited in the study areas. Channel V was used by more than half (67%) of the farmers to sell their processed product to the rural agents.

Also, the traditional practice of open air sun drying method was popular in the study areas.

10.1.3.2. Ginger

Ginger was cultivated as a sole cropping and intercropping crop in the study areas. The average cultivated area for ginger cultivation was 1.9917 whereby the highest number which is half of the respondents (50%) carried out farming in an area “between 2 to 3 acres” of jhum area. The average seed rhizomes planted was 1361 kilogram in the study areas. The total average production by the farmers was 3419.87 kilogram and an average quantity of 3396.67 kilogram was sold by the farmers through which ginger growers earned ₹ 32300.

Among the different phases of ginger cultivation, weeding required the highest mandays (121.37) while the lowest average mandays of 61.4 was used for harvesting ginger. For the cultivation of ginger, the economic value of household human labour contribution was the highest. The overall average mandays used for an average jhum area of 1.9917 was 83 mandays.

Further, it was noticed that the farmers expenditure were made on five items namely- input cost, farming expenses, transportation expenses, marketing expenses and hired human labour expenses. The total average expenditure incurred was accounted for ₹ 59568.8825 ,whereby, the highest cost was incurred on hired human labour (78.84 %) (₹4963.70) and the lowest cost was incurred on marketing expenses constituting 0.46 (₹275) of the total average expenditure.

Farmers: They were the actors who engaged in producing ginger. These farmers were found to have sold ginger to different actors like rural traders, urban commissioners and consumers.

Farmers sold ginger rhizomes for ₹10 directly to the consumers as well as sold baby ginger and rhizomes ginger at ₹ 80 per kg and ₹20 per kg respectively to the urban commissioner in the Urban market (Aizawl). Farmers sold fresh ginger at ₹10 to rural agents (CDAR) while farmers sold fresh ginger between ₹ 7 to ₹12 with an average rate of ₹9 to the rural traders/agents of wholesalers (Assam).

Rural Agents/traders: There were two kinds of rural agents who served as an agent for wholesaler (Silchar and Bagha) and Society (CDAR). These rural traders /agents were from the local village ,wherein, the rural traders/agents for wholesaler (Slichar and Bagha) were men while rural society agent was found to be woman.

Rural agents procured ginger from the producers and supply the produced to the wholesaler and Society, thereon, ginger was distributed to different areas within and outside of India. The rural agents earned ₹ .50 per kg for collecting ginger for the Society (CDAR) and rural agents of wholesaler (Silchar) obtained ₹ 1 per 1 kg from trading it while a ranged from ₹ .05 to ₹1 per kg with average income of ₹.05 can be earned from trading it to wholesalers (Bagha) .

In a different case, when the rural agents themselves transported the produced to Bagha and trade directly to the wholesaler (Bagha), the rural traders can earn between ₹3.5 and ₹ 10 per kg with an average income of ₹5.75 per kg.

Community Action Development and Reflection (CDAR): CDAR partners with international exporting companies and the major exporter were Suminter India Organics in Mumbai, Phalada Agro Research Foundation (Pure and Sure) in Bangalore, and Sresta Natural Bio-Products Pvt Ltd (24 Mantra) in Hyderabad and these exporters sold the product mainly to European countries. The selling rate of processed ginger by CDAR to these exporters was between ₹ 220-₹250. The processing ratio from fresh to flake products was 7:1 per kilogram.

Wholesalers (Bagha and Silchar): These wholesalers were an important actor

,wherein, Thanga and Vanrammawia (2013) further mentioned that marketing agents would, in turn, transport ginger to the wholesale traders operating in Assam, like Karimganj, Bagha, Silchar for further dispatch to terminal market via Siliguri to Kolkata, Azhadpur (Delhi), Amritsar, Mumbai etc and through Karimganj to Bangladesh.

However, the information on these wholesalers reselling rate of ginger was not able to collect.

Urban commissioners: The urban commissioners were the one who resold ginger at the urban market (Aizawl). These urban commissioners were mostly men. The urban commissioners resold ginger (baby ginger and rhizomes ginger) at a profit ranged between ₹30 to ₹40 per kg to the final consumers.

Consumers: Consumers were the final actor of the marketing chain for ginger. These consumer consumed ginger as in raw form, added in curry, chutney, etc

According to the data obtained from the field survey, there were four marketing channels through which famers sold their produced. Among those existed marketing channels, Channel I was utilized by majority (76.67 %) of the respondents to sell ginger to the rural agents/traders.

Since, there were farmer adopting two cropping method: sole and mixed cropping system, the following are the comparison between the two cropping system:-

In the selected villages, 27 household practiced mixed cropping system whereas three household carried out sole cropping system. The average area of farmers practicing sole cropping system and mixed cropping system were 3.1667 and 1.8611 jhum areas respectively whereby sole cropping system was carried out by 100 per cent in an area of “ above 3 acre” jhum land whereas more than half (56%) of the respondents carried out mixed cropping system on an area “between 2 to 3 acres". It was also learnt that, the average total production of 9179.67 kilograms and 2779.89 kilograms were produced from farming system practicing sole cropping and mixed cropping system respectively. An average of 9166.67 kilograms and 2755.56 kilograms was sold from the sole cropping and mixed cropping jhum areas respectively and earned an income of ₹ 76500 and ₹27400 from sole cropping and mixed cropping farming system.

10.1.3.3. Maize

Maize was calculated as a mixed cropping system in the selected villages wherein an average 3.025 acres of jhum land was used for carrying out maize cultivation. It was observed that the highest number (40 %) of the sampled maize growers operated an area of "between 1 to2 acres" of land for maize cultivation and mean average of 3.8583 kilograms of maize seeds were sown by the farmers.

For the cultivation, weeding required the highest mandays, accounting for 108.47 average mandays and the lowest average mandays (5.93) was used for carrying out sowing activity. On average, the overall mandays used for maize cultivation was 47.89 mandays. The economic value of household human labour participation was the highest in maize cultivation.

Further, an expenditure was incurred on five items such as input cost, farming expenditure, transport expenses, marketing expenses and hired labour expenses. The average expenditure incurred was estimated to be ₹ 37074.55 whereby the highest expenditure was made on hired labour (72.31%) (₹26807) and lowest cost was incurred on input cost (1.01%) (₹373.33)

The overall average production yield from an average area of 3.025 acres of land was found to be 10900 fresh cobs and 438.33 processed cobs . From the total average production, the total average sold quantity of fresh maize was 9414 cobs, wherein, an average amount of ₹ 28400 was obtained. From the average total processed harvested, an average 400 cobs were sold and an average amount of ₹ 1427.83 were earned from selling it.

In the marketing system of maize, the identified actors were producers (farmers), rural traders, urban commissioner and consumers. There were six main marketing channel identified for maize. Among the channels, channel II was used by 40 per cent and 3.33 per cent of the maize growers to sell their fresh produces and both production(fresh and processed) respectively. In this channel, the farmers sold their produced to the rural traders.

Farmers: Farmers were the only actor who involved both in production and marketing activities. They sold their produced to three actors namely- consumers, rural traders and urban commissioners. Farmers sold maize directly to the consumers set their own rate, thus, the farmers sold maize between ₹8 to ₹ 14 per cob with an average earning of ₹10 per cob during the early harvesting season. Duringthe peak harvesting season maize was sold for ₹5- ₹7 per cob by the maize produces.

In respect to processed marketing, the processed maize was sold for ₹ 6 per cob to the final consumers while ₹3 per cob was the selling rate to the rural trader.

Famers sold fresh maize to the rural traders between ₹ 5-₹6 per big size cob and ₹3-4 for medium to small size cob for the first harvesting week. During the peak harvest season big size cob was sold between ₹3-4 and small/ medium cob was sold between ₹1-₹2.

Farmers sold maize to the urban commissioner between ₹4- 8 per big size cob during the first week of harvesting and between ₹2-1 per small/medium size cob.

Rural Traders: Rural traders were from the local village and they consist of 1) a person collecting maize at the local area from the farmers and resold it to the urban commissioner (Aizawl) at a profit between ₹ 1 to ₹ 2 per cob (big and small) and 2) a rural trader who resold at the local market at a profit between ₹ 4 to ₹ 6 per big cob and ₹2 to ₹5 per small/medium cob

Urban Commissioner- Urban commissioner were those commissioners selling maize at the urban market (Aizawl) such as commissioner who resold at the Aizawl main market , peddlers who resold fresh maize by going house from house in Aizawl city, roadside vendors selling roasted maize and boiled maize (Aizawl city)

Consumers: This actor purchased maize for household consumption. Maize was consumed as a simple boiled maize on the cob.

10.1.3.4. Soyabean

Soyabean was grown as sole cropping and mixed cropping system in the selected villages. Further, 50 per cent farmers reported to have practiced single cropping system whereas the equal number (50 %) adopted mixed/intercropping with other crops.

An average area of 0.5083 was operated for cultivating soyabean. Moreover, a large majority (90 %) of the respondents cultivated soyabean in an area “below 1 acre” of jhum land during the data collection. An average 2.853 kg of soyabean was sown by the farmers. The overall average mandays used for soyabean cultivation was 9.97. In addition, the average proportion of mandays required for weeding was the highest (24.03) as compared to other farming activities whereas the average lowest mandays was spent on post-harvesting activity (3.73).The household mandays contribution in soyabean cultivation when converted into economic value was found to be the highest.

It was difficult to convert and calculate the processed quantity, therefore, the calculation of the total production and total sold quantity were taken in fresh form.

The total average production was accounted for 114.37 kilograms wherein fresh average quantity of 83 kilogram and processed average quantity of 47.39 kilogram were sold. An average income of ₹ 7053.33 and ₹ 7029.21 were earned from selling fresh and processed products.

In addition, the selling of fresh produced, soyabean farmers earned an average of ₹ 5647.86 and ₹8566.92 from practicing soyabean as sole cropping system and mixed cropping system respectively. In the case of processed products, on average, soyabean farmers obtained ₹6795.45 and ₹7350.62 from carrying out soyabean as a sole cropping system and mixed cropping system respectively.

It was estimated with the local farmers that a fresh soyabean of one kilogram when processed into wet fermented soyabean, ₹ 200 can be obtained from selling the produce. Also, from one kilogram of fresh soyabean when processed into dried fermented product, ₹180 can be obtained.

In the study areas, the major share of expenditure were made on five items like input cost, farming expenses, transportation expenses, marketing cost and hired human labour cost. The total mean expenditure was calculated to be ₹6916.32. Of all the aforementioned items, the expenditure spent on hired labour cost was the highest (66.40 %) (₹45925) while the lowest cost was incurred for marketing cost (1.84%). (₹127.5).

The identified actors in the marketing channel of soyabean were producers, rural traders, urban commissioners and final consumers. Channel I was used by 20 per cent, 6.67 per cent, 23.33 per cent to sell their produced such as- fresh soyabean, processed and both production (fresh and processed) respectively. In channel I, farmers sold their produced directly to the final consumers.

Farmers – Farmers were an important actor who cultivated soyabean and participating in marketing as well. Farmers sold their produced to the consumer, rural traders and urban commissioners. Soyabean farmers sold their fresh produced between ₹70 to ₹95 per kg to both the final consumer and rural traders.

The farmers also sold processed soyabean to the urban commissioners with a price ranged from ₹ 180 to ₹200 from 1 kilogram of soyabean. .

Rural traders: Rural traders, mostly women, were from the local village. They procured fresh soyabean from the farmers and processed into wet and dried form. Rural traders sold the processed soyabean directly to the final consumer who resided within the village and to its neighboring villages as well as sold processed soyabean to the urban commissioners in urban market (*Aizawl*) for a profit between ₹ 105-₹130.

Urban commissioners: Urban commissioners, by and large being women, were commissioners from different areas in *Aizawl* District. These women commissioners were 1) one who had a market seat at the Market 2) one who resold processed products going from door to door. Urban commissioners obtained a profit of ₹80 to ₹100 from reselling soyabean processed products to the final consumers.

Consumers: Consumers were the final actor of the marketing chain for soyabean. They purchased soyabean (Fresh and processed) for household consumption purposes. Fresh soyabean were further processed for household consumption. The processed product purchased were consumed as it is, added in a Mizo bai, prepared as a chutney etc.

Comparison Between Single Cropping System and Mixed Cropping System of Soyabean

In the study areas, 50 per cent of the farmers practiced single cropping system while the equal number (50 %) adopted mixed/intercropping with other crops. The average area of carrying out mixed cropping system of soyabean was 0.6333 whereas sole cropping system of soyabean was practiced in an average jhum area of 0.3833. Under the cultivation area of sole cropping system of soyabean, a large majority of soyabean farmers (93 %) operated in an area of “below 1 acre” while most of the soyabean growers (80 %) practiced farming activities in an area “below 1 acre”.

It was difficult to calculate the exact measurement of processed soyabean, therefore, the quantity of fresh soyabean used for processing soyabean was taken for this calculation.

Farmers practicing sole soyabean yielded an average production of 92.67 kg wherein an average 63.07 kilogram of fresh soyabean and an average of 37.41 kg processed soyabean were sold. Further, an amount of ₹ 5647.83 and ₹ 6795.45 were obtained from selling it fresh and processed soyabean respectively.

Soyabean growers who adopted mixed cropping system, yielded an average of 136.13 kg wherein an average fresh quantity of 104.46 kilogram and processed quantity of 61.12 kilogram were sold, hence, an income of ₹ 8566.92 and ₹ 7350.621 were generated from selling fresh and processed form respectively.

10.1.3.5. Sugarcane

Sugarcane was cultivated as intercropping with other crops. Sugarcane was cultivated on an average jhum area of 3.667 wherein, more than half (60 %) practiced sugarcane cultivation in an area of “3 acres and above”. The average cane setts planted was 12500 setts. The overall average mandays used for sugarcane cultivation was accounted for 143.58 mandays. The economic value of household mandays contribution towards sugarcane cultivation was the highest. Among the different phases of farming activities, combine activities of harvesting and processing demanded the highest mandays (236.77 average mandays) while the lowest mandays were used on land preparation activities (79.27 average mandays).

The average total production of processed sugarcane were 2996.33 kg and an average quantity of 2946 kilograms were sold, whereby, ₹ 17000 was earned from selling jaggery by the farmers. Also, the average total production and sold quantity of fresh sugarcane stalks were 7207.14. Fresh stalk of sugarcane were sold based on the demand of the agents. An amount of ₹ 46500 was obtained from the selling of cane stalk .

The average total expenditure for the cultivation of sugarcane was ₹ 5678.98 out of this 74.63 per cent of the average total expenditure was incurred on hired human labour cost (₹41852.5) while the lowest expenditure spend was on inputs cost (2.90%) (₹1624.74).

The major actors in the marketing system were found to be farmers, rural traders and urban commissioners and consumers. It was learnt from the data collection that there were ten marketing channels that were utilized by farmers to earn their living. Channel I was utilized by the 23.33 per cent and 6.67 per cent famers to sell their produce of jaggery and both production (fresh and processed) respectively to the rural traders.

Farmers: Farmer’s were the actor who engaged in sugarcane production. Farmers sold jaggery and cane stalk to three actors namely- final consumers, rural traders and urban commissioners. The practice of selling the produced to more than two or more actors by one farmers was prevalent in the study areas.

When farmers sold jaggery directly to the consumer, they usually sold it at a rate ranged from ₹45 to ₹70 per kilogram, however, when selling jaggery through rural traders and urban commissioners, the farmers sold it at a price ranged between ₹ 40 to ₹ 60 respectively.

As for selling fresh cane stalk, the farmers sold cane stalk at ₹ 7-8 per cane stalk directly to the urban commissioner (sugarcane juice seller). However, when selling it through rural traders, farmers sold it for ₹5-6 per cane stalk .

Rural Traders: Rural traders acted as middlemen for farmers and urban commissioners. Rural traders include both- 1) Rural traders who collected the produced (jaggery and cane stalk) from the producers and then resold it in the urban market and 2) rural trader who resold jaggery at the local market as well as supplied jaggery to urban market (Aizawl city).

These rural traders resold jaggery to the urban commissioner at a profit of ₹5 to ₹ 10 per kilogram and rural traders resold fresh cane stalk at a profit of ₹2.5-3.5 per cane stalk to urban commissioner who sells sugarcane juice.

Urban Commissioners: Urban commissioners resold jaggery in the urban markets. These urban markets were located in Aizawl city, Serchhip town, Kolasib town, Champhai town, Lunglei town and Vairengte town. Urban commissioner resold jaggery at a profit of ₹ 20 to ₹40 per kilogram to the final consumer.

Urban sugarcane juice sellers in Aizawl city purchased cane stalk at a rate between ₹7-10 per cane stalk. With rough calculation with the urban surgarcane juice sellers, approximately, 400 ml to 800 ml of sugarcane juice can be extracted from a healthy one cane stalk. Moreover, a 200 ml of cane juice was sold for ₹ 10 by the sugarcane juice sellers.

Consumers: The final actor of the value chain of sugarcane was the consumers. Jaggery was the only product that was purchased directly by the consumers for household consumption. Jaggery was consumed commonly with tea by the final consumers.

10.1.3.6. Turmeric

Turmeric was cultivated as intercropping crop in the study areas. Turmeric cultivation was carried out in an average jhum area of 1.7167 acre of land. Among the 30 respondents, the highest and an equal number (43.33 %) of farmers operated jhum areas of “between 1 to 2 acre” and “between 2 to 3 acre” respectively. An average of 764.4 kg turmeric rhizomes was sown in the selected villages. For the cultivation of turmeric, different activities were involved and among the various activities, the highest average mandays was used for weeding activities (85.4) while the lowest average mandays was used for carrying out processing activity (27.48). On average, the overall mandays used for turmeric cultivated accounted for 46.35 mandays ,in which, the economic value of household mandays contribution was constituted to be the highest for turmeric cultivation.

The total average expenditure incurred by the turmeric growers was estimated to be ₹ 39300.8. Among these items, the highest expenditure was made on hired labour cost, constituting an average number of 72.30 per cent (₹28145) whereas the lowest expenditure was spent on marketing of turmeric products i.e. 0.76 per cent (₹300)

From the average 1.7167 acre of jhum land, the overall average production, which was calculated in fresh form, was 3392.33 kilogram. Some rhizomes turmeric further processed by the farmers, wherein, the average quantity of processed turmeric sold was 377.13 kilograms and earned ₹ 60700. With calculation one dried kilogram of turmeric can be obtained from an average fresh eight kilograms of turmeric rhizomes. The average fresh rhizomes quantity sold was 3392.33 kilograms and generated an income of ₹15800 from marketing the rhizomes.

The main turmeric marketing actors such as producers, rural traders, Society (Reiek Multifarming Co-operative Society and Reiek Block Turmeric Grower Society), urban commissioner and consumer were involved in the marketing system of turmeric.

Farmers: Farmers sold turmeric powder at a rate of ₹ 120 ,₹210 , ₹230 and turmeric juice for ₹ 80 per litre to the final consumers respectively. Fresh rhizomes were sold between ₹ 7 -9 per kilogram to the rural traders while turmeric powder was sold for ₹ 170 to the rural traders

Reiek Multi-farming Co-operative Society: Reiek Multifarming Co-operative Society procured dried sliced turmeric for ₹ 135 per kilogram from the farmers and purchased fresh rhizomes from the rural traders for ₹ 13- 15 per kg. The Reiek Multifarming Co-operative Society further dried the fresh soyabean and later processed the dried sliced turmeric into a fine powder at its processing unit. Packaging of turmeric powder was done by the society at the society level as well. The processed powder was supply to the urban agent at a rate of ₹210 per kilogram. From the urban agents the turmeric powder was distributed in different areas in Mizoram.

Reiek Block Turmeric Grower Society: This Society procured fresh rhizomes at ₹15 per kilogram from the farmers and again distributed the rhizomes to its society member for turmeric production.

Rural Traders: Rural traders were from the local village. There were three types of rural traders in marketing turmeric-1) Rural Trader sold fresh turmeric directly to the Reiek Multi-farming Co-operative Society at a profit ranged between ₹4 to 6 to the Society as well. 2) The other rural traders further processed turmeric into a powder and sold it to the urban commissioner in Aizawl with a price ranged between ₹100 - ₹150 and 3) this rural trader procured powered turmeric from the farmer at ₹170 per kg and resold it to the final consumer at a rate of ₹250. There were rural traders who engaged with both Reiek Multi-farming Co-operative Society and urban commissioners.

Urban Commissioner: The urban commissioners have a market seat at the urban market (Aizawl). The urban commissioner sold the powder at a profit of ₹ 50-100 per kilogram to the final consumers.

Consumers: Consumers purchased only processed product of turmeric for household consumption. Consumers were the final actor for this value chain of turmeric. The processed powder was mostly used in curry, fried vegetable and the juice was consumed as a medicinal purpose.

Among the four identified marketing channels, Channel I was used by almost half of the respondents (46.67 %) to sell their fresh produced to the rural traders.

10.1.4. Sustainability of Jhum Farming

The various possibility of Sustainability of environment are through practicing Alder farming system, slash and mulch farming system, organic farming system, conservation agriculture system, agroecology farming system, low external input farming system, ecological intensification also natural farming system. Also extending the cropping jhum period and conversion of community land to private land will contribute to sustainability of environment.

Sustainability of production can be achieved from information dissemination through ICT, combining traditional farming system with modern technology, integrating nutrient management, improving soil through application of organic fertilizers, efficient pest and disease management, management of crops according to the various requirement of nutrients, right time of sowing and right time of harvesting, proper water management, conversion of soil through SALT method, using good seeds, using proper sanitation measures, proper monitoring management and practicing integrating farming system.

Value chain can be sustained by strengthening production system, good marketing channels, monetary assistance from the state government, imparting farming knowledge, collaboration with state government, setting policies and regulation by the government and participating in Central government provided digital platform.

Agricultural marketing is essential for farmers as it is the primary source of income for majority of the selected farming households. Therefore, the different possible ways of making marketing sustainable for the farmers are providing proper cold storage infrastructure by the state government, arrangement of good transportation facilities for the farmers, providing good road condition, involvement of less intermediaries, formation of effective farmers society, prioritizing human and environmental health, good quality of production and efficient function of marketing.

10.1.5. Nutritional Information of the Crops under Study

Chili comprises of vitamin A, vitamin C, vitamin E and vitamin K. Also, chilli is a good source of folic acid. Chilli helps in digestion and loose motion. It is used in treatment of cancer, asthma, cough and sore throats. Chilli is also used for external purposes such as pain relieving balms and vapurrubs. In the study areas, more than half (63.33 percent) of the chilli growers consumed chilli “between 1 to 2 percent” from annual production. Chilli can be consumed after 2 months of sowing. Ginger contains vitamin C, magnesium, potassium, copper, iron, calcium and phosphorous etc. Ginger is commonly used for treating digestive problems, motion sickness, cold, cough and nausea. Ginger also helps in lowering blood pressure and manages to help pain and inflammation. It was noticed that a large majority (90 %) of the ginger growers consumed “less than 1 percent” of their annual production. There were 10 per cent of farming households that consumed “more than 5 percent” of ginger from their total production. Ginger was consumed from time of blooming of the green flower till the ginger becomes mature in the study villages.

Maize is a good source of carbohydrates, carotene and vitamin A, vitamin B, vitamin C and vitamin K. Maize has numerous benefits such as it helps in improving the functioning of thyroid gland and immune system. Maize silk is also used for the treating kidney stones, urinary tract infection, jaundice and fluid retention. The decoction of silk, roots, and leaves are used for bladder problems, nausea, and vomiting, while decoction of cob is used for stomach problems. It was found from the field survey that the highest number (30 percent) of the farming household consumed “ more than 5 percent” of their annual maize production. There was an equal number of 13.33 per cent that consumed maize “between 1 to 2 percent” and “between 4 to 5 percent” from their total production respectively. Maize was mainly consumed as boiled on the cob and roasted on the cob using charcoal. There were also farmers who transformed the processed dried on the cob into popcorn. The frequency of consumption was on an average between 3- 4 times a week during the harvesting period.

Soyabean is rich in vitamin E and can be considered as one among the best sources of plant-based protein. Soyabean components are protein, oil, carbohydrates, vitamins and minerals. Soyabean is used for different purposes such as treating type 2 diabetes, asthma, lung function, cancers, constipation, diarrhea and improving memory etc. Soyabean is also used by women specifically for breast pain, preventing from breast cancer, preventing hot flashes for breast cancer, menopausal symptoms and premenstrual syndrome (PMS). It was observed from the information gathered that almost half of the respondents (46.67 %) had consumed "between 1 to 2 percent" of soyabean from their total production. More than one third (40 %) of the sample farmers consumed soyabean " less than 1 percent" of their production. Soyabean was commonly consumed in fermented form (wet and dried form) by vast majority of the selected farmers.

Sugarcane juice contains magnesium, potassium, manganese, iron, phosphorus, calcium, organic acids, vitamin A, vitamin B, vitamin C and vitamin E. Sugarcane juice prevents cancers, particularly, prostate and breast cancer, jaundice, constipation, stomach burn, heart diseases and kidney diseases. Cane juice is also good for Covid- 19 patients as it boosts immunity and treats sore throat. Jaggery also comprises of calcium, sulphates, magnesium, potassium, iron, protein, phosphate, sodium, copper, vitamin A, vitamin B, vitamin C and vitamin E. Jaggery helps in curing jaundice, purifies the blood, prevents constipation, anaemia, boosts intestinal health, controls blood pressure, treats cold, cough, throat and lung infections etc. Jaggery consumption is also benefitted for Covid- 19 patients as it helps in treating cold and cough, it helps to increase the total count of haemoglobin in the blood and boost resistance against infections. Jaggery also prevents problems related to respiratory problems such as asthma and bronchitis, etc. In the selected villages, more than half (56.67 %) of the respondents consumed "between 1 to 2 percent" from their total production. There were 3.33 per cent of farmers found to have consumed "more than 5 percent" of their total production. The consumption form of sugarcane is mainly in a processed form.i.e. jaggery.

Turmeric consists of curcumin, sterols, resins and volatile oils. Turmeric is rich in vitamins C, B3 and B6, magnesium, manganese, potassium, copper, sodium, phosphorus, calcium, iron, zinc and omega-6 fatty acids. Turmeric is considered a carminative, tonic, blood purifier, vermicide and an antiseptic. Turmeric is used for the treatment of diabetes and leprosy, gall stones and gall complaints and to relieve sore throat and common cold. Raw rhizomes of turmeric is used as an anti-parasitic against many skin infections. Turmeric helps to detoxify the liver,balance cholesterol levels, fights allergies, stimulates digestion, boost immunity, purifies blood and enhance the complexion. It is also an antioxidant, stomachic, carminative, tonic, vermicide and an antiseptic. Turmeric is used in the preparation of medicinal oils, ointments and poultice. It is stomachic, carminative, tonic, blood purifier, vermicide and an antiseptic.It was observed from the field survey that more than half of the respondents (63.33 %) had consumed "less than 1 percent" of turmeric from their total production. A respondent of 30 percent consumed turmeric "between 1 to 2 percent" from their annual production. An equal number of 3.33 per cent were noticed consuming turmeric "between 2-3 percent" and "between 3-4 percent" from their total production respectively. Generally, turmeric was consumed in the form of powder by all the respondents.

The overall household consumption was that the highest number constituting 40 per cent of the farmers consumed "less than 1 percent" of their production, followed by 37.78 per cent consumed 'between 1 to 2 percent" from their annual production. The third highest number (10 %) fell under the category of consuming "between 2 to 3 percent" of their annual production. There were few farmers (6.11%) who consumed "more than 5 percent" of their total production.

10.1.6. Opportunities for Value Addition of the Selected Crops

The study showed that processing of chilli was done minimally at the producer's level. Whole dried form was the most common processed product prepared by the 66.66 per cent sample chilli growers. Thus, in Mizoram, the opportunities of marketing chilli is wide open through enhancing chilli into red/ green chilli powder, green/ red chilli paste, green/red chilli pickle, red chilli flakes, chilli oil, chilli sauce, whole dried green chillies, canned chilli, brined/pickled, fermented chilli etc .

Ginger was not sold in any processed form by the all the farmers (100 %), wherefore, in Mizoram, many products can be manufactured from ginger such as ginger pickle, dried ginger, ginger powder, ginger paste, ginger beer, ginger candy, ginger tea, ginger coffee, ginger wine, salted ginger, ginger oil, encapsulated ginger, ginger oleoresins, etc.

The only processed form done by the maize growers was dried on cob. This is again prepared into popcorn by the end users. Therefore, the scope of expanding maize market through processing of raw maize into maize flour, maize oil, rolled maize, animal feed, maize syrup, oil cake, cornflakes, boiled/cooked maize cob etc. is opened in Mizoram.

Soyabean was processed into traditional fermented food called *bekang um* and *bekang rep/ro*. These two are the main processing activities performed by the sample farmers. Hence, the opportunities of adding value to soyabean was found to be wide open as soyabean can be prepared into numerous products like soyabean oil, soya cake, soyabean feed, soya chunk, powder, soya meat substitute, soya flour, soya sauce, soyabean papad, soyabean milk, soyabean paneer /tofu, soyabean yogurt/curd, fortified soyabean products for infants and women, fermented soya beans and other direct food uses of soya bean in the form of soya-fortified cereal/legume flour, soya-based sattu, roasted/fried/fermented soya-snacks, soya millet based extruded/baked food products, soya mayonnaise, soya biscuit, soya noodles, soyabean paste, soya candles, soya biodiesel, soya supplements, soya crayons, soya ink, biodiesel, tempe/ tempeh and natto etc

Jaggery is the only processed product practiced in the selected villages (100%). This implied that the scope of creating different by-products from sugarcane is possible. Therefore, jaggery can be transformed into various products such as sugarcane beer, rum, ethanol, sugarcane white sugar (Sucrose), sugarcane brown sugar, packed sugarcane juice, jaggery syrup/powder, liquid jaggery, granular jaggery, blackstrap molasses, bagasse papers, bagasse disposal plate, bagasse disposal cup, sugarcane vinegar etc. In addition, jaggery can be further processed combining with other products and create several products like- reori, gazak, chikki, patti and ramdana, etc. in addition, good packaging will also add value to jaggery as printed newspaper was commonly used by the farmers.

The general processed products of turmeric undertaken by the turmeric growers were dried slice, powder and juice. Apart from these three value added activities, there are several ways of adding value to turmeric in Mizoram such as in the form of capsule, face pack, turmeric drops, dietary supplement, turmeric essential oil, turmeric oleoresin, turmeric oil, turmeric herbal tea etc.

10.2. Conclusions

Based on the data collection the following conclusions were drawn:-

10.2.1. Social-Economic Profile

The highest number ofthe respondents were between 50-60 of age. The literacy rate of the respondents was 97.78 per cent wherein the highest number completed middle level education.Majority of the household was between 5 to 10 members with overall mean household size was 5.93. The government categorized household as AAY, PHH and APL and the highest number of the farming household were entitled to receive the benefits of Priority Householder (PHH). The mean annual income of the respondent households was ₹ 200000/- while the annual total average expenditure was ₹104000/-

10.2.2. Cultivation Practices

The average jhum landholding size was 2.3 acres of land wherein the highest number of farming households operated “more than 3 acres above”.

There were farmers who managed two plots (12.78 %) and three plots (1.67%) respectively. A great majority of the respondents(98.33 %) cultivated crops in the jhum land for one year while there were farmers cultivating crop for two consecutive years and more than three consecutive years. The highest number reported to have resided more than 6 kilometers away from their jhum land.

The average farming experienced of the sample farmers in cultivation the crops was 16.99 years. Most of the farmers carried out farming in their own land. The main cultivated vegetables, leafy vegetables, cereals and spices were Pumpkin (*Mai*) ,Cowpea leaves (*Behlawihnah*), Maize (*Vaimim*), Mizochilli (*Hmarchate*) respectively.

Clearing of forest was performed from the month of October to February. Firelines were prepared prior to carrying out burning activity. Burning was carried out usually before 15th of March and reburning activity was performed if necessary. Farmers began their first sowing from February and continued till September. The timing and frequency of sowing may differ base on the types of crops cultivated. A large majority of the farmers used their own seeds for planting.

Weeding activity was carried out from February and continued till October. The first round was performed by all i.e. 180 (100%) of the sample respondents. The number of cultivators carried out weeding activity was starting to decline round after round.

Harvesting of crops was carried out in each month (from January to December). Harvesting period was differed from crops to crops. Harvesting was done manually wherein chilli and maize were handpicked, ginger and turmeric were harvested using hoe (*Tuthlawh)*, kodali (*Bawngtuthlawh*), matured soyabean was gathered using sickle and sugarcane harvesters reaped their production by employing dao/sword (C*hempui*). For carrying harvested crops human power, own vehicles, hired vehicles and animals were used. For transporting the produced to the neighbouring villages and urban market (*Aizawl* city) sumo was mainly utilized. Pick-up truck was also hired by the famers as well.Almost half of the respondents sold crops in fresh form while 30.56 per cent of the farmersprocessed their produced. Few farmers (20 %) practiced both methods of both post- harvest handling. The agricultural products processed at the farmers level were chilli into whole dried , maize into dried on the cob, soyabean into fermented soyabean (wet and dried form), sugarcane into jaggery and turmeric into powder, juice and whole dried form.

10.2.3. Value Chain

Mobile phone was the main tool of communication employed by the actors so as to exchange information between them. The practice of selling their produced to more than two or more actors by one farmer was prevalent in the study areas. In general, a large quantity of produced was sold through rural traders in each crop value chain. Farmers benefitted the most when selling their produced directly to the final consumers, however, farmers had to comply with the price set by the other actors when selling their produced through them.

10.2.3.1. Chilli

Chilli was cultivated as mixed cropping with other crops in an average jhum area of 3.0083 wherein, more than half operated chilli cultivation in an area of "3 acres and above". The average seeds sown were 16.9667 kilograms. The overall average mandays used for chili cultivation was 86.22 mandays. Weeding required the highest mandays as compared to other farming activities. The economic value of a household human labour contribution for chilli production was the highest. The average total production of fresh and processed chilli were 2053.4 kg and 1020.8 kg respectively, whereby, 1982.9 kilograms of fresh produce and 973.45 kilograms of processed produced were sold. On average, ₹ 121000 and ₹ 227000 were earned from selling fresh green chillies and processed Mizo chillies respectively. On an average, fresh mizo chilli equivalent . The total average expenditure was ₹58448.52, out of which 92.81 per cent (₹54243.75) of the average total expenditure was incurred on hired human labour cost.

The main actors involved in selling fresh chillies were farmers, farmer's association, rural traders, urban commissioners and consumers while the main actors identified for processing channels were –farmers, rural agents, wholesaler. Five marketing channels were observed in the study areas. Channel V was used by more than half of the farmers to sell their processed product to the rural agents. Also, the traditional practice of open air sun drying method was popular in the study areas.

Farmers sold fresh chillies at ₹45, ₹47 and ₹40 per kg to the final consumer, rural traders and urban commissioners respectively. Farmers sold fresh chillies to the

Farmer's Association at a rate ranged from ₹40 to ₹125 per kg with an average rate of ₹71 per kg. The selling and buying activities were mainly carried out in the form of auction, wherein, chillies were sold to the rural traders who can offer the highest price. These rural traders resold fresh chillies to the urban commissioner at a profit ranged between ₹20 from ₹ 33 with an average profit of ₹ 18.5 in Aizawl market. The urban commissioners resold fresh chillies to the final consumers at a profit of ₹15, ₹50 and ₹ 70 per kg.

In Sailulak village the selling rate of dried Mizochilli was between ₹180 to ₹ 200 while in Thingsai village, the selling rate of Mizo dried chilli was ranged from ₹250 to ₹ 300 per kg. The purchasing rate of dried Mizo chilli by the Assamese rural agents were influenced by the prevailing rate of Silchar market. The collected products were transported to the wholesaler, Silchar, thereon, whole dried Mizo chillies were resold and transported to Siliguri factory, Siliguri for further value addition. Also, Retailers in different parts of the state obtained dried Mizo chillies from the wholesaler.

10.2.3.2 Ginger

Ginger was cultivated as a sole cropping and mixed cropping crop. From the respondents, 90 per cent practiced mixed cropping of ginger while 10 per cent practiced sole cropping system.

The average cultivated area for ginger cultivation was 1.9917 whereby the highest number of the respondents cultivated ginger in an area "between 2 to 3 acres" of jhum area. The average seed rhizomes planted was 1361 kilogram. The total average harvested was 3419.87 kilogram. Moreover, an average quantity of 3396.67 kilogram was sold hence, earned ₹ 32300. Furthermore, an average of 9166.67 kilograms and 2755.56 kilograms was sold from the sole cropping and mixed cropping jhum areas respectively. It was also learnt that income obtained from sole ginger farming (₹76500) was higher that mixed cropping of ginger (₹27400)

The overall average mandays used for an average jhum area of 1.9917 was 83 mandays. Weeding required the highest mandays (121.37) among all the farming activities. The economic value of household human labour participation was the highest for cultivation of ginger. The total mean expenditure incurred was ₹ 59568.8825 ,whereby, the highest cost was incurred on hired human labour (78.84 %).

The actors involved in ginger value chain were farmers, rural traders/agents, society, urban commissioners and wholesalers. According to the understanding from the data collection, among all the crops, the value chain of ginger is the longest as ginger in flakes form were sold to European country. Farmers selling ginger to more than one or two actors were prevalent in the ginger marketing. Among those four existed marketing channels, channel I was utilized by 76.67 per cent of the respondents to sell ginger to the rural agents/traders.

Farmers sold ginger rhizomes for ₹10 directly to the consumers and sold baby ginger and rhizomes ginger at ₹ 80 per kg and ₹20 per kg respectively to the urban commissioner respectively. The urban commissioners resold ginger (baby ginger and rhizomes ginger) at a profit ranged between ₹30 to ₹40 per kg to the final consumers.

Farmers sold fresh ginger at ₹10 to rural agents (CDAR) and the rural agents earned ₹ .50 (paise) per kg for collecting ginger for the Society (CDAR). CDAR again processed ginger into flakes and sold it to the exporters at a rate ranged from ₹ 220-₹250 per kg.

Also farmers sold fresh ginger between ₹ 7 to ₹12 with an average rate of ₹9 to the rural traders/agents of wholesalers (Silchar and Bagha). The rural agents of wholesaler (Silchar) earned ₹ 1 per 1 kg from trading it while a ranged from ₹ .05 to ₹1 per kg with average income of ₹.05 can be earned from trading it to wholesalers (Bagha) . The rural agents earned between ₹3.5 and ₹ 10 per kg with an average income of ₹5.75 per kg when transported the produced and traded directly to the wholesaler (Bagha). The data on reselling rate of wholesalers was not collected.

3.2.3.3. Maize

Maize was grown as a mixed cropping system wherein an average 3.025 acres of jhum land was used for maize cultivation. The highest number of maize growers operated an area of "between 1 to 2 acres" of land for maize cultivation and mean average of 3.8583 kilograms of maize seeds were sown. Weeding required the highest mandays as compared to other farming activitiesand on average, the overall mandays used for maize cultivation was 47.89 mandays. The economic value of household human labour contribution towards maize cultivation was the highest.

The average expenditure incurred was estimated to be ₹ 37074.55. The highest expenditure was made on hired labour (72.31%) (₹26807). The overall average production yield from an average area of 3.025 acres of land was 10900 fresh cobs and 438.33 processed cobs. The total average sold quantity of fresh maize was 9414 cobs and an average amount of ₹ 28400 was obtained. An average 400 processed cobs were sold and from the sold quantity, an average amount of ₹ 1427.83 were earned by the maize growers. The identified actors were farmers, rural traders, urban commissioner and consumers. There were six main marketing channel identified for maize. Among the channels, channel II was used by 40 per cent and 3.33 per cent of the maize growers to sell their fresh produces and both production (fresh and processed) respectively to the rural traders.

Farmers sold maize directly to the consumers can set their own rate. The farmers sold maize between ₹8 to ₹ 14 per cob with an average earning of ₹10 per cob during the early harvesting season. During the peak harvesting season maize was sold for ₹5- ₹7 per cob by the maize growers. The processed maize was sold for ₹ 6 per cob to the final consumers and ₹3 per cob to the rural trader.

Famers sold fresh maize to the rural traders between ₹ 5-₹6 per big size cob and ₹3-4 for medium to small size cob for the first harvesting week. During the peak harvest season big size cob was sold between ₹3-4 and small/ medium cob was sold between ₹1-₹2. Farmers sold maize to the urban commissioner at a price ranged from ₹4- 8 per big size cob during the first week of harvesting and between ₹2-1 per small/medium size cob.

Rural traders were from the local village and they consisted of 1) a person collecting maize at the local area from the farmers and resold it to the urban commissioner (*Aizawl*) at a profit between ₹ 1 to ₹ 2 per cob (big and small) and 2) a rural trader who resold at the local market at a profit between ₹ 4 to ₹ 6 per big cob and ₹2 to ₹5 per small/medium cob. Urban commissioner were those commissioners selling maize at the urban market (*Aizawl*) such as commissioner who resold at the *Aizawl* main market , peddlers who resold fresh maize by going house from house in *Aizawl* city, roadside vendors selling roasted maize and boiled maize (*Aizaw*l city).

10.2.3.4. Soyabean

Soyabean was cultivated as sole cropping and mixed cropping system. The total average area of 0.5083 was operated for cultivating soyabean. A large majority (90 %) of the respondents cultivated soyabean in an area “below 1 acre” of jhum land. An average 2.853 kg of soyabean was sown.

The overall average mandays spent for soyabean cultivation was 9.97. The average mandaysused for weeding was the highest (24.03) as compared to other farming activities. The economic value of household human labour was observed to be the highest.

It was difficult to convert and calculate the processed quantity, therefore, the calculation of the total production and total sold quantity were taken in fresh form.

The total average production was 114.37 kilograms. The average fresh quantity of 83 kg and processed quantity of 47.39 kg were sold. An income of ₹ 7053.33 and ₹ 7029.21 were earned from selling fresh and processed products.

It was estimated with the local farmers that a fresh soyabean of one kilogram when processed into wet fermented soyabean, ₹ 200 can be obtained from selling the produced. Also, from one kilogram of fresh soyabean when processed into dried fermented product, ₹180 can be obtained.

The total mean expenditure was calculated to be ₹6916.32. The highest cost was incurred on hired labour cost (66.40 %) (₹45925). The identified actors in the marketing channel of soyabean were farmers, rural traders, urban commissioners and final consumers. Channel I was used by 20 per cent, 6.67 per cent, 23.33 per cent to sell their produced to the final consumer. such as- fresh soyabean, processed and both production (fresh and processed) respectively. Farmers sold fresh soyabean at arate between ₹70 to ₹95 per kg to both the final consumer and rural traders. The farmers also sold processed soyabean to the urban commissioners with a price rangedfrom ₹ 180 to ₹200 from 1 kilogram of soyabean. Rural traders procured fresh soyabean from the farmers and processed into wet and dried form. Rural traders soldthe processed soyabean to the final consumer and urban commissioner for a profit between ₹ 105-₹130. Urban commissioners obtained a profit of ₹80 to ₹100 from reselling soyabean processed products to the final consumers.

10.2.3.5. Sugarcane

Sugarcane was cultivated as mixedcropping system on an average jhum area of 3.667. An average 12500 cane setts was planted. The overall average mandays used for sugarcane cultivation was 143.58 mandays. Combine activities of harvesting and processing demanded the highest mandays (236.77 average mandays) as compared to other farming activities.

The average total production of processed sugarcane were 2996.33 kg and an average quantity of 2946 kilograms were sold, whereby, ₹ 17000 was earned from selling jaggery by the farmers. Also, the average total production and sold quantity of fresh sugarcane stalks were 7207.14. An amount of ₹ 46500 was obtained fromthe selling of cane stalk.

The average total expenditure for the cultivation of sugarcane was ₹ 5678.98 and 74.63 per cent of the average total expenditure was incurred on hired human labour cost (₹41852.5) .

The major actors in the marketing system were found to be farmers, rural traders and urban commissioners and consumers. Among the ten marketing identified, channel I was used by 23.33 per cent and 6.67 per cent famers to sell theirproduce of jaggery and both production (fresh and processed) respectively to the rural traders.

Farmers sold jaggery directly to the consumer at a rate ranged from ₹45 to ₹70 per kilogram while jaggery was sold to rural traders and urban commissioners ata price ranged between ₹ 40 to ₹ 60 per kilogram respectively. Again, these rural traders resold jaggery to the urban commissioner at a profit of ₹5 to ₹ 10 perkilogram. Urban commissioner resold jaggery at a profit of ₹ 20 to ₹40 per kilogramto the final consumer.

Farmers sold cane fresh stalk at ₹ 7-8 per cane stalk directly to the urban commissioner (sugarcane juice seller) and ₹5-6 per cane stalk to rural traders. The rural traders resold fresh cane stalk at a profit of ₹2.5-3.5 per cane stalk to urban commissioner (juice seller). Urban sugarcane juice sellers in Aizawl city purchased cane stalk at a rate between ₹7-10 per cane stalk. Moreover, a 200 ml of cane juice was sold for ₹ 10 by the sugarcane juice sellers.

10.2.3.6. Turmeric

Turmeric was cultivated as mixed cropping crop. Turmeric cultivation was operated in an average jhum area of 1.7167 acre of land. An average of 764.4 kg turmeric rhizomes was sown. On average, the overall mandays used for turmeric cultivated accounted for 46.35 mandays. The highest average mandays was used for weeding activities.

The total average expenditure incurred by the turmeric growers was estimated to be ₹ 39300.8. The highest expenditure was incurred on hired labour cost with an average number of 72.30 per cent (₹28145).

The overall average fresh production was 3392.33 kilogram. The average quantity of processed turmeric sold was 377.13 kilograms and obtained ₹ 60700. As calculated with the local farmers, it was estimated that one dried kilogram of turmeric can be obtained from an average fresh eight kilograms of turmeric rhizomes. The total average fresh rhizomes quantity sold was 3392.33 kilograms and generated an income of ₹15800 from marketing the rhizomes.

The main turmeric marketing actors such as producers, rural traders, Society (Reiek Multifarming Co-operative Society and Reiek Block Turmeric Grower Society), urban commissioner and consumer were involved in the marketing system of turmeric. Among the six identified marketing channels, channel I was used by almost half of the respondents (46.67 %) to sell their fresh produced to the rural traders.

Farmers sold turmeric powder at a rate of ₹ 120 ,₹210 , ₹230 and turmeric juice for ₹ 80 per litre to the final consumers respectively. Farmers also sold fresh rhizomes between ₹ 7 -9 per to the rural traders. Rural traders who sold fresh turmeric directly to the Reiek Multi-Farming Co-operative Society obtained between

₹4 to ₹ 6 per kg and further processed these fresh rhizomes. This society also procured dried sliced turmeric for ₹ 135 per kilogram from the farmers. The society processed the dried turmeric into a powder and sold it to the urban agency, Aizawl.

The other rural traders who purchased fresh rhizomes from the farmer further processed turmeric into a powder and sold it to the urban commissioner in Aizawl with a price ranged between ₹100 -₹150. The urban commissioner resold the powderat a profit of ₹ 50-100 per kilogram to the final consumers.

Reiek Block Turmeric Grower Society procured fresh rhizomes at ₹ 15 per kilogram from the farmers and again distributed the rhizomes to its society member for turmeric cultivation.

Famers also sold turmeric powder at ₹ 170 to the rural trader as well. This rural trader resold turmeric powder at a profit of ₹80 to the final consumers.

10.2.4. Sustainability of Jhum Farming

Sustainability of environment, sustainability of production, sustainability of value chain and sustainability of marketing altogether are important for farmers to meet their economic needs as well as nutritional needs. The following are the possible option for sustainability of jhum farming:-

Sustainability of environment can be attained through practicing Alder farming system, slash and mulch farming system, organic farming system, conservation agriculture system, agroecology farming system, low external input farming system, ecological intensification also natural farming system. Also extending the cropping jhum period and conversion of community land to private land will contribute to sustainability of environment.

Sustainability of production can be achieved from information dissemination through ICT, combining traditional farming system with modern technology, integrating nutrient management, improving soil through application of organic fertilizers, efficient pest and disease management, management of crops according to the various requirement of nutrients, right time of sowing and right time of harvesting, proper water management, conversion of soil through SALT method,

using good seeds, using proper sanitation measures, proper monitoring management and practicing integrating farming system

Sustainability of value chain can be built by strengthening production system, good marketing channels, monetary assistance from the state government, imparting farming knowledge, collaboration with state government, setting policies and regulation by the government and participating in Central government provideddigital platform

The goal of sustainability of marketing can be attained by providing proper cold storage infrastructure by the state government, arrangement of good transportation facilities for the farmers, providing good road condition, involvement of less intermediaries, formation of effective farmers society, prioritizing human and environmental health, good quality of production and efficient function of marketing.

10.2.5. Nutritional Information of the Selected Crops

More than half of the chilli growers consumed chilli “between 1 to 2 percent”from their annual production. This indicated that the farmers can get the nutrients contain in Chili such as vitamin A, vitamin C, vitamin E, vitamin K. and folic acid. In addition, the chilli growers can use chilli for various treatment like digestion and loose motion, cancer, asthma, cough and sore throats. Chilli is also used for external purposes such as pain relieving balms and vaporubs. A large majority of the ginger growers consumed “less than 1 percent” of their annual ginger production. From the consumption of ginger, ginger growers can get nutrients like vitamin C, magnesium, potassium, copper, iron, calcium and phosphorous etc. which are contained in ginger. Further, farmers can use ginger to treat digestive problems, motion sickness, cold, cough and nausea. Ginger also helps in lowering blood pressure and manages to help pain and inflammation. Ginger was consumed from time of blooming of the green flower till the ginger becomes mature in the study villages.

Most of the farming household consumed “ more than 5 percent” of their annual maize production. Hence, farmers can get nutrients such as carbohydrates, vitamin A, vitamin B, vitamin C and vitamin K. Moreover, maize can help maize growers in improving the functioning of thyroid gland and immune system. Maize grower can use maize silk for treating kidney stones, urinary tract infection, jaundice and fluid retention. The decoction of silk, roots, and leaves are used for bladder problems, nausea, and vomiting, while decoction of cob is used for stomach problems. Maize was mainly consumed as boiled on the cob and roasted on the cob using charcoal. There were also farmers who transformed the processed dried on the cob into popcorn. The frequency of consumption was on an average between 3- 4 times a week during the harvesting period.

Almost half of the respondents reported to have consumed “between 1 to 2 percent” of soyabean from their total production. Soyabean was commonly consumed in fermented form (wet and dried form) by vast majority of the selected farmers. This fermented soyabean called *bekang um* prepared by the soyabean farmer is quite similar with ‘ Kinema’ a fermented soyabean prepared by the Nepali communities of the Eastern Himalaya. According to the research, ‘Kinema’ has several health-promoting benefits such as its antioxidant property, digested protein, essential amino acids, vitamin B complex, low-cholesterol content (Phytosterols), etc. Likewise, if ‘Kineama’ is said to be same with *bekang um*, then the soyabean farmers can get the health benefit generated by *bekang um.*

Farmers of soyabean can also get nutrients such as protein, oil, carbohydrates, vitamins and minerals from soyabean. In addition, farmers can use soyabean fordifferent purposes such as treating type 2 diabetes, asthma, lung function, cancers, constipation, diarrhea and improving memory etc. Soyabean is also used by women specifically for breast pain, preventing from breast cancer, preventing hot flashes for breast cancer, menopausal symptoms and premenstrual syndrome (PMS).

More than half of the respondents consumed “between 1 to 2 percent” from their total production. The consumption form of sugarcane is mainly in a processed form.i.e. jaggery. In general, the frequency of jaggery consumption by the farmers was daily. Whence, farmers can get the benefit of calcium, sulphates, magnesium, potassium, iron, protein, phosphate, sodium, copper, vitamin A, vitamin B, vitamin Cand vitamin E. Also, farmers can used jaggery to cure jaundice, purify the blood, prevent constipation, anaemia, boosts intestinal health, control blood pressure, treat cold, cough, throat and lung infections etc. Moreover, jaggery consumption is also benefitted for Covid- 19 patients as it helps in treating cold and cough, it helps to increase the total count of haemoglobin in the blood and boost resistance against infections. Jaggery also prevents problems related to respiratory problems such as asthma and bronchitis, etc . Though sugarcane juice was not consumed regularly, however, farmers can be benefitted from the nutrients contain in sugarcane like magnesium, potassium, manganese, iron, phosphorus, calcium, organic acids, vitamin A, vitamin B, vitamin C and vitamin E. Farmer can also use sugarcane juice in order to prevent diseases like cancers, particularly, prostate and breast cancer. Sugarcane juice can also be used for treating jaundice, constipation, stomach burn, heart diseases and kidney diseases. Farmers can also use Cane juice for treating Covid- 19 as it boosts immunity and treats sore throat.

More than half of the respondents had consumed “less than 1 percent” of turmeric from their total production. From the consumption of turmeric farmers can get vitamins C, B3 and B6, magnesium, manganese, potassium, copper, sodium, phosphorus, calcium, iron, zinc and omega-6 fatty acids. curcumin, sterols, resins and volatile oils. Moreover, turmeric growers can use turmeric as a carminative, tonic, blood purifier, vermicide and an antiseptic as well as used for the treatment of diabetes, leprosy, gall stones and gall complaints, to relieve sore throat and common cold. Farmers can also use raw rhizomes of turmeric as an anti-parasitic against many skin infections. Further, turmeric helps to detoxify the liver,balance cholesterol levels, fights allergies, stimulates digestion, boost immunity and enhance the complexion. Generally, turmeric was consumed in the form of powder by all the respondents.

10.2.6. Opportunities for Value Addition of the Selected Crops

More than half of the respondents prepared Mizo chilli into whole dried form. This was the only processed product prepared by chilli growers. This indicated that the scope for value addition of chilli in Mizoram is vast open. Products such as red/ green chilli powder, green/red chilli pickle, red chilli flakes, whole dried green chillies, green/ red chilli paste, red chilli flakes, chilli oil, chilli sauce, whole dried canned chilli, brined/pickled and fermented chillietc .can be prepared from chillies.

Ginger was sold in fresh form only by 100 per cent of the respondents. The potential for value addition on ginger crops in Mizoram has a good scope. Gingerthat can be prepared into different products such as ginger pickle, dried ginger, ginger powder, ginger candy and ginger tea, ginger paste, ginger beer, ginger coffee, ginger wine, salted ginger, ginger oil, encapsulated ginger, ginger oleoresins, etc.

Dried on cob (popcorn variety) was the sole form of processing carried out bythe maize farmers in Mizoram. The kernel of maize was further prepared into popcorn by the final consumers. The scope for value addition of maize is opened in Mizoram and can be produced into maize flour, maize oil, rolled maize, animal feed, maize syrup, oil cake, cornflakes, and boiled/cooked maize cob etc.

Traditional fermented food called *bekang um* and *bekang rep/ro* were the only two processing activities carried out at the farmer level. The opportunities for value addition to soyabean in Mizoram was observed to be wide open. The followingare the products that can be enhanced by adding value to soyabean- soyabean milk, soyabean paneer /tofu, soyabean yogurt/curd, soya mayonnaise, soya biscuit, soyabean paste,soyabean milk, soyabean paneer /tofu, soyabean yogurt/curdsoya mayonnaise, soya biscuit, soya noodles, soya candles, soya biodiesel, soya supplements, soya crayons, soya ink and biodiesel etc.

All the farmers (100%) prepared jaggery from sugarcane juice. And in fact, jaggery is the only processed product prepared by the sugarcane growers. Jaggery was simply wrapped with newspaper by the farmers, hence, good packaging material will also add value to jaggery as well. The opportunity of preparing different products from sugarcane is thus opened in Mizoram and the following value addition can be prepared from sugarcane - liquid jaggery, granular jaggery, blackstrap molasses. Products such as sugarcane beer, rum, ethanol, sugarcane white sugar (Sucrose), sugarcane brown sugar, packed sugarcane juice, jaggery syrup/powder, granular jaggery, bagasse papers, bagasse disposal plate, bagasse disposal cup, sugarcane vinegar etc.

Turmeric growers processed turmeric into dried slice, powder and juice. The scope for adding more value to turmeric can produce turmeric capsule, face pack, turmeric drops, dietary supplement, turmeric essential oil, turmeric oleoresin, turmeric oil, turmeric herbal tea etc. is open.

10.3. Recommendations

Based on the findings and conclusions, the following recommendations areproffered:-

1) Shifting cultivation is labour intensive thus required more labour so as to manage the jhum land. From the data collection, household human labour was the major contributor of mandays for cultivation of crops. Further,majority of the respondents were in the age group between 50-60years. The physical strength of a person is likely to decline after reaching middle age whereby results in less productive towards agricultural production. Therefore, it is recommended that young farmers must be motivated towards active participation incarrying out farming activities as well as developed their capacity through training.Active participation of young farmers combine with the accumulated farming experiences from the older farmers can result in productive, profitable and sustainable agriculture.

2) Most of the roads in the villages of Mizoram are in poor condition thereby hinders the ability to collect crops production during harvesting season in some sample villages as some farmers jhum area were located far away from the major roads which in turn affects households' income. Another constraint faced during monsoon seasons were, because of the poor road condition and natural calamities occurrence (mostly landslides), roads were frequently blocked. This delayed the transportation of the produced to other market places for commercialization purposes, wherein, farmers had to suffer crop losses because of their high perishability nature. Thus, it isrecommended that good road connectivity must be constructed for farmer's convenience which is crucial especially during the harvesting period as better road condition can accelerate crop production and improve household income as well as motivate farmers to cultivate more crops.

3) Crops are highly perishable in nature and have respired even after harvesting. Due to the short life of crops, farmers have to sell off their produce immediately at a lower price as farmers do

not have post-harvest management facilities. Therefore, providing facility for post-harvest management for the benefits of the farmers is highly recommended ,whereby, post-harvest management facility would reduce crop waste, enablefarmers to improve their income, preserve the nutrient content and the quality of the crop and facilitate continuous supply of their produced at a higher rate during the off season and price fluctuating period.

4) With regard to price, it was observed that majority of the farmers had to sell their produce to rural agents due to the following reasons- shortage of household labour, farmers do not have proper seat at the urban market and extra expenditure has to incur on transportation cost etc. Because of all the aforementioned factors, farmers have to comply with the price offered by the rural agents. Also, the selling rate of crops were highly determined by the prevailing market rate of Aizawl city and Assam State (Ginger and processed chilli).As reported by one maize grower, during peak harvesting period, due to low selling rate of maize coupled with far location of their jhum land and high demand of human resources, the farmer was discouraged by these factors and reluctant to use extra mandays to collect their produce.Another constraint faced by soyabean farmers was that soyabean cultivation area was comparatively smaller than other crops, this was because of it's semi-perishable nature of soyabean related with weak marketing channel. Therefore, considering all these factors,it is suggested that the state government should establish regulate market price wherein every value chainactor can earn income in each channel , particularly, farmers who receive the least benefits from their produced when they are the actor who performed theactual field work.

5) From the data collection, it can be understood, to a great extent, that among the actors urban commissioner and society were found to be the most financially benefitted actors while farmers were the least financially benefitted in the chain. Famers earned highest income when they sold their produced directly to the consumers. Further, it was noticed that value chain with multiple actors involved in each marketing channel were found less remunerative for farmers as every actor has to earn income through this mode. Hence, minimizing the number of intermediariesinvolvement can generate higher return to the farmers. Consequently, the state government strong intervention by providingconsistent marketing facilities in order to obtain regular income is recommended.

6) Farmers Association is composed of farmers sharing a common interest in order to earn their income for their household. A Farmer Association is an important instrument for farmers to meet their needs such as toincrease their productivity and enhance the economic well. In terms of

marketing, as per the information gathered, it was observed that chilli grower association of Mualpheng village practiced collective marketing thus sold fresh chilli to therural traders who offered the highest rate. The rural traders offered price wasdetermined by the prevalent rate of uraban (Aizawl) market. This indicated that farmers did not have the power to set their own rate whereby they haveto comply by the rate set by the rural traders. Therefore, it is crucial that a farmer Association is adamant in price fixation against intermediaries. Also,it should seek any alternative possible profitable channels that will allow the group to generate more income and make a better and effective society for its members. Nevertheless, the advantage that collective marketing offered was it saved time and provide marketing opportunity for farming household with limited human resources. However, Farmers Association formation is highly recommended as it would give farmers the power/authority in price fixing of the crops against the local middleman/trader for their own welfare and enhance their bargaining power also Therefore, it is advisable that groups with mutual objectives must be formed to strengthen their power and improve their agricultural income. Also, Farmer Association member must be provided capacity building training by higher authorities etc.

7) The common method of packaging solid jaggery in Mizoram is wrapping/packing the product in a printed newspapers which is quite unhygienic and can further cause health issues. Good packaging will also allow to maintain the shelf life of solid jaggery. Therefore, packing solid jaggery in a paper bag/pouch, aluminum foil bag/ pouch, plastic bag/pouch, stand-up pouch, transparent hinged lid plastic container, polystyrene foam food container/ box etc. will add more value to the product itself and is recommended. Moreover, it is recommended to use recyclable orbiodegradable packaging material for improving the pollution control.

8) It was known from the survey that mobile phone was the main communication mode between actors. Hence, this also proved that technology has brought convenience to these actors in dealing business. Almost all the respondents (97.78 per cent) were found to be literate. This indicated that all the farmers can access mobile phone technology. Wherefore, making used of this opportunity is valuable, wherein, farmers can easily obtain agricultural related information like production technique, availability of inputs, market price information, information on crops, expert advice and weather forecast etc. and will also help in dealing with rural traders as resourcesIgnorant on market price information knowledge about the crops results in weak bargaining power for the farmers. Therefore,equipping farmers with market price and information on agricultural farming through radio, television, newspaper, mobile phone and social media is desirable. Furthermore, the state government

must be immediate in making the essential information available to the farmers when utilizing these different resources.

9) Among the selected crops such as chilli, ginger, maize, soyabean, sugarcane and turmeric, it was observed that ginger was the only crop that did not receive any sort of processing. Nevertheless, the other crops that were also processed were doneminimally at the farmers' level.This implies that that value addition of the selected crop into different by-products has a wide scope in Mizoram. Further, it was learnt that processed product can obtain higher income for the farmers and generates more employment opportunities at the local level. Therefore, setting up processing unit for each crop is highly recommended so that there will be consistency in generating income for the farming households, especially during the off season of harvesting. Moreover, from the field survey, it was observed that each crop cultivators were willing to cultivate more quantity of the crops as long as consistent marketing is available and higher income can be generated from the crops.

10) If a processing unit is established, arrangement for farmer capacity building programme in handling the crops will be required so that the product wouldmeet the quality standardin upgrading and packaging. The responsibility of providing training for the farmers can be shared between the stat government or the NGO's. Furthermore, any potential technologies which could likely benefit more than one value chain should also be considered.

11) Transportation is a necessity for farmers to transport their produced from farm to home and home to urban market. Transportation is also vital for farmers to reach their jhum land on a daily basis. According to the field survey, it was noticed that majority of the farmers used human power to carry their produce from their farm to home. The highest number of the respondents resided about six kilometers away from their jhum land. There were also farmers who had owned motor vehicle or motorcycle or scooter while some did not own any vehicles in the study areas. However, farmers were compelled to hire transportation facilities like pick-up truck in thevillage for bulk transport from farm to home, home to urban market etc and they had to incurred high transportation expenses for the hired fare. Therefore, transportation cost directly or indirectly decreased their household income from the amount received from selling their produced. Thus, it is suggestedthat the state government should arrange transport serviceswithminimum charges for the welfare of the farmers throughout the year.

12) Farming is a risky occupation for farmers as farmers are easily affected by the outbreak of diseases and pest, uncertainties in natural calamities, marketing price, yields etc. Also,

financial resources were highly in need to employed labour during harvesting period especially crops like maize, chillies and soyabean required more human labour as the crops easily become mature and delay harvesting may cause quantitative and qualitative loss. For these reasons, adequate and easy accessibility of financial credit facilities should be made available at the farmers level by higher authorities so that producers can obtain financial services whenever they require as they are extremely vulnerable to agricultural loss.

13) Mature, diseases free and healthy seeds could contribute to higher yielding and healthy production of crops. Whence seeds constituted to be a vital input for the farmers. It was learnt from the study that large majority of the farmers used their own healthy seed for planting crops. Moreover, This is the traditionalpracticed of saving seeds.Nevertheless, it is suggested thatcertified seeds must be provided to the farmers to ensure high productivity ofcrops.

14) Maintenance of hygienic processing is vital during processing period.

Cooked fingers were dried in the sun by spreading on a silpaulin or on a cemented floor in front of a farmers' house or rooftop. Thus, this practiced was not quite hygienic as it can be easily contaminated by human, dust, rainfall and insects etc. As for chillies, chillies were sundried in the farm which is less air polluted yet it is not quite hygienic as it can contaminate with dust, rainfall, dirt and insects etc. Therefore, the practice of more hygienic drying method like using a solar green house or others is recommended. Furthermore, training must be organized for farmers on handling processing activity by the government/ higher authority.

15) Shifting cultivation has been practicing for many years and it has been the primary source of income for majority of the farmers. This is supported by the information gathered from the survey wherein the highest number of household which belonged to Priority Householder (PHH) earned their livelihood through the practiced of shifting cultivation. This indicated that the practiced of shifting cultivation will not be ceased anytime soon despite the claim that shifting cultivation has adversely effect on the environment. Therefore, it is important torather strengthen the farming system without harming the environment and this can be done by extending jhum cycle for minimum two years with combination of adopting various farming systems such as organic farming, conservation agriculture, agroecology, low external input agriculture,ecological intensification and alder farming system etc.

16) Out of 180 respondents, 3 farmers were found to have cultivated jhum cultivation on the

same land for 2-3 consecutive years. Further, it was also noticed that one farmer did not carry out burning activity in the second year of jhum cycle. The activity of carrying out burning was optional. The highest number of farmers carried out farming in their own jhum land. With the aforementioned findings, this means that the practice of carrying out farming for more than 2 years can be possible in own private land and for this, proper soil management through adoption of slash and mulch system, Sloping Agricultural Land Technology (SALT), crop rotation, applying manure and compost etc were recommended.

17) The selected crop sfor the study viz. chilli, ginger, maize, soyabean, sugarcane and turmeric are a good source of various nutrients which are essentials for human beings body. These crops are cultivated by majority of the farmers in Mizoram. Hence, it is suggested that awareness must be made about the health benefits of these crops and information can be disseminated via different media such as newspapers, radio, television and internet etc. so that farmers can treat minor illness using these crops, furthermore, it can exempt them from spending money on medicine.

18) Consumers are becoming health conscious and the demand for organic crop is increasing gradually. It is suggested that in order to build customer relationship, farmers must adopt organic farming system. Adopting organic farming system is also a sustainable production system for the future of the farmers. An organic farminginclude the application of animal manure, green manure, vermi compost, organic herbicides and organic insecticides/pesticides etc.

19) The study on 'Value Chain Analysis on Jhum Crop in Mizoram' covered a limit aspect of value chain. Therefore, further research in Mizoram with larger size of sample population and crops, etc related to this field in order to explore more marketing opportunities available, especially, for the welfare ofthe farmers in Mizoram are highly recommended.

Mizoram University

Interview Schedule for Ph.D Research

Appendix-A

INTERVIEW SCHEDULE

VALUE CHAIN ANALYSIS OF JHUM CROPS IN MIZORAM

Schedule No. : - ☐ ☐ ☐ ☐
Name of Village : ______________________________
RD Block : ______________________________
District : ______________________________
Name of Investigator : ______________________________
Date of Interview : ______/______/___________
(Day/Month/Year)

Contact No. of Respondent: ______________________________

Part I. Socio-Economic

1. Household Members

Sl. No.	Name(Starting with Head of Family)	Sex	Age	Educational Qualification
1.				
2.				
3.				
4.				
5.				
6.				
7.				

2. Household Income

Sl. No.	Source of Income	Approximate Income *(Annual)*
1.		
2.		
3.		
4.		
5.		
Total (Annual Income)		

3. Monthly household expenditure *(of recent or last month)*: Rs. _______________

4. Ration Card held by the family: ☐ Yellow ☐ Blue ☐ White
(Yellow = AAY; Blue = Priority Household; White = APL (Non-FSA)

5. Landholdings and Uses

5.1. Permanent land

5.1.1. Total area of land owned *(in Tin)*: ______________

5.1.2. Area of land cultivated *(in Tin)*: _____________

5.1.3. Crops grown: i) ________________________ **ii) _______________________**

iii) ______________________ **iv) _______________________**

v) _______________________ **vi) _______________________**

5.1.4. Land used for other purpose *(specify with area)*:
____

5.2. Jhum land

5.2.1. Area of current jhum*(in Tin)*: ______________

5.2.2. Crop grown: i) _________________________ **ii) _______________________**

iii) ______________________ **iv) _______________________**

v) _______________________ **vi) _______________________**

vii) ______________________ viii) _______________________

Part II. Value Chain

1. Information on Crop under study

1.1. Name of Crop: ________________________________

1.2. Area of cultivation *(in Tin)*: ______________

1.3. Cultivation system: ☐ SingleMixed ☐

1.4. If mixed, list of other crops: i) ____________________

ii)________________ iii)________________ iv) ________________

v)_________________ vi) ________________

1.5. Yearsof cultivation *(since when)*: ___________________

1.6. Time required for harvest *(from sowing/planting to harvesting)*: ____________

1.7. Crop cycle *(till shifting/rotation to another)*: _________________

1.8. Annual income from the crop *(approximate)*: Rs. _____________

2. Input

2.1. Seeds:

Sl. No.	**Source**	**Quantity**	**Cost *(if purchased)***
2.1.1.			
2.1.2.			
2.1.3.			
2.1.4.			

2.2. Equipment:

Sl. No.	**Name of equipment**	**Source**	**Quantity**	**Cost *(if purchased)***
2.2.1.				
2.2.2.				
2.2.3.				
2.2.4.				

2.3. Other inputs:

Sl. No.	Particular	Source	Quantity	Cost *(if purchased)*
2.3.1.				
2.3.2.				
2.3.3.				
2.3.4.				

3. Production

3.1. Land preparation

3.1.1. Time of land preparation: ___________________

3.1.2. Duration of land preparation: ________________

3.1.3. Total mandays involved in land preparation: ______________

3.1.4. No. of labour engaged, if any *(a part from household members)*: _____________

3.2. Sowing/Planting

3.2.1. Time of sowing/planting: ___________________

3.2.2. Duration of sowing: _______________

3.2.3. Total mandays involved in sowing/planting: ______________

3.2.4. No. of labour engaged, if any (a part from household members): ___________

3.3. Weeding

3.3.1. No. of weeding per year/production cycle: _____________

3.3.2. Duration of weeding *(per weeding)*: ___________

3.3.3. Total mandays involved in weeding *(per year/production cycle)*: ____________

3.3.4. Labour engaged in weeding per production cycle *(a part from household members)*: _____________

3.4. Other production activities:

Sl. No.	Activity	Cost*(per production cycle)*, if any	
		Cash	Mandays
3.4.1.			
3.4.2.			
3.4.3.			
3.4.4.			

4. Harvesting

4.1. Time of harvest: ____________________

4.2. Quantity of harvest*(yearly average)*: _________________

4.3.Total mandays involved in harvesting: ____________

4.4.No. of labour engaged, if any *(a part from household members)*: ____________

5. Post-Harvest and Processing

5.1.Post-harvest activities

Sl. No.	**Activities**	**Means/Mode**	**Cost, if any *(Per Production Cycle)***	
			Cash	**Mandays**
5.1.1.				
5.1.2.				
5.1.3.				
5.1.4.				

5.2.Processing

Sl. No.	Form of processing	Means/Mode	Cost, if any (Per Production Cycle)	
			Cash	Mandays
5.2.1.				
5.2.2.				
5.3.3.				
5.3.4.				

6. Marketing

6.1. Own marketing

Sl. No.	Form of marketing	Place	Quantity	Income	Expenditure *(if incurred any)*
6.1.1.	Fresh				
6.1.2.	Processed				

6.2. Marketing through middleman/commissioner

Sl. No.	Form of marketing	Place	Quantity	Income	Expenditure *(if incurred any)*
6.2.1.	Fresh				
6.2.2.	Processed				

7. Household consumption

7.1. Whether the household consumes the crop: ☐ Yes ☐ No

7.2. If yes, form of consumption and quantity *(in percentage)*:Fresh: ____________

Processed: _____

7.2.1. If fresh, form of preparation:

____

7.2.2. If processed, form of processing:

____

7.3. Frequency of consumption: Fresh:______________ Processed: ___

7.4. Other food items consumed *(regularly)* by the household:

Sl. No.	Food item *(own produce)*	Sl. No.	Food item *(procured from outside)*
7.4.1.		7.4.2.	
7.4.3.		7.4.4.	
7.4.5.		7.4.6.	
7.4.7.		7.4.8.	
7.4.9.		7.4.10.	
7.4.11.		7.4.12.	
7.4.13.		7.4.14.	

8. Options for sustainability of production system *(suggested by respondent, if any)*: 8.1. In production:

____

____

____

8.2. In marketing:

____

____

____

9. Other relevant information:

____

____

____

____

____

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ABSTRACT

VALUE CHAIN ANALYSIS OF JHUM CROPS IN MIZORAM

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VALUE CHAIN ANALYSIS OF JHUM CROPS IN MIZORAM

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Submitted

in partial fulfilment of the requirement of the Degree of Doctor of Philosophy in Extension Education and Rural Development of Mizoram University, Aizawl

1. Introduction:

Mizoram is one among the eight North East Sister States situated in the North Eastern part of India. Aizawl is the largest city and capital of Mizoram. The State is flanked by Bangladesh on the west and Myanmar on the east of south sharing a total of 722 km international boundary with the two countries. It also shares its boarders with three states- Assam, Tripura and Manipur.

Jhum Cultivation in Mizoram

Jhum lands are very common in Mizoram. They are classified variously as current jhum land, old jhum land and abandoned jhum land. Jhum lands are more prevalent in eastern Mizoram where extensive and intensive jhumming is practiced. Similarly, the areas in western side in Lunglei district towards Bangladesh have also Jhum lands (forest.mizoram.gov.in).

The backbone of Mizo economy has been agriculture through jhuming, which made the Mizo till recent past a migrating tribe. They shifted from one village to another at regular intervals and this practice led them to possess very little property. Whatever they had was simple to replace and could be carried easily without the help of transport facility (Kabra, 2008). Major crops grown under the jhum cultivation in Mizoram are paddy, maize, oil seed crop, soyabean, french bean, potato, colocasia, pumpkin, brinjal, okura, cucumber, bitter gourd, mustard, cowpea, chilli, sweet potato, solanum and ginger etc. These crops are cultivated either for household consumption or for cash crop in order to generate income for the households to meet end-needs.

Value Chain

The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky and Morris, 2000).

Importance of Value Chain

Value chain analysis provides researchers with a tool to ask important questions about the distribution of power and value across the chain and is therefore eminently capable of addressing the agency of workers and small producers. This analysis can identify the scope for improving incorporation into the market – increasing returns and reducing risks. It acknowledges the political and competitive nature of the relationships involved and explores the difference which the organization of poor producers or labourers can make. But addressing labour markets, social arrangements and vulnerability is required to get the poorest people onto trajectories where more advantageous incorporation into chains becomes possible.

While much of the value chain literature and policy prescriptions – such as export-led manufacturing growth – focus on global chains, it is local and regional chains and labour markets associated with all value chains which are often of greatest relevance to poor people (Coles and Mitchell, 2011).

Scope of the study

Various efforts have been made in Mizoram to do away with jhum cultivation and introduce permanent way of farming system. Some of such endeavors are jhum Control Programme, Mizoram Intodelhna Project (MIP) and New Land Use Policy (NLUP). In spite of the efforts, many farmers in the rural areas are still engaged in jhum cultivation. It is believed that the practice of this traditional way of farming will not be easily put to an end as many of the farmers in rural Mizoram are still inclined to it.

In the midst of practicing jhum cultivation, many of the crops grown under jhums are believed to have ability to generate nutrition, income and employment for individual *jhumia* families and the community at large. From review of literature, not much of study on value chain particularly of jhum crops has been conducted in Mizoram. The present study is therefore conceptualized with an interest of finding out the contributions of jhum crops towards the livelihoods of *jhumia* families and the larger community through value chain system. The study was confined to Mizoram with the particular focus in villages where jhum cultivation is being practiced. Jhum crops having comparatively high volume of productions and potentials for generating income and employment were selected for the value chain analysis.

Objective of the study

The overall objective of the present study is to analyze the value chain of *jhum* crops in Mizoram. Specifically, the study attempted to:

1) Identify the existing value chains and activities involved in different stages;

2) Assess the ability to generate nutrition and income for the family;

3) Find out options for sustainability of the production system; and

4) Identify opportunities for value added processing that can generate additional income and employment.

2. Research Methodology

This chapter outlines the methodologies adopted in the study approach and data collection related with the tools and techniques applied for selection of sampling size, data collection and data analysis in order to achieve the objectives of the research.

Selection of Crops

For the purpose of the study, jhum crops with comparatively high volume of production in the State were selected. According to Agriculture Statistical Abstract 2013-2014 prepared by Department of Agriculture, Government of Mizoram, major jhum crops being produced are Rice, Maize, Sesamum, Soyabean and Sugarcane, Topioca, Cow Pea, French Bean, Potato etc. Among these, the jhum crops having comparatively high volume of production and income generation prospects for actors viz. Chilli, Ginger, Maize, Soyabean, Sugarcane and Turmeric were selected for the value chain study (see Table 2.1).

Selection of Study Sites

As in other parts of the northeastern region, jhum or shifting cultivation is widely practiced in Mizoram specifically in the rural areas. More than 50% of the total population depends on jhum cultivation for their livelihood.

The study made used of multi-stage sampling technique in selection of districts and villages. The selection of study sites was based on the volume of production of selected jhum crops. Firstly, the districts having highest volume of production of a particular crops were selected. At the time of data collection, there were only eight districts in Mizoram wherefrom selection of sites was based. Out of which, a total of 6 districts viz. Aizawl, Serchhip, Lunglei, Champhai, Kolasib and Mamit were selected for the study (See Table 2.1)

Secondly, villages with high volume of production within a particular district were selected again. The focal villages in a particular district were furthermore narrowed down into three villages for each identified crop having comparatively high volume of production. Thus, a total of 18 villages (3 villages per crop x 6 crops) were selected for the study.

Table 3.1:Sample crop with selected areas

Sl.No.	Name of the Crop	District	Village
1	Chilli	Aizawl	Mualpheng
		Serchhip	Sailulak
		Lunglei	Thingsai
2	Ginger	Champhai	Chawngtlai
		Aizawl	Khawruhlian
		Mamit	Lungphun
3	Maize	Kolasib	North Kawnpui
		Aizawl	Sesawng
-	-	Aizawl	Sihfa
4	Soyabean	Serchhip	Chhingchhip
		Aizawl	Kepran
		Champhai	Ngopa
5	Sugarcane	Serchhip	Khawlailung
		Aizawl	North Lungleng
		Aizawl	Phulpui
6	Turmeric	Aizawl	Ratu
		Mamit	Reiek
		Mamit	West Phaileng

Sample of the Study

Purposive sampling technique was adopted for the study. As mentioned, three villages were selected for each of the selected crops which make a total of 18 villages for six crops. A total of 10 farmers from each of the sample villages were identified as sample of the study. So, a total of 180 farmers (6 crops x 3 villages x 10 respondents) constituted sample of the study. The crops identified for the study with number of villages and respondents covered are presented in Table 2.2. In addition, information was also collected from selected actors who played important roles in various stages of the value chain to enrich the data collected from the respondents.

Table 2.2: Sample of the study

Sl. No.	Crops	No. of Villages	No. of Respondents
1	Chili	3	30
2	Ginger	3	30
3	Maize	3	30
4	Soyabean	3	30
5	Sugarcane	3	30
6	Turmeric	3	30
Total		18	180

Data Collection

The study relied on both primary and secondary sources of data to elicit information. Primary data was collected personally by the researcher from both the respondent farmers and other actors in the value chain using interview schedule. The interview schedule was developed with careful consideration of the objectives of the study and was pre-tested to a group of farmers who were not included in the sample of the study prior to the actual field of data collection. The duration of collecting primary data was from November 2016 to October 2017. Secondary data was also obtained from office documents, internet, books, census and journals.

Data Analysis

The data collected from the field were encoded and analysed using statistical tool viz. Statistical Packages for Social Science (SPSS). The study mainly relied on quantitative data and descriptive statistics such as frequency counts, percentage, mean, standard deviation and range were used.

Limitation of the Study

Whatever information generated from the study has its own limitations as the information collected was mainly based on simple recall of the respondents. Hence, the discussion and interpretations of the results may be understood in the light of this limitation.

Definition of Concepts

- Jhum cultivation : Jhum cultivation or shifting cultivation involves clearing of trees and other vegetations, making firelines, burning of the debris and reburning the unburnt trees etc.

- Jhum Crops: Jhum crops are those crops cultivated in the land where jhum cultivation is practiced.

- Value chain- The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky and Morris, 2000).

- Value added – Value added products in general indicates that for the same volume of a primary product, a high price is realised by means of processing, packaging, upgrading the quality or other such methods (Kumar, 2014).

- Actors – Actors in value chains are those who involves in the marketing channels. A value chain actors include producers, rural agents, society, commissioners, wholesalers and retailers etc.

- Rural agents/ Rural traders: Rural agents/ traders served as an intermediary between the farmers and the wholesalers/ agricultural commissioners.

3. Results and Discussions:

The results of the data are presented and discussed as follows:-

Socio- Economic Profile

It was observed that the highest number of the respondents were between the age group of 50-60 year. The literacy rate of the respondents was quite high with a percentage of 97.78 wherein the highest number completed middle level education.

Majority of the household was between 5 to 10 members with overall mean household size was 5.93and the highest number of the farming household belonged to Priority Householder (PHH) category. The average annual income of the farming households was₹200000/- while the annual total average expenditure was ₹104000/-.

Cultivation Practices

The average jhum landholding size was 2.3 acres of land. There were farmers who managed two plots and three plots during the data collection.

Additionally, there were farmers cultivating crop for two consecutive years and more than three consecutive years.

The average farming experienced of the sample farmers in cultivation the crops was 16.99 years. The different activities of land preparation were carried out between the month of October till April first week.

Farmers began their first sowing from February and continued till September. The timing and frequency of sowing may vary according on the types of crops cultivated. A large majority of the farmers used their own seeds for planting.

Weeding activity was carried out from February and continued till October. Harvesting of crops was carried out in each month (from January to December). Harvesting period was differed from crops to crops. Harvesting was done manually by the respondents farmers. For carrying harvested crops human power, own vehicles, hired vehicles and animals were used. For transporting the produced to the neighbouring villages and urban market (Aizawl City) sumo was mainly utilized. Pick-up truck was also hired by the famers as well. Almost half of the farming households (49.44 %) sold crops in fresh form while 30.56 per cent processed their produced. Few farmers (20 %) practiced both methods of both post- harvest handling.

The agricultural products processed at the farmers level were chilli into whole dried , maize into dried on the cob, soyabean into fermented soyabean (wet and dried form), sugarcane into jaggery and turmeric into powder, juice and whole dried form. This indicated that the scope of value addition in Mizoram is opened

Value Chain

Mobile communication was the main tool used by the actors between them in order to exchange information. The practice of selling their produced to more than two or more actors by one farmer was common in the study areas. Farmers were financially benefitted the most when selling their produced directly to the final consumers, however, farmers had to comply with the price set by the other actors when selling their produced through them. It was also observed that a large proportion of their produced were sold through rural traders/agents in each crop value chain.

Chilli

Chilli was grown together with other crops in the study areas. The economic value of a household human labour contribution for chilli production was the highest. The average seeds sown were 16.9667 kilograms. The average total production of fresh and processed chilli were 2053.4 kg and 1020.8 kg respectively and earned an average of ₹ 121000 and ₹ 227000 from selling fresh green chillies and processed Mizo chillies respectively. The main actors involved in selling fresh chillies were farmers, Farmer's Association, rural traders, urban commissioners and consumers while the main actors identified for processing channels were –farmers, rural agents, wholesale.

Ginger

Ginger was cultivated as a sole cropping and mixed cropping crop. From the respondents, 90 per cent practiced mixed cropping of ginger while 10 per cent practiced sole cropping system. The average seed rhizomes planted was 1361 kilogram. An average quantity of 3396.67 kilogram was sold and earned ₹ 32300. It was also learnt that income obtained from sole ginger farming (₹76500) was higher that mixed cropping of ginger (₹27400). The economic value of household human labour participation was the highest for cultivation of ginger.

The actors involved in ginger value chain were farmers, rural traders/agents, society, urban commissioners and wholesalers.

Maize

Maize was grown as a mixed cropping system. The mean average of 3.8583 kilograms of maize seeds were sown. The economic value of household human labour contribution towards maize cultivation was the highest.

An average 9414 cobs was sold and earned₹ 28400 and an average 400 processed cobs were sold and an average amount of ₹ 1427.83 was obtained. The identified actors were farmers, rural traders, urban commissioner and consumers.

Soyabean

Soyabean was cultivated as sole cropping and mixed cropping system. An average 2.853 kg of soyabean was sown by the farmers. The economic value of household human labour was observed to be the highest. An income of ₹ 7053.33 and ₹ 7029.21 were obtained from selling fresh and processed products respectively. With Simple calculation with the farmer, fresh soyabean of one kilogram when processed into wet fermented soyabean, ₹ 200 can be obtained from selling the produced. Also, from one kilogram of fresh soyabean when processed into dried fermented product, ₹180 can be earned.

The identified actors in the marketing channel of soyabean were farmers, rural traders, urban commissioners and final consumers.

Sugarcane

Sugarcane was cultivated as mixed cropping system on an average jhum area of 3.667. An average 12500 cane setts was planted. The average total production of processed sugarcane were 2996.33 kg and an average quantity of 2946 kilograms were sold, whereby, ₹ 157000 was earned from selling jaggery by the farmers

The average total production of processed sugarcane were 2996.33 kg and an average quantity of 2946 kilograms were sold, whereby, ₹ 157000 was earned from selling jaggery by the farmers. Also, the average total production and sold quantity of fresh sugarcane stalks were 7207.14. An amount of ₹ 46500 was obtained from the selling of cane stalk..

The main actors in the marketing system were found to be farmers, rural traders and urban commissioners and consumers.

Turmeric

Turmeric was cultivated as mixed cropping crop. An average of 764.4 kg turmeric rhizomes was sown. The overall average fresh production was 3392.33 kilogram. The average quantity of processed turmeric sold was 377.13 kilograms and obtained ₹ 60700. As calculated with the local farmers, it was estimated that one dried kilogram of turmeric can be obtained from an average fresh eight kilograms of turmeric rhizomes. The total average fresh rhizomes quantity sold was 2350.45 kilograms and earned an income of ₹15800. The main turmeric marketing actors such as producers, rural traders, Society (Reiek Multifarming Co-operative Society and Reiek Block Turmeric Grower Society), urban commissioner and consumer were involved in the marketing system of turmeric. .

Sustainability of Jhum Farming

Sustainability of environment, sustainability of production, sustainability of value chain and sustainability of marketing altogether are important for farmers to meet their economic needs as well as nutritional needs. The possible option for sustainability of jhum farming practicing Alder farming system, slash and mulch farming system, organic farming system, conservation agriculture system, agroecology farming system, low external input farming system, conversion of soil through SALT method, using good seeds.

Sustainability of value chain can be built by strengthening production system, good marketing channels, monetary assistance from the state government, imparting farming knowledge, collaboration with state government, setting policies and regulation by the government and participating in Central government provided digital platform

The sustainability of marketing can be attained by providing proper cold storage infrastructure by the state government, arrangement of good transportation facilities for the farmers, providing good road condition, involvement of less intermediaries, formation of effective farmers society, prioritizing human and environmental health and etc.

Nutritional Information of the Selected Crops

Chili cotains vitamin A, C, E, K. and folic acid. In addition, the chilli growers can use chilli for various treatment like digestion and loose motion, cancer, asthma, cough and sore throats. Chilli is also used for external purposes such as pain relieving balms and vaporub..

Ginger contained nutrients like vitamin C, magnesium, potassium, copper, iron, calcium and phosphorous etc. which are contained in ginger. Further, farmers can use ginger to treat digestive problems, motion sickness, cold, cough and nausea. The nutrients present in Maize are carbohydrates, vitamin A, vitamin B, vitamin C and vitamin K. Moreover, maize can help maize growers in improving the functioning of thyroid gland and immune system. Maize grower can use maize silk for treating kidney stones, urinary tract infection, jaundice and fluid retention. The decoction of silk, roots, and leaves are used for bladder problems, nausea, and vomiting, while decoction of cob is used for stomach problems.

Soyabean was commonly consumed in fermented form (wet and dried form) by vast majority of the selected farmers. This fermented soyabean called *bekang um* prepared by the soyabean farmer is quite similar with ‘ Kinema’. According to the research, ‘Kinema’ has several health-promoting benefits such as its antioxidant property, digested protein, essential amino acids, vitamin B complex, low-cholesterol content (Phytosterols), etc. Likewise, if ‘Kineama’ is said to be same with *bekang um*, then the soyabean farmers can get the health benefit generated by *bekang um.*

Farmers of soyabean can also get nutrients such as protein, oil, carbohydrates, vitamins and minerals from soyabean. In addition, farmers can use soyabean for different purposes such as treating type 2 diabetes, asthma, lung function, cancers, constipation, diarrhea and improving memory etc.

The frequency of jaggery consumption by the farmers was daily. Whence, farmers can get the benefit of calcium, sulphates, magnesium, potassium, iron, protein, phosphate, sodium, copper, vitamin A, vitamin B, vitamin C and vitamin E. Jaggery can be used for treating jaundice, purify the blood, prevent constipation, anaemia, boosts intestinal health, control blood pressure, treat cold, cough, throat and lung infections etc.

Farmers can get vitamins C, B3 and B6, magnesium, manganese, potassium, copper, sodium, phosphorus, calcium, iron, zinc and omega-6 fatty acids. curcumin, sterols, resins and volatile oils. Moreover, turmeric growers can use turmeric as a carminative, tonic, blood purifier, vermicide and an antiseptic as well as used for the treatment of diabetes, leprosy, gall stones and gall complaints, to relieve sore throat and common cold. Farmers can also use raw rhizomes of turmeric as an anti-parasitic against many skin infections. Further, turmeric helps to detoxify the liver,balance cholesterol levels, fights allergies, stimulates digestion, boost immunity and enhance the complexion.

4. Recommendations

Based on the findings and conclusions, the following recommendation are offered:-

1) Shifting cultivation is labour intensive thus required more labour so as to manage the jhum land. From the data collection, household human labour was the major contributor of mandays for cultivation of crops. Further, majority of the respondents were in the age group between 50-60 years. The physical strength of a person is likely to decline after reaching middle age whereby results in less productive towards agricultural production. Therefore, it is recommended that young farmers must be motivated towards active participation in carrying out farming activities as well as developed their capacity through training. Active participation of young farmers combine with the accumulated farming experiences from the older farmers can result in productive, profitable and sustainable agriculture.

2) Most of the roads in the villages of Mizoram are in poor condition thereby hinders the ability to collect crops production during harvesting season in some sample villages as some farmers jhum area were located far away from the major roads which in turn affects households’ income. Another constraint faced during monsoon seasons were, because of the poor road condition and natural calamities occurrence (mostly landslides), roads were frequently blocked. This

delayed the transportation of the produced to other market places for commercialization purposes, wherein, farmers had to suffer crop losses because of their high perishability nature. Thus, it is recommended that good road connectivity must be constructed for farmer's convenience which is crucial especially during the harvesting period as better road condition can accelerate crop production and improve household income as well as motivate farmers to cultivate more crops.

3) Crops are highly perishable in nature and have respired even after harvesting. Due to the short life of crops, farmers have to sell off their produce immediately at a lower price as farmers do not have post-harvest management facilities. Therefore, providing facility for post-harvest management for the benefits of the farmers is highly recommended, whereby, post-harvest management facility would reduce crop waste, enable farmers to improve their income, preserve the nutrient content and the quality of the crop and facilitate continuous supply of their produced at a higher rate during the off season and price fluctuating period.

4) With regard to price, it was observed that majority of the farmers had to sell their produce to rural agents due to the following reasons- shortage of household labour, farmers do not have proper seat at the urban market and extra expenditure has to incur on transportation cost etc. Because of all the aforementioned factors, farmers have to comply with the price offered by the rural agents. Also, the selling rate of crops were highly determined by the prevailing market rate of Aizawl city and Assam State (Ginger and processed chilli). As reported by one maize grower, during peak harvesting period, due to low selling rate of maize coupled with far location of their jhum land and high demand of human resources, the farmer was discouraged by these factors and reluctant to use extra mandays to collect their produce. Another constraint faced by soyabean farmers was that soyabean cultivation area was comparatively smaller than other crops, this was because of it's semi- perishable nature of soyabean related with weak marketing channel.

Therefore, considering all these factors, it is suggested that the state government should establish regulate market price wherein every value chain actor can earn income in each channel , particularly, farmers who receive the least benefits from their produced when they are the actor who performed the actual field work.

5) From the data collection, it can be understood, to a great extent, that among the actors urban commissioner and society were found to be the most financially benefitted actors while farmers were the least financially benefitted in the chain. Famers earned highest income when they sold their produced directly to the consumers. Further, it was noticed that value chain with multiple actors involved in each marketing channel were found less remunerative for farmers as every actor has to earn income through this mode. Hence, minimizing the number of intermediaries involvement can generate higher return to the farmers. Consequently, the state government strong intervention by providing consistent marketing facilities in order to obtain regular income is recommended.

6) Farmers Association is composed of farmers sharing a common interest in order to earn their income for their household. A Farmer Association is an important instrument for farmers to meet their needs such as to increase their productivity and enhance the economic well. In terms of marketing, as per the information gathered, it was observed that chilli grower association of Mualpheng village practiced collective marketing thus sold fresh chilli to the rural traders who offered the highest rate. The rural traders offered price was determined by the prevalent rate of uraban (Aizawl) market. This indicated that farmers did not have the power to set their own rate whereby they have to comply by the rate set by the rural traders. Therefore, it is crucial that a farmer Association is adamant in price fixation against intermediaries. Also, it should seek any alternative possible profitable channels that will allow the group to generate more income and make a better and effective society for its members. Nevertheless, the advantage that collective marketing offered was it saved time and provide marketing opportunity for farming household with limited human resources, However, Farmers Association formation is highly recommended as it would give farmers

the power/authority in price fixing of the crops against the local middleman/trader for their own welfare and enhance their bargaining power also Therefore, it is advisable that groups with mutual objectives must be formed to strengthen their power and improve their agricultural income. Also, Farmer Association member must be provided capacity building training by higher authorities etc.

7) The common method of packaging solid jaggery in Mizoram is wrapping/packing the product in a printed newspapers which is quite unhygienic and can further cause health issues. Good packaging will also allow to maintain the shelf life of solid jaggery. Therefore, packing solid jaggery in a paper bag/pouch, aluminum foil bag/ pouch, plastic bag/pouch, stand-up pouch, transparent hinged lid plastic container, polystyrene foam food container/ box etc. will add more value to the product itself and is recommended. Moreover, it is recommended to use recyclable or biodegradable packaging material for improving the pollution control.

8) It was known from the survey that mobile phone was the main communication mode between actors. Hence, this also proved that technology has brought convenience to these actors in dealing business. Also, 97.78 percent of the respondents were found to be literate. This indicated that all the farmers can access mobile phone technology. Wherefore, making used of this opportunity is valuable, wherein, farmers can easily obtain agricultural related information like production technique, availability of inputs, market price information, information on crops, expert advice and weather forecast etc. and will also help in dealing with rural traders as resources Ignorant on market price information knowledge about the crops results in weak bargaining power for the farmers. Therefore, equipping farmers with market price and information on agricultural farming through radio, television, newspaper, mobile phone and social media is desirable. Furthermore, the state government must be immediate in making the essential information available to the farmers when utilizing these different resources.

9) Among the selected crops such as chilli, ginger, maize, soyabean, sugarcane and turmeric, it was observed that ginger was the only crop that did not receive any sort of processing. Nevertheless, the other crops that were also processed were done minimally at the farmers' level. This implies that that value addition of the selected crop into different by-products has a wide scope in Mizoram. Further, it was learnt that processed product can obtain higher income for

the farmers and generates more employment opportunities at the local level. Therefore, setting up processing unit for each crop is highly recommended so that there will be consistency in generating income for the farming households, especially during the off season of harvesting. Moreover, from the field survey, it was observed that each crop cultivators were willing to cultivate more quantity of the crops as long as consistent marketing is available and higher income can be generated from the crops.

10) If a processing unit is established, arrangement for farmer capacity building programme in handling the crops will be required so that the product would meet the quality standard in upgrading and packaging. The responsibility of providing training for the farmers can be shared between the state government or the NGO's. Furthermore, any potential technologies which could likely benefit more than one value chain should also be considered. Moreover, from the field survey, it was observed that each crop cultivators were willing to cultivate more quantity of the crops as long as consistent marketing is available and higher income can be generated from the crops.

11) Transportation is a necessity for farmers to transport their produced from farm to home and home to urban market. Transportation is also vital for farmers to reach their jhum land on a daily basis. According to the field survey, it was noticed that majority of the farmers used human power to carry their produce from their farm to home. The highest number of the respondents resided about six kilometers away from their jhum land. There were also farmers who had owned motor vehicle or motorcycle or scooter while some did not own any vehicles in the study areas. However, farmers were compelled to hire transportation facilities like pick-up truck in the village for bulk transport from farm to home, home to urban market etc and they had to incurred high transportation expenses for the hired fare. Therefore, transportation cost directly or indirectly decreased their household income from the amount received from selling their produced. Thus, it is suggested that the state government should arrange transport services with minimum charges for the welfare of the farmers throughout the year.

12) Farming is a risky occupation for farmers as farmers are easily affected by the outbreak of diseases and pest, uncertainties in natural calamities, marketing price, yields etc. Also, financial resources were highly in need to employed labour during harvesting period especially crops like maize, chillies and soyabean required more human labour as the crops easily become mature and delay harvesting may cause quantitative and qualitative loss. For these reasons, adequate and easy accessibility of financial credit facilities should be made available at the farmers level by higher authorities so that producers can obtain financial services whenever they require as they are extremely vulnerable to agricultural loss.

13) Mature, diseases free and healthy seeds could contribute to higher yielding and healthy production of crops. Whence seeds constituted to be a vital input for the farmers. It was learnt from the study that large majority of the farmers used their own healthy seed for planting crops. Moreover, This is the traditional practiced of saving seeds. Nevertheless, it is suggested that certified seeds must be provided to the farmers to ensure high productivity of crops.

14) Maintenance of hygienic processing is vital during processing period. Cooked fingers were dried in the sun by spreading on a silpauline or on a cemented floor in front of a farmers' house or rooftop. Thus, this practiced was not quite hygienic as it can be easily contaminated by human, dust, rainfall and insects etc. As for chillies, chillies were sundried in the farm which is less air polluted yet it is not quite hygienic as it can contaminate dust, rainfall, dirt and insects etc. Therefore, the practice of more hygienic drying method like using a solar green houseetc is recommended. Furthermore, training must be organized for farmers on handling processing activity by the government/ higher authority.

15) Shifting cultivation has been practicing for many years and it has been the primary source of income for majority of the farmers. This is supported by the information gathered from the survey wherein the highest number of household which belonged to Priority Householder (PHH) earned their livelihood through the practiced of shifting cultivation. This indicated that the practiced of shifting

cultivation will not be ceased anytime soon despite the claim that shifting cultivation has adversely effect on the environment. Therefore, it is important to rather strengthen the farming system without harming the environment and this can be done by extending jhum cycle for minimum two years with combination of adopting various farming systems such as organic farming, conservation agriculture, agroecology, low external input agriculture, ecological intensification and alder farming system etc

16) Out of 180 respondents, 3 farmers were found to have cultivated jhum cultivation on the same land for 2-3 consecutive years. Further, it was also noticed that one farmer did not carry out burning activity in the second year of jhum cycle. The activity of carrying out burning was optional. The highest number of farmers carried out farming in their own jhum land. With the aforementioned findings, this means that the practice of carrying out farming for more than 2 years can be possible in own private land and for this, proper soil management through adoption of slash and mulch system Sloping Agricultural Land Technology (SALT), crop rotation, applying manure and compost etc were recommended.

17) The selected crops for the study viz. chilli, ginger, maize, soyabean, sugarcane and turmeric are a good source of various nutrients which are essentials for human beings body. These crops are cultivated by majority of the farmers in Mizoram. Hence, it is suggested that awareness must be made about the health benefits of these crops and information can be disseminated via different media such as newspapers, radio, television and internet etc. so that farmers can treat minor illness using these crops, furthermore, it can exempt them from spending money on medicine.

18) Consumers are becoming health conscious and the demand for organic crop is increasing gradually. It is suggested that in order to build customer relationship, farmers must adopt organic farming system. Adopting organic farming system is also a sustainable production system for the future of the farmers. An organic farming includes the application of animal manure, green manure, vermi

compost, organic herbicides and organic insecticides/pesticides etc.

19) The study on ‘Value Chain Analysis on Jhum Crop in Mizoram’ covered a limit aspect of value chain. Therefore, further research in Mizoram with larger size of sample population and crops, etc related to this field in order to explore more marketing opportunities available, especially, for the welfare of the farmers in Mizoram are highly recommended.

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