PRODUCTION AND MARKETING OF GINGER AND CHILLIES IN CHAMPHAI DISTRICT, MIZORAM

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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Ph.D. REGISTRATION NO: MZU/PhD/803 of 22.05.2015

DEPARTMENT OF ECONOMICS

SCHOOL OF ECONOMICS, MANAGEMENT AND INFORMATION SCIENCE

JUNE, 2022

PRODUCTION AND MARKETING OF GINGER AND CHILLIES IN CHAMPHAI DISTRICT, MIZORAM

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CERTIFICATE

This is to certify that the thesis entitled **"Production and Marketing of Ginger and Chillies in Champhai District, Mizoram"** by C. Lalthantluangi has been written under my guidance. This thesis is the result of her investigation into the subject and was never submitted to any other University for any research degree.

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DECLARATION

I, C. Lalthantluangi, 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 University/ Institute.

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

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ACKNOWLEDGEMENT

I feel deeply indebted to many people who have greatly inspired and supported me during my Ph.D. study at Mizoram University and the writing of this thesis.

First and foremost, I want to express my deepest gratitude to my supervisor, Prof. Lalhriatpuii, for her invaluable guidance, encouragement, and dedicated support in every step of the thesis writing process. This thesis would not have been possible without her constant guidance and support.

I am sincerely grateful to Dr. C.Lalnunmawia for the help he extended with statistical analysis and for his support and encouragement.

I am thankful to the Department of Economics, Mizoram University, for providing me with this opportunity to do my research. I would also like to express my sincere gratitude and appreciation to all the faculty members and non-teaching staff at the Department of Economics, Mizoram University, for their unwavering support and assistance.

My heartfelt gratitude goes to my colleagues at the Department of Economics, Govt. Champhai College, for their unending support throughout the years.

I am also grateful to the Office of Economics and Statistics Champhai, the Directorate of Economics and Statistics, Planning and Programme Implementation Department, and the Directorate of Agriculture, Govt. of Mizoram, for all their assistance and support in providing me with relevant data for this research.

I express my profound gratitude to everyone who responded to my research questions and those who assisted me in collecting data from my study area.

I am forever grateful to my parents and siblings for their constant encouragement and inspiration.

Finally, I owe everything to God, who provided me with the strength to face the challenges of this endeavor.

C. LALTHANTLUANGI

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APMC	Agricultural Produce Market Committee
B-C	Benefit-Cost Ratio
CAGR	Compound Annual Growth Rate
CES	Centre for Ecological Science
CMV	Cucumber Mosaic Virus
COI	Census of India
CV	Coefficient of Variation
ECA	Essential Commodities Act
GVA	Gross Value Added
GSDP	Gross State Domestic Product
GSVA	Gross State Value Added
ISO	International Standards Organization
ISS	Interest Subvention Scheme
KCC	Kissan Credit Card
KVK	Krishi Vigyan Kendra
MAMSOL	Mizoram Agriculture Marketing Solution
NER	North-East Region of India
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMKSY	Pradhan Mantri Krishi Sinchai Yojana
SHC	Soil Health Cards
SPSS	Statistical Package of Social Science
WRC	Wet Rice Cultivation

CHAPTER-I

INTRODUCTION

1.1 INTRODUCTION

Agriculture is both an art and science of raising plants and animals, and it involves choices about the use of resources to grow the animal foods and the plants we eat. The term agriculture is derived from two Latin words *ager* (field) and *colo* (cultivate), which form the Latin *Agricultura*: field or land tillage (Harris and Fuller, 2014). A farmer is a person who manages the farmland ecosystems and biological processes needed for plant and animal production (Power, 2010). However, in addition to the farm production systems, agriculture includes all the businesses that convert raw farm commodities into food and fiber products that people want to eat and use. It also involves processing, transportation, storage, and other business activities typically referred to as marketing. Thus agriculture includes a wide gamut of activities, many of which do not occur on farms and are not managed by farmers (FAO, 2017).

The history of agriculture is practically inseparable from the history of civilization (Srivastava, 2008). Agriculture was a significant factor in the rise of sedentary human civilization, as domestic variety farming resulted in food surpluses that allowed people to live in cities. There has been much debate about when and where agriculture began as it has a long history that dates back thousands of years. Farmers began planting wild grains more than 11,500 years ago after harvesting them for at least 105,000 years. Domestication of pigs, cattle, and sheep began tens of thousands of years ago. Plants were grown in at least ten different parts of the planet separately (Malik and Kumar, 2021; Susain and Vijayalaksmi, 2020; Lev-Yadun, *et al*., 2000). Before agriculture, humans were hunter-gatherers who relied on wild resources for their nutritional needs (Brown, *et al*., 2009), and when bands of hunter-gatherers began domesticating plants and animals, they abandoned their nomadic lifestyle and established villages and towns that lasted for thousands of years. With a reliable food supply, the size of the population increased, and small egalitarian groups grew into kingdoms spanning hundreds of miles (Zimmer, 2016).

The transition from hunting and gathering to farming was a watershed moment in human history. It is a well-known fact that India has been primarily an

agrarian economy since time immemorial. The seasonal movement of hunter-gatherers, who gathered food from wild plants and animals, gave way to the settled life of farmers who cultivated crops and raised domesticated livestock. The size of Harappan towns suggests that it was plow agriculture with a reliance on bullocks for a draught (Naulakha, 2021; Olsson and Hibbs, 2005). Other historical evidence suggests that rice and cotton were grown in the Indus valley, and plowed fields were excavated at Kalibangan in Rajasthan. Some of the earliest records of Indian agriculture are found in Vedic literature. Plowing, fallowing, irrigation, fruit, and vegetable production are all described in Rig-Veda hymns (Rao, 2008; Singh, 2016). The various properties of ginger were mentioned in Vedas dating back to 6000 BC, and the country has been known for its spice trade since the discovery of the sea routes. All of these attracted foreigners to India, and as a result, European countries invaded and imperialized the country (Asha and Maurya, 2020; Rajashekar, 2017).

A country in its stages of economic growth cannot afford to ignore the progress in the agricultural sector, and it is especially crucial in the early stages of economic growth. The existence of a substantial agricultural surplus is a precondition for the general economic development of a country (Nelson, 2008). Like in most developing economies, agriculture is the primary source of income for the vast majority of Indian families, accounting for more than 58 percent of rural households (Giri, 2021; Pearce, 2001). It is the core of planned economic development in India, as the trickledown effect of agriculture is significant in reducing poverty and regional inequality in the country. It has been for centuries, playing an instrumental role in shaping the thought, outlook, culture, and economic life of the people of India (Thirtle, *et al*., 2001). The agriculture sector has undergone a dramatic evolution over the last two decades, with globalization and liberalization policies opening up new opportunities for its modernization. The Agriculture and Allied sector accounts for 20.19 percent of total Gross Value Added (GVA) of 179.15 lakh crores Indian rupees at current prices and 16.38 percent at 2011-12 prices (NSO, 2021). Though the share of the agriculture sector in national income has decreased over time, it remains an important sector and contributes significantly to the overall socio-economic development of the country (Byerlee, *et al.*, 2009; Cervantes and Brooks, 2008).

Most agricultural practices in India are limited to a few monsoon months. During the monsoon season, India received abundant rain; however, on several occasions, this bountiful monsoon turns into terror, causing uncontrollable floods in various parts of the country and ultimately affecting agricultural production (Singh and Parihar, 2015). Major crop-growing seasons in India are classified into two groups based on these monsoon seasons: summer crop-growing season, or 'Kharif,' and winter crop-growing season, or Rabi. Rice, maize, sugarcane, cotton, jute, groundnut, soybean, Bajra, etc., are important Kharif crops. Depending on crop duration the Kharif crops can be harvested in the autumn (October to November) or winter (December to February). The winter crop-growing season, also known as Rabi begins after the summer monsoon and lasts until the next spring or early summer. Rainfall at the end of the monsoon season replenishes stored soil moisture and, in some cases, irrigation water for the Rabi crop, as seen in the post-monsoon season (October–November). Some of the Rabi crops are Wheat, mustard, barley, potato, onion, gram, etc., (Mall, *et al.,* 2006; Selvaraju, 2003).

Marketing is the exchange, conversation, and intervention of goods and services to improve their quality and obtain some benefits (Gervase, 2009). An effective marketing system is critical to a country in any condition and at any stage of development (Duhaime, *et al.,* 1985). Agriculture marketing, in the strict sense, includes the transactions of the farmers both in buying and selling, but it is generally confined to the selling side of his business and is used to cover all activities entailed from the time the product leaves the farm until it reaches the consumer (Acharya, 2004; Kherallah, *et al.,*2000). Storage and processing are essential marketing functions in modern agricultural product marketing, and the most important activity in the marketing process is buying and selling (Pandey and Tiwari, 2022). Hence, agricultural marketing entails a variety of activities such as collecting and storing agricultural goods, transporting them to sale points, processing and grading them, settling bargains, and so on (Hayami, *et al.,* 1987)

Agricultural products such as jute, tea, tobacco, coffee, spices, and sugar account for a substantial component of India's export commerce. It helps in the

growth of the country's foreign exchange (Yogita, 2016) and its share of global agricultural and allied sector trade has more than doubled from 1.1 percent in 2000 to 2.2 percent in 2018. In 2020-21, the agriculture and allied sector contributed 14.2 percent of total Indian exports. It includes a diverse range of raw and processed commodities such as cereals, horticultural crops, sugar, livestock, and marine products. Cereals account for the lion's share (22.3 percent) of India's farm export basket, owing primarily to high global demand for Indian rice, both basmati, and non-basmati (RBI Bulletin, January 2022).

The agriculture sector in India is expected to gain traction in the coming years due to increased investment in agricultural infrastructures such as irrigation facilities, warehousing, and cold storage. Increased use of fertilizers, improved water management techniques, reforms to land distribution, and food distribution systems will further enhance productivity and help India meet its growing demand for food. Strengthening marketing practices, developing cold storage, encouraging the establishment of processing units, lowering transaction costs and time, improving port gate management, and providing better fiscal incentives, would all help the sector grow. Furthermore, the increasing use of genetically modified crops will certainly increase yield for Indian farmers (Bansode, 2016; Cagliarini and Rush, 2011; Das and Chanu, 2014; Sai *et al.,* 2022).

Given the inadequacy and lack of rural markets and the increasing prevalence of market distortion, the role of government in agriculture becomes even more critical in developing countries (Ramakumar, 2012). As a result, the government of India has taken several initiatives to improve the agriculture sector. The implementation of the Interest Subvention Scheme (ISS) for providing credit for crop production at a lower interest rate, Soil Health Cards (SHC) for improving agricultural productivity, Pradhan Mantri Krishi Sinchai Yojana (PMKSY) for ensuring irrigation facilities, Pradhan Mantri Fasal Bima Yojana (PMFBY) for providing a safety net against natural calamities, and National Agriculture Market Scheme are some of the important initiatives taken by the Government. There is also a renewed emphasis on allied activities to supplement farmers' income (Sahni, 2020).

After independence, several legislative actions aimed at protecting the agriculture sector had a significant impact on the growth of the agricultural commodity market. To protect the interests of both farmers and consumers, the Essential Commodities Act (ECA) of 1955 envisaged price and movement protection for a variety of agricultural commodities, especially food grains such as paddy, wheat, coarse grains, and pulses (Ali and Gupta, 2011). Besides this, due to the adoption of green revolution technologies and the price support program of the government, the agricultural production system in India has undergone significant changes over the years (Chand, 2003). Technological advances in food crops, coupled with investments in irrigation, infrastructure, and institutions, have propelled India out of the food insecurity syndrome. However, the task of producing more food remains as critical as it has been in the past due to the expanding population (Nelson *et al.,* 2009).

The government has passed two new farm Acts and amended the ECA of 1951. The Farmers' Produce Trade and Commerce (Promotion and Facilitation) Act of 2020 seeks to establish an ecosystem that promotes efficient, transparent, competitive, and barrier-free inter-and intra-state trade of farmers' produce outside of the Agricultural Produce Market Committee (APMC). This is expected to improve farmers' market access and price realization. Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Act, 2020 establishes a legal framework for agreements between farmers and sponsors and is expected to reduce market and price risk, accelerate diversification, and strengthen ties between farmers and processors/exporters. The Essential Commodities (Amendment) Act of 2020 ensures predictability in government action to invoke the ECA and is expected to encourage private investment in storage and logistics infrastructure (Deodhar, 2021; Srivastava and Saxena, 2021).

1.1.1 Physiology of Ginger

Ginger (Zingiber officinale), which belongs to the family Zingiberaceae is a flowering plant whose rhizome, also known as ginger root or ginger, is widely used as a spice and in folk medicine. It is an herbaceous perennial with one-meter-tall annual pseudostems (false stems made of the rolled bases of leaves) bearing narrow leaf blades (Nikkhah Bodagh *et al*., 2019). The chemical components of ginger rhizome vary greatly depending on the location of cultivation, the species of ginger, the maturity of the rhizome, the climate in which the plants are grown, whether the rhizomes are fresh or dried, and postharvest treatments (Grzanna, *et al.,* 2005; Kafeshani, 2015). The pungent ketones such as gingerol cause the strong aroma of ginger, and the rhizome, also known as "ginger root," is the part of the ginger plant consumed. The rhizome is the horizontal stem of the plant from which the roots grow (White, 2007). Shogaol, paradol, zingerone, and oily gases are the major biological compounds found in ginger (McKenna, *et al.,* 2012; Shidfar, *et al.,* 2015). Furthermore, the rhizome contains a variety of biologically active compounds, including curcumin, 6-gingerol, 6-shogoals, zingiberene, bisabolene, camphene, geranial, linalool, borneol, and oleoresin, which account for its distinct aroma and therapeutic properties, as well as a variety of other lipids, which give ginger its pungent and stimulant medicinal properties. (Bliddal, *et al*., 2000; Kaushal, *et al.,* 2017). Gingerol and shogaol were the main active components in the fresh and dry ginger rhizome, respectively (Ali, *et al*., 2008). Ginger grows best at temperatures ranging from 19 to 28°C and its production requires a pH of 6.0 to 6.5 and relative humidity of 70 to 90 percent, respectively (Mahat, *et al*., 2019).

1.1.2 Physiology of Chilli

Chilli (Capsicum annum L.) belongs to the nightshade family Solanaceae (tribe Solaneae, subtribe Capsicinae), is a spice, a fruit vegetable, and is widely cultivated in the world for its pungency (Wahyuni *et al*. 2013). Capsaicin (trans-8-methyl-N-vanillyl-none amide) is the main pungent and irritating component of chilli (Arabaci, *et al.,* 2014; Oyagbemi, *et al.,* 2010; Surh, *et al.,* 1995). Carotenoids, proteins, vitamin A, vitamin C, provitamins E, P, B1, B2, B3, steroidal alkaloidal glycosides, and scopoletin are all found in chilli. Chillies have low saturated fat,

cholesterol, and sodium content. It is high in vitamins A, C, K, and B6, potassium, copper, manganese, dietary fiber, thiamin, riboflavin, niacin, folate, iron, magnesium, and phosphorus (Bargavi and Elumalai, 2016; Batiha, *et al*., 2020). Chilli requires a warm, humid climate for growth and a dry climate for maturity (Hussain and Abid, 2011). Temperatures between 25 and 30 degrees Celsius are ideal for seed germination and temperatures between 18 and 30 degrees Celsius are optimal for productivity. Chillies tolerate a wide range of soil conditions. However, well-drained soils and fertile, medium loams with a pH of 5.5 to 6.8 are generally considered best. If the pH falls below 5.5, chilli plants will grow slowly and produce low yields (Idrees, *et al*., 2020), as a result, soil with a low pH should be neutralized ahead of time with lime or dolomite (Herminingsih, 2017). Rainfall suitable for chilli planting is 80 mm, with four rain events per month and rainfall of 600-1,250 mm/year or 50-100 mm/month distributed evenly over the growing season resulting in high yields. Heavy rain during the flowering period causes flower shedding, poor fruit setting, and rotting of fruits during the ripening period (Chatterjee, *et al*., 2012). The presence of pigments such as chlorophyll (green), anthocyanins (violet/purple), and - and β-carotene, zeaxanthin, lutein, and β-cryptoxanthin (yellow/orange) contribute to the variety of colors found in chilli. During ripening, these fruits undergo profound morphological, physiological, and metabolic transformations that are affected by genotype, maturity, and growth conditions (Hernández-Pérez, *et al.*, 2020).

1.2 SIGNIFICANCE OF THE STUDY

The dominance of marginal and small farmers is one of the issues confronting the agricultural economies of developing countries, including India. They are a significant entity in terms of both numbers and cultivated areas. These households account for the majority of India's rural poor (Hazra, 2001). Ginger and chilli production is primarily a family farm enterprise of smallholder farmers who face numerous challenges such as increased production costs, suboptimal resource use, a lack of market information, and inefficient marketing channels. Efficient marketing with a dynamic supply chain is critical for the agricultural sector. Markets in

different parts of Mizoram are not commodity-specific; they are typical rural hats that cater to all of the daily needs, both agricultural and non-agricultural. Cash crop producers are not receiving adequate returns commensurate with the labor and investments they put in because it is evident that traders from other states who make collective purchases of the farm produce collude with wholesalers and act against the interests of the producers.

Agriculture is the most important occupation of the people of Mizoram, as the state has no major industry. Studies on the production and marketing of important crops are critical for farmers and those who rely on agriculture and its related activities. Despite the enormous potential of ginger and chilli to alleviate rural poverty, no specific and elaborated research has been carried out on the economic aspects of ginger and chilli cultivation. Keeping this in mind, the study was carried out with a specific goal to provide a framework for the state to address problems and improve ginger and chilli cultivation by recommending a suitable policy package, efficient farm management, and regulation and marketing activities.

1.3 STATEMENT OF THE PROBLEM

Indian agriculture has significantly contributed to the growth of the Indian economy and continues to play an important role. Despite its importance, agriculture in India is limited by several factors (Kumar and Nain, 2013), such as lack of cold storage, food packaging, transportation, proper marketing channels, etc. An unsafe and inefficient rural transportation system often results in high rates of food spoilage, particularly during monsoons and other inclement weather. Food travels to the consumer via a slow and inefficient chain of traders. Traditional and modern farming techniques coexist in Indian agriculture. The traditional use of cattle to plow remains in use in some parts of India (Balraj and Arockiasamy, 2018). Furthermore, the sustainability of natural resources, the impact of climate change, the decline of productivity factors, and the declining trend in landholding size pose challenges to the profitability and sustainability of farming (Behera and France, 2016).

In Mizoram, agriculture plays a significant role in the rural economy, and the commercialization of agriculture appears to have gained traction over time. Although the production of ginger and chillies has increased over the years, the marketing chain has often been unable to keep up with supply. Most of the time, farmers do not have enough buyers for their products due to a lack of proper markets. In the absence of a manufacturing or wholesale market for these products, most sales occur in villages through chance encounters with floating traders. Prospective buyers visit villages shortly after harvest to make group purchases, and farmers are helpless to dispose of their commodities unless such buyers come their way.

In many situations, farmers become price takers rather than price makers. As price movements affect the growth of these crops, farmers frequently have to resort to distress sales. However, with few options for crop substitution, a sizable farmer must continue to cultivate ginger and chillies to supplement their meager income from jhum cultivation. As a result, to improve the production and marketing of ginger and chillies in the state, it is critical to conduct a study to identify the various problems associated with these crops and suggest solutions. The contributing factors to the ever-lower ruling prices for these products, which arise from a lack of proper market, must be identified. Keeping these in mind, the current study examined trends in the production of ginger and chillies, flaws in the existing marketing organization, and suggested recommendations for improvement of the state's agriculture sector.

1.4 OVERVIEW OF AGRICULTURE IN MIZORAM

Mizoram is one of the youngest states in India; it became the 23rd state of the Indian Union in February 1987. It is located between 92^{0}15' to 93^{0}29' East Longitude and 21^{0}58' to 24^{0}35' North Latitude. The total geographical area of the state is 21,087 square kilometers. The temperature in the State varies between 11^0 to 21^0 C in winter and 20^0 to 30^0 C in summer. The rainy season (summer monsoon) typically begins in April and lasts until late October, when it rains heavily from May to September, and the annual rainfall in 2019 was 1812.74 millimeters. The winter season lasts from November to February and is mostly dry with little rain. Mizoram has the most varied hilly terrain in the eastern region of India. The hills are steep and separated by

rivers that flow either north or south, creating deep gorges between the mountain ranges. There are up to 21 major hill ranges or peaks of varying heights that run the length and breadth of the state. With its picturesque landscape, hilly terrains, meandering streams, deep gorges, and a rich wealth of flora and fauna, Mizoram is a treasure trove of natural beauty.

As per the 2011 Census of India (COI), Mizoram has a population of 1,097,206 of which 555,339 (50.61 percent) are males and 541,867 (49.39 percent) are females. The population of Mizoram constituted 0.09 percent of the Indian population in 2011. The growth rate of the population was 47.89 percent and the density of the population was 52 per square kilometer. The sex ratio in the state was 976, which is higher than the national average of 940. In Mizoram, 5, 25,435 (47.89 percent) are living in rural areas and 5, 71,771 (52.11 percent) are living in urban areas. Literacy rates in Mizoram have seen an upward trend and are 91.33 percent, with male and female literacy rates of 93.35 percent and 89.27 percent, respectively. In actual number, Mizoram has 848,175 literates, with males accounting for 438,529 and females accounting for 409,646 (Statistical Handbook, Mizoram, 2020).

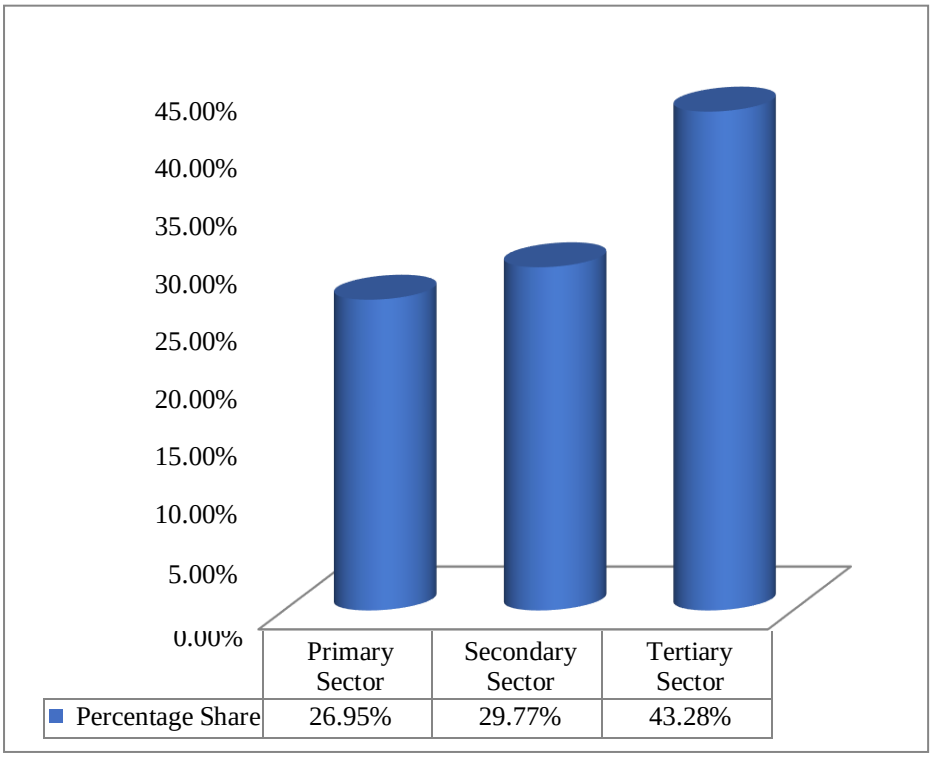
Mizoram shares a 404 kilometers international border with Myanmar and a 318 kilometers border with Bangladesh. The state has been divided into 11 districts, 26 rural development blocks, 23 sub-divisions, and 3 Autonomous district councils and the agro-climatic conditions of these districts are ideal for growing fruits, vegetables, spices, and plantation crops, flowering, medicinal and aromatic plants. Fruit crops, such as mandarin orange, banana, passion fruit, grapes, pineapple, citrus, and papaya, are the most important horticulture crops in Mizoram. Flowers like anthurium, orchid, roses, and other subsidiary seasonal flowers, and Spices such as ginger, turmeric, black pepper, and bird's eye chillies are also grown. In many parts of the state, people have also begun to plant oil palm, several medicinal and aromatic plants.

In Mizoram, there are eight agricultural districts, viz., Aizawl, Lunglei, Champhai, Kolasib, Saiha, Lawngtlai, Mamit, and Serchhip districts. Under these

eight districts, there are 14 sub-divisions and 53 Agricultural circles/ Sub-circles. There are four minor irrigation divisions, viz., Aizawl, Lunglei, Champhai and Kolasib. Under these divisions, there are nine minor-irrigation sub-division and nine Krishi Vigyan Kendra (KVK) Centers. Small landholdings, sloping marginal farmlands, and rain-fed farming are the dominant features of farming in Mizoram.

The agricultural production in Mizoram is dominated by Kharif crops, with Rabi crops playing a minor role. The main pattern of agriculture followed is Jhum or shifting cultivation and despite efforts given by the State government to bring more areas under settled cultivation, the area under jhum cultivation in the state is still high. Because of the hilly terrain, the potential area for Wet Rice Cultivation (WRC) in the state is very limited. There is a potential WRC area of 74,644 hectares with a slope of 0-25 percent in the state (Mizoram Economic Survey, 2019-2020).

Figure 1.1 Sector-wise Share in GSVA at Current Price (2019-2020)



Source: Statistical Handbook, Mizoram 2020

Sector-wise share in Gross State Value Added (GSVA) at the current price was illustrated in Figure 1.1. Figure 1.1 shows the remarkable contribution of the tertiary or service sector, which accounts for approximately 44 percent of the total GSVA at the current price. The secondary sector contributed 29 percent, while agriculture and allied industries contributed 27 percent to the GSVA (Statistical Handbook, Mizoram 2020). Though the share of agriculture and allied activities to the GSVA has come down, it continues to be an important sector and provides livelihood to more than half of the population and continues to be a critical sector in the overall performance of the economy of the state.

Table 1.1 Land Use Statistics of Mizoram (*Area in thousand hectares*)

Sl No	Particulars	2017-18	2018-19
1	*2*	*3*	*4*
I	**Geographical Area**	**2108**	**2108**
II	**Reporting Area for Land Utilization Statistics (1-5)**	**2108**	**2058**
	1. Forests	**1585.01**	**1493**
	2. Not available for cultivation (a+b+c+d)		**114**
	a) Water logged land	100	102
	b) Social Forestry		
	c) Land under still water		
	d) Other land		
	2 (a) Barren & unculturable land		
	Total (2 + 2 a)		
	3. Other uncultivated land excluding fallow land (a+b+c)		
	a) Permanent pastures and other	5.02	5
	b) Land under miscellaneous tree	74	70
	c) Culturable waste	7.01	10
	Total of 3 (a+b+c)	**86.03**	**85**
	4. Fallow land (a+b)		
	a) Fallow land other than current	107.01	102
	b) Current fallow	37.99	47
	Total of 4 (a+b)	**145.000**	**149**
	5. Net Sown Area	**173.99**	**213.67**
	6. Total Crop Area	**176.990**	**217**
	7. Area Sown more than once	**3**	**3.33**
III	**Net Irrigated Area**	**18.8**	**19.08**
IV	**Gross Irrigated Area**	**20.46**	**20.8**
V	**Current Jhum**	**19.60**	**18.90**

Source: Statistical Handbook, Mizoram, 2020

Table 1.1 shows the land-use statistics of Mizoram. As per the table, the state's total cropped area in 2018-19 was 217 thousand hectares out of a total geographical area of 2,108 thousand hectares, accounting for 10.29 percent of the total area. Of the total cropped area, the gross irrigated area was 20.8 thousand hectares and the rest was under rain-fed cultivation. The net sown area increased from 173.99 thousand hectares in 2017-18 to 213.67 thousand hectares in 2018-19. The current fallow land was 47 thousand hectares in 2018-19, while the fallow land other than current decreased from 107.01 thousand hectares in 2017-18 to 102 thousand hectares in 2018-19.

Table 1.2 Area, Production and Yield of Principal Agricultural Crops

Sl No	Name of Crop	2018-19			2019-20		
		Area (Ha.)	**Production (MT)**	**Yield (Kg/Ha)**	**Area (Ha.)**	**Production (MT)**	**Yield (Kg/Ha)**
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	Rice						
	1)Jhum	18,957	23,372	1,232.90	18,510	22,904	1,237.39
	2)WRC-Kharif	16,133	35,678	2,211.49	16,232	36,357	2,239.83
	3)WRC-Rabi	460	960	2,086.96	468	978	2,089.74
	Total of WRC (2+3)	**16,593**	**36,638**	**2,208.04**	**16,700**	**37,335**	**2,235.63**
	Grand Total of Rice (1+2+3)	**35,550**	**60,010**	**1,688.05**	**35,210**	**60,239**	**1,710.85**
2	Maize	6,163	10,970	1,779.98	6,353	11,568	1,820.87
3	Pulses	3,769	5,889	1,562.48	4,052	5,507	1,359.08
4	Oilseeds	2,311	2,757	1,192.99	2,460	3,488	1,417.89
5	Sugarcane	1,462	44,260	30,273.60	1,468	46,842	31,908.72
6	Potato	134	509	3,798.51	144	534	3,708.33

Source: Statistical Handbook, Mizoram, 2020

Table 1.2 shows the area, production, and yield of principal crops in Mizoram. As can be seen from the Table, rice accounted for the highest area under cultivation, followed by maize and pulses. The total area under rice cultivation in 2019 was 35,210 hectares, which accounts for about 20.43 percent of the total cropped area. Rice is the main food crop and staple food of the people in the state. The minimum rice requirement is estimated to be around 1, 80,000 million tonnes per year; however, current rice production of 60,239 million tonnes per year can only meet 33.47 percent of the state's rice requirement. The remaining 66.53 percent must be imported from elsewhere in the country. Increasing rice production and diversifying agricultural farming would improve rural livelihoods and reduce poverty in villages and is therefore critical for the state's food security.

The area under maize cultivation increased from 6,163 hectares in 2018-19 to 6,353 hectares in 2019-20, and the production increased from 1,970 million tonnes in 2018-19 to 1820 million tonnes in 2019-20. The total production of pulses in 2019-20 was 5,507 million tonnes, and that of oilseeds was 3488 million tonnes in the same year. With a slight increase in area under sugarcane cultivation from 1462 hectares to 1468 hectares, the total production increased from 44,260 million tonnes in 2018-19 to 46,842 million tonnes in 2019-20. The production of potatoes was 534 million tonnes in 2019-20. An agricultural holding is a unit of production that produces agricultural goods primarily through the use of land, plants, and animals (Deac and Fagadar, 2021).

Table 1.3 shows the year-wise and the district-wise number of Agricultural holdings in Mizoram. Overall, half of the agricultural holdings in Mizoram are marginal (less than 1 hectare). According to the Agricultural Census data, small (1-2 ha) and marginal holdings account for 80.74 percent of total holdings in 2015-16, compared to 87.02 percent in 2010-11, while large holdings (10 ha and above) account for only 0.32 percent. In 1990-91, the total number of marginal holdings in the State was 28,538 and that of the smallholding was 23,039. The semi-medium (2-4 ha) and medium holdings (4-10 ha) increased from 9,922 and 1,731 in agriculture census 2010 to 13,834 and 3,209, in census 2015 respectively. The increase in the

share of semi-medium and medium holdings indicates that there is a change in the cropping pattern in the state-a shift towards plantation crops.

Table 1.3 Numbers of Agricultural Holdings (Agriculture Census)

SN	Census Year / District	Marginal	Small	Semi-medium	Medium	Large	All Sizes
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	1976-77	16,682	19,622	10,586	1,688	1011	48,679
2	1980-81	15,651	19,146	10,380	1,399	21	46,597
3	1985-86	20,692	18,098	10,967	1,284	81	51,122
4	1990-91	28,538	23,039	8,736	717	0	61,030
5	1995-96	27,674	25,656	11,752	730	9	65,821
6	2000-01	33,695	27,973	12,539	1,258	58	75,523
7	2005-06	43,382	31,061	13,744	1,443	36	89,666
8	2010-11	50,210	29,753	9,922	1,731	264	91,880
9	2015-16	44,963	27,483	13,834	3,209	285	89,774
District-wise (2015 - 16)							
1	Mamit	4,845	4,088	4,088	1,114	120	14,255
2	Kolasib	1,539	2,574	3,491	1,591	126	9,321
3	Aizawl	9,831	3,898	1,892	174	9	15,804
4	Champhai	9,029	2,177	315	46	0	11,567
5	Serchhip	3,603	1,877	1,270	190	12	6,952
6	Lunglei	8,019	6,926	868	19	18	15,850
7	Lawngtlai	5,320	4,382	1,247	60	0	11,009
8	Saiha	2,777	1,561	663	15	0	5,016
	Total:	**44,963**	**27,483**	**13,834**	**3,209**	**285**	**89,774**

Source: Statistical Abstract, Mizoram 2019

There is a preponderance of marginal and smallholdings in all the districts of Mizoram. More than half (62 percent) of agricultural holdings in the Aizawl district are marginal, and that of the smallholdings was 24.67 percent. The large holdings accounted for only 0.05 percent of the total agricultural holdings in the district. The smallholding in Lunglei and Saiha stood at 43.69 percent and 31.12 percent, respectively. In the Lunglei district, the marginal holdings accounted for 50 percent of the total holdings, while the large holding was less than 1 percent. Semi-medium holdings in the Kolasib district account for 37.45 percent and 28.68 percent in the Mamit district. In Serchhip, the marginal holding was 51.83 percent of the total agricultural holdings. The marginal holdings and smallholdings in Champhai districts were 78.05 percent and 18.82, respectively.

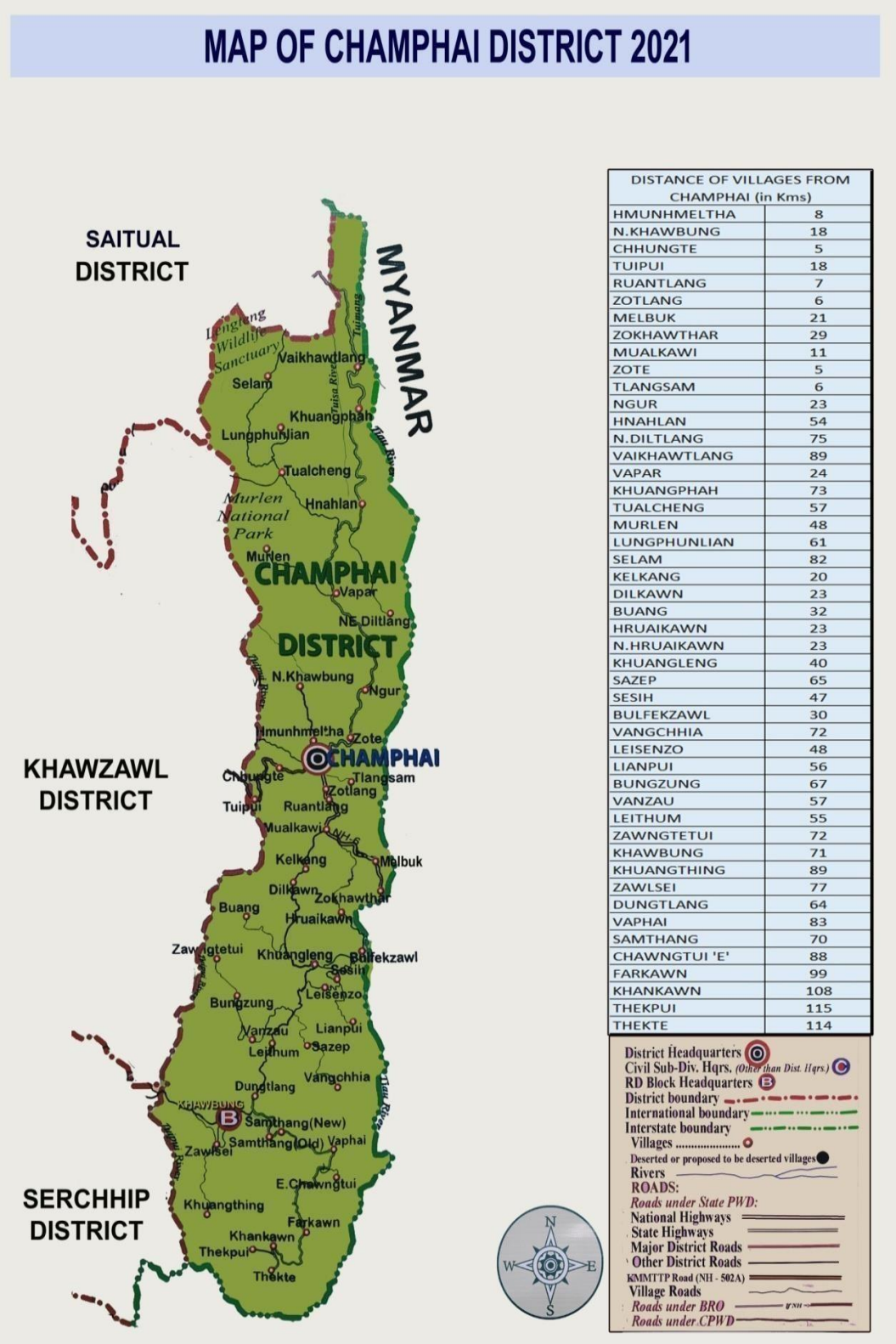
Smallholders do not lag behind other farm size categories based on the adoption of improved technologies and using fertilizer and irrigation. Furthermore, as evidenced by the lower fertilizer imbalance index, marginal and smallholder farmers make better use of inputs. In recent years, the inverse relationship between farm size and productivity based on the aggregate of all crops has become quite noticeable. However, while a small farm in India outperforms other farmers in terms of output, it falls short in terms of generating sufficient income and sustaining livelihood (Chand, *et al.,* 2011).

1.5 AREA OF THE STUDY

1.5.1 Introduction

Champhai, a bustling trading district on the Indo-Myanmar border, is a beautiful place with many tourist attractions. A chain of green hills encircles lush rice fields, adding to the beauty of this place. In addition to its breathtaking beauty, it is a treasure trove of ancient relics, monuments, legends, and folklore. The small towns and villages in the district are studded with monuments and monoliths depicting war success, valorous hunting, personal distinctions, and achievements.

Fig 1.2 Map of Champhai District



Source: Unofficial Map Drawn by Economics & Statistics, Champhai

1.5.2 Location

Champhai district, one of the eleven districts in Mizoram, is located in the North-Eastern region of Mizoram, between $93^0$3' East Longitude and $23^0$4' North Latitude and at an elevation of 1,678 meters (5505 ft). The district covers an area of 3,185.83 kilometers. It is bounded on the north by Manipur, on the south and east by Myanmar, and on the west by the districts of Saitual and Serchhip districts.

The international border between Myanmar and Champhai District is 160 kilometers long. The Tiau River in the east demarcated India with Myanmar, and the total length of the river within the district is approximately 148.06 kilometers. The administrative headquarters of the district is Champhai town.

1.5.3 Forest

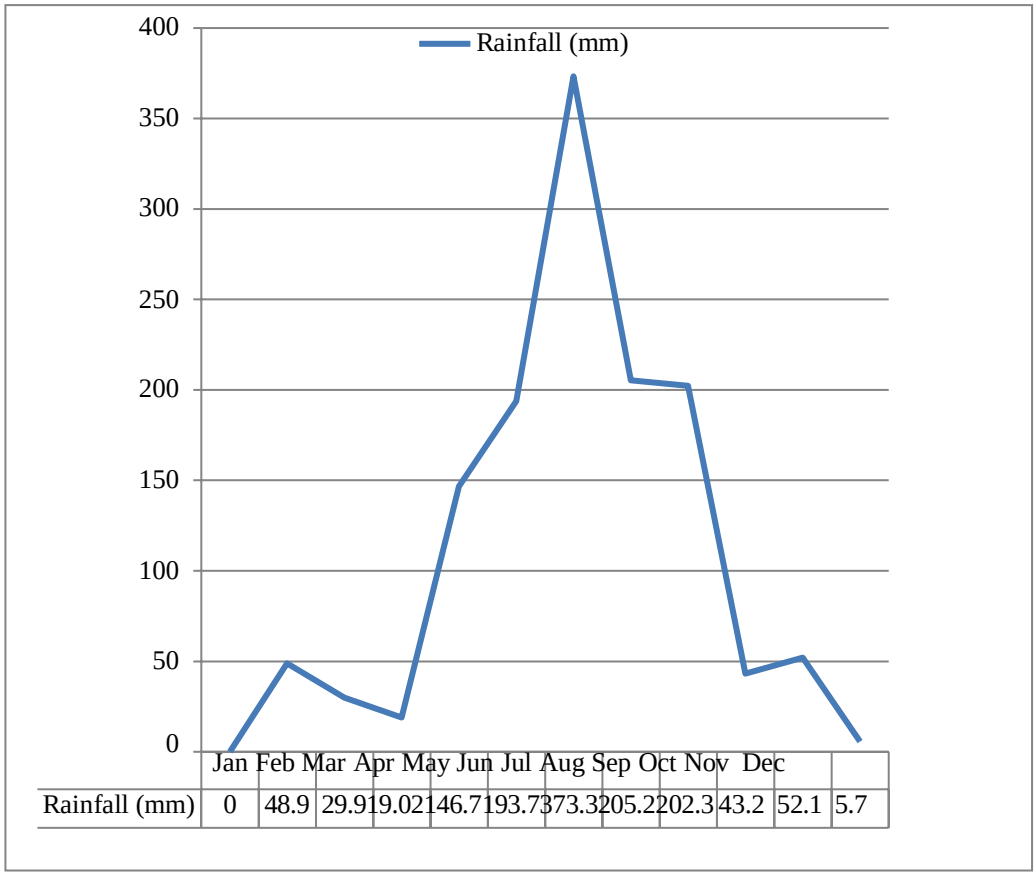
The total forest cover of the district is 2,785 square kilometers. The type of forest cover is primarily subtropical forest, especially on the eastern side, where the altitude is higher. On the western side, there is tropical wet evergreen forest mixed with semi-evergreen and tropical moist deciduous forests, primarily bamboo. The vegetation is made up of a variety of species. The forests have been classified as dense, medium dense and less dense based on the density of the canopy cover.

The dense forest, which includes natural forests that have not been disturbed by biotic factors such as shifting cultivation or other human activities, covers an area of 663.99 square kilometers, accounting for 20.84 percent of the total area of the district. While the medium dense forest which includes forests with a crown cover that is neither too thick nor too thin, covers 577.77 square kilometers, accounting for 18.14 percent of the total area of the district. The less-dense, which are the lands where shifting cultivation had been practiced and then left fallow for over a year, resulting in new vegetation that regenerated to form new forest covers an area of 805.19 square kilometers, which accounts for 25.27 percent of the total area of the district. Mullen National Park, home to a variety of flora and fauna, covering an area of 200 Square kilometers, was located in the district.

1.5.4 Climate

The climate in Champhai is moderate, and the temperature ranges from 0 to 20 degrees Celsius in the winter and 15 to 30 degrees Celsius in the summer. Pre-monsoon rains occur from March to May, with the regular south-west monsoon beginning in June and lasting until October. The monthly average rainfall in Champhai (2019) is shown in Figure 1.3.

Figure 1.3 Monthly Average Rainfalls in Champhai, 2019



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Rainfall (mm)	0	48.9	29.9	19.02	146.7	193.7	373.3	205.2	202.3	43.2	52.1	5.7	

Source: Statistical Handbook, Mizoram 2020

The average annual rainfall in 2019 was 1,320.02 millimeters and the monthly rainfall average in the district was 110 cm; the heaviest rainfall of 373.3 cm was received during July while there was no rainfall in January. 73.82 percent of the annual rainfall in the district is concentrated between the months of June to

September (Fig 1.3). In Champhai district, the southern region receives significantly more rain than the northern region. Despite the high rainfall, there are prolonged dry spells and occasional drought conditions. Crops are mostly grown rain-fed, depending on monsoon rainfall.

1.5.5 Demography

The number of households in the district in 2021 was 25,520. As per the 1971 census, the total population in the district was 49,139. This increased to 63,729 and to 83,023 in the 1981 and 1991 Census of India (COI), respectively. The population of Champhai district as of 2011 was 125,745 which accounts for 11.46 percent of Mizoram's population, of which males and females were 63,388 and 62,357, respectively. The total population was 55,756 in COI, 2001 (Table 1.4). The decadal variation was 76.60 percent in 2001; it increased to 86.20 percent in 2011. The density of the population was 39 people per square kilometer (COI, 2011).

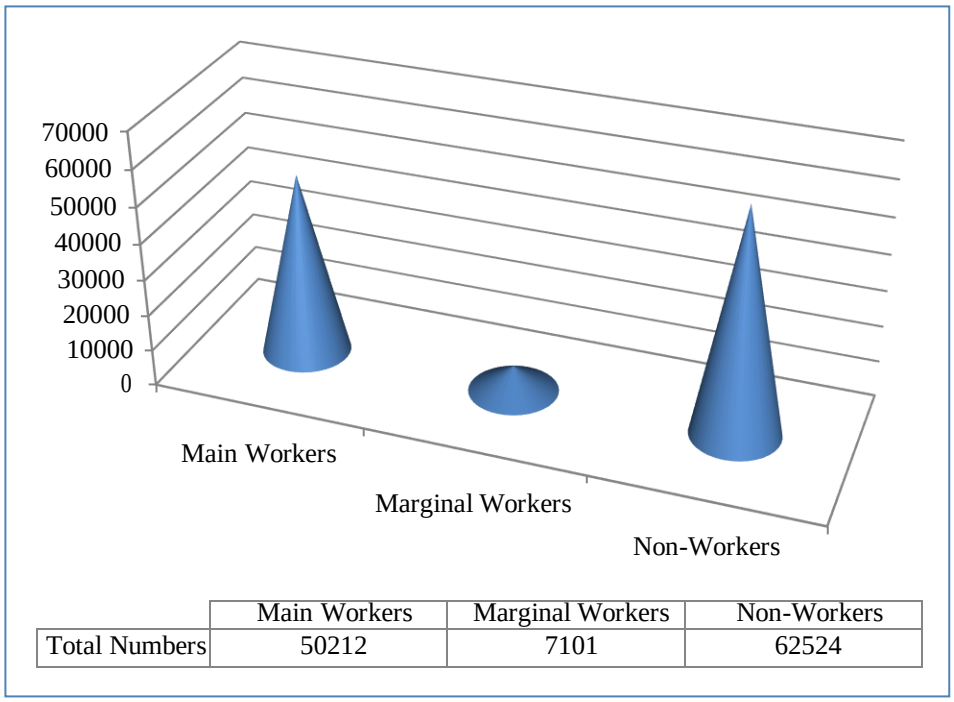
Table 1.4 Population Trend of Champhai District

Year	Male	Female	Total persons	Decadal variation (%)
1971	23,925	25,214	49,139	-
1981	31,814	31,915	63,729	77.11
1991	42,129	40,894	83,023	76.76
2001	55,756	52,636	1,08,392	76.60
2011	63,388	62,357	1,25,745	86.20

Source: Statistical Handbook, 2018 Champhai District

As per the COI, 2011, the literacy rate was 95.91 percent, the male literacy rate was 97.21 percent, and the female literacy rate was 94.59 percent. The growth rate of the population in the district was 16.01 percent and the sex ratio was 984. There are 22,645 children in the age group 0 to 6, compared to 18,433 in 2001, with males and females comprising 10,474 and 10,171, respectively. The child sex ratio in 2011 was 976, compared to 972 in 2001.

Figure 1.4 Population by Categories of Workers



	Main Workers	Marginal Workers	Non-Workers
Total Numbers	50212	7101	62524

Source: Statistical Handbook, Champhai District 2018

Figure 1.3 shows population categories by workers in Champhai district. As per the 2011 Census of India, out of the total population of 1,25,745 in the district, 50,212 (39.93 percent) were cultivators and 7,101 (5.65 percent) were marginal workers and the rest 62,524 (49.72 percent) were non-workers.

1.5.6 Economy

The economy of the Champhai district is based primarily on agriculture and international border trade. Champhai is the main trading center of Mizoram, with goods such as clothes, kitchenware, edible items, electronics, etc., imported from Myanmar, and many goods are exported from Mizoram to Myanmar via the Zokhawthar trading post. In Champhai town, approximately 87.32 percent of the total household depends on agriculture. The secondary sector accounts for 8.40 percent, while the tertiary sector accounts for 4.28 percent of the workforce (Master Plan for Champhai Town, 2041).

1.5.7 Agriculture Scenario of the District

Champhai District is composed of steep hill ranges separated by narrow valleys. The topography and climate are ideal for growing a wide range of crops. Agriculture, like in the other districts of Mizoram plays a vital role in the life of the people. The cropping system in the District is diverse because it is influenced by soil, microclimate, and the overall socioeconomic status of the area.

Table 1.5 Areas and Production of Principal Agricultural Crops in Champhai District, 2020-2021

Sl No	Name of Crops	Area (Ha.)	Production(MT)
1	*2*	*3*	*4*
1	Rice		
	Jhum	2930	4394
	WRC-Kharif	3162	8217
	WRC- Rabi	-	-
	Total of WRC (2+3)	3162	8217
	Grand Total of Rice (1+2+3)	6092	12611
2	Maize	480	768
3	Pulses	284	274
4	Oilseeds	80	70
5	Sugarcane	59	1897
6	Potato	35	50

Sources: Directorate of Agriculture (CH), Mizoram

As shown in Table 1.5, in Champhai district, 6,092 hectares were used for rice cultivation, out of which 3,162 hectares were under Wet rice cultivation. The total production of rice in 2000 was 12,611 million tonnes. Maize and pulses were grown on 480 and 284 hectares of land, respectively. 1,857 million tonnes of sugarcane were produced in 2020-21 from an area of 59 hectares. The area under potato cultivation was 35 hectares and the total production was 50 million tonnes. Since agriculture and allied sectors are critical for the people, particularly for small and marginal farmers, their progress and development should be prioritized.

Livestock rearing is an important occupation of many households to meet their daily needs and supplement their household income. Piggery and poultry farming is primarily for meat and egg production, and in a few areas, people are also engaged in cattle rearing and dairy farming. Horticulture vegetables such as cabbage, brinjal, onion, beans, and spices like ginger, chilli, turmeric, and several plantation crops and fruits were grown in Champhai. Almost all horticultural crops survive in Mizoram's climate. As a result, maximum output and productivity can be expected if the ideal input requirements are available (Economic Survey Mizoram 2019-20). Though ginger and chillies are grown in other districts of Mizoram, this study confines itself to the erstwhile Champhai district only as it is the most important agricultural center of the state and is one of the largest producers of ginger and chillies in the state. Champhai has an international border with Myanmar and thus had a great trading advantage compared to other parts of the State.

1.6 OBJECTIVES OF THE STUDY

The objectives of the study are as presented below

1. To analyze the production and productivity of ginger and chillies in Champhai district.
2. To study the marketing arrangements and also the channels involved in the marketing of ginger and chillies.
3. To examine per hectare returns, Cost, and Benefit-Cost (BC) ratio during the study period.
4. To analyze factors affecting the productivity of ginger and chilli in the study area.
5. To compare and contrast ginger and chilli production, productivity, cost of cultivation, and profitability.

6. To compare and contrast marketing margin, marketing cost, producer's share and price spread in ginger and chilli marketing.

7. To estimate the marketing efficiency of ginger and chillies in different marketing channels.

8. To identify production and marketing problems faced by producers in the study area.

1.7 HYPOTHESES

The underlying hypotheses in the study are as follows:

1. There is a significant relationship between the ginger area of cultivation and lagged price of ginger and the chilli area of cultivation and lagged price of chilli.

2. The numbers of agricultural labor in the family, the quantity of seeds used, and the amounts of fertilizer input in both the spices significantly determine the productivity of ginger and chilli.

3. There is an inverse relationship between the area of farm size and its productivity.

1.8 METHODOLOGY

The study is based on both primary and secondary data. The primary data were obtained through a structured questionnaire and secondary data was obtained from sources such as Statistical Abstracts, Economic Survey, and Statistical Handbooks, articles, journals and other e-resources.

1.8.1 Survey Design and Data Collection:

A multistage sampling technique was adopted in this study. In the first stage, two rural development blocks were selected to represent Champhai district. The second stage involved the random selection of twelve villages i.e., six villages from each block. In the last stage, requisite data were collected randomly from households in each village with a total number of 676 randomly selected farmers' i.e., 354 respondents for Ginger and 322 respondents for Chilli. Data were also obtained through face-to-face interviews and key informants' interviews. A field survey was conducted covering six years as a reference period starting from 2014-15 to 2019-20.

1.8.2 Methods and Techniques of Data Analysis

Cost of Production:

The variable cost components were taken into account while calculating the cost of production. This is mainly because agriculture in Mizoram is still traditional and no machines or tools were applied in the agriculture system. Moreover, the nature of the agriculture system is mainly shifting cultivation under which labor, seeds, fertilizers, pesticides, irrigation and weeding are the main cost components.

Keeping this, expenditure on seed, land preparation, fertilizers and manure, pesticides, weeding, irrigation, harvesting, and labor, are included in the variable cost while the fixed cost was left in the analysis since the fixed cost has no considerable share in the cost structure. The total cost of production was calculated by adding all the expenditures on variable inputs and can be expressed as:

$$\text{Total cost} = \sum \text{Cost incurred on all the variable items}$$

Benefit-Cost Analysis:

For benefit-cost analysis, the total cost of production of the selected crop and total gross return from the products were used. For calculating gross return, income from produce sales was accounted. So the B/C ratio was calculated using the following formula:

$$\text{B/C ratio} = \text{Gross Return/Total Cost.}$$

***Profitability Analysis**:*

The profit is the difference between total revenue and the total cost incurred. Thus, net profit for any farm business can be written as:

$$\Pi = TR - TC$$

Where, Π = net profit, TR = total revenue, TC = total cost.

***Marketing Margin and Producer's Share**:*

Marketing margin is the difference between the farm gate price received by the farmers and the price paid by the consumer (Tomek 1984). A wider price spread signifies a higher marketing cost and, as a result, an inefficient market. It was calculated by subtracting the farm gate price from the retailer's price and is mathematically expressed as

Marketing Margin (MM) = Selling Price (SP) – [Purchase Price (PP) + Marketing Cost (MC)]

Similarly, the producer's share is the price received by the farmer expressed as a percentage of the retail price, which is the price paid by the consumers. It was calculated using the following formula.

$$\text{Producer Share} = \frac{\text{Farm Gate Price (FGP)}}{\text{Consumer Price (CP)}} \times 100$$

***Marketing Efficiency**:*

Producers' share of the consumer price is simply the producer's price as a proportion of retail pricing. The magnitude of the producer's share of the consumer price is directly proportional to marketing efficiency.

The Modified Marketing Efficiency (MME) as suggested by Acharya (1999) was employed as an index of marketing efficiency. It is defined as

$$MME = \frac{FP}{MC + MM}$$

Where FP is the net price received by farmers, MC is the total marketing cost and MM is the total marketing margins.

***Indexing / Scaling**:*

For finding the importance of different production and marketing problems five-point scale was used based on the farmer's perception of them. It comprises very high importance, high importance, normal importance, less importance, and the least importance to the different problems. The highest important problem was assigned a scale value of 5 followed by high importance with a scale value of 4 and so on. Production and marketing problems were ranked using the following formula:

$$\text{Index of Importance} = \sum \frac{\mathbf{SiFi}}{\mathbf{AN}}$$

Where, Iimp = index of importance $\sum$ = summation Si =ith scale value Fi = frequency of ith importance given by the respondents, A = highest scale value N = total number of respondents.

Factors affecting the Yield of Ginger and Chillies:

To estimate the factors affecting the yield of ginger and chilli a Multiple Linear Regression method was applied to determine significant factors from potential explanatory variables. Productivity (production/hectare) was accounted for as the dependent variable while the area under cultivation, amount of seeds, fertilizers, gender of the household head and labor are considered as the explanatory variables. The mathematical specification is given as,

$$Y = \alpha + \beta_1 A + \beta_2 S + \beta_3 F + \beta_4 L + \beta_5 G$$

Where, A is the area under cultivation, S is the amount of seed, F is expenditure on fertilizer and L is the amount of labor employed and G is the gender of the household head. α, β_1…….β_5 are Coefficients to be estimated.

Model Adequacy Checking

The model adequacy diagnostics were checked via residual analysis or residual plots. These include:

Linearity: Linearity indicates that the relationship between the dependent and independent variables should be linear in the parameter.

Normality: Normality of random error tested with a plot of residual against the cumulative probability or quantile-quantile plot.

Homoscedasticity: Plotting the standardized residuals against time order is to examine the variance of the error term is constant.

Multicollinearity: The decision on multicollinearity is based on the variance inflection factor (VIF). If the value of VIF is less than ten, the collinearity was tolerable, but if it is more than 10, VIF is a risk

Growth Rate Analysis:

To compute the growth rate of area, production and productivity major spices of state and district the exponential function was used, which is as follows:

$$Y = AB^t$$

Equation (1) was converted into the logarithmic form to facilitate the use of linear regression.

Taking logarithm on both sides of the equation (1).

$$\text{Log } Y = \log A + t \log B$$

Assuming as:

$$\log Y = Y$$

$$\log A = a$$

$$\log B = b,$$

We get, $Yt = a + bt$ (t = 1, 2, 3… n)

Yt= area/production/productivity in the year‘t’

a = intercept term indicating Y in the base period (t = 0)

b = Regression coefficient

t = Time variable (t = 1, 2, 3..... n)

After regression analysis we got the value of a and b.

Since, b = 1+ r,

Hence, r = b – 1

r = Compound growth rate = (antilog of b-1) 100

1.9 CHAPTERISATION

The study has been organized into six chapters.

CHAPTER I: Introduction

In this chapter, we have addressed the background of the study and the overview of agriculture in the state. This chapter also incorporates the significance, objectives, and hypotheses of the study and methodology.

CHAPTER II: Literature Review

Chapter II provides a detailed account of the existing literature related to the study. The review of the literature is carried out in three parts: a review of existing literature on the history and origin of ginger and chillies, ginger production and marketing, and a review of existing literature on chilli production and marketing. The last section of the chapter contains a summary of the chapter.

CHAPTER III: An Overview of Ginger and Chillies in India

The third chapter deals with an overview of ginger and chillies in India.

CHAPTER IV: Production of Ginger and Chillies: Data Analysis

The fourth chapter analyses data on acreage response to price, production and productivity trends, growth rates, the cost of ginger and chilli cultivation, and profitability. The chapter also discusses the productivity determinants of ginger and chilli, as well as a comparative analysis of ginger and chilli cultivation.

CHAPTER V: Marketing of Ginger and Chillies: Data Analysis

Chapter V examines the characteristics of agriculture markets in the study area by exploring marketing practices and constraints, the marketing channels, and disposal patterns. The chapter also analyses the marketing cost of ginger and chillies, the marketing margin, producer's share, and price spread. In addition, the various marketing problems in the study area have been presented in the last part of the chapter.

CHAPTER VI: Summary of Findings, Conclusions, and Recommendations

Chapter VI provides the summary of findings, conclusions, and recommendations.

CHAPTER-II

REVIEW OF LITERATURE

2.1 INTRODUCTTION

Several studies have already been carried out in different countries to analyze various aspects of agricultural development, such as production, marketing, etc. This chapter attempted to review the relevant literature relating to the present study. There are six sections in this chapter. Following the introduction, Section 2.2 reviews studies relating to the history and origin of ginger, and section 2.3 reviews literature relating to the history and origin of chillies. Section 2.4 highlights the relevant studies on the production and marketing of ginger. Section 2.5 of the chapter highlights the studies relating to the production and marketing of ginger. Section 2.6 concludes the chapter by providing a summary of the literature reviewed.

2.2 HISTORICAL BACKGROUND OF GINGER

Ginger (Zingiber officinale Rosc.), a tropical and subtropical plant is believed to have originated in India or South-East Asia, and was introduced to Europe by Arab traders (Mabberley, 1997; Park and Pezzuto, 2002; Purseglove, *et al.*, 1981). It was introduced into the Mediterranean region from India/China in the first century A.D. It is described in Ayurvedic texts as acrid and digestive, and has been used since ancient times to used to treat cold, asthma, cough, colic, palpitation of the heart, tympanites, swellings, piles treat, food poisoning, osteoarthritis, epilepsy, nausea, inflammation, cold, motion sickness, menstrual cramps, cancer, and many other ailments. Aside from these, it has antimicrobial and antioxidant properties, an indication that no part of the ginger plant can be considered waste (Akbar, 2020; Chew, 2018; Elizabeth, *et al.*, 2013; Gupta and Sharma, 2014; Shukla, and Singh, 2007).

Ancient historians equate the ownership of ginger or its trade routes with prosperity in 5000 B.C (Duke, 2002). When Marco Polo visited China and Sumatra in the thirteenth century, he brought some ginger back to Europe (Elzebroek and Wind 2008). The Portuguese introduced it to West Africa and other tropical areas in the sixteenth century (Kochhar, 1986). To make it more widely available, Spanish explorers introduced ginger to the West Indies, Mexico, and South America in the 16th century, and these regions began exporting this valuable herb back to Europe.

Ginger plants grown in pots were transported abroad on long sea voyages to prevent scurvy (Bhatt, *et al.*, 2013).

Ginger has a long and well-documented history of culinary and medicinal use all around the world by ancient physicians, particularly in Chinese, Indian, and Japanese medicine. It is an anti-inflammatory herb used in Indian ayurvedic medicine and traditional Chinese medicine (Abubacker, 2009; Gaikwad, *et al*., 2017; Nayak, *et al.*, 2005; Nicoll and Henein, 2009), and Tibb-Unani herbal medicines for centuries (Wang and Wang, 2005). Confucius mentioned it in his Analects, and Dioscorides, a Greek physician, listed ginger as an antidote to poisoning, as a digestive, and as warming to the stomach in his treatise "De Materia Medica" (Braun and Cohen, 2015). In 2165 B.C., Chinese Princess Tai died and was buried with cinnamon, galangal, ginger, and pepper (Imtiyaz, 2013). Ginger has been used to season foods in Korea for approximately 1,000 years (Daily, *et al*., 2015).

The generic name of ginger 'Zingiber' is derived from the Greek zingiberis, which is derived from the Sanskrit name of the spice, singabera. Zingiber means "shaped like a horn" in Latin and refers to the roots, which resemble deer antlers (Knappert, 1988; Shahrajabian, *et al.*, 2019; Vasala, 2012; Wilson *et al*., 2013). It was a vital trade item exported from India to the Roman Empire over 2000 years ago, where it was highly valued for its medicinal properties. Even after the fall of the Roman Empire, ginger remained a highly in-demand commodity in Europe, with Arab merchants controlling the trade in ginger and other spices for centuries. A pound of ginger was worth the price of a sheep in the thirteenth and fourteenth centuries. By the Medieval period, it was imported in preserved form for use in sweets (Bode and Dong, 2011).

In different parts of the world, the plant is known by different names, such as jing or Sang Kyung in Chinese, Uday or Adrak in Hindi, Gabi or Alia in Indonesia, Gimber in Dutch, Gingembre in French, Inghwar in German, Zengeru in Italian, and Jengibre in Spanish (Abdulwase, *et al.*, 2020; Tan and Vanitha, 2004). It is one of the most important and earliest known oriental spices and is being cultivated in India

both as a fresh vegetable and as a dried spice since time immemorial (Pavithra, 2021).

2.3 HISTORICAL BACKGROUND OF CHILLIES

Chilli peppers are cultivated plants native to the New World, in the southern Peruvian and Bolivian regions (Egawa and Tanaka, 1984; Pickersgill, 1971; Pozzobon, *et al.*, 2006; Villalón, 1981) and spreading further south, their popularity continues to grow across the world. Chillies were introduced to Europe by Christopher Columbus in 1493 and to India by the Portuguese in the seventeenth century (Mehta, 2017; Pandit, *et al*., 2020). The Tehuacán and Ocampo remains are as of now the oldest macrobotanical evidence for preceramic chilli pepper in the New World. Although these chilli specimens cannot be identified as cultivated or domesticated, their archaeological association with domesticated remains of important crops such as maize and squash strongly suggests ancient intensive human interaction with chilli in these areas (Kraft, *et al.*, 2014). Long before Columbus arrived in America, indigenous peoples used it as food, as war artifacts, and in religious rituals (Chiou, *et al*., 2014).

When Christopher Columbus arrived in the New World, he was one of the first Europeans to encounter the fruits of the Capsicum species, which he dubbed "peppers" because they had a spicy hot taste unlike anything else in Europe at the time. Chillies were added to dishes in Spain and Portugal, and their culinary use quickly spread across Europe and Asia (Coe, 2021). Starch grains of Capsicum was discovered on artifacts recovered from house floors in two early village sites in south-western Ecuador, Loma Alta and Real Alto, dating back approximately 6,000 years (Perry, *et al.*, 2007).

Before the 15th century, chillies were grown to varying extents from Chile to the American Southwest (Chiou and Hastorf, 2014). It was used as an essential ingredient in the preparation of dishes serving as a "signature food" in pre–Columbian times (Gasser and Kwiatkowski, 1991). It became widely exploited after Columbus because of its fruits, which have high nutritional contents, notably

vitamins. The pungent cultivars are used as spices, while the sweet cultivars are used as vegetables (Moscone, *et al.,* 2006).

For thousands of years, people in Mexico have collected, cultivated, and consumed chilli peppers. The earliest evidence for what would later become an important domesticate is the remains of wild chilli peppers recovered from several levels of Coxcatlán Cave in Mexico's Tehuacán Valley (Smith and Byers, 1967). Excavations at Guila Naquitz and Silvia's Cave, two dry rock shelters near Mitla, Oaxaca, Mexico, revealed the remains of 122 chilli peppers dating from A.D. 600 to A.D. 1521 (Perry and Flannery, 2007).

Chilli peppers are essential ingredients in many traditional dishes throughout Sub-Saharan Africa (Ezekiel *et al*., 2019). Chilli plays an important role in Nigerian cuisine, with large amounts used in traditional dishes such as suya, tsire, kilishi, and pepper soup (Mann, 2011; Oktay and Sadıkoğlu, 2018). They are an essential ingredient used in food preparation around the world, as well as an important product used in the pharmaceutical, food, cosmetic, and poultry industries (Jin, *et al*., 2009).

2.4 PRODUCTION AND MARKETING OF GINGER

Ginger is an important spice that shows a great diversity of uses, such as in dietary supplements, beverages, and food products such as curry powder, confectionaries, soups, jams, and baked goods (Abubakar *et. al*. 2020; Thomson, *et. al*. 2002). In addition, it has also been used as a traditional and herbal medicine in many parts of the world, particularly for the treatment of nausea, vomiting, cough, diabetes, arthritis, and muscle pain (Black, *et al.*, 2010; Li *et al*. 2019; Terry, *et al.*, 2011). In China, ginger is commonly consumed as a fresh paste, dried slices/powder, candy (crystallized ginger), or tea flavoring, and it is also used as a condiment in the food, beverage, and fragrance industries due to its pungent constituents and aromatic volatile constituents. The volatile constituents play a dominant role in imparting the distinctive, pleasant aroma of various ginger products (Ding, *et al.*, 2012). Finely

minced ginger is added to the spicy paste ingredients just before the fermenting process in traditional Korean Kimchi (Kim and Chun, 2005).

There are many ginger varieties around the world (Nishidono, *et al*., 2020). Some of the important cultivars are Cochin ginger, Wayanadan ginger, Chinese ginger, Buderim gold, and Jamaican (Kizhakkayil and Sasikumar, 2011). Based on the size of the rhizome, in Japan, ginger is usually classified into three groups: small, medium, and large. Kintoki, Yanaka, and Sanshu make up the small group. Ginger kintoki (dried rhizomes) are native to Japan and have long been used for medicinal purposes. Boshu and Rakuda are members of the medium group. Tosa, Ohtafuku, and Ohmi are among the large group. Whereas small rhizomes of ginger are generally used for medicinal purposes, medium and large rhizomes are used in food and beverages (Iijima, and Joh, 2014). Badak or Gajah (big white ginger or giant ginger), emprit (small white ginger), and Merah or beureum (small red ginger) are the three ginger varieties in Indonesia. Badak or Gajah (big white ginger or giant ginger) is generally used as a spice or flavour for foods and beverages, while the other varieties are mostly used for medicinal purposes (Supu, *et al.,* 2018). In India, several ginger cultivars are grown in various ginger-growing areas, and they are named after the places where they are cultivated or collected (Pawar, *et al.*, 2011). Maran, Kuruppampadi, Ernad, Wynad, Himachal, and Nadia are some of the most famous indigenous cultivars in India (Nampoothiri, *et al*., 2012).

Ginger is usually grown on forest fringe lands. It grows well in red sandy and deep soils that are less exploited (Balamatti *et. al.*, 2016), it is also grown in black and red loamy soils (Mahesha, *et al*., 2020). Beds are preferred for rain-fed ginger production in southern Kaduna, Nigeria, whereas ridge planting is recommended for irrigated ginger production (Adegboye, 2011). It requires 210–240 days to reach full maturity after planting. After 180 days, ginger is harvested for vegetable purposes, depending on demand (Sharifi-Rad, *et al.*, 2017). Ginger is grown in most tropical and sub-tropical regions. It is primarily produced in India, China, Nepal, Nigeria, Thailand, Indonesia, Bangladesh, Japan, and Cameroon, accounting for nearly half of the global production (Ghayur, *et al.,* 2005)

A variety of factors influence ginger production. In Ethiopia, the main factors that influence ginger production were fertilizer, farm area per hectare, diseases such as bacteria, weed effect, and the experience and education level of farmers (Eticha, 2020). Labor and planting material are principal variables to be considered in ginger production in the guinea savannah of Nigeria (Ewuziem and Onyenobi, 2012). In Surkhet, Nepal, availability of labor, land under cultivation, training received by farmers, and provision of subsidies are the major socio-economic factors affecting ginger production (Mahat, *et. al.*, 2019). While in Tanzania, farmers' education level, fertilizer use, land size under ginger production, and frequency of contacting extension services, all had a significant impact on ginger farming and thus productivity (Mmasa, and Mhagama, 2017).

There is an increase in ginger cultivation in the rainforest zone of Nigeria. This is mainly due to the high demand for ginger in recent years (Egbuchua and Enujeke, 2013). It is an important cash crop in the South, Southwest, and North-western regions of Ethiopia (Girma and Digafie, 2004) as the development policy and strategy have targeted the crop for poverty reduction and food security goals at the household level for resource-poor farmers. It appears to encourage market-oriented production by providing farmers with access to appropriate markets and thus increasing marketable surplus (Asale and Ashango, 2017). Countries such as Australia, Canada, the Netherlands, Japan, the United Kingdom, and the United States prefer low fibre ginger with high pungency for oil and oleoresin extraction, whereas Pakistan and Bangladesh prefer medium to high fibre ginger (Pandotra, *et al.*, 2015). In the Southern Kaduna State of Nigeria, males in the productive age category of 31 to 40 years dominated ginger farming because they were more educated and had more experience (Shehu, *et al.*, 2013).

India is the largest grower of ginger in the world, (Bheemudada and Natikar, 2016; Kadam, *et al.*, 2019). India's ginger production increased by 11.5 percent in 2019 compared to the previous year, putting the country first in the world (Joshi and Khanal, 2021). For many decades ginger farming has played an important role in employment and income generation (Gogoi, 2020). It was a very profitable enterprise

(Ezra *et al.* 2017). With improved income, ginger farming also improved the socio-economic status of women (Yiridomoh, *et. al.*, 2021). It is one of the spices that provide financial support to many farmers in Kerala, Karnataka, Arunachal Pradesh, Orissa, West Bengal, Sikkim, and Madhya Pradesh. Cochin Ginger (NUGC) and Calicut Ginger (NUBK) are the two most popular varieties of Indian ginger in the international market. It comes in four varieties: oil, oleoresins, ground ginger, and fresh ginger (Karthick *et al*., 2015).

The most popular Indian ginger varieties on the global market are Cochin ginger and Calicut ginger (Bag, 2018). Among the various factors of ginger production, ginger seed and human labor have played a significant role in ginger production across the North-eastern states of India. As a result, the ginger rhizome should be planted in a direction so that farmers can store their rhizome for the following season's crop; this necessitates the installation of post-harvest storage structures in the vicinity of the ginger growing area. To increase research and development expenditures in the Hilly Region to help reduce the cost of human labor in ginger cultivation in the region. There is an urgent need to develop small-scale machinery to lower the cost of ginger production (Singh, *et al.,* 2020).

The North-East Region of India (NER), which lies at the foot of the Himalayas, is regarded as a treasure trove of ginger diversity due to its wide range of ecology, topography, and soil characteristics (Ravi Kiran, *et al.,* 2013), and ginger is an important cash crop supporting the livelihood and improving the economic condition of many people in the region. Farmers in the area are interested in the cultivation of ginger as soil; climate and other ecological factors favoured the growth of the crop (Yadav *et.al.* 2004). The NER is one of the highest productivity areas in the world. Ginger farmers in this region follow traditional methods for ginger cultivation, which are eco-friendly, inexpensive, utilize local resources, knowledge, and labor (Rahman *et. al.* 2009). Farmers in Umroi, Ri Bhoi District, Meghalaya depend on ginger for their livelihood; they prefer ginger crops to other crops as ginger is the only crop that is grown solely for commercial purposes and not for self-consumption (Mawlong, 2017).

Ginger production is influenced by both biotic and abiotic factors. Viruses, bacteria, fungi, and nematodes are examples of biotic factors. The most important biotic factor is bacteria, which causes wilt and soft rot. The next major pathogen is a fungus, which causes rhizome rot, soft rot, Sclerotium rot, and yellows disease. The root-knot disease is caused by nematodes, and viruses cause mosaic and chlorotic fleck in ginger plants, reducing rhizome yield. Conogethes punctiferalis, Aspidiella hart ii, rhizome scale, rhizome fly, and thrips are among the insects that attack ginger. Sunburn (due to high light intensity) and lime-induced chlorosis (due to excessive liming in the soil) are caused by abiotic factors in the ginger crop (Paret, *et al.*, 2010; Wang, 2020).

Several factors influence agricultural productivity. These include agricultural inputs such as land, water, seeds, fertilizers, access to agricultural loans and crop insurance, assurance of reasonable prices for agricultural produce, and storage and marketing infrastructure **(**Deshpande, 2017**).** The size of a farm and its productivity are inversely related. Whether productivity is defined as gross output per hectare cultivated, gross output excluding input costs including labor per hectare cultivated, or total factor productivity, the inverse relationship is found to hold for farms cultivating between zero and approximately three hectares (Muyanga and Jayne, 2019).

There were many actors involved directly and indirectly in the supply of agricultural inputs (Dahal and Rijal, 2020). A value chain is the activities required to bring a product or service from the supply of inputs to its end users through different phases. It includes the cost of inputs and the price paid during stages of production (Parajuli, *et al.*, 2021). The primary value chain actors involved in the ginger value chain were input suppliers, farmers, local collectors, district traders, exporters, commission agents, wholesalers, and retailers (Ghimire and Koirala, 2019). The socioeconomic characteristics of the ginger value chain actors such as experience, education, age, sales income of farmers, assemblers, wholesalers, and retailers have a significant influence on the profitability of ginger enterprises (Abah, *et al*. 2018). To have a sustainable ginger chain and decrease the various malpractices in the supply

chain, proper monitoring of the value chains and transparency are essential. (Thapa *et al*., 2021).

The production process is not complete until the product reaches the final consumers. An efficient marketing system is necessary for ensuring a remunerative price to the growers. It is essential for increasing agricultural production as this assures reasonable returns for the farmer's efforts and sacrifices. The efficiency of the marketing system is judged based on the size and price spread of a commodity. A lower price spread indicates greater marketing efficiency, while a higher price spread refers to the difference between the producer price and the consumer price (Sangolkar, 2013). Seasonality is a major cause of price variation in the market for dried ginger. The seasonal index of ginger was generally negative in rural markets, indicating a declining trend caused by fewer incentives for rural ginger farmers and marketers (Mani, *et al.*, 2018).

Marketing of ginger includes all actions involved in the transfer of farmer's products, whether fresh or processed, to consumers on a domestic and international scale. Different channels were used to transport various types of ginger from farmers to consumers. The type of channel used varied depending on the farmer's ginger varieties and the location of the farm (Upadhyaya *et al.,* 2020). Ginger marketing channels are significant aspects of agribusiness which affect the share received by the ginger farmers and the prices paid by consumers. Generally, the shorter the marketing channel, the cheaper the marketing costs and the lesser the price paid by the consumers. (Pandey and Tewari, 2010) The share of ginger growers in consumers' rupees also varied from channel to channel. (Shinde *et. al.* 2020) The most common type of marketing channel in Sunsari District, Nepal was, Farmers-Wholesalers-Retailers-Consumer, followed by a marketing channel of Farmers-Retailers-Consumers and Farmers-Commission agents–Wholesalers-Retailers-Consumers (Chalise, *et. al.*, 2019).

The most common method of selling ginger is in its raw form. However, there are several other products including, dry ginger, ginger powder, and ginger oil

(Choenkwan, 2017). In Indonesia, when the harvest is abundant, the diversification of product processing is an alternative for improving the quality and value-added of the product. (Siregar *et. al*., 2021) Most farmers depend on both local traders and cooperatives to dispatch their products (Khanal, 2018). The quality of ginger found in the market varies depending on the weather and climate where the crop is grown, the type of soil used, and the method of production and post-harvest management used by the farmer, all of which have a significant impact on the quality and the major problem influencing the price of ginger. Despite the country's favourable climatic conditions, the production system and product quality are very low (Buke, *et al*., 2016).

High cost of labor and transportation, insufficient and low-quality fertilizers, lack of credit, and absence of improved drying techniques reduce ginger production and productivity (Geta and Kifle, 2011). In addition, farmers' attachment to the traditional method of ginger cultivation also resulted in a low output (Husman, *et. al*., 2015). Lack of improved cultivars and technical knowledge, small-scale conventional farming, and the incidence of rhizome rot are the key problems of ginger production in Nepal (Basnet and Gurung 2018). Weeds are a major impediment to ginger production in Tepi, South West Ethiopia. Ginger was found to be such a poor weed competitor that delaying weeding resulted in a massive yield loss (Kifelew, *et al.,* 2015).

Fresh ginger rhizomes deteriorate rapidly after harvest due to poor handling, rot caused by microorganisms, and physiological breakdown caused by sprouting. Ginger roots of high quality should be large, firm, and free of defects such as soft spots, peeled skin, cuts, bruises, and scratches. Fresh Ginger should be stored at a temperature of 13 °C and with a relative humidity of about 65 percent. Ginger could be stored in this condition for an average of 6 months. When ginger is stored a room temperature, the crop shrivels and may sprout, reducing the storage life to about one month. Dry Ginger should be stored at a room temperature of 22 to 25 °C with a relative humidity of 70 percent to maintain a shelf life of about 12 months (Sharma, 2017). After three to four weeks of storage, fresh ginger suffers from weight loss,

shrinkage, sprouting, and rotting. This spoilage can be prevented by processing fresh produce into value-added products (Nath *et al*, 2013).

Poor marketing systems that discourage production and marketing based on enforceable quality standards, a lack of value addition in major agro-processing activities in spices, and a lack of structured market information service to the various spice actors all have an impact on spice marketing (Hibistu, 2020).

To generate more income for farmers and to create more employment for the youth, there is a need to inject confidence among the farmers and those engaged in various aspects of ginger activities such as input suppliers, buyers, and processors of the product (Ihuoma and Dogara, 2018). To bring the sizeable area under superior ginger cultivars, India needs to percolate its superior and high-yielding cultivars with the help of tissue cultures in different states of the country (Bag, 2018). Ginger enterprises should be made more appealing by the availability of modern farm technologies. Farmers should form cooperative societies to obtain production inputs as well as to market their products in both domestic and international markets (Mailumo, *et al*., 2014).

Seed storage methods, seed treatments, and their interactions all had a significant impact on yield per hectare (Shadap, *et al*., 2014). The increasing global demand for high-value-added products like oleoresin and volatile oil shows the prospects for their production in developing countries (Govindarajan, and Connell, 1983). Credit availability, agrochemicals, extension programs, mechanization of ginger production, and farmer access to ginger seedlings all have a significant impact on farmer income (Ukamaka, *et al.*, 2018). Capital availability and accessibility are critical for increasing ginger production, and efforts should be made to lessen the impact of climate change through the availability of irrigation facilities (Onwusiribe, *et al*., 2017).

Education, training, and cooperative participation had a negative impact on technical inefficiency, whereas areas under ginger cultivation had a positive impact

on technical inefficiency. As a result, improving farmers' technical knowledge through training on optimal input utilization, combined with the motivation to join agriculture cooperatives and farmer's associations, may improve the technical efficiency of ginger growers (Khatiwada, and Yadav, 2022). Establishing cluster-based agro-processing units of spices and popularizing local inputs would provide a better opportunity for employment for the rural youth. (Singh, *et. al*., 2021) Furthermore, the adoption of good agriculture practices such as sustainable and eco-friendly farming practices with the minimum use of chemicals and optimal uses of locally available natural resources like plant extracts, vermin-compost, can also improve the yield and net farm income of ginger growers (Baral, *et. al*., 2021).

2.5 PRODUCTION AND MARKETING OF CHILLIES

Chilli (Capsicum annuum L. Solanaceae) is an economically important vegetable grown by farmers around the world (Setiawati *et al*., 2021). It is a resilient plant that is easy to grow and can be harvested twice a year if farmers manage the field properly. Rural farmers can easily earn a decent income from their small plot of land, especially when the population grows and agricultural land becomes increasingly scarce (Acaye and Odongo, 2018). Chilli can be consumed raw or processed. It is also rich in nutrients and vitamins, such as calories, protein, fat, carbohydrates, calcium, and vitamins A, B1, and C. In addition, chilli is also a common ingredient in medicine and beverages (Orobiyi *et al.*, 2015, Saleh *et al*., 2018, Karyani *et al*., 2021).

The world's chilli crop production is estimated to be around 7 million tonnes, with 1.5 million hectares under cultivation. Although chilli is produced all over the world, Asian countries produce the majority of it (Balraj and Arockiasamy, 2018). It is one of the most important horticultural commodities in Indonesia as most Indonesians enjoy spicy dishes made with chilli as the main ingredient, resulting in high demand for commodities (Sumarno *et al*., 2021). Fresh chilli consumption in the United States has increased from slightly over three pounds per person in 1980 to over 7 pounds per person in 2020 (Lilywhite and Tso, 2021) .

It is one of the most important horticultural commodities (Sumarno, *et al.*, 2021) with a promising economic value (Saidah, *et al.,* 2019) and it comes in a variety of shapes, sizes, colours, and levels of pungency. Depending on the type of chilli and how it is prepared and used, it is also known as Capsicum, Paprika, Pimento, Sweet pepper, Red pepper, Cayenne pepper, and Bird's eye chilli. Many chilli varieties are grown for vegetables, spices, condiments, sauces, and pickles (Shaker, *et al.,* 2021).The Capsicum genus contains approximately 30 wild species and five domesticated species: Capsicum annuum, Capsicum baccatum, Capsicum chinense, Capsicum frutescens, and Capsicum pubescens (Arimboor *et al.*, 2015; Bosland and Votava, 2012; Sikora and Nowaczyk, 2014).

India is one of the world's largest producers and exporters of spices (Kumar and Jain, 2018). Among spices, chillies play a significant role in the Indian diet. It is a must-have in the Indian kitchen (Dangore, *et al.*, 2015) and was used as a flavour in most curries and dry dishes (Manaswi, *et al.*, 2020). Andhra Pradesh, Telangana, Maharashtra, Karnataka, Madhya Pradesh, and Tamil Nadu are some of the most important chilli-growing states in India (Shaker *et al.,* 2021).

To meet the increasing demand for chilli year after year, chilli production must be increased through improved cultivation and the application and utilization of efficient location-specific production technology innovations. (Panudju, *et al.*, 2021) Using quality seeds is one of the main factors in increasing agricultural production, and using quality seeds will result in higher production and productivity. (Pujiarti, *et al.*, 2020) The number of leaves also affects production because the more leaves there are, the more photosynthesis there is, and the higher the chilli yield (Irmawati and Gofar, 2020). In addition to these, light, water, temperature, and differences in the planting time also have an impact on chilli production (Devy *et al.*, 2021)

To increase production, the Indonesian government has implemented programs such as area expansion, and intensification of farming, which has yielded encouraging results in terms of national red chilli production, indicating the need for a long-term effort. One of them is an effort to increase good productivity through

intensification via plant age, diverse varieties, soil fertility, land and climate suitability, non-intensive cultivation techniques, and pest and disease factors (Usman and Kasimin 2021).

The United States, Sri Lanka, and Mexico are the top importers of Indian chillies. China has emerged as the world's leading exporter and a serious competitor in the international market for India (Jagtap *et al*., 2012). Chillies are harvested seasonally but consumed all year and they can survive in a variety of soil types and climatic conditions. However, the best yield of this crop is obtained when grown on deep, loamy, fertile soil with appropriate moisture content (Huq and Arshad, 2010).

Investment in chilli production is a profitable enterprise for generating income, reducing poverty, creating jobs, and improving food security for every household (Mohammed, *et. al.,* 2016). Given the price of the input, cost efficiency means the ability to produce particular outputs with low expenditures. As a result, the intermediary expects the farmers to make a profit (Rahayu and Febriani, 2021). The profitability of a farm can be estimated using a variety of economic indicators. Obtaining a net return is the most important factor commonly used to evaluate the efficiency of an agricultural crop (Srikala, *et al.,* 2016).

Production costs are affected by input levels, input prices, farming practices, and institutional elements such as finance and marketing costs. The cost of production was divided into two categories: variable and fixed. Variable expenses include land preparation, seed costs, labor, fertilizer, plant chemicals, irrigation costs, and labor capital interest (Hajong, *et al.,* 2020) , expenditure on these can reduce production risks (Wulandari *et al*., 2021).

The cost of producing red chilli during the rainy season was much higher than during the dry season due to additional costs, particularly the cost of controlling diseases and pests. During the rainy season, pest and disease attacks on red chillies such as bacterial wilt, fruit and leaf spots, and fruit rot and leaf rot increased the intensity of spraying. The average R/C in red chilli farming in Garut Regency, West

Java Province, is 1.91 in the dry season and 1.69 in the rainy season (Saidah *et al.*, 2020). The cost of producing chillies also varies depending on the variety. This is due to price differences in seed prices, as the cost of hybrid chilli seeds is higher than that of the local variety. Most of these costs are used to pay labor wages from planting to harvest, purchase inputs, and pay land rent (Simatupang *et al.*, 2021).

Chilli frequently experiences extremely high and fluctuating price spikes. The availability of chillies on the market cannot meet the needs of the Indonesian community during certain seasons, (Angreheni, *et al*., 2020) such as Christmas and New Year's holidays. Chilli price fluctuations are also heavily influenced by previous price fluctuations. The more price fluctuations there were in the preceding period, the more price fluctuations there will be in the present period, and vice versa (Khasanah, *et al.*, 2020). In general, price rises in chillies are caused by uneven supply and demand conditions. One factor that causes red chilli scarcity in the market is an inefficient supply chain from suppliers to consumers (Arhim *et. al.*, 2019). The price of chilli also fluctuates due to 1) the availability of local chilli supplies; 2) weather, pests, diseases, etc., 3) The availability of red chilli pepper supplies from outside and 4) the availability of marketing facilities (Nasution and Rahman, 2021).

Harvesting is the busiest time of year for chilli farmers. It cannot be done by just one or two farmers, so farmers should look for laborers by hiring labor or exchanging labor using traditional custom help, known as sambatan in Indonesia. Hiring harvesting labor can cost as much as 25,000–30,000 IDR per person for eight hours a day (Raya, 2014). The harvest was carried out by evenly picking chillies, which are bright red, with gloves. The chilli was then put in a bucket carried by each farmer and placed in a sack (Wigati, *et al*., 2020).

Agriculture marketing is the process of moving agricultural products from one location to another, as well as from farmers to consumers. It also transfers funds from customers to producers via existing marketing channels (Ifeanyichukwu *et al.*, 2018). An efficient marketing system must be able to meet two requirements: (1) the creation of an efficient product supply chain from upstream to downstream through

marketing institutions; and (2) The ability to allocate a fair share of the remuneration from the entire end consumer price to all those involved in production until the marketing activities (Pranata *et al*., 2021).

Seasonal price fluctuations, overall production in the country, global demand, stocks in cold storage, etc. influence the chilli market. The mandatory quality testing of chilli and chilli products has made Indian chilli more acceptable in the international market and has assisted in increasing the country's exports. Malaysia, Sri Lanka, Indonesia, the United States, Bangladesh, Singapore, the United Kingdom, Nepal, and Mexico are the major importers of Indian chillies (Geetha and Selvarani, 2017)

Given the particular nature of horticultural commodities in general, such as perishable, and voluminous, production is seasonal while consumption happens throughout the year, marketing of chilli commodities plays an essential role in improving the performance of chilli farming as a whole. These distinct properties necessitate special handling in the form of careful transit, standard and good packing, temperature-controlled storage, and a variety of additional preservation procedures for the item to endure as long as possible. (Sukmawati and Srimenganti, 2020).

Chilli growers in the Sivagangai District bring their harvest to a common market for sale during the harvest season. Only a few farmers keep a portion of their harvest for personal consumption. Others would sell the entire harvest (Sabaritnathan, 2016). Most of the producers do not sell directly to end-users. Between producers and users, there are channels, which are groups of marketing intermediaries that perform various functions and go by different names. Traders are intermediaries who buy, take over rights to and resell products, such as wholesalers and retailers. Others, such as brokers, manufacturing representatives, and sales agents, seek customers and can negotiate on the manufacturer's behalf, but do not own the goods; they are referred to as agents.

A supply chain is a network of organizations that are involved in the various processes and activities that produce value in the form of products and services delivered to the ultimate consumer via upstream and downstream linkages (Banua, *et al* 2017). The cost of production, labor, packaging, post-harvest loss, profit at each stage, commission, hauler fee, transportation, and other costs such as electricity, water, telephone, and building rent were all significant factors affecting the vegetable chain. The major contributing factors throughout the chain are the cost of production and post-harvest losses. Each factor measured post-harvest losses at each stage (Kumari, *et al.,* 2021).

The chain that connects each commodity from the land to the end customer is critical in determining the price of the goods and the farmer's income (Rao and Rao, 2014). Many intermediaries add value to the products along the chain. There are several tasks required to keep the product flowing until it reaches the consumer's hands (Jayalath and Perera, 2021). In general, there are two types of agricultural supply chains: fresh items and processed products. Fruits, vegetables, and other items that do not require any extra processing or chemical change are examples of fresh produce. A chemical modification or a change in shape is required for processed agricultural goods. Farmers or planters, processors or manufacturers, distributors, and retailers will all be involved in the supply chain for processed agricultural products (Soepatini, *et al.,* 2018).

Multiple actors are involved in the chilli pepper supply chain, including farmers as producers, farmers' groups in response to collect products after harvest, and farmers' associations in charge of post-harvest and marketing via an auction system. A supplier is an actor who acts as a trader and supplies products to both traditional and modern markets. As an agro-input supplier, the local government is responsible for supporting groups of farmers in developing production processes and setting up agro-input shops (Perdana, *et al.,* 2018). In rural China, the current supply chain model includes a supermarket-dominated supply chain, a wholesale market-dominated supply chain, and a manufacturing and processing company-dominated supply chain (Wang *et al*., 2021).

When it comes to marketing, farmers have a lot to consider, especially when selecting a marketing channel (Dewi *et. al.*, 2021). The choice of marketing channel is a crucial decision for farmers, and many factors and conditions must be considered before making a final decision. Since different marketing channels offer different profitability and costs, understanding the factors influencing channel selection and how to overcome the limitations associated with those factors is crucial not only for the growth of marketing channels but also for increasing agricultural income and investment conditions (Soe *et al.*, 2015; Xaba and Masuku, 2013). As a result, many farmers have the problem of choosing between different marketing channels to sell their products. Factors that potentially influence the choice of marketing channel include farm size, product type, farm location and farmer experience, and demographics. (Plakias *et. al.*, 2020).

The longer the marketing channel, the lower the share of the producers, (Hoq, *et al*., 2014) and was maximum in direct sales (Meena, et. al., 2017) Besides, farmers do not benefit from higher selling prices; instead, collectors and traders do (Hamdani, *et al*., 2021). Farmers' share of commodity prices is an important measure of marketing efficiency, indicating that the greater the share, the more efficient the channel is from the farmers' perspective (Safi *et al*., 2018). The chilli marketing channel in Indonesia was long and complicated. Markets were fragmented depending on the type of chilli, which was categorized as either local or hybrid cultivars. Farmers chose marketing channels based on their business circumstances and farm location, and their ability to choose a marketing channel was restricted by distance and agreements with traders (Mariyono, 2019). On the other hand, farmers in Tra Vinh province, Vietnam, mainly sell their products through cooperative channels and traditional channels (local traders). The cooperative channel is the preferred channel when farmers face selling pressure due to the perishable nature of the chilli but and was a safe channel for more risk-averse farmers (Hung and Khai, 2020).

Farmers have a strong dependence on local wholesalers (Wibowo, *et al*., 2021). In Sukalaksana Village, farmers sell their chillies to the middleman for a variety of reasons. First, they like the presence of a middleman who arrives with a

vehicle, allowing them to avoid renting one to deliver their chillies. Second, rather than letting their massive chillies wilt and become unfit for sale, they'd rather sell them as soon as possible and make money right away. Third, because there is a mutual need, the chilli producers and the intermediary have formed a deep tie that is difficult to break. Farmers require an intermediary to act as a lender and a vendor of chilli yields. As a result, the intermediary requires the farmers to profit from them (Karyani *et al.,* 2020).

Marketing Channel III: Producers – wholesalers – retailers - consumers were the most common channels through which 50 percent of the district's production was sold in the Amravati district. This channel had a high price range for chilli due to the large number of market functionaries involved (Jorwar, *et al*, 2018). Controlling the risks that arise in the chain is critical for meeting consumer quality and quantity expectations (Iskandar and Ayu, 2021).

Chilli growers face several market-related issues, including a lack of knowledge about the actual market price of chilli, the lack of a nearby controlled market, and the non-availability of seeds, insecticides, and fertilizer on time. The majority of the growers lacked sufficient market intelligence, which caused the majority of the issues (Naik, *et al.,* 2019). They also faced several other issues such as production and price fluctuations (Ilyas and Nappu, 2021), high middle-man profitability, expensive inputs, low-quality inputs, a lack of extension services, and disease attacks. The government should improve extension services to make farmers more aware of the best use and it should also establish farmer field schools to educate farmers on modern agricultural practices. Monitoring teams should inspect the retail market for the quality of agricultural inputs (Khan *et al.,* 2017).

The main cause of low chilli production in the Sawang District in Indonesia is an inefficient combination of various inputs. Furthermore, farming is influenced by a variety of production factors such as land, seeds, fertilizers, labor, and pesticides (Adhiana, 2021). Chilli growers in Pakistan's Sindh Province have raised concerns over a lack of training in proper cultivation (Rais *et al.,* 2021); there is a

need to conduct training programs to raise farmers' understanding of the importance of using balanced dosages of fertilizers and insecticides. Besides, since chilli farming is a labor-intensive process, mechanization of production and post-harvest management is required (Patel, *et al.*, 2015). Another suggestion is to promote and strengthen collective action through farmer organizations. The existence of cooperatives and farmer organizations not only encourages the exchange of knowledge and information between smallholder farmers but also strengthens their market position with supermarket chains (Maspaitella, *et al.*, 2018).

The main issues that farmers in Jaipur District, Rajasthan faced when marketing chilli was low chilli prices, a lack of proper storage facilities, market price fluctuations, difficulty maintaining quality standards, and high transportation costs, among other things (Kala, *et al.*, 2020). Chilli farmers in Bali are constantly faced with uncertain weather, along with pests and diseases, all of which indicate that chilli growing is fraught with risk. This uncertainty increases the production risk, which is reflected in the fluctuations in the harvested area and the number of harvestable plants (Dewi and Parining, 2017).

Producing chilli is a difficult task because the plant is vulnerable to attacks from a variety of microorganisms, bacterial diseases, and pests. The symptoms of the attacks are usually identified by inspecting the leaves, stems, or fruit (Husin, *et al.*, 2012). Chilli curl disease is the major problem with chilli cultivation in Bukit village. The chillies they planted were occasionally attacked by the disease, resulting in a short harvesting period. When a plant is attacked by curl disease, the fruit quickly loses quality and became shorter and crooked (Tobing *et al.*, 2021). This disease is caused by the Cucumber Mosaic Virus (CMV) and is spread by insects (Kasim *et al.*, 2020).

Chilli growers in Bangodua Subdistrict, Indramayu Regency have been farming for a long time, yet they are still far from self-sufficient. They are unable to make the optimal farming decisions since they do not have market access to harvested product distribution and are still subject to the "mastery" of others (Aida *et*

al., 2020). It is recommended that a terminal market be established at the local level to provide Chilli growers with a closer outlet for their produce while also significantly lowering marketing costs. This measure will provide growers with a permanent facility in the area, which may result in increased benefits such as improved market links, storage options within the production area, and future contracts (Olayiwola, 2014).

The information exchange between chilli farmers and intermediaries/collector traders is still low. Middlemen/collector traders continue to monopolize chilli marketing information. This demonstrates how vulnerable the farmers' institutional structure is in terms of marketing their crops (Gandasari and Musyadar, 2018). The lack of pricing and marketing information, the lack of relevant institutions dealing with chilli governance, and the limited use of innovation have resulted in asymmetric information from chilli business actors and the emergence of new actors in the trading system that dominates the chilli trade (Wardhono *et al.*, 2020).

2.6 CONCLUDING REMARKS

The literature review highlights several contributions of ginger and chillies in terms of income generation, employment opportunities, etc. Previous studies have also revealed that purchases of farm inputs such as seeds and fertilizers are often limited due to a lack of capital or access to credit facilities. We can conclude from various studies that by making the necessary efforts, one can help accelerate the adoption of improved ginger and chilli cultivation practices, particularly in seed treatment, fertilizer application, weed control, and plant protection measures. Provisions for timely and appropriate training, adoption of sustainable and eco-friendly farming practices, and construction of a terminal market at the local level will improve the production and productivity of ginger and chillies. There is also a necessity for adequate access to ginger and chilli seedlings to improve sales performance, quality, and market share.

CHAPTER-III

AN OVERVIEW OF GINGER AND CHILLIES IN INDIA

3.1 INTRODUCTION

The present chapter provides an overview of ginger and chillies in India. It also provided a short profile of production and marketing of spices in India. The study relied on secondary data, and the main sources of secondary data used in this study are Spices Statistics at a Glance and the Spice Board of India. The chapter is divided into five sections. Following the introduction, the second section depicts spice production in India. The third section of the chapter provides the profile of ginger in India. Section four focuses on the profile of chillies in India. The last section is the summary of the chapter.

3.2 PRODUCTION AND MARKETING OF SPICES IN INDIA

Spices have been used in many cultures around the world since time immemorial. India known as the "Land of Spices" is one of the major spice producing and exporting countries of the world. It has long been an integral part of the Indian diet. Without the tangy and delectable flavor of Indian spices, no Indian meal is complete. Spices are natural plant products used to enhance the flavor, aroma, taste, and color of food, liquors, pharmaceutical, cosmetic, and perfumery products. Pepper, cardamom, chilli, ginger, turmeric, coriander, cumin, fennel, fenugreek, celery, saffron, tamarind, and garlic are some of India's most important spices. Aniseed, dill seed, poppy seed, bay leaf, kokum, bishop's weed, curry leaves, cinnamon, and a few other culinary herbs are also produced and exported in small quantities. Tree spices such as clove, nutmeg, star anise, mace, and allspice are produced in small amounts, as are some herbal spices such as rosemary, thyme, marjoram, oregano, chive, parsley, sage, savory, tarragon, and basil. India is the only country in the world with such a diverse range of spice crops.

Out of 109 spices listed by International Standards Organization (ISO), India produces around 75 spices in various parts of the country. No other country in the world produces as many different types of spices as India. Indian spices are renowned for their exceptional aroma, flavor, and pungency in domestic as well as international markets which is unrivalled by any other country. The demand for spices has tremendously increased due to the recognition of spices as a health

supplement especially during the pandemic, which can be seen from the growing export of spices like turmeric, ginger, cumin, chilli, etc. The monsoon influences spice production. If there is an unfavorable monsoon, there will be a shortfall in the output- surplus rain harms the crops, whereas a scarcity of rain reduces output.

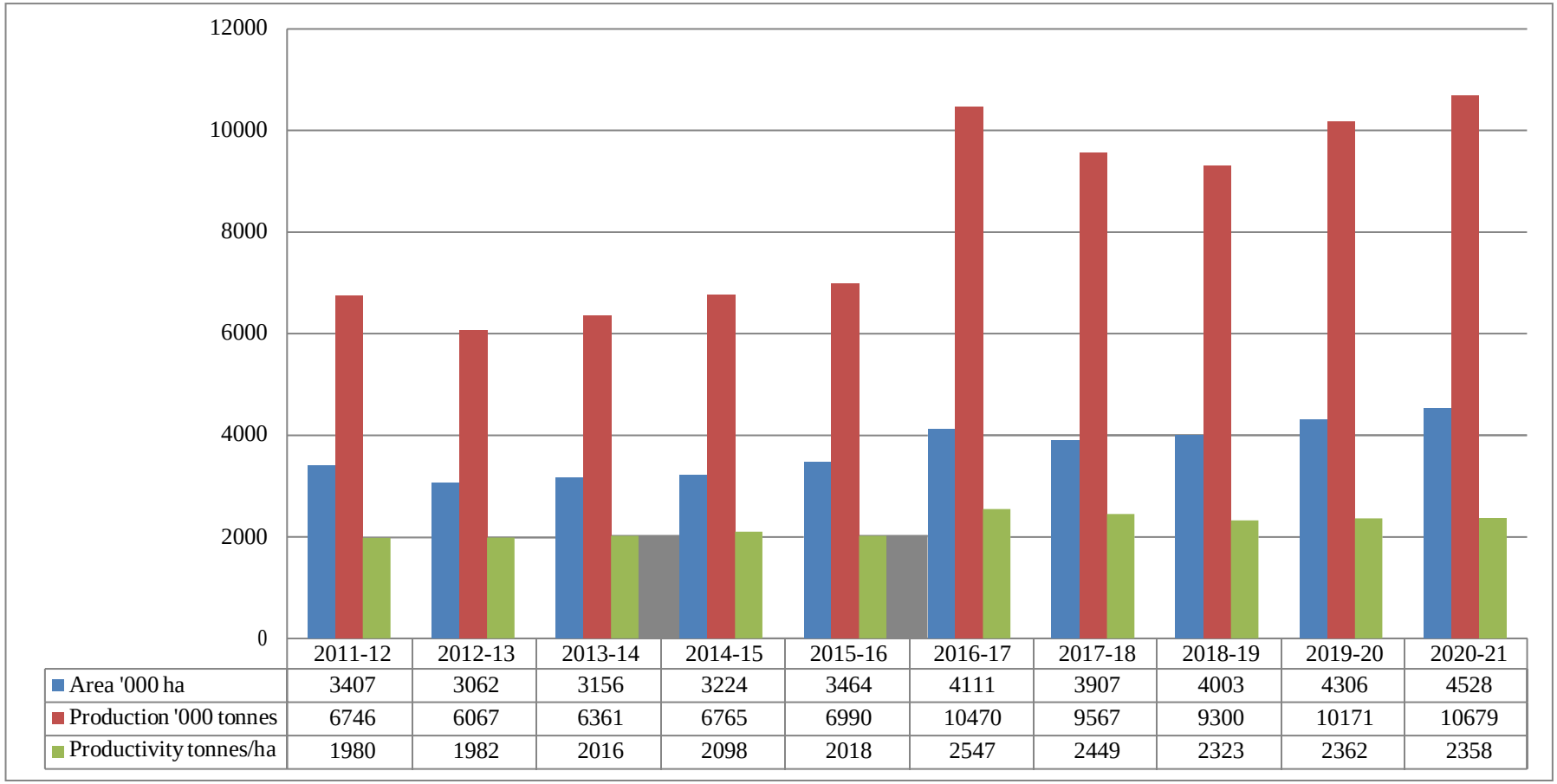
3.2.1 PRODUCTION OF SPICES IN INDIA

India has certain natural comparative advantages when it comes to the production and utilization of spices, including diverse agro-climatic production environments, the availability of a wide variety of food and cultivars of each spice suitable for different climatic conditions, cheap labor, a large domestic market, and a strong tradition of using spices and their products in food, medicine, and cosmetics. The distinct climatic advantages found in almost every state and union territory allow for the cultivation of one or more spices, whether tropical, subtropical, or temperate. (Devi and Jadav, 2018).

Spices provide a source of income and employment for many people in the country, both rural and urban (Sahu and Mishra, 2013). The pattern of spice production in various regions has changed over time. Shifts in domestic consumer preferences, increase in incomes, demographic and social factors, and changes in spice productivity have all resulted in changes in consumption patterns and, as a result, demand for spices (Shinoj and Mathur, 2006).

Figure 3.1 shows that spices production in the country was 67.46 lakh tonnes in 2011-12 and 63.61 lakh tonnes in 2013-14, and the area under spice cultivation was 34.07 lakh hectares in 2011-12 and 31.56 lakh hectares in 2013-14. The total productivity of spices was increased from 1,980 tonnes per hectare in 2011-12 to 2,016 tonnes per hectares in 2013-14. The total production of spices grew from 67.65 lakh tonnes in 2014-15 to 106.79 lakh tonnes in 2020-21, an annual growth rate of 7.9 percent, following an increase in area under spices cultivation from 32.24 lakh hectares to 45.28 lakh hectares during the period. The total productivity also increased from 2,098 tonnes per hectare in 2014-15 to 2,358 tonnes per hectare in 2020-21.

Figure 3.1 Growth in Area and Production of Spices in India



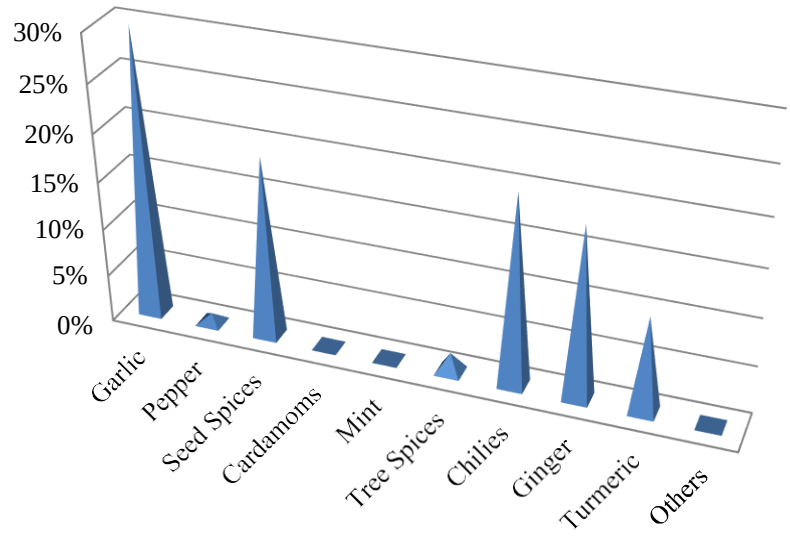
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Area '000 ha	3407	3062	3156	3224	3464	4111	3907	4003	4306	4528
Production '000 tonnes	6746	6067	6361	6765	6990	10470	9567	9300	10171	10679
Productivity tonnes/ha	1980	1982	2016	2098	2018	2547	2449	2323	2362	2358

Source: Spices Statistics at A Glance 2021

Trends in the production of Indian spices are expected to rise year after year as the population is growing rapidly, and consumer spending on food is also increasing. The spice industry is also showing a positive trend, with spice production expected to gradually increase over the next five years. The government is also interested in increasing spice value addition. It has been observed that the future of the spice industry in India is bright, and the units and firms involved in the production, processing, and trading of spices will benefit more in the future.

Due to the diverse growing conditions in the respective regions, there is a great variation in spice productivity across states. With an estimated production volume of over three million metric tons, Madhya Pradesh was the largest producer of spices across India in 2021. Rajasthan, Gujarat, Karnataka, Tamil Nadu, Assam, Kerala, Andhra Pradesh, Maharashtra, Orissa, Uttar Pradesh, and West Bengal are the other major spices producing states in India.

Figure 3.2 Spice-Wise Share of Production of Spices in India 2020-2



	Garlic	Pepper	Seed Spices	Cardamoms	Mint	Tree Spices	Chilies	Ginger	Turmeric	Others
Spice-wise Share	30%	1%	19%	0%	0%	2%	20%	18%	10%	0%

Source: Collated from Spices Statistics at a Glance, 2021

Among the major spices, garlic (30 percent) ranks first in terms of production in 2020-21, followed by Chillies (20 percent). Seed spices accounts for 19 percent of total spices production in the country. The share of ginger production to total spices production was 18 percent. Turmeric accounts for 10 percent of spices production, tree spices accounts for 2 percent and Pepper 1 percent of production of total spices in the country.

3.2.2 MARKETING OF MAJOR SPICES IN INDIA

Spices are high-value and export-oriented crops, and they have a long history of being one of the world's most traded commodities. India is the principal supplier of spices in the global market, and Indian spices are a vital component of international agricultural trade. Indian spices are a vital component of international agricultural trade. The spice board of India constituted in 1987 under Spices Board Act, 1986, regulates the export of spices in India. It is the Indian government's spice regulatory and export promotion agency. The increased availability of high-quality spices has led to annual growth of 9.1 percent in terms of the volume of spices exported. The total exports of spices increased from 9, 47,790 tonnes in 2016-17 to 1,100,250 tonnes in 2018-19, which further increases to 1,565,000 tonnes in 2020-21. The value of exports of spices was Rs 1,781,223.59 (2,655.29 million US $) in 2016-17. It further increased to Rs 1,950,581.20 (2,805.50 million US $) in 2018-19.

Despite the COVID-19 Pandemic, India's spice exports have continued to rise in 2020-21, surpassing the 3.6 billion US dollar milestone. The estimated exports of spices from the country during 2020-21 is 1,565,000 tonnes valued at Rs.27, 193.20 crores (3,624.76 million US $) compared to the 1,208,400 tonnes valued at Rs. 22,062.80 crores (3,110.63 million US $) in the previous financial year, making spices the third largest export earner among principal agricultural commodities. Compared to 2019-20, the export has shown an increase of 30 percent in quantity and 23 percent in value in 2020-21. The demand for spices has tremendously increased due to the recognition of spices as a health supplement especially during the pandemic, which can be seen from the growing export of spices like turmeric, ginger, cumin, chilli, etc.

Table 3.1 Item-wise Export of Spices from India Financial Year 2016-2020 With an Estimate for 2021 (Quantity in tonnes and Value in Rs Lakhs)

Major Spices	2016-17		2017-18		2018-19		2019-20		2020-21*	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Cumin	1.19,000	1,96,320.14	1,43,670	2,41,798.78	1,80,300	2,88,480.00	2,14,190	3,32,806.00	2,99,000	4,25,310.00
Chilli	4,00,250	5,07,075.63	4,43,900	4,25,632.74	4,68,500	5,41,117.50	4,96,000	6,71,039.53	6,01,500	8,42,975.00
Garlic	32,200	30,711.50	46,980	30,936.38	29,500	17,110.00	22,280	17,182.52	17,950	15,630.00
Ginger	24,950	25,704.85	22,605	21,607.49	18,150	19,602.00	60,410	52,905.00	1,25,700	75,665.00
Coriander	30,300	29,208.49	35,185	27,274.96	48,900	35,208.00	47,135	39,831.38	57,000	48,982.50
Pepper	17,600	1,14,312.60	16,840	82,078.48	13,540	56,868.00	17,000	53,370.94	16,300	54,445.50
Fennel	35,150	30,875.93	34,550	25,906.35	26,250	24,412.50	24,220	23,162.14	31,800	27,630.00
Celery	6,250	6,246.11	6,480	5,950.30	6,100	6,649.00	6,230	6,903.85	7,650	9983.50
Total	9,47,790	1,781,223.59	1,028,060	1,798,016.24	1,100,250	1,950,581.20	1,208,400	2,206,279.91	1,565,000	2,719,320.25
Value in Million US $		2,655.29		2,789.35		2,805.50		3110.63		3,624.76

Source: Spice board of India

3.3 PROFILE OF GINGER IN INDIA

Among all the spice crops ginger is one of the principal spice crops not only in India but in the entire world which gives valuable foreign exchange for the country.

3.3.1 AREA AND PRODUCTION OF GINGER IN INDIA

India is the world leader in ginger production and is exporting ginger to more than 50 countries. The most popular cultivars of ginger in India include Maran, Kuruppampadi, Ernad, Varada, Wayanad, Himachal, Nadia and Rio de-Janeiro cultivar.

Table 3.2 Trend in Area, Production and Productivity of Ginger

Year	Area ('000 ha)	Production ('000 tonnes)	Productivity (Kg/ha)
2001-02	103.704	390.468	3765
2002-03	101.690	353.352	3475
2003-04	99.636	383.682	3851
2004-05	112.559	466.915	4148
2005-06	127.793	497.545	3893
2006-07	125.574	498.627	3971
2007-08	119.597	489.021	4089
2008-09	139.041	610.377	4390
2009-10	156.049	687.869	4408
2010-11	163.161	766.202	4696
2011-12	148.943	716.573	4811
2012-13	136.867	713.785	5215
2013-14	147.970	1031.269	6969
2014-15	163.189	1222.956	7494
2015-16	158.689	1107.389	6978
2016-17	171.731	1830.590	10660
2017-18	165.275	1761.552	10658
2018-19	167.389	1851.088	11059
2019-20	178.135	1868.435	10489
2020-21	176.348	1886.533	10698

Source: Spices Statistics at A Glance, 2021

Ginger plays a significant role in our national economy because of its large domestic production, consumption, and growing demand for exports. In 2001-02, 103.704 thousand hectares of the area were under ginger cultivation with a production of 390.468 thousand tonnes. The total productivity during the period was 3,765 kilograms per hectare. Despite the decrease in total area under ginger cultivation from 101.690 thousand hectares in 2002-03 to 99.636 thousand hectares in 2003-04, the total productivity of ginger increased from 3,475 kilogram per hectare in 2002-03 to 3,851 kilograms per hectare in 2003-04. The production has increased from 380.10 thousand tonnes in 2008-09 to 702.00 thousand tonnes in 2010-11.

Since 2014, India's ginger production increased 8.7 percent year on year. In 2018-19, the country was number one among other countries in ginger production with 1,851.088 thousand tonnes. China, Nigeria, and Nepal ranked number 2, 3, and 4, respectively. The production was 1,868.435 thousand tonnes in 2019-2020, and the total productivity was 10,489 kilograms per hectare. In 2020-21, the volume of ginger production in India was 1,886.533 thousand tonnes. This was an increase from 780 thousand tonnes in the financial year 2016. The total productivity was 10,698 Kilograms per hectare in 2020-21.

3.3.2 TOP GINGER PRODUCING STATES IN INDIA

Ginger is cultivated all over the states; however, several states are the main centers of ginger cultivation, namely, Madhya Pradesh, Karnataka, Kerala, Assam, Meghalaya, Mizoram, Sikkim, Orissa, Arunachal Pradesh, and Gujarat. Among various states, Madhya Pradesh occupies the major area under ginger in the country followed by Karnataka and Assam. Madhya Pradesh also ranks first in terms of production followed by Karnataka, Assam, West Bengal, and Orissa.

MADHYA PRADESH

Madhya Pradesh is the country's second-largest state by area and the fifth largest state by population, with an estimated population of around 87.4 million. Agriculture is the predominant sector in the state and accounts for nearly one-fourth

of the Gross State Domestic Product (GSDP). It is the primary source of employment for more than 65 percent of the population and accounts for 60-75 percent of rural income. The majority of the state's farmers are small and marginal. Agriculture is primarily rain-fed and monoculture. Mustard, Coriander, Chillies, Garlic, Ginger, and the major spices are grown.

Table 3.3 Area and Production of Ginger in Madhya Pradesh (Area in Hectare, Production in Tons)

Year	Area	Production
2016-17	23153	372640
2017-18	23431	377470
2018-19	24964	414280
2019-20	27480	438394
2020-21(adv.est)	28348	458073

Sources: Spice Board of India

The state is the largest producer of ginger in the country. The total area under ginger in the year 2016-17 was 23,153 hectares. It increased to 23,431 hectares in 2017-18, and 27,480 hectares in 2019-20. The production was 372,640 tonnes in 2016-17. It increased from year to year and was estimated to be 458,073 tonnes in 2020-21. Tikamgarh, Chhintwara, Sagar, Anuppur, Dhar, Chhatarpur, Rewa and Katani are the major ginger growing districts in the state.

KARNATAKA:

Ginger cultivation in Karnataka, is mainly done by migrant farmers from Kerala but it is not only the migrant farmers who are cultivating ginger. Native farmers, too, are turning to this cash crop. Ginger is increasingly being grown in the Western Ghats districts of Uttara Kannada, Dakshina Kannada, Hassan, Shimoga, Chikkamagaluru, Udupi, Kodagu and Mysore, comprising the Malenadu region.

Table 3.4 Area and Production of Ginger in Karnataka (Area in Hectare, Production in Tons)

Year	Area	Production
2016-17	23088	271490
2017-18	20809	249920
2018-19	15858	244070
2019-20	22388	234171
2020-21(adv.est)	20536	249911

Sources: Spice Board of India

But uncertainty in the market triggered by the pandemic has cast a pall over thousands of farmers who have cultivated ginger in Karnataka. Besides, low demand for products and crop diseases are the major reason for the poor prices in the state. A sharp fall in export to Bangladesh and very few inquiries from north India have also contributed to the crisis. An average of 30 trucks used to transport ginger from the ginger growing area in the state to Bangladesh, but the number dropped to 5 -10 per day and the demand in the domestic market is low compared to previous years.

The spot price of old ginger in 2021 was Rs.1,500 per 60kg bag as against Rs.4,000-4,200 in the corresponding period in 2020. There is no demand for fresh ginger rhizomes in some markets, while in some markets it was sold for Rs.700 as against Rs.1, 500 in the corresponding period of 2020. The area under cultivation has also declined by 20 percent in 2021 in some ginger growing districts in the state owing to the low price of the produce and poor rainfall in the state.

Hundreds of migrant ginger farmers from the nearby states were cut off from their farms due to lockdown and restrictions imposed on interstate travels in Karnataka. Farmers have urged the state government to take up the matter and issue a special pass for them since they have already incurred huge losses due to the slump in ginger price.

The Centre for Ecological Science (CES) has proposed measures to mitigate the hazards of ginger farming in Karnataka. One of them is stopping the trading of

banned chemicals. The study also suggests that the forest department should restrict areas under ginger cultivation in eco-sensitive zones. They should urge district agriculture centers and agriculture universities and institutes to help farmers shift from chemical-intensive farming to organic ginger farming

ASSAM

Ginger, a major cash crop in Assam, has a high potential for increasing farm income and generating employment, thereby improving farmers' living conditions. It is widely grown in various parts of the state. The quality and organic characteristics of ginger produced, particularly in Karbi-Anglong and Dima Hasao, are well known owing to the state's favorable climate and soil type suitable for the cultivation of the crop. Nalbari and Barpeta, Sonitpur and Darrang, Golaghat, Sibsagar, Tinsukia, and Nagaon district are all popular ginger belts.

Table 3.5 Area and Production of Ginger in Assam (Area in Hectare, Production in Tonnes)

Year	Area	Production
2016-17	17632	156660
2017-18	18105	161600
2018-19	17865	166270
2019-20	19352	183157
2020-21(adv.est)	17786	167803

Sources: Spice Board of India

In many parts of the state, especially in the hilly areas, farmers use a part of the previous year's harvest as seeds for the new season. No chemicals or fertilizers are used, and indigenous pest control and disease management measures are used. In 2016-17 the state produced 156.660 tonnes of ginger from an area of 17,632 hectares, contributing about 9 percent to the country's ginger production. The total area under ginger cultivation in the state was 18,105 hectares with a production of 161,600 tonnes in 2017-18. With an increase in the area under ginger cultivation from 17,865 hectares in 2018-19 to 19,352 hectares in 2019-20, the total production of ginger in the state increased from 166,270 tonnes in 2018-19 to

183,157 tonnes in 2019-20. In 2020-21 the area under ginger cultivation was 17,786 hectares with an estimated production of 167,803 tonnes.

3.3.3 MARKETING OF GINGER IN INDIA: A BRIEF SCENARIO

The most vital function after production is marketing which includes assembling, processing and distribution. An efficient marketing system is vital for timely delivery and lower marketing costs. Several external factors, such as policy, infrastructure, and regulatory framework influence market efficiency. All of the business activities involved in transferring ginger from growers to market centers and ultimately to consumers are referred to as ginger marketing. Ginger is traded in a variety of forms around the world. The most commonly traded ginger is processed ginger, such as dried ginger, confectionary ginger, and ginger extracts such as oils and resins. It is used primarily for flavoring and medicinal purposes.

China is the world's largest exporter of ginger, with exports amounting to 578 thousand tonnes, accounting for nearly 63 percent of total exports in 2020, followed by the Netherlands, Thailand, Peru, and India. The United States, on the other hand, is the world's largest importer of ginger, followed by Japan, the Netherlands, Pakistan, and Germany. The demand for ginger has been increasing for ages, whether it is used to add flavor to food, as medicine, or in the cosmetics industry.

Globally, the recognition of ginger in the cosmetic and pharmaceutical industries boosts the ginger market; making it one of the most exported and imported spices worldwide. The total export of ginger increased from 21,550 tonnes in 2011-12 to 40,400 tonnes in 2014-15. During 2016-17, 24,950 tonnes of ginger were exported from India fetching an income of Rs 25,704.85 lakhs and 22,605 tonnes were exported during 2017-18.

The total income received from exporting ginger in 2017-18 was Rs 21,607.49 lakhs. In 2019-20, 60,410 tonnes of ginger was exported to different parts of the world fetching an income of Rs 52,905.00 lakhs. During 2020-21, exports from India are expected to reach 125,700 tonnes. The top competitors for ginger

export are China, Nigeria, and Thailand. Domestic production, distribution, and other factors such as the global economic scenario, domestic prices relative to world prices, exchange rate, export taxes and subsidies, and the inflation rate in countries competing with India for the global market influence export growth.

Table 3.6 Year Wise Export of Ginger from India

Year	Quantity (tonnes)	Value (Rs lakhs)
2011-12	21,550	20,420.00
2012-13	22,207	18,725.00
2013-12	23,300	25,614.00
2014-15	40,400	33,133.00
2015-16	24,800	27,596.00
2016-17	24,950	25,704.85
2017-18	22,605	21,607.49
2018-19	18,150	19,602.00
2019-20	60,410	52,905.00
2020-21*	1,25,700	75,665.00

Source: Spices Board, 2020 (Advance estimate)*

Bangladesh was the most important destination for ginger exports from India, accounting for more than half of the total exports. Morocco stood second with a total of 6,873.97 tonnes in 2019-20, followed by the U.S.A, U.A.E and Saudi Arabia, respectively. The total exports of ginger to Nepal increased from 305.51 tonnes in 2017-18 to 815.53 tonnes in 2019-20. In 2020-21, Bangladesh was estimated to import Rs 33,853.63 lakhs worth of ginger from India, whereas U.A.E was estimated to import 5,805.39 lakhs worth of ginger in the same year. The development of market infrastructure, storage, warehousing, and transportation will facilitate increased export. To compete and increase India's global market share, India must consistently supply a diverse range of high-quality ginger at competitive prices. Production efficiency must be increased to reduce unit costs. Organic ginger cultivation should be encouraged.

Table 3.7: Country-Wise Exports of Ginger from India (Quantity in M.T, Value in Rs Lakhs)

Country	2016-17		2017-18		2018-19		2019-20		2020-21 (adv.est)	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Bangladesh	11350.22	3146.76	8404.44	1777.61	8597.03	2649.37	36473.26	189485.47	112336.80	33853.63
Morocco	1664.02	2373.81	4033.00	4633.14	2230.01	3550.98	6873.97	16171.51	5797.58	13612.10
U.A.E	818.36	1095.30	1319.65	1441.43	893.55	1090.32	2631.52	2460.40	5790.65	5805.39
U.S.A	1408.54	3297.40	1943.60	4182.39	2022.49	4682.29	2649.09	6816.42	1891.70	4924.80
Saudi Arabia	992.69	1411.09	696.61	855.00	237.30	413.24	1154.91	2059.35	1089.97	1932.82
U.K	755.39	1556.36	1005.83	1585.03	952.38	1660.63	703.28	1540.25	692.59	1584.23
Nepal	433.38	675.06	305.51	384.82	616.38	724.50	818.53	1349.81	1056.69	1275.84
Netherlands	358.46	865.27	264.32	520.16	238.86	519.06	421.69	946.41	282.06	531.87

Sources: Spice Board of India

Table 3.8 Year Wise Import of Ginger to India

Year	Quantity (tonnes)	Value (Rs lakhs)
2011-12	16,920	4,739.00
2012-13	57,090	10,410.00
2013-14	36,400	10,178.00
2014-15	23,050	10,666.00
2015-16	26,610	9,201.00
2016-17	35,605	9,201.48
2017-18	34,300	10,060.32
2018-19	30,085	16,154.35
2019-20	18,874	11,025.87
2020-21*	15,385	13,926.65

Source: Spices board (Advance estimate)*

As shown in Figure 3.8, India imports 16,920 tonnes of ginger with an outlay of Rs 4,739.00 in 2011-12. The total import of ginger decreased from 57,090 tonnes in 2012-13 to 26,610 tonnes in 2016-16. In 2016-17, 35,605 tonnes of ginger were imported to India with a total outlay of Rs 9,201.48 lakhs. The total import of ginger in 2018-19 was 30,085 tonnes against 34,300 tonnes in 2017-18. In 2019-20, Rs 11,025.87 worth of ginger was imported into India. The total import of ginger was estimated to be around 15,000 tonnes with a total outlay of Rs 13,926.65 lakhs in 2020-21.

3.4 PROFILE OF CHILLI IN INDIA

Chilli is one of the most widely grown commercial spices. It is known as the "wonder spice" as it is the most extensively used universal spice because they contribute flavor and color to the foods. Different cultivars are grown for various uses, such as vegetables, pickles, condiments, and sauces. Chillies produced in Asia are mainly of hot types, whereas European production is predominantly of a mild type, and African countries, they cultivate both hot and mild varieties.

3.4.1 AREA AND PRODUCTION OF CHILLI IN INDIA

India is the world's largest producer of chillies, followed by China, Thailand, Ethiopia, and Indonesia. India is not only the world's largest producer of chilli but also its largest consumer and exporter. The main chilli varieties grown in the country are Sannam, LC 334, Byadgi, Wonder hot, and Jwala.

Table 3.9 Trend in Area, Production and Productivity of Chilli

Year	Area ('000 ha)	Production ('000 tonnes)	Productivity (Kg/ha)
2001-02	880.000	1069.000	1215
2002-03	827.400	894.600	1081
2003-04	774.580	1235.370	1595
2004-05	821.060	1198.480	1460
2005-06	652.890	1013.350	1552
2006-07	769.850	1226.950	1594
2007-08	805.820	1292.970	1605
2008-09	792.180	1350.730	1705
2009-10	815.710	1461.130	1791
2010-11	721.890	1320.990	1646
2011-12	781.250	1481.720	1695
2012-13	687.450	1463.770	1886
2013-14	686.135	1534.195	1963
2014-15	709.984	1631.535	2298
2015-16	741.730	1494.691	2015
2016-17	859.787	2449.590	2849
2017-18	676.148	1710.731	2530
2018-19	706.709	1515.557	2145
2019-20	623.446	1841.799	2954
2020-21	728.627	2092.153	2871

Source: Spices Statistics at a Glance 2021

During the last two decades area under chilli cultivation in the country has largely remained the same hovering around 7 lakh hectares. In 2001-02, 880,000 thousand hectares were used for chilli cultivation in the country. The total production

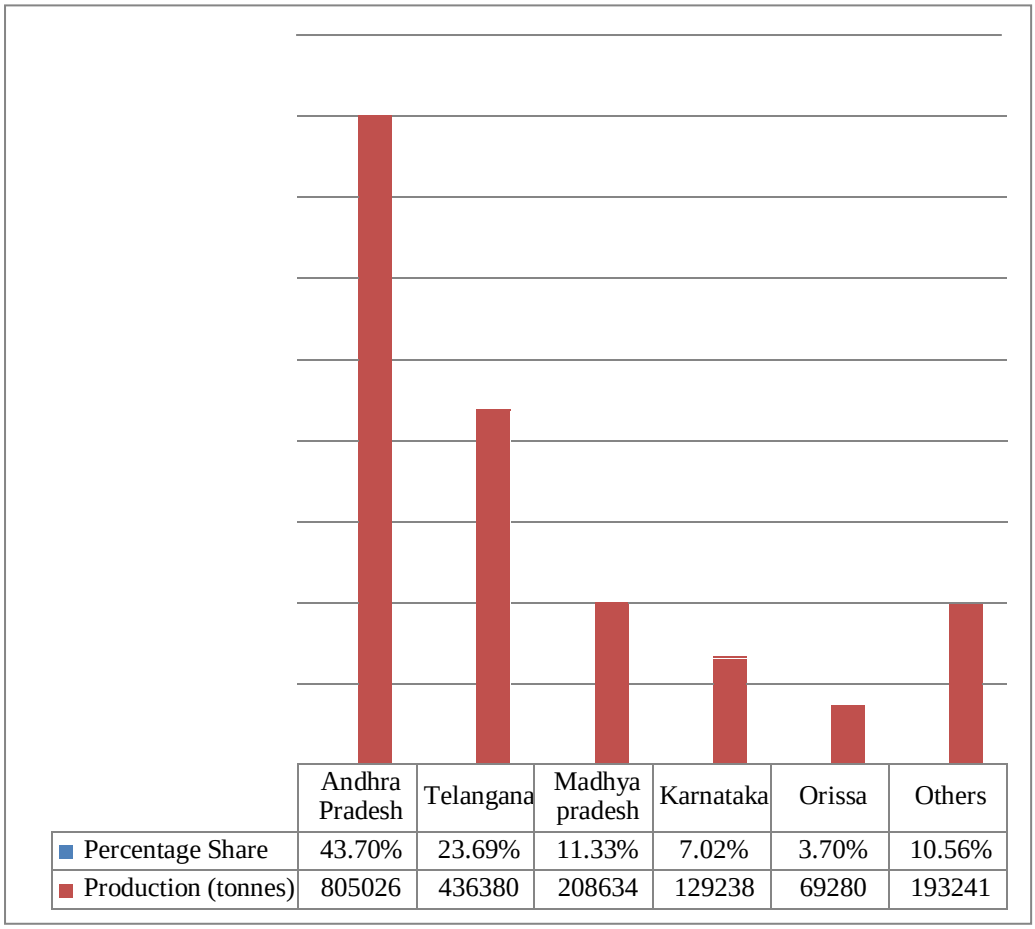
and productivity were 1,069.000 thousand tonnes and 1,215 Kilograms per hectare, respectively. Chilli was grown in an area of 827.400 thousand hectares with a total production of 894.600 thousand tonnes and the yield was 1,081 Kilograms per hectare in 2002-03. The total production was 10.69 lakh tonnes with an average yield of 1,215 kilograms per hectare.

The area and production of chilli during the year 2004-05 were 821.060 thousand hectares and 1198.480 thousand tonnes respectively with an average yield of 1,460 kilograms per hectare. In 2007-08, Indian chilli occupied an area of 805.820 thousand hectares with a production of 1,292.970 thousand tonnes and productivity of 1,605 kilogram per hectare. In 2017-18 chillies were grown on an area of 676.148 thousand hectares with an annual production of 1,710.731 thousand tonnes and the productivity during the period was 2,530 kilograms per hectare. During 2019-20, chilli was grown in an area of 623.446 thousand tonnes with a production of 1,841.799 thousand tonnes and the productivity was 2,954 Kilograms per hectare. According to 2020-21 first advance estimates, Indian chilli occupied an area of 728.627 thousand hectares with a production of 2092.153 thousand tonnes and productivity of 2,400 kilograms per hectare.

3.4.2 TOP CHILLI PRODUCING STATES IN INDIA

Chilli is cultivated in all the states and Union territories of the country. The major producing states in India, namely, Andhra Pradesh, Telangana, Madhya Pradesh, Karnataka and Orissa contribute around 80 percent of area under chilli cultivation and 90 percent of the total chilli crop cultivation in India. Andhra Pradesh is the largest producer of chillies in India with a 43.70 percent share in total production followed by Telangana, and Madhya Pradesh. With a total production of 129,238 tonnes in 2019-20, Karnataka followed Madhya Pradesh (7.02 percent). Orissa ranks fifth (3.70 percent) in chilli production in the country with a total production of 69,280 tonnes, in 2019–20, and the state is expected to produce around 69,000 tonnes in 2020–21. In Tamil Nadu, chilli was grown in an area of 47,911 hectares with a total production of 29,618 tonnes in 2019-20.

Figure 3.3 Major Chilli Producing States in India during 2019-20



	Andhra Pradesh	Telangana	Madhya pradesh	Karnataka	Orissa	Others
Percentage Share	43.70%	23.69%	11.33%	7.02%	3.70%	10.56%
Production (tonnes)	805026	436380	208634	129238	69280	193241

Source: Collated from Spice Board, 2020

ANDHRA PRADESH

The total area under chilli cultivation in Andhra Pradesh was 209.350 lakh hectares in 2016-17, and the total production during the period was 992.900 thousand tonnes. In 2017-18, the total area under chilli cultivation in the state was 119,260 hectares and the total production was 618,350 tonnes. With an increase in the area under chilli from 153.082 lakh hectares in 2019-20 to 180.000 thousand hectares in 2020-21, the total production was estimated to be increased from 805,026 tonnes in 2019-20 to 836,000 tonnes in 2020-21.

Table 3.10 Area and Production of Chillies in Andhra Pradesh (Area in Hectare, Production in Tonnes)

Year	Area	Production
2016-17	209350	992900
2017-18	119260	618350
2018-19	158428	501410
2019-20	153082	805026
2020-21(adv.est)	180000	836000

Sources: Spice Board of India

Chilli is cultivated in all districts of Andhra Pradesh, but the most important districts are Guntur, Warangal, Khammam, Krishna and Prakasam. The chilli varieties of Teja, Byadigi, and Guntur sannam are fetching high returns to the growers. The 'Teja' and 'Guntur Sannam' varieties cultivated in the Guntur - Prakasam - Krishna region of the state make Andhra Pradesh the leader in chilli production in India. The Guntur district, known as the chilli city of the country, is India's primary producer and exporter of chillies and chilli powder to Sri Lanka, Bangladesh, the Middle East, South Korea, the United Kingdom, the United States, and Latin America. Guntur chillies, a group of chilli cultivars from the Guntur and Prakasam districts play a vital role in curries and other popular dishes in the state. Guntur Mirchi Yard, the main trading place for the Guntur chilli is Asia's largest dried red chilli market. The annual value of transactions handled by the Guntur Mirchi Yard was Rs 6,000 crores in 2020.

Despite lockdown restrictions in many states and the Covid-19 outbreak, demand for chilli in the export market has increased, allowing farmers to earn reasonable profits. Due to various factors, including crop loss in chilli-producing states such as Madhya Pradesh, Maharashtra, and Karnataka, farmers in Andhra Pradesh received an average price of Rs 10,000 to Rs 12,000 per quintal during the previous season. A few farmers who grew high-demand chilli varieties like Byadgi and Gunturu Sannalu organically and from clean stock earned Rs 20,000 per quintal.

However, chilli cultivation is a risky venture because it requires a large investment ranging from Rs 1 to Rs 1.2 lakh per acre, which the farmer can only recover if yields are satisfactory and prices are reasonable. In many parts of the states, poor farm practices by the majority of the farmers, such as the use of large amounts of pesticides and drying stocks in open fields, resulted in low prices.

TELANGANA

Telangana was the second largest producer of chilli among other states across India. In 2016-17, chilli occupied an area of 124,320 hectares in the state with a production of 482,870 tonnes and productivity of 3,884 kg per hectare. According to 2020-21 second advance estimates, though Telangana ranked fourth in chilli area coverage after Andhra Pradesh, Karnataka and Madhya Pradesh, it ranked second in production with an estimated production of 407,268 tonnes from an area of 90,300 ha, contributing 23.69 percent of all India area and production respectively. The total area under chilli cultivation in Telangana was 73,780 hectares in 2017-18, and was increased to 80,579 hectares in 2019-20. As a result, the total production increased from 340,800 tonnes in 2017-18 to 436,380 tonnes in 2019-20

Table 3.11 Area and Production of Chillies in Telangana (Area in Hectare, Production in Tonnes)

Year	Area	Production
2016-17	124320	482870
2017-18	73780	340800
2018-19	82521	369020
2019-20	80579	436380
2020-21(adv.est)	90300	407268

Sources: Spice Board of India

Khammam, Mahabubabad, Mulugu, Gadwal, Suryapet, and Warangal (Rural) are the major chilli-growing districts in the state. In 2019-20, the state produced 436,380 tonnes of chillies from an area of 80,579 hectares.The total production of Chillies in Khammam district was 150,235 tonnes and the total productivity was 7,148 per hectare in 2019-20. In the Mahabubabad district, 52,959 tonnes of chillies

were produced from an area of 13,719 hectares in 2019-20. The total production and productivity of chillies in Mulugu districts were 47,900 tonnes and 6,108 kilogram per hectare respectively from 2019-20. The total productivity of chillies in Warangal (Rural) district was 4,195 in 2019-20.

MADHYA PRADESH

Madhya Pradesh was the third-largest producer of chillies among other states across India with a total production of 208,634 tonnes in 2019-20, contributing about 11.33 percent to the total chilli production in the country.Madhya Pradesh has a diverse range of agro-climatic conditions that allow for the year-round cultivation of chilli, ensuring a continuous supply of fresh demand. Chilli is the important spice/vegetable crop of Madhya Pradesh. The Nimar region of western Madhya Pradesh is one of the country's major chilli-producing regions.

Table 3.12 Area and Production of Chillies in Madhya Pradesh (Area in Hectare, Production in Tonnes)

Year	Area	Production
2016-17	98540	303630
2017-18	94410	232700
2018-19	87839	217550
2019-20	88675	208634
2020-21(adv.est)	113366	292616

Sources: Spice Board of India

According to government data, 54,451 tonnes of chilli were produced in the Nimar region's five districts of Khargone, Dhar, Khandwa, Barwani, and Alirajpur, which account for 25 percent of the state's total chilli production. Many districts in Madhya Pradesh, notably Khargone and Barwani, have a bumper harvest of green chillies in 2021. However, due to an increase in production, the price of chilli has dropped drastically in many regions. Some farmers spend more money on the field than is received in the market.

There is a need to expand the adoption of chilli production technology through proper use of information sources, extension contacts, exhibitions,

Kisan Melas, and training programs provided by concerned authorities in different aspects of chilli production. The majority of chilli growers have a moderate understanding of approved chilli-producing technology. As a result, extension steps should be taken to improve chilli growers' awareness of suggested chilli production technology.

3.4.3 MARKETING OF CHILLIES IN INDIA: A BRIEF SCENARIO

India is currently the most dominating player in the world chilli market. The exports of Chilli from India account for more than half of the global chilli trade, with China being the closest competitor, but it is far behind in second place. Chillies are primarily brought to regulated markets in various parts of the country by primary producers. Unlike other perishable commodities, dry chillies are sold in the market in different phases by many producers. The producers try to take advantage of the prices as much as possible. They keep the product for as long as possible and bring it to market when prices are favorable to them. Only during an excess supply will the producer-seller come to the market and try to get rid of the lots as soon as possible because storing and selling may result in additional losses due to a price crash. Village merchants, itinerant merchants, wholesalers, commission agents, and cooperatives are among the other agencies selling produce in the market yard.

Table 3:13 Major Markets of Chilli Producing States

STATES	IMPORTANT MARKETS
Andhra Pradesh	Guntur, Warangal, Khammam, Krishna, Prakasham, Hyderabad, Pundur Nizamabad, Cuddpah, Rajamundry, Nellore, Srikakulam, Vijaynagaram, Paddapallim, Eluru, Tadepalligudem, Pittapuram, Jagital and Prakasam
Assam	Silchar, Kamarup, Guwahati, Barapeta, Karbi
Goa	Maragoan, Ponda, Mapua, sattri, bicholim
Karnataka	Dharwad, Mysore, Hasan, Bangalore, Bellary, Ranibennur, Hubli, Gadag, Byadgi
Madhya Pradesh	Indore, Khargone, Jabalpur, Katni, chindwara, Khandwa, Gwalior, Morena, Bhind, Bhopal
Maharashtra	Nagpur, Nasik, Ahmednagar, Sholapur, Aurangabad Nanded Lasalgaon Amravati, Dhulia, Chandrapur, JalgaonAnjangaon, Morshi, Dandaichi, Chimur, Amainer, Achalpur and Sangli.

Punjab	Amristar, Nabha, Patiala, Sunam
Rajasthan	Jodhpur, Ajmer, Bhilwara, Pali, Sikar, Bharatpur, Swaimadhopur
Tamil Nadu	Coimbatore, Ramanathapuram, Tuticorin, Tirunelveli, Virudunagar, Kanayakumari, Salem, Trichi, Villupuram, Cuddalore Pollachi, Arialur, Madurai, Theni, Podukottai, Pattukottai, Tanjaur, Pollachi, Thindivaram, and Virudhachalam.
Uttar Pradesh	Orai, Jhansi, Ramnagar, Ujhani, Lucknow Bareily, Khurja.
West Bengal	Coochbehar, Haldibari, Dinhata, Mathabhanga, 24 paraganas Gonheta, Amalgora, Salboni, Sat Bankura, Maynaguri, Falakata Dhupguri Dinajpur and Jhargram
Orissa	Bhubaneswar, Jagat Singhapur, Cuttack, Jaleswar and Baripada
Gujarat	Dahod, Jhalod, Gonded, Banankanta, Rajkot

Sources: Department of Agriculture and Cooperation, Govt of India

Transport is crucial for a country's economic development because every commodity produced requires transportation from the production area to the distribution stage. Rapid, low-cost, dependable, and convenient modes of transportation are critical for increasing production and trade. Chillies are typically transported in gunny bags (new or old) and, on occasion, bamboo baskets. In the transportation of chillies, from farm to assembling markets, producers and village merchants are involved, and from assembling market to consuming places, wholesalers and processors are involved. Head loads, cartloads, and tractors are commonly used, depending on the economic status and landholdings of chilli producers.

India has huge potential to export various types of chillies to markets all over the world. Chilli accounts for a significant portion of the country's total spice export (approximately 6,500 crores per year). The total export value is around Rs. 21,500 crores. The export of chilli from India accounts for nearly half of the global market for this spice, with China being its closest competitor, but it is far behind in second place.

The increase in chilli production over the last few years, as well as the availability of a large exportable surplus in the country, coupled with lower crop

expectations in other major producing countries, has boosted India's export opportunities. Though Indian exports are trending favorably, India is currently facing very tough competition in the international export market because the price of Indian chilli powder is considered very high, and other competing countries are providing chilli at very reasonable rates to the major importing countries. Exports can be increased further if India can meet the stringent quality requirements of the international market.

Table 3.14 Year Wise Export of Chillies From India

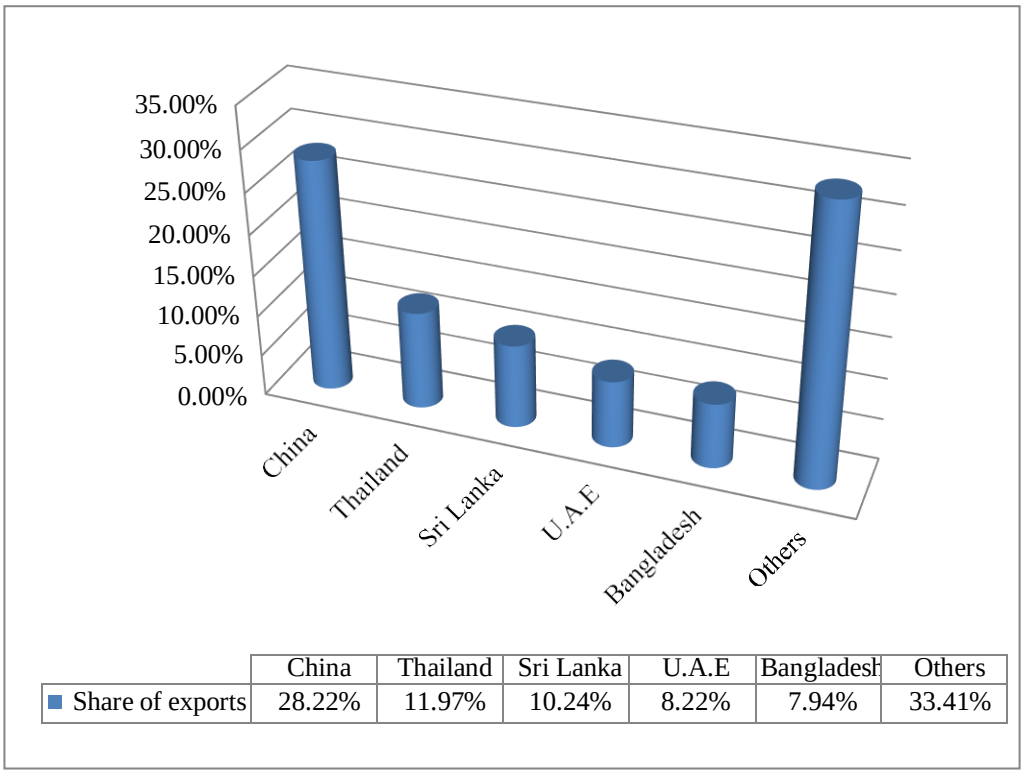
Year	Quantity (tonnes)	Value (Rs lakhs)
2011-12	241,000	214,408.00
2012-13	301,000	238,061.00
2013-14	312,500	272,227.00
2014-15	347,000	351,710.00
2015-16	347,500	399,744.00
2016-17	400,250	507,075.63
2017-18	443,900	425,632.74
2018-19	468,500	541,117.50
2019-20	496,000	671,039.53
2020-21*	601,500	842,975.00

Source: Spices Board and Spice Statistics at Glance (Advance estimate)*

India started exporting chilli in 1960-61. The export performance of chillies has been excellent. It has grown steadily in both volume and value over the last decade. Chilli is exported to over 144 different countries. In 2011-12, India exports 241,000 tonnes of ginger which increased to 347,000 tonnes in 2014-15. The total income received from exporting ginger was Rs 214,408.00 in 2011-12 and Rs 351,710.00 in 2014-15. The total export of chillies from India was 400,250 tonnes in 2016-17, valued at Rs 507,075.63 lakhs. India exported chilli worth Rs 425,632.74 lakhs in 2017-18. The total volume of export in 2017-18 was 443,900 tonnes. In 2018-19, total chilli exports rose to 468,500 tonnes. India earned about Rs 5, 41,117.50 in 2018-19. India exported 496,000 tonnes of chilli, worth about Rs

671,000 lakhs in 2019-20. Chilli is the most exported spice from India in 2020-21 with an estimated volume of more than 601 thousand tonnes valued at Rs 842,975.00 lakhs.

Figure 3.4 Country Wise Shares of Chilli Exports from India in 2019-2020



	China	Thailand	Sri Lanka	U.A.E	Bangladesh	Others
Share of exports	28.22%	11.97%	10.24%	8.22%	7.94%	33.41%

Source: Spice Board of India

Chilli is predominantly exported to China, Vietnam, Thailand, Sri Lanka, Indonesia, and Malaysia, accounting for 42 percent of the country's entire spice export volume. China is the largest buyer of Indian chilli in 2019-2020 with a share of 28.22 percent of India's chilli exports, followed by Thailand (11.97 percent), Sri Lanka (10.24 percent), the U.A.E (8.22 percent), Bangladesh (7.94 percent) and others (33.41 percent). In recent years, Chinese people have developed a taste for Indian chillies, which are much hotter than those produced by their neighboring country. China does not grow red chillies similar to Indian varieties such as Teja, Sannam, and Bydagi. Proper blending of these varieties allows for the preparation of appropriate compositions for various markets. Indian chilli exporters can easily

export to China. Furthermore, China's reduction in chilli procurement from conflict-torn Syria, Turkey, and Iran has increased the demand for Indian chillies.

Table 3.15 Year Wise Import of Chillies to India

Year	Quantity (tonnes)	Value (Rs lakhs)
2011-12	1,740	2134.00
2012-13	1,225	940.22
2013-14	580	1034.73
2014-15	275	702.50
2015-16	425	1024
2016-17	1055	1931.90
2017-18	1450	2,699.50
2018-19	1230	1,960.95
2019-20	1280	2,120.70
2020-21*	1808	4,263.50

Source: Spices Board (Advance estimate)*

India imports 1,740 tonnes of chillies in 2011-12 with an outlay of Rs 2,134.00 lakhs. In 2013-14, the total import of chillies was 580 tonnes which was further reduced to 275 tonnes in the next year i.e., 2015-16. The total import of chilli in 2016-17 was 1,055 tonnes with an outlay of Rs 1,931.90 lakhs. In 2018-19 the country imported 1,230 tonnes of chillies which were lower than the previous year's record i.e., 1,450 tonnes. The total outlay was reduced from Rs 2,699.50 lakhs in 2017-18 to 1,960.95 lakhs in 2018-19. In 2019-20 1,280 tonnes of chillies were imported which was estimated to be 1,808 tonnes in 2020-21.

3.5 CONCLUSION

This study focused on production and marketing performance and prospects of ginger and chilli cultivation in India. It was found that despite fluctuations in the area under ginger crop cultivation during the last 15 years, ginger productivity shows an increasing trend. Since 2014, India's ginger production has increased 8.7 percent year on year. In 2019, the country was number one among other countries in ginger

production with 1.79 million metric tonnes. Bangladesh was the most important destination for ginger exports from India, accounting for more than half of the total exports.

India is the largest producer of chilli in the world, followed by China, Thailand, Ethiopia, and Indonesia India is not only the world's largest producer of chilli, but also its largest consumer and exporter. The export of chilli from India accounts for nearly half of the global market for this spice, with China being the closest competitor, but it is far behind in second place. The increase in chilli production over the last few years and the availability of a large exportable surplus in the country, coupled with lower crop expectations in other major producing countries, has boosted India's export opportunities.

CHAPTER-IV

PRODUCTION OF GINGER AND CHILLIES: DATA ANALYSIS

4.1 INTRODUCTION

This chapter deals with the economic analysis of ginger and chilli production in Mizoram with special reference to the study area. An overview of ginger and chilli cultivation in Mizoram as well as in the study area, acreage response to price, trends of production and productivity, growth rates, cost of ginger and chilli cultivation and profitability analysis are discussed in this chapter based on secondary data and primary data. The chapter further discusses the determinants of productivity of ginger and chilli along with a comparative analysis of the cultivation of ginger and chilli wherever appropriate.

4.2 OVERVIEW OF GINGER AND CHILLI CULTIVATION IN MIZORAM

Ginger and chilli are valuable cash crops in the state of Mizoram. In terms of volume of production, Mizoram is one of the major producers of ginger in India. According to the Directorate of Arecanut and Spices Development, Mizoram is the 11th largest producer of ginger in India during 2019-20. The state also occupied the 13th position in terms of chilli production among the 26 producing states in India during the same period. While Mizoram was ranked above the average in terms of volume of production of ginger and chilli, its position fell drastically in terms of productivity (i.e., production/area). This is a disheartening result for the state as it indicates the inefficient utilization of land resources in the state. Among many factors, the main reason for low productivity in the state was the adoption of traditional farming methods. In Mizoram, a considerable number of farmers still practice old and traditional farming methods in which the application of fertilizers, irrigation facilities, and mechanization of farming techniques are mostly absent. Ginger and chilli are grown in jhum lands, terraced lands, and in other places. Farmers use organic inputs and local resources, and are heavily dependent on rainfall. State-wise areas of cultivation, production and productivity during 2017-18 to 2020-21 are attached in Appendix-1 and 2.

In terms of volume of production, Mizoram is one of the hubs of ginger and chilli production in Northeast India. As per the Directorate of Arecanut and Spices Development, the State accounts for nearly 12 percent of the production of ginger and 25 percent of the production of chilli in Northeast India. During 2019-20, the state produced 61,001 tonnes of ginger in 8,553 hectares of land, while chilli covered 11,196 hectares with a production of 10,918 tonnes. If we compare the area under cultivation of ginger and chilli, the area under chilli cultivation occupied larger area. This is because chilli is typically planted alongside other vegetable crops such as rice, brinjal, maize, etc., whereas ginger is grown on a single plot of land. As a result, the area under chilli cultivation is typically equal to the size of a jhum land. The area and production of ginger and chilli in Mizoram during 2009-10 to 2018-19 are shown in Table 4.1.

Table 4.1 Area, Production and Productivity of Ginger and Chilli in Mizoram

Years	Area (Ha)		Production (MT)		Yield(MT/Ha)	
	Ginger	**Chilli**	**Ginger**	**Chilli**	**Ginger**	**Chilli**
2009 - 10	6,200	8700	31,000	47850	5.00	5.5
2010 - 11	6,500	8700	31,950	47850	4.92	5.5
2011 - 12	7,010	8900	34,460	9790	4.92	1.1
2012 - 13	7,280	9025	28,390	8210	3.90	0.91
2013 - 14	7,480	9040	29,920	9100	4.00	1.01
2014 - 15	7,650	9140	31,200	9330	4.08	1.02
2015 - 16	7,340	9140	30,790	9330	4.25	1.02
2016 - 17	8,550	11170	62,740	10730	7.24	0.96
2017 – 18	85 85.5	11195	6,2743.6	109181	7.34	0.98
2018 - 19	8 553.07	11196	60,130.50	109181	7.03	0.98
CAGR	3.6%	2.8%	7.6%	9.6%	3.9%	-17%

Source: Statistical Abstract of Mizoram-2019

As indicated in Table 4.1, the area under ginger cultivation has been increasing over the years with a Compound Annual Growth Rate (CAGR) of 3.6 percent. In like manner, the production, although certain fluctuations were seen, is also increasing significantly during the reference periods with 7.6 CAGR. Agricultural productivity is what shows the efficient utilization of land and indicates the performance of the agriculture system as a whole. As shown in Table 4.1, ginger productivity in Mizoram has been fluctuating over the years ranging between 3.9 and 7.3 with a CAGR of 3.9 percent. Despite, the prevalence of the traditional agricultural practice, low investment in the sector and poor socio-economic condition of the farmers, productivity is nevertheless high when compared to other Indian states. This signifies the agricultural potential of the state if the state's agriculture is mechanized or new methods of cultivation are introduced.

Regarding chilli cultivation, a gradual increase in area under cultivation was also seen with a CAGR of 2.8 percent, but lower than the CAGR of ginger cultivation. The production of chilli has witnessed certain fluctuations over the years. Bulk production of more than 47 thousand tonnes in chilli was seen during 2009-10 and 2010-10 with the productivity of more than 5 metric tonnes per hectare. Thereafter, production has drastically declined below 10 thousand tonnes till 2015-16 leading to low productivity which hovered at around 1 metric tonne per hectare. Surprisingly, production volume again increased to the tune of more than 100 thousand tonnes in the last two years of the reference periods, however, owing to the increase in the area of cultivation, productivity did not jump up as expected which further led to negative CAGR in the productivity of chilli.

4.3 ACREAGE RESPONSE TO LAGGED PRICES

Variations in the acreage planted for various crops are common in developing economies. A combination of endogenous and exogenous factors causes these changes but determining which of these factors is most responsible, and to what extent, for such

changes is a difficult task. Farmers considered various factors such as demand for the product, marketing opportunities, prices of the produce, relative prices, cost of cultivation and many other aspects. Under such circumstances, it is not an easy task to chalk out which factor mostly influences farmers' decisions on the size of the cultivation. However, according to economic theory, prices are one of the major determinants of economic behavior, and a rational farmer is considered to be able to react quickly enough to changes in output prices.

When the agriculture sector is underdeveloped, and farm mechanization does not take place, an increase in agriculture production is heavily dependent on the size of land under cultivation. In this scenario, it is plausible to infer that agricultural product price is the primary determinant of the area under cultivation because higher product prices are likely to push farmers to expand their cultivation area to take advantage of the rising price.

So, prices of ginger and chilli in the previous year (lagged price) may be considered as the factors that determine the area of the cultivation. Table 4.2 below shows acreage response to the lagged price of ginger and chilli in Mizoram for a period of ten years starting from 2009-10 to 2018-19.

Table 4.2 Acreage Response to Lagged Price

Coefficients							
Model		Unstandardized Coefficients		Standardized Coefficients	t-statistic	Significance	R Square
		B	Std. Error	Beta			
Ginger	(Constant)	8.267	0.350	-	23.624	0.000	.34
	Price	0.179	0.093	0.589	1.929	0.095	
Chilli	(Constant)	8.982	.065		138.184	.000	.45
	Price	.001	.000	.736	3.072	.015	
a. Dependent Variable: Area							

Source: Calculated From Statistical Abstract of Mizoram-2019

As shown in Table 4.2, the coefficient of acreage response to the lagged price of ginger is not significant at 5 percent implying that price changes do not have any statistical impact on the area of cultivation of ginger. This means that there is no significant positive relation between ginger cultivation area and lagged price of the ginger which is also confirmed by a weak coefficient of determination as shown in the eight column of Table 4.2. The result is not as expected since the lagged price of ginger is highly considered to influence the ginger cultivation area. However, we have a contrasting result when we investigate the case of chilli. The area under chilli cultivation and the lagged price have a positive significant relationship with a coefficient of 0.001 indicating that the price of chilli has influenced its area of cultivation.

The insignificant coefficient of ginger may be attributed to the limited livelihood options in Mizoram. Owing to limited livelihood options, ginger cultivation is the sole livelihood option in a certain areas of Mizoram. Farmers with poor socio-economic conditions cannot change their farm size in response to a change in the price of ginger. Another major factor is the monocropping nature of ginger cultivation in Mizoram. As mentioned earlier, ginger is grown without any other crops, unlike chilli where mixed cropping is being practiced. Such circumstances coupled with uncertain future prices, increasing ginger cultivation implies taking a high risk by the poor farmers. Thus, acreage response to lagged price in the case of ginger is not statistically significant in Mizoram. These poor farmers do not have other livelihood options and cultivation is the mainstay of their livelihood. Thus, it can be concluded that lagged price of ginger is not a good predictor of changes in the area under cultivation.

The positive relation between the area of chilli cultivation and the lagged price is mainly because of the mixed cropping nature of chilli. In Mizoram, chilli is grown with other crops such as sesame, maize, cucumber, brinjal, etc., since the harvesting periods are different and smooth crop rotation can be maintained. Thus, when some crops have shown a handsome rise in price, farmers are more likely to increase the size of their

jhum land. Unlike ginger cultivation, chilli cultivation is not a high risk rather it is a risk-spreading since multi-cropping has been done in jhum land. The size of jhum land being the size of chilli cultivation, we have significant relation between the lagged price and area of chilli cultivation. The value of R square in case of acreage response to the lagged price of chilli is 0.45 percent indicating that 45 percent of the variation in the jhum area is explained by the lagged price of chilli while the rest is explained by other factors. It is worth noting that substantial literature has been established claiming that farmers in developing nations are not responsive to price fluctuations and are less responsive than those in developed countries. That is why we have a low value of R square in both ginger and chilli acreage in response to lagged prices.

4.4 GINGER AND CHILLI PRODUCTION AND PRODUCTIVITY IN CHAMPHAI DISTRICT

Champhai district is in the eastern part of Mizoram and Champhai town is the headquarters of the district. Agriculture is the primary source of income for the residents of this district. The district is regarded as the 'Rice Bowl of Mizoram' due to the extensive rice farming on wide tracts of land and the maximum producer of rice in the state. The Agro-climatic conditions, fertile soil, and abundant rainfall are favorable for horticultural fruits such as bananas, grapes, pineapple, and vegetables such as cabbage, cauliflower, tomatoes, leafy vegetables, ginger, chilli, and other vegetables.

Kolasib district is the largest producer of ginger in the state with a total volume of 9,123.60 metric tonnes, followed by Mamit district (9,069.80 metric tonnes), and Aizawl district (8,995.80 metric tonnes). Champhai district is the fifth largest producer of ginger in the state with a production volume of 7,890.80 metric tonnes which is 13.12 percent of the total produce of the state. However, in terms of yield per hectare, the district reported the second-lowest ginger productivity among the districts. Mamit district is on the top of the list, followed by Lawngtlai district. Area-wise, Champhai

district has the lowest area under ginger cultivation among the districts in Mizoram. Lunglei district top the list followed by Lawngtlai district.

Table 4.3 Area, Production and Productivity of Ginger and Chilli in Champhai District

District	Area		Production		Yield(MT/Ha)	
	Ginger	Chilli	Ginger	Chilli	Ginger	Chilli
Mamit	663.6	689.1	9,069.80	1291.2	13.67	1.87
Kolasib	406.47	1344	9,123.60	1000	6.49	0.74
Aizawl	446.5	2217.85	8,995.80	2245.9	6.22	1.01
Champhai	321.5	1474	7,890.80	1586	5.97	1.08
Serchhip	565.5	1700	8,441.80	1282	5.39	0.75
Lunglei	834.5	1902	5,617.10	1597	6.73	0.84
Lawngtlai	687.5	1194	5,596.80	963	8.14	0.81
Siaha	627.5	674.8	5,394.80	953	8.6	1.41

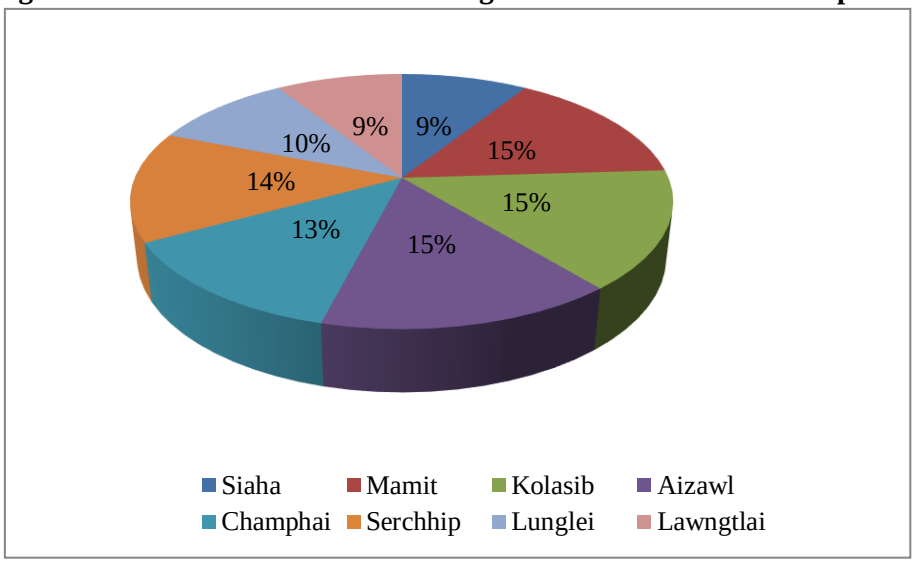
Source: Calculated from Statistical Abstract of Mizoram-2019

Champhai district occupies the third position among the districts in the state, both in terms of production volume and productivity of chilli. The district produced 1,586 metric tonnes of chilli in 2018-19 which accounts for 14.53 percent of the total produce of the state. The productivity of chilli in Champhai district was 1.08 metric tonnes per hectare. The production of chilli in Mizoram is largely dominated by Aizawl district which contributes nearly 21 percent (2245.9 metric tonnes) of the total produce. The total productivity of chilli cultivation in Aizawl district was 1.01 metric tonnes per hectare. Lunglei district produced 1,597 metric tonnes of chilli, and the total productivity was 0.84 metric tonnes per hectare.

Like ginger, chilli productivity was also highest in Mamit district (13.67 metric tonnes per hectare), followed by Siaha district (8.6 metric tonnes per hectare). The area under chilli cultivation was the largest in Aizawl district while Siaha district has the

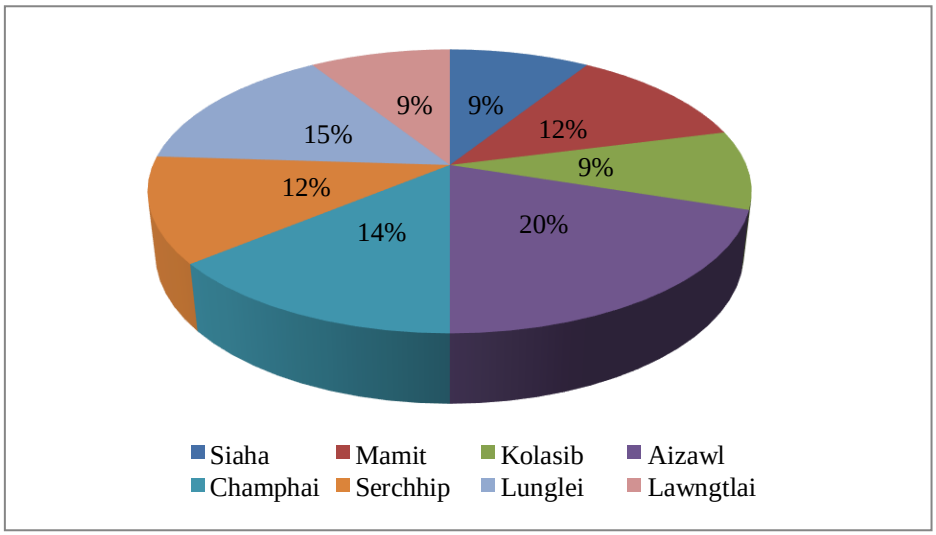
lowest area under chilli cultivation in the state. Details of district-wise production and productivity during 2018-19 were depicted in Table 4.3 and Figures 4.1 and 4.2 below for references.

Figure 4.1 District-wise Percentage Contribution to Total Output Of Ginger



Source: Calculated from Statistical Abstract of Mizoram-2019

Figure 4.2 District-wise Percentage Contribution to Total Output Of Chilli



Source: Calculated from Statistical Abstract of Mizoram-2019

4.5 GINGER AND CHILLI PRODUCTION AND PRODUCTIVITY IN THE STUDY AREA

Owing to the vast chunk of plain lands and hills with a gentle slope, wet rice cultivation and terrace cultivation are very popular across the district. As a result, ginger and chilli are produced exclusively in a few villages. Furthermore, the district being a growing hub for Indo-Myanmar border trade with economic diversification necessitates some villages along the border area to abstain from farming activities. With this backdrop in mind, the purposive sampling technique was adopted since it would make more sense than a random selection of villages in the district. Thus, we selected villages that are still engaged in chilli and ginger cultivation within the district. For ginger cultivation, six villages were selected from Khawbung and Champhai blocks and another six villages were selected from the same blocks for chilli cultivation. Trends in the production and productivity of ginger and chilli for the last six years in the study area are shown in Table 4.4.

Table 4.4 Production and Productivity in the Study Area

Years	Production (in quintal)		Productivity	
	Ginger	Chilli	Ginger	Chilli
2015-16	10361.7	1080.9	5.29	0.74
2016-17	11086.8	1546.4	5.36	0.89
2017-18	12358.4	1970.6	5.67	0.93
2018-19	13492.6	2314.1	6.05	0.98
2019-20	15315.9	2719.1	6.62	1.04
2020-21	16405.1	3207.5	6.90	1.10
Mean	13170.08	2139.77	5.98	0.95
Standard Deviation	2368.96	775.63	0.66	0.13
Coefficient of Variation	0.18	0.36	0.11	0.13
CAGR (in per cent)	10	23.17	5.6	6.86

Source: Field Survey 2014-15 to 2019-20

As presented in Table 4.4, both ginger and chilli have shown a gradual increase in terms of production and productivity over the years with a CAGR of 10 percent and 23 percent respectively despite certain fluctuations. The mean production and productivity of ginger are significantly higher than the mean production and productivity of chilli during the reference periods. However, this does not mean that ginger is more profitable than chilli. Profitability is a different concept from that of production volume and productivity since it requires further consideration of cost and the prevailing market price of the product. As such, profitability analysis is kept in the coming section.

Regarding the Coefficient of Variation (CV), ginger has a lower value of CV than chilli in both production and productivity indicating a lower degree of fluctuations over the years. A huge fluctuation in chilli production and productivity indicates that certain factors effectively influence the production and productivity of chilli while the lower CV of Ginger infers that the production and productivity of ginger are very unresponsive to changes in some factors. These results are also in line with the result we have obtained in Section 4.2 of the present chapter which shows that the acreage response to lagged price is not statistically significant in the case of ginger, but not in the case of chilli.

4.6 COST OF CULTIVATION

Data on the cost of production is of great importance to know which crops are relatively cost-effective as well as to identify the area where it is most economical to produce various commodities. Commission for Agricultural Costs and Prices also considers the cost of production of crops as the most important factor while making its recommendations on Minimum Support Prices to the Government of India. In an organized sector such as industry, regular accounts are kept, thus the actual cost of production may be calculated with relative ease. On the other hand, bookkeeping is the exception rather than the rule in an unorganized sector such as agriculture.

Since profitability is determined by the value of output and cost of cultivation, it must be one of the important factors that greatly influenced the farmers' allocation of resources among alternative crops. However, in rural India as well as in Mizoram, the cost of cultivation/ production of crops have not been taken seriously. This may be attributed to many factors such as farmers' ignorance, poverty, lack of alternative options, and the subsistence nature of farming. So, the farmers unknowingly pursue agricultural activities without any record of the cost of productions. This has posed a serious problem in estimating the cost of cultivation of crops even in the study area. Fortunately, the Directorate of Economics and Statistics, Department of Agriculture and Farmer Welfare has formulated the concept of cost for estimating the cost of production of crops in India which includes classification of cost, cost items, and imputation methods. However, keeping the unique features of agricultural practices in Mizoram, the study has collected only relevant cost items for the state to have a realistic assessment of the cost of cultivation in the state.

In this study, the cost of cultivation both for ginger and chilli covered expenditure on seed, land preparation, fertilizers and manure, pesticides, weeding, irrigation, harvesting, hired labor, and imputed cost incurred by the owner of the farm. Costs such as depreciation on implements and building, interest on working capital, the rental value of own land and expenditure on other fixed assets were excluded as such expenses are not relevant in Mizoram. In Mizoram, with a low density of population, land for agricultural purposes is not an issue since each village has community land which can be cultivated free of cost. Moreover, the practices of shifting cultivation and the adoption of traditional methods also make expenditures such as interest on working capital, the rental value of own land, and expenditure on fixed assets irrelevant.

Given the above conditions, the average cost of cultivation of ginger and chilli is estimated for one hectare of land for simplicity of our analysis. The total cost of cultivation consists of 11 items for both ginger and chilli. It should be noted here that

self-owned inputs such as family labor and owned implements are converted into their monetary value based on the statutory wage rate or the actual market rate.

4.6.1 Cost of Cultivation of Ginger

Table 4.5 and Figure 4.3 demonstrate the components of cost of cultivation, the monetary value of each component, and the percentage share of each component for one hectare of land in the study area in 2019-20. As evident from Table 4.5 and Figure 4.3, the cost of seeds topped the list with 20 percent (Rs 20,000 per hectare) of the total cost followed by weeding and maintenance with 17 (Rs 16,800 per hectare) percent. A farmer generally kept a certain amount of ginger produced as seed for the next cycle. If a new farmer would like to start ginger farming, he has to purchase from the local market at the prevailing price. In both cases, the amount of ginger used as the seed is multiplied by the market price to get the cost of seed for ginger cultivation. Regarding weeding and maintenance, we take into account expenditure for hiring labor as well as the imputed value of owned services rendered by the family.

Harvesting costs are the third-highest cost of ginger farming in the study area. It accounts for 15 percent (Rs 15,600 per hectare) of the total cost of cultivation. Ginger harvesting necessitates arduous manual labor, including digging the ginger, cleaning, packaging, and storing it in a storehouse.

Transportation of ginger from the farms site to villages is another cost item that induced farmers to incur huge expenditures. Generally, transportation from the farm sites to local places has three basic modes of transportation such as headload, hiring horses, and vehicles. In most cases, transportation was done by headload due to the absence of motorable road connectivity and lack of abundant horses and bullock carts. In any of the above scenarios, the cost of hiring labor, horses, or vehicles is counted as a transportation expense. It is vital to note that the cost of transportation includes the imputed cost of family labor engaged in transportation work.

The cost of slashing forest, building a jhum house, and sowing or planting are roughly the same, accounting for 7 to 8 percent of the overall cost of cultivation in the study area. These cost items are expected to increase with an increase in the size of jhum land as larger size requires more labor to complete the work.

Table 4.5 Cost of Cultivation of Ginger

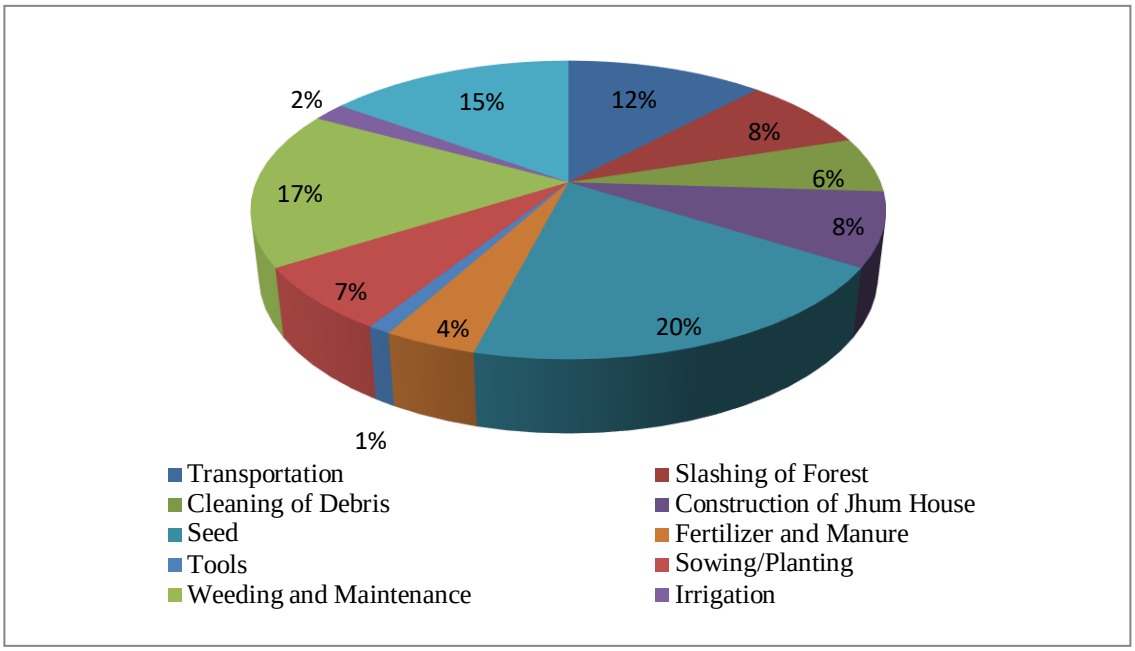
Sl.No.	Cost Items	Expenditure Amount (in Rs)	Percentage Share
1	Land Preparation (Slashing of Forest)	7800	7.72
2	Cleaning of Debris	5600	5.54
3	Construction of Storage	8600	8.51
4	Seed	20000	19.78
5	Fertilizer and Manure	4000	3.96
6	Tools	1500	1.48
7	Sowing/Planting	7200	7.12
8	Weeding and Maintenance	16800	16.62
9	Irrigation	2000	1.98
10	Harvesting	15600	15.43
11	Transportation	12000	11.87
12	Total	101100	100.00

Source: Field Survey 2019-20

The cost of fertilizer accounts for Rs 4,000 per hectare (4 percent of the total cost of cultivation) in the study area. Agricultural practices being traditional and non-mechanized, the cost incurred by the farmers on irrigation, tools and implements has a negligible share in the overall cost of cultivation as shown in Table 4.5 and Figure 4.3. In Mizoram where shifting cultivation prevailed, farmers heavily dependent on rainfall and proper irrigation are not adopted in such a system. As a result, the expenditure on

irrigation accounts for only 2 percent (Rs 2,000 per hectare) of the total cost of ginger cultivation in the study area. Furthermore, the farmer usually used outdated tools such as a hoe, dao, sickle, etc. Owing to the adoption of traditional tools and practices, expenses on tools and implements are very low compared to other states where the agriculture system is a little bit advanced.

Figure 4.3 Cost of Cultivation of Ginger



Source: Field Survey 2019-20

4.6.2 Cost of Cultivation of Chilli

Although the method for estimating the cost of cultivation for chilli and ginger is similar, there is a little difference in the percentage share of cost components in the total cost of cultivation. The fundamental difference in cost of cultivation between ginger and chilli farming is that ginger is grown as a monocropping crop, whereas chilli is grown as a mixed cropping crop. As a result, chilli farming takes up more space than ginger farming. Furthermore, the nature of sowing and harvesting ginger and chilli differs significantly. Table 4.6 illustrates the components of cost of cultivation of chilli, the

monetary value of each component, and the percentage share of each component for one hectare of land in the study area during 2019-20.

As shown in Table 4.6 and Figure 4.4, the cost of harvesting has the highest share of the total cost with 23.68 percent (Rs 21,000 per hectare) followed by weeding and maintenance (21.31 percent). These two items are significantly higher than the rest of the cost items accounting for about half of the overall cultivation costs. Harvesting and weeding are more expensive in chilli cultivation than in ginger production because the area under chilli cultivation is frequently larger, necessitating more labor during the busy season like harvesting and weeding.

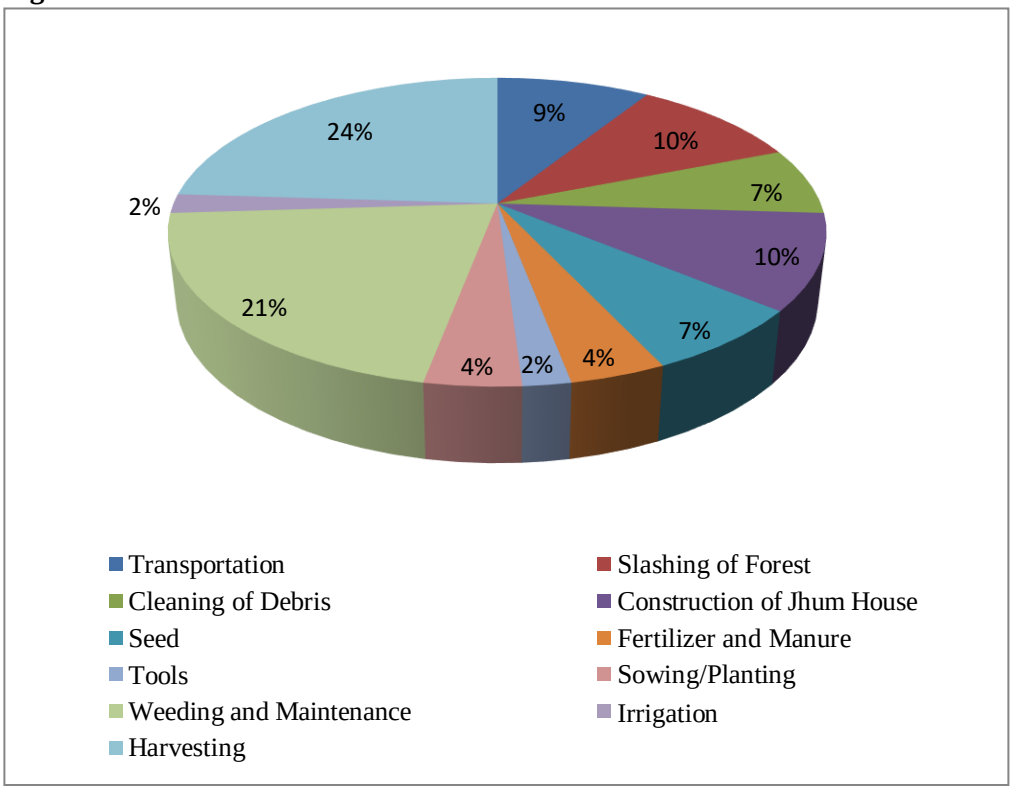
Table 4.6 Cost of Cultivation of Chilli

Sl.No.	Cost Items	Expenditure Amount (in Rs)	Percentage Share
1	Land Preparation (Slashing of Forest)	9200	10.37
2	Cleaning of Debris	6300	7.10
3	Construction of Jhum House	8700	9.81
4	Seed	6000	6.76
5	Fertilizer and Manure	4000	4.51
6	Tools	1800	2.03
7	Sowing/Planting	3200	3.61
8	Weeding and Maintenance	18900	21.31
9	Irrigation	1600	1.80
10	Harvesting	21000	23.68
11	Transportation	8000	9.02
12	Total	88700	100.00

Source: Field Survey 2019-20

The third and fourth largest cost items are slashing of forest (10.37 percent) and construction of jhum house (9.81 percent). The Transportation cost accounts for 9.02 percent of the total cost of cultivation. While the cost of clearing debris accounted for 7.10 percent of the total cost of chilli cultivation in the study area. The cost of seeds accounts for 6.76 percent. The percentage share of the rest of the cost components ranges between 4.51 percent and 1.80 percent, with irrigation costs being the lowest share. Figure 4.4 below shows the percentage share of different cost components in the total cost of chilli cultivation.

Figure 4.4 Cost of Cultivation of Chilli



Source: Field Survey 2019-20

4.6.3 Other Relevant Information on Cost of Ginger and Chilli Cultivation

On the cost structure of ginger and chilli, fertilizer, irrigation, and tools constitute only a negligible share of the total cost of cultivation. On the other hand, expenditure on weeding and maintenance, harvesting and transportation are major contributors to the total cost of cultivation in both ginger and chilli. The overall average cost of cultivation of ginger is Rs 101,100 per hectare which is higher than the average cost of cultivation of chilli cultivation which was Rs 88,700 per hectare in the study area. It was noticed that the per hectare cost of ginger cultivation was lower than chilli cultivation. This may appear perplexing, given that the area under chilli cultivation is typically larger than the area under ginger cultivation. So, it is reasonable to reason why chilli cultivation costs less than ginger cultivation, although the area under chilli cultivation is often larger. The first reason may be attributed to the cost of seeds. Chilli cultivation does not require a large quantity of seed unlike ginger cultivation which makes the cost of chilli cultivation less expensive compared to ginger cultivation.

Secondly, the process of sowing or planting seeds in ginger and chilli cultivation differs significantly. In one hectare of land, sowing chilli takes no more than 6 men days, whereas sowing ginger may take more than 16 men days. The transportation cost of the commodities from the farms to the local markets also differs significantly. This is because, chilli is harvested in dried form, whereas ginger is harvested in green form, which is much heavier than dried chilli thus necessitating additional transportation costs especially where transportation is done by headload. Thus, from the above observation, chilli cultivation is more likely profitable since the cost of cultivation is lower than ginger cultivation. In the economic theory of maximization, cost minimization is one of the criteria for profit maximization; one such condition is met in the case of chilli cultivation compared to ginger cultivation.

4.7 RETURN AND PROFITABILITY ANALYSIS OF GINGER AND CHILLI CULTIVATION

Monetary return on any type of cultivation depends upon several factors including the variety of seed, agro-climatic conditions, soil quality, disease, cultural practices, market prices, cost of cultivation, etc. Since these factors vary regionally, so is the return across the country. A crop that yields a high return in one state might not offer a high return in other states. Thus, profitability analysis is very crucial before starting any kind of farming.

In this section, per hectare annual gross return, net return (profit), and benefit-cost ratio (B-C ratio) of ginger and chilli were estimated for the last six years beginning from 2014-15 to 2019-20. Gross return is simply the market value of production whereas net return implies the difference between gross return and total cost of cultivation. It is important to note that the market value of production was estimated by multiplying the quantity of output with the prevailing market price in that particular year. Apart from that, per hectare cost of cultivation and production were also estimated by taking per hectare average production from different villages in the study area. Table 4.7 depicted per hectare average cost of cultivation, average gross return, the net return, and benefit-cost ratio (B-C ratio) in the study during 2015-16 to 2019-20.

From the results presented in Table 4.7, it is very clear that the average cost per hectare has fluctuated in both ginger and chilli cultivations, but the degree of fluctuation is more in chilli cultivation than in ginger cultivation. The reason for the high fluctuation in chilli cultivation is that farmers in this area have grown chilli as an intercrop in paddy fields (jhum land) while ginger is treated as a monocropping in the study area. Since chilli as mixed cropping in jhum land is more likely to be affected by any policy changes in the state. Policy changes usually have an impact on the cropping pattern in the State which has affected the jhum area under cultivation making ups and down in the cost of cultivation of chilli.

As regards gross income, the study revealed that gross income from ginger and chilli cultivation consistently increases over the years. In 2014-15, the gross income from ginger production per hectare was Rs 144,432, which increased to Rs 208,311.90 in 2019-20, a 1.5-fold increase in just 6 years. Similarly, chilli experienced a similar trajectory, with a gross income per hectare of Rs 207,931 in 2014-15 rising to Rs 383,662.13 in 2019-20, representing an increase of more than 1.8 times in six years.

Table 4.7 Profitability Analysis of Ginger and Chilli Cultivation

Year Column-1	Average Cost (in Rs) Column-2		Gross Return (in Rs) Column-3		Net Return/Profit (in Rs) Column-4		B-C ratio Column-5	
	Ginger	Chilli	Ginger	Chilli	Ginger	Chilli	Ginger	Chilli
2014-15	92042.49	117254.93	144432.8	207931.47	52390.35	90676.54	1.57	1.77
2015-16	95171.36	100694.58	134601.5	229896.59	39430.11	129202.00	1.41	2.28
2016-17	99506.76	83828.52	157832.2	266862.29	58325.48	183033.80	1.59	3.18
2017-18	94376.99	74186.48	180282.2	273861.78	85905.26	199675.30	1.91	3.69
2018-19	92112.59	70988.92	215654.1	319953.77	123541.54	248964.90	2.34	4.51
2019-20	94925.69	88700.00	208311.9	383662.13	113386.21	294962.10	2.19	5.98

Source: Field Survey 2014-15 to 2019-20

High gross income is a heartening result, yet it does not show how profitable the cultivation is. The profitability is clearly shown by the net income and benefit-cost ratio. The net income and benefit-cost ratio are shown in the fourth column of Table 4.7. The net income of ginger and chilli cultivation increased significantly over the years. The net income of ginger is Rs 52,390.35 in 2014-15 which increased to more than double in 2018-19. The net income of chilli cultivation shows a more robust result which increased from Rs 90, 676.54 in 2014-15 to Rs 319,569.20 in 2018-19, which is more than three times the initial value.

The benefit-cost (B-C) ratio in the last column reveals that chilli cultivation is relatively profitable compared to ginger cultivation. The average B-C ratio of chilli during the reference periods was 3.56 while the average B-C ratio of ginger was only 1.83. The higher B-C ratio of chilli cultivation is mainly because while chilli cost of cultivation per hectare declined from Rs 117,254.93 in 2014-15 to Rs 88,700 in 2019-20, its market price per kilogram has dramatically increased from Rs. 264.77 to Rs 360.23 during the same period. Such situations have not been observed in ginger cultivation, where, despite rising cultivation costs, the market price was relatively stable over time, hovering around Rs 26-31.

From the result of the analysis, we found that chilli cultivation is relatively more profitable than ginger cultivation. The average product of ginger for the study periods is 6,357.10 Kg whereas the average product of chilli was 915.34 Kg. Although chilli has a lower average product, it has a far higher market value than ginger. During the period 2014-15 to 2018-19, the market price of chilli climbed by 36.05 percent, while the price of ginger increased by only 6.5 percent. This indicates that chilli cultivation is more viable and promising than ginger cultivation in the study area.

As mentioned in the previous section, farmers in the study area adopted the traditional method with outdated tools and implements. The absence of a proper irrigation system, lack of fertilizer, and prevalence of shifting cultivation combined with poor road connectivity would undoubtedly present several challenges and have

a negative impact on the profitability of ginger and chilli cultivation. Despite these issues, farmers who have no other options could still make a handsome return. If the competent authority pays attention and provides incentives to the farmers, the farmers in the study area will certainly be able to earn a higher net return and thereby contribute to the state's welfare.

4.8 PRODUCTION PROBLEM IN GINGER AND CHILLI CULTIVATION

Identification of problems relating to production is the most important single factor for further improvement in the agriculture sector. Once the problem is known, the government can develop strategies and policies to effectively address the issues and launch specific interventions in the most critical areas. This will ensure effective policy formulation and implementation. In this study, the problem relating to production are measured using a five-point Likert scaling technique by taking relevant production problems such as disease, fertilizer, skills of the labor, irrigation, and availability of credit facilities. Results of the rank scale for ginger and chilli cultivation are presented in Table 4.8.

The value derived from the rank scale revealed that lack of credit facilities had an index value of 0.82 in ginger cultivation and was ranked as the most serious problem, followed by disease and insect problem while fertilizer was ranked as the least significant problem with an index value of 0.42. In chilli cultivation, disease and insect have the highest index value of 0.83 followed by credit facilities with an index value of 0.70. One can observe that the top two problems in ginger and chilli cultivation are interchange. Relative seriousness of the problems experienced by the ginger growers followed the sequence of lack of credit facilities, disease and insect problems, skilled labor, irrigation and fertilizer while chilli has a sequence of disease and insect problems, credit facilities, lack of skilled labor, fertilizer, and irrigation.

Table 4.8 Important Index of Production Problems

Relative Importance Index (RII) of Production Problems								
Items (Column-1)	Total Score		A*N		Index		Rank	
	Ginger	Chilli	Ginger	Chilli	Ginger	Chilli	Ginger	Chilli
Disease and Insects	1338	1338	1770	1610	0.76	0.83	2	1
Fertilizer	617	762	1770	1610	0.35	0.47	5	4
Irrigation	873	671	1770	1610	0.49	0.42	4	5
Skilled Labor	1033	1039	1770	1610	0.58	0.65	3	3
Credit Facilities	1450	1129	1770	1610	0.82	0.70	1	2

Source: Own Calculation from Field Survey Data

According to ginger growers, the absence of easy credit for farmers has put lots of hardship in raising production and productivity. Farmers, for example, have three peak seasons in shifting cultivation, forest slashing and debris clearing, weeding, and harvesting. All these seasons necessitate a high number of labor forces, thus farmers must hire laborers to finish the task on time, or else production and productivity would suffer. Farmers, in such situations, require financial support from banks not only for productive purposes but also for family consumption. As a result, if credit access is not available, all farm activities will not complete on time, resulting in low production and productivity.

The problem of disease and insects is a common problem among poor farmers not only in Mizoram but also across the country. The reason for the low index value of fertilizer and irrigation in both ginger and chilli cultivation indicates that the agro-climatic conditions in the study area are favorable for growing crops. Since Mizoram has a good rainfall with the predominance of shifting cultivation, a proper irrigation system is not considered the problem in ginger and chilli cultivation. Likewise, with the farming system being organic and the soil being fertile, the farmers did not treat the lack of fertilizer as a serious problem.

4.9 DETERMINANTS OF PRODUCTIVITY IN GINGER AND CHILLI CULTIVATION

Identification of determinants of production and productivity is critical to making further advancements in the agriculture sector. Without knowing the basic determinants of production and productivity, it is very difficult to make the rapid pace in developing the agriculture sector. However, the identification of determinants of farm production and productivity is not an easy task as many factors are involved. Traditionally, it is believed that production and productivity are determined by physical capital, human capital, natural endowment, and technological knowledge. Although these factors affect production and productivity, they are broad terms and can further be decomposed into various factors. Thus, identification of specific factors affecting farm production and productivity are still the major challenges due to lack of data availability, difficulty in identifying relevant factors, the scientific nature of agriculture, and financial and time constraints. Owing to such hassles, the study considers only some characteristics which can be collected from the household directly.

In developing countries like India, agriculture is mostly backward and underdeveloped. In such a scenario, the volume of production and area of the farm size are highly correlated and hence expansion of the farm size would imply a higher level of output. However, owing to the expansion of farm size, increasing output might not increase the productivity of a farm. Thus, what matters is the identification of determinants of productivity to make the right track for agriculture development. Therefore, in this study, the focuses have been given to the determinant of productivity of ginger and chilli.

As mentioned in the methodology in the first chapter, determinants of productivity of ginger and chilli are estimated using a multiple linear regression model by taking the number of agricultural labor in the household, gender of the household head, amount of seed and fertilizer used, and area of farm size as independent variable and productivity of ginger and chilli as the dependent variable.

Table 4.9 shows the model summary of the multiple regressions generated by Statistical Package of Social Science (SPSS).

Table 4.9 Model Summary of Ginger and Chilli Cultivation

Model Summary									
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**Change Statistics**				
					R Square Change	**F Change**	**df1**	**df2**	**Sig. F Change**
Ginger	.605	.366	.356	1.5755754	.366	39.087	5	339	.000
Chilli	.549	.301	.288	1.6197555	.301	21.831	5	253	.000
a. Predictors: (Constant), Gender, Seed, Labor, Fertilizer, Area									
b. Dependent Variable: Productivity									

Source: Own Calculation from Field Survey Data

As shown in Table 4.9, F-change is statistically significant for both ginger and chilli indicating that the predictors can account for a significant amount of variance in the productivity of ginger and chilli. In other words, the overall regression models of ginger and chilli are a good fit for the data indicated by F-values, and p-values in table 4.9. Table 4.9 shows that the independent variables significantly predict the dependent variable for both ginger and chilli productivity with $F(5, 339) = 39.087$, $p(.001) < .05$ for ginger and $F(5,253) = 21.83$, $p(0.001) < 0.5$ for chilli.

The R-square indicates the collective impact of the predictors on the dependent variable for both ginger and chilli, as shown in Table 4.9. In the case of ginger, the predictors in the model explain 36.6 percent of the change in productivity, whereas it is 30.1 percent in the case of chilli. Although the overall regression models are statistically significant for studying ginger and chilli, the values of R-square are very low indicating that the productivity of ginger and chilli is greatly affected by many factors such as soil quality, rainfall, temperature, and other climatic conditions. As such, our regression model could explain only about 36 percent of the

variation in ginger productivity and 30 percent of the variation in the productivity of chilli.

The model summary presented in Table 4.9 look at the overall regression model while the coefficient table looks at each of the predictors individually as shown in Table 4.10. From the results presented in Table 4.10, ginger productivity is influenced by the number of agricultural laborers in the family, quantity of seed and fertilizer, gender of the household head, and size of the farm, which are statistically significant at 5 per cent. The same inputs were statistically significant in the case of the productivity of chilli except for the number of agricultural laborers. This may be attributed to the more susceptibility of chilli against diseases and unfavorable climate compare to ginger. With such vulnerabilities, a household having many agricultural laborers may also experience low production and productivity. However, this does not mean that ginger is unsusceptible and resistive to diseases and unfavorable climates. It means that ginger if not attacked by diseases generally gives a constant output while chilli is vulnerable to many other factors such as rainfall, diseases, sunshine, etc., throughout its maturity period from sowing to harvesting. Furthermore, while ginger requires much labors during the sowing seasons chilli does not require such amount of labor as the seeds are usually dispersed on the jhum land.

The amount of seed also has a significant impact on the productivity of ginger and chilli. In the case of ginger, it is significant at 5 percent while in the case of chilli, it is significant at 1 percent. In shifting cultivation, chilli is sown by dispersing the seeds on the farmland, which may be swept away by heavy rainfall or may fail to grow because of drought. In this scenario, the amount of seeds used is the most critical factor in achieving a high output. Ginger is planted by digging the ground and placing the seedlings inside the ground; unlike chilli cultivation, the seedlings are not usually lost.

The coefficient of fertilizer is equal to 0.63 and 1.207 for ginger and chilli respectively indicating the change in ginger and chilli productivity when fertilizer used increased by 1 kilogram. The ginger productivity increased by 0.63 quintals and

chilli productivity by 1.207 compared with none fertilizer users when all other predictor variables were constant in the regression model.

Table 4.10 Coefficient Table

Coefficients						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
Ginger	(Constant)	7.145	.380		18.782	.000
	Labor	.186	.061	.133	3.063	.002
	Seed	.148	.068	.106	2.180	.030
	Fertilizer	.630	.135	.215	4.654	.000
	Gender	.593	.285	.091	2.081	.038
	Area	-1.855	.192	-.502	-9.685	.000
Chilli	(Constant)	9.270	.714		12.988	.000
	Labor	.193	.102	.100	1.884	.061
	Seed	.555	.143	.222	3.889	.000
	Fertilizer	1.207	.169	.405	7.139	.000
	Gender	.955	.455	.113	2.100	.037
	Area	-1.024	.501	-.109	-2.043	.042
a. Dependent Variable: Productivity						

Source: Calculated using SPSS-20 from Field Survey Data

Gender also has influenced the productivity of ginger and chilli, since both these variables are significant at a 5 percent level of significance indicating that a household head with male is more likely to have a higher yield in the cultivation of ginger and chilli.

Land area is one of the most important factors in agricultural production. Generally, the farm size has a positive impact on production and productivity as a larger farm size has the advantage of applying advanced machinery and technology. However, the study found an inverse relationship between farm size and productivity. This highlights the peculiarity of shifting cultivation practice in the

study area. The reason we have an inverse relationship between farm size and yield is that when the farm area increased by 1 hectare, the farm size is beyond the farmer's manageable level given his existing resources. This is the case of diseconomies of scale where the expansion of operation or scale leads to a lower yield. The study found that when farm size increased by 1 hectare, the level of yield decreased by 1.855 for ginger and 1.024 for chilli keeping all other variables constant.

CHAPTER-V

MARKETING OF GINGER AND CHILLI: DATA ANALYSIS

5.1 INTRODUCTION

Marketing has played a crucial role in the development of agriculture, especially in developing countries. A well-functioning agricultural marketing system is the key component for accelerating agricultural production and thereby promoting economic growth. An efficiently organized market system not only facilitates the smooth disposal of farmers' produces but also acts as a catalyst to stimulate production and productivity. Agricultural marketing serves not only as a means of exchange, but also as a means of production, distribution, and allocation, thus affecting the level of income, employment, distribution patterns, and economic development in general. In short, agricultural marketing creates a conducive environment and conditions for rapid economic growth. Thus, any economic development plan that aims at reducing poverty, lowering prices, increasing foreign exchange earnings, or eliminating economic waste must therefore give special attention to the development of an efficient agricultural marketing system.

5.2 MARKETING PRACTICES IN THE STUDY AREA

A good agricultural marketing system is vital to the development of the agriculture sector in a state like Mizoram where predominance of agriculture still prevails. Strong and healthy economic expansion requires commercialization of the agriculture sector, specialization, and raising productive capacity, which in turn depend on an efficient marketing system. Unfortunately, there is no systematic and reliable marketing system in the study area. Processing and value addition such as cleaning, drying, grading, and packaging are not practiced in the study area. Farmers sold their produce in raw form. The farmers do not have adequate storage facilities which further reduce their bargaining power. The produce collected from their farms is stored in their yards or open spaces before selling to the agents. This resulted in post-harvest losses such as spoilage, moisture, etc., which lead to physical damage to the product.

The ginger growers and local collectors are the key players in the marketing of ginger while in some cases middle man from other states also engaged in the marketing activities. Collectors and middlemen are mostly responsible for buying, assembling, and

transporting objects, whereas farmers are only in charge of selling. The general marketing practices in the study area are described below.

Packing

Packaging is an important function for every produce and so is the marketing of any produce. Owing to agriculture practices in Mizoram being very backward and unorganized, packing is done mostly to facilitate convenience in transportation and storage. It is also a practice to protect the produce from any damage during storage, transportation and other marketing aspects. Packing of ginger and chilli is mostly carried out by the producers. Producers generally use gunny bags to take their produce to the collection center in the village. The capacity of the bag is usually 50 kilograms. In the case of ginger, farmers sold it in green form, while in the case of chilli; dry chillies are marketed in the study area.

Storing

The farmers in the study area do not have adequate storage facilities which significantly reduced their holding capacity of the produce. Before the farmers take the produce to the village collection centers, they stored their products in their house courtyard, basement, or in an open spaces. The produces are then brought to the collection center when the farmers find that the price is suitable. However, green ginger being a perishable good, the farmers cannot s t o r e i t for a long period. The important factors responsible for losses in the storage of ginger are dehydration, rhizome rot and damage by insects. The majority of chilli produced is dried in open space. The major loss was due to dryness, which amounted to 20-15 percent of the total weight of the pods. Dry chilli can be stored for a longer period without much quality deterioration, yet farmers mostly sold without holding much longer owing to the fluctuation and uncertain price of the produce.

Grading and Labelling

Grading and labelling are pre-requisite for the development of the modern marketing, trade, and economy of any commodity. Grading and labeling of ginger and chilli are not administered in the study area which is the next step for producers in which improvement can be made. Since almost all the ginger and chilli farming are organic; it is possible to have certified grading or labeling as organic products. Apart from that, geographical identification tag (GI Tag) may also be obtained for the unique characteristics of ginger and chilli in Mizoram.

Mode of Transportation

Transportation is a critical component of a more efficient and well-organized marketing system. The availability of a quick, dependable, and less expensive mode of transportation has a considerable impact on the profitability of ginger growth. Transportation is one of the underlying problems in ginger and chilli marketing in the state and the study area. The lack of less expensive modes of transportation is the main reason why farmers cannot perform direct selling to retailers and customers outside the state where prices are favorable. The procurement of the product from the farm site to the villages is done by the farmers by head load or by hiring vehicles where there is a linked road. Because of this, the cost of transporting the produce from the farm site to the village is not included in the cost of marketing. Rather, the marketing cost of transportation of the produce consists of expenditure incurred by farmers or agents from villages to further upstream market channels. Generally, the commission agent/middleman/village merchant collected the produce from the collection center in each village at a price determined by such agents which are then transported to other destinations using motor vehicles. The destination of such produce depends upon the channel of the market inwhich the producers choose to sell.

Assembling

Since no controlled market places are available in the state, the primary producers keep the produce for times of glut when village merchant/agent/Itinerant offer certain prices. When producers feel that prices are favorable, they brought their products to the collection point in their village and try to sell them as quickly as possible, because storing and selling them at a lower price could result in further losses due to price fluctuations. Dry chillies are sold in the case of chilli, whereas raw ginger is sold to the buyer in the case of ginger.

Loading and Unloading

Transportation of the produce from one point to another requires loading and unloading of the produce. The collected produce at the collection point in each village is loaded to the truck for other destinations. The expenses for the loading and unloading are mostly borne by the intermediaries. However, a certain percentage of producers used to sell their produce directly to the retailer in Aizawl city of Mizoram and Bagha of Assam. In such a case, all the loading and unloading charges are paid by the producers.

Dispatches

Raw ginger and dry chilli, packed in gunny bags are mostly dispatched to the markets of adjoining states (i.e. Assam). Unlike other states in India, it is found that a large quantity of ginger and chilli; almost 98 percent of the total produce is dispatched outside the states. In the study area, the local consumption of ginger and chilli accounted for about only 1 per cent of the produce. The low consumption level of ginger and chilli within the state may be attributed to a lack of processing facilities as well as limited value addition of the products.

5.3 GENERAL MARKETING CONSTRAINTS IN THE STUDY AREA

Lack of Marketing Information:

Due to a lack of market information such as prices, demand, and current prices in other market places, it is difficult for farmers to choose whether to sell or store their produce to capture a good price. Under such circumstances, it is very risky for poor farmers to bring their produce to sell in other markets such as Bagha, Silchar or Guwahati**.** Even if they brought their produce to such markets, they are still at risk of losses due to their lack of bargaining power.

Lack of Adoption of Grading

Grading and labeling ginger and chilli would ensure better prices for the producers and better quality for consumers. However, most of the agricultural markets in the state are lagging in providing grading services. This has led to the manipulation of the market for ginger and chilli. The intermediaries or other parties may treat the products as low quality and negotiate low prices even though the quality of the commodity is of good quality.

Inadequate Storage Facilities

Due to inadequate storage facilities, farmers are forced to sell their produce at lower rates. This is the case, especially in ginger where fresh gingers are sold to the agent. In the case of chilli also, farmers do not have adequate storing facilities. Even though dry chilli does not require cold storage unlike other perishable goods, it requires more space in a safe place. It is difficult to provide such spaces and safe storage for a long period of time; therefore, farmers are still forced to sell chilli within a short span of time.

Lack of Processing Units

Due to a lack of processing units, excess productions during the peak season are sold at distress rates or even get perished at the farm level. The farmer has no other

option but to sell his or her produce at a price set by middlemen. As a result, farmers have little price control and are thus exploited by intermediaries from outside the state.

Lack of Training of Producer

The farmers are not properly trained in harvesting, transporting, and marketing ginger and chilli. Training will improve their skill for better marketing of their produce.

5.4 MARKETING CHANNEL

Since the farmers in the study area are mostly small and marginal farmers with a limited surplus, they find it convenient to sell the produce to the village merchants or other agents at nearby markets at a price decided by negotiations. Besides, most of them are not generally familiar with the marketing practices followed in the upstream market. Thus, the assembling of ginger and chilli generally takes place in two ways. Firstly, the farmers themselves take the produce to the nearby markets for sale. Secondly, the village merchants or other agents purchase the produce from growers in the villages and take the same to the assembling markets. Village merchants or agents have a major role in assembling the product.

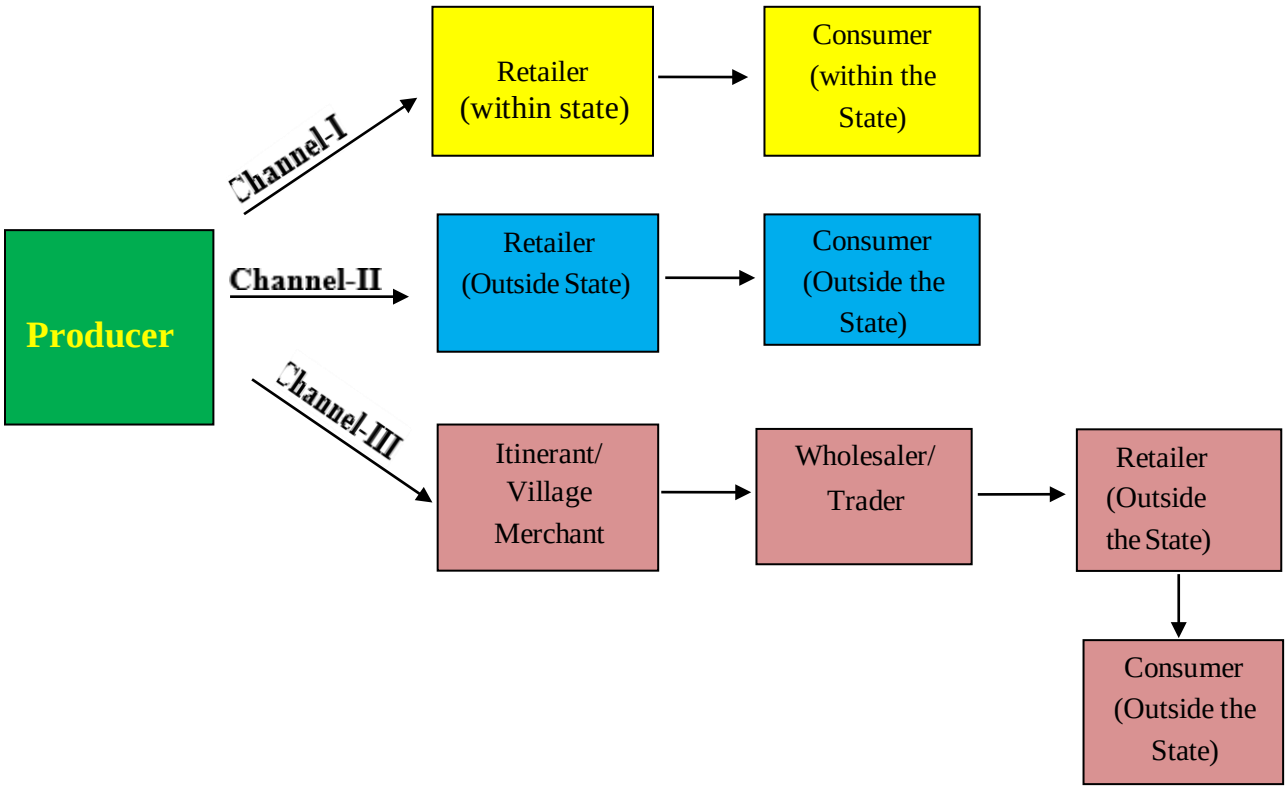
Marketing Channel is simply called a distribution method of production, in which produce is transferred from the point of production to the point of consumption. In simple terms, it is a channel between the producer and the customers. The marketing channel has played a crucial role in shaping the commercialization of agriculture. It is considered that a good marketing channel will automatically lead to the development of the agriculture sector on the one hand and an incentive to the farmers on the other. Unfortunately, there is no organized marketing channel in the study area even though ginger and chilli are the most important cash crops. The market for ginger and chilli is still uncertain not only in the studyarea but also in the state of Mizoram as a whole.

Altogether, the current marketing channel of both ginger and chilli can be classified into three channels as shown below.

Channel-I: Producer--------- Retailer----------Consumer (Local)

Channel-II: Producer----------Retailer------- Consumer (Outside State)

Channel-III: Producer-----Itinerant/Village Merchant-------Wholesaler/Trader----Retailer --------- Consumer (Outside State)



In Channel-I, the farmer/producer directly sold their produce to the retailer in the local market mainly in Aizawl city. Since, only small portion of the producer is directly sold to the retailer within the state, the relative share of Channel-1 in terms of volume of the total produce is very small and negligible. In Channel-1, the producers take their produce to the retailer in Aizawl city and sell it at a price mostly decided based on negotiation. In most cases, the farmers brought their produce to the Aizawl market by their own transportation arrangement thus bearing all the marketing cost such as expenses on loading and unloading, packing, assembling and transportation. In case of ginger, the marketed good are mostly in raw and green form, while in case of chilli, both dry chilli and green chilli are traded under Channel-I. It is to be noted that we consider only marketing of green ginger and dry chilli as both are the common practices in the state. The reason behind the low relative share of Channel-I in both ginger and chilli marketing is due to low domestic demand. As per COI, 2011, Mizoram is one of the least populated states in India with less than 11 lakh population. With such small population and predominance of agriculture, demand for fresh ginger and dry chilli is unlikely to be high.

In Channel-II, the producers or representative of producer collect the produce and sold directly to the retailer at Bagha at a negotiated price. However, the farmers with weak bargaining power has little control over the price and hence, the price mostly favor the retailers. The prices in channel two are slightly lower than the prevailing wholesale prices of the next destination. Once they have gathered enough quantity, they take them in bulk to the market at Bagha (Assam) by arranging their own transportation. Usually, the relative share of Channel-II in the total produce is slightly higher than Channel-I, but much lower than Channel-III. Producer in Channel-II generally received higher prices since they sold their produce directly to the retailer outside the state. However, Channel-II required producer to bear all the marketing cost and necessitate them to make transportation arrangement up to the point of sell outside the state. This poses difficulty to the producers who have limited knowledge on the

market price, demand condition outside the state. As a result, only small portion of producers can follow Channel-II despite the fact that prices are relatively better.

In Channel-III, itinerant traders from outside states appear to be the key actors at the village level. However, itinerant traders also employ local agents to procure farmers' produce by providing requisite fund. Thus, local agents also act as commission agent for the sake of the itinerant trader and make certain amount of profit. Generally, the itinerant and commission agents collected the farm produces (i.e. ginger and chilli) in the villages at the price determined by the itinerant traders. In this way village merchant/itinerant serves as a vital link between producers and wholesalers in Assam. However, tracing the flow of these products after they pass through the primary collection points of Assam is extremely difficult. This can be considered as the limitation of the study to further study the marketing aspects of ginger and chilli outside Mizoram. In most cases, the products were transported by the itinerant traders to the wholesalers in the next destination such as Silchar and Guwahati in Assam and some part of West Bengal, which is further moved to the next dealers located in otherparts of the country and foreign countries.

5.5 DISPOSAL PATTERN OF THE PRODUCTS

Based on the above marketing channels in the study area, the farmers are classified based on the channels in which they sold their produce for the year 2019-20. It is evident that among the three Channels, the most common type of marketing in both ginger and chilli was marketing Channel-III while the least prevalent channel was Channel-1. Table-5.1 represents, marketing agents, number of farmers and volume of the produce sold in both ginger and chilli marketing in the study area during the period of 2019-20.

As shown in Table 5.1, out of the total respondent of ginger farmers, 88.98 percent of the ginger farmers follow Channel-3, 7.63 percent follow Channel-II and the rest 3.39 percent follow Channel-1. Chilli market also witnessed the same pattern where channel is the most prevalent Channel and Channel-I is the least opted channel. More than 94 percent of the total respondent of chilli producers followed Channel-3, 6.51 percent followed Channel-II and the remaining 3.11 percent of producers chose Channel-1. From the above table, it revealed that only 1.18 percent and 1.43 of the total produce of ginger and chilli were disposed in Channel-I. Channel-II shows disposal of slightly higher volume in both ginger and chilli with 4.13 percent and 4.21 percent of the total produce respectively. In Channel-III, 94.69 percent of the total produce of ginger and 94.66 percent of the total produce of chilli are sold.

Table 5.1 Disposal Pattern of Ginger and Chilli in Different Marketing Channels

Channel	Main Agents	No. of Farmer		Volume of the Produce	
		Ginger	Chilli	Ginger	Chilli
I	Producers/Farmers	12 (3.39%)	10 (3.11%)	1.18%	1.43%
II	Retailers/Village Merchants	27 (7.63%)	21 (6.52%)	4.13%	4.21%
III	Itinerant and Local Agents	315 (88.98%)	291 (90.37%)	94.69%	94.66%
Total		354	322	100	100

Source: Own Calculation from Field Survey Data, 2019-20.

As mentioned earlier, Channel-I is mostly denied by farmers on ground of limited demand for fresh ginger and chilli in the domestic market. In Mizoram, shifting cultivation is still practiced across the state, in which mixed cropping is the common

practice. As such, almost every household in the villages has harvested different vegetable crops for subsistence consumption. The demand for such vegetable corps arises mainly from Aizawl city other towns. Regarding Channel-II, many farmers are not willing to engage in various marketing activities such as transportation arrangement, bringing the produce to retailers outside state, hiring labor for loading and unloading. Rather, farmers/producers are happy in selling their produce at the collection center in their villages without any further engagement in marketing activities. These are the reasons why marketing Channel-III has absorbed majority of the total produce of both ginger and chilli. The relatively higher share of Channel-III in terms of both number of farmers and volume of trade is mainly the presence of agent at the village level and bulk purchasing of such agent with easy payment to the farmers. The farmers, who do not have good storage and packing facilities, cannot move their bulk produce at retail market or wholesale market, which further requires transportation arrangement, transportation cost and longer period of payment. As such, most farmers of ginger and chilli chose Channel-III, where the agent collect their produce nearby their house and make payment within a short period of time.

It is evident from the above that if the government could intervene in areas such as transportation, storage, minimum support price, etc., the farmers' negotiating power would be strengthened, allowing them to sell at a better price. Due to the lack of such intervention, farmers in most cases sold their produce at a price set by the agents, as the farmers' bargaining power is extremely limited. The result of the analysis also shows that the amount of local consumption, as indicated by volume of produce in Channel-1 is very low compared to volume of produce sold in other channels. This clearly reveals absence of value addition in the supply chain of both ginger and chilli. It also indicates lack of processing unit in the states, otherwise, the volume of produce in Channel-1 are likely to be higher than the present record. Thus, improving the agro-based industries and processing units is the need of the hour to reap the fruit of agriculture sector in the state.

5.6 MARKETING COST OF GINGER AND CHILLI

Marketing costs is the total expenditure on the marketing activities which include expenditure on hiring labor, transportation, packaging, containers, rent, etc. Marketing costs of agricultural produce vary from commodity to commodity and changes overtime depending on the nature of commodity, consumption pattern, storage, transportation, market distance, packing, labor, tax and price (Acharya and Agarwal, 2010).

In this section the marketing cost of each channel is estimated separately. In all marketing channels, the average estimated marketing cost of ginger and chilli borne by the producers and marketing agencies in different marketing channels is used as the representation of marketing cost of that particular channel. Marketing cost items in all channels include expenditure on loading and unloading, gunny bag or plastic bag and transportation cost, expenses on assembling and packing. In case of Channel-I, producer has borne all the marketing cost till the commodity reach its destination. However, in case of Channel-II and channel-III, the marketing costs are shared by producer and agent. The marketing cost of the three prevailing channels is presented in Table 5.2 below.

The total marketing costs turned out to be highest in Channel-III in the destination of Silchar and followed by Channel-II with destination of Bagha, while it is lowest in case of Channel-1. It is, thus, clear that the total marketing costs is directly related to the distance the commodity must travel to reach its destinations.

The stakeholders in Channel-1 usually transport their goods using motor vehicles by paying hiring charge, while 207 motor and trucks are the means of transportation in this channel. The marketing cost in this channel for fresh ginger and dry chilli is estimated to be Rs 125 and 395 per quintal respectively. In Channel-II the producers hired trucks of 6 wheels, after packing the produce in gunny bags and

transported to the retailers in Bagha (Assam). The marketing cost is estimated to be Rs. 605 per quintal in case of fresh ginger and Rs 757 in case of dry chilli. The total charges of the destinations in Channel-III are estimated to be Rs.659 per quintal for ginger and Rs.765 per quintal for dry chilli.

Another feature of marketing cost is that the producer bear expenses on packing, assembling and transporting loading and unloading, not by the facilitating agency, in case of Channel-I, while in case of Channel-II, the producer carried out packing, assembling, transporting, loading and unloading, the retailer also make expenses on assembling, storage charges and transportation charges from the warehouse to the retail market within that area. In Channel-III, the producer makes expenses on assembling where his produces are brought from his stock point to the collection point in his village. The remaining marketing cost in Channel-III is shared by retailers and wholesaler with wholesaler share being more than the retailer share. The marketing cost of in Channel-II and Channel-III are relatively higher since the distance of the destination is relative longer.

From Table 5.2, it is evident that the marketing cost of chilli is relatively higher than that of ginger marketing cost. It is noteworthy that in each marketing channel, the hiring charges of labor for loading and unloading is almost same in both ginger and chilli, yet ginger being a heavier commodity requires less gunny bags for packing 1 quintal while chilli require more bags for packing 1 quintal. Apart from that the carrying capacity of a truck for ginger and dry chilli also shows significant different. Dry chilli being a light commodity requires more space unlike fresh ginger, which limited the carrying capacity of motor vehicles leading higher per quintal transportation cost.

It is to be noted that the respondent farmers are unable to give detail information on the expenditure incurred in the process of marketing their produce. Likewise, detail marketing cost of wholesaler and retailer outside the state are difficult to collect since

these respondents do not like to share some information on marketing activities. In some cases, they did not know the exact figure since they do not properly maintain record book. As such, it difficult to collect information on taxes, storage chargers, handling charges of the retailers and wholesaler outside the state. It was therefore; decided to limit marketing cost to some common items in which average figure can be estimated.

Table 5.2 Marketing Cost of Ginger and Chilli in the Study Area

Channels	Destination	Main Actors	Cost Items	Marketing Cost(Rs/Quintal)				Marketing Cost(Rs/Quintal)			
				Ginger				Chilli			
				Producer	Agent		Total	Producer	Agent		Total
Channel-I	Aizawl	Producer/Farmers	Gunny Bags	60	60		60	60	0		60
			Labor (loading and Unloading)	60	0		60	50	0		50
			Transportation	200	0		20	285.7	0		285.7
Total Marketing Cost in Chanel-I				125				395			
Channel-II	Bagha	Producers/Village Merchants	Gunny Bags	60	45		45	80	60		60
			Labor (loading and Unloading)	60	60		60	60	60		50
			Transportation	500	100		500	647	150		647
Total Marketing Cost in Chanel-II				605				757			
Channel-III	Bagha/Silchar	Itinerants/Village Merchant	Gunny Bags	0	45	45	90	0	60	60	120
			Labor (loading and Unloading)	15	60	65	140	15	60	65	125
			Transportation	0	100	329	429	0	150	370	520
Total Marketing Cost in Chanel-III				659				765			

Source: Own Calculation from Field Survey Data, 2019-20

5.7 MARKETING MARGIN, PRODUCERS' SHARE AND PRICE SPREAD

The study of marketing margin and price spread is critical in developing an effective marketing policy. Considering the quality of various services and operations carried within the agricultural marketing system, the most essential measure of the efficiency of a marketing system is the marketing costs, marketing margin and price spread, (Kahlon and George, 1985). The marketing margins and price spread in an efficient marketing system are relatively close to transportation expenses, handling charges, and the traders' usual earnings.

Marketing margin and pricing spread range significantly from Channel to Channel and are closely proportional to channel length, (i.e., the longer the channel, the higher the marketing margin and price spread). Marketing margin is the profit earned by various intermediaries involved in moving the product from the point of production to the ultimate consumer, while the price spread is the difference between the price paid by the consumer and the price received by the producers for an equivalent quantity of farm produce. In the view point of marketing efficiency, this gap must be reduced to the closest minimum (Gunwant *et al.*, 2012).

The fraction of the consumer's payment received by the producers is known as the producer's share. The marketing margin and producer's share and price spread are indicators of the current marketing system's efficiency. Marketing system efficiency is ensured by a lower marketing margin, lower price spread and a higher producer's share. Channel wise analysis of marketing cost, marketing margin, price spread, and net price received by farmer producer of ginger and chilli is presented in Table 5.3, Table 5.4, and Table 5.5

Table 5.3 Marketing Margin, Producer's Share and Price Spread of Ginger and Chilli in Channel – I (*Rs/Quintal*)

Particular	Ginger	Producer Sharein Ginger	Chilli	Producer Share in Chilli
Selling Price	3300	82.5	31400	87.22
Marketing Cost	125	3.125	395	1.09
Net Price Received by Producer	3175	79.375	31005	86.12
Marketing Margin	575	14.375	4600	12.77
Price Spread	700	17.5	4995	13.87
Consumer Price	4000	100	36000	100

Source: Own Calculation from Field Survey 2019-20

Table 5.4 Marketing Margin, Producer's Share and Price Spread of Ginger and Chilli inChannel – II *(Rs/Quintal)*

Particular	Ginger	Producer Sharein Ginger	Chilli	Producer Share inChilli
	Producer Level			
Selling Price	4100	85.42	37000	88.10
Marketing Cost (A)	605	12.60	757	1.80
Net Price Received by Producer	3495	72.81	36243	86.29
	Retail Level			
Purchase price/sale price of producer	4100	85.42	37000	88.10
Marketing cost of Retailer(B)	205	4.27	355	0.61
Net margin of Retailer	895	10.31	4645	11.30
Total Marketing Cost (A+B)	810	16.88	1112	2.41
Consumer Price	5200	100.00	42000	100.00
Price Spread	1100	14.58	5000	11.90

Source: Own Calculation from Field Survey 2019-20

In Channel II, retailers subsist as an intermediary between producer and consumer. In this channel, farmer-producer sells their produce directly to retailer outside the state by their own transportation arrangement. The total marketing cost of ginger and chilli in Channel-II is Rs 810 and Rs 1012 per quintal respectively. Out of the total marketing cost, the farmer/producer obtains 74.6 percent while the percentage costs incurred by retailer is 26.4 percent. It indicates cost of producers share in consumer's rupee is high among the producer than retailers attributed to their high transportation cost. The producer and retailer received Rs 3395 and Rs 1195 as net price respectively. The producer receives 85.42 percent of the consumer's rupee and the remaining 10.31 percent is obtained by the retailers as business margin after deducting 4.27 percent in cost. The difference in price paid by the consumer and the price received by the producer is Rs.1400 per quintal showing wide price spread with additional intermediary.

Out of Rs. 659 per quintal total marketing cost of ginger in Channel III, wholesaler incurred 66.62 percent of the total cost followed by retailer and farmer-producer with 31.11 per cent and 2.27 percent respectively. In case of chilli, whole seller accounted for 63.10 percent of the total marketing cost while retailer and producer incurred 34.40 per cent and 2.54 percent respectively. High marketing cost at wholesaler's level is on transportation, because all necessary market agreement in reaching the commodity to different stakeholders from the place of production to market are arrange by them.

While low marketing cost of producer is due to their low engagement in marketing activities. Producers are engaged only in assembling the commodity (by manual labor or by motor) to a point within the village or near production area accessible for wholesalers. The net price received by ginger producers is Rs. 2785 which is 53.55 percent of the consumer price in Channel-III. Chilli producer received a net price of Rs 29,980 which is 71.38 percent of the consumer price.

Table 5.5 Marketing Margin, Producer's Share and Price Spread of Ginger and Chilli in Channel- III

Particular	Ginger	Producer Share inGinger	Chilli	Producer Share inChilli
Producer Level				
Selling Price	2800	53.85	30000	71.43
Marketing Cost (A)	15	0.29	20	0.05
Net Price Received byProducer	2785	53.55	29980	71.38
Wholesaler Level				
Purchase Price/saleprice of producer	2800	53.85	30000	71.43
Marketing cost ofWholesaler (B)	439	8.44	495	1.18
Net margin ofWholesaler	861	16.56	6505	15.49
Retail Level				
Purchase price/saleprice of producer	4100	78.85	37000	88.10
Marketing cost of Retailer (C)	205	3.94	270	0.64
Net margin of Retailer	895	17.21	4730	11.26
Total Marketing Cost(A+B+C)	659	12.67	785	1.87
Consumer Price	5200	100	42000	100
Price Spread	2400	46.15	12000	28.57

Source: Own Calculation from Field Survey 2019-20

Thus, chilli marketing has a higher producer share in Channel-III than ginger marketing. The net margin of wholesalers and retailers in ginger marketing are Rs.439 per quintal and Rs. 895 per quintal, while the net margin of wholesalers and retailers in chilli marketing are Rs 6,505 per quintal and Rs 4,730 per quintal, ensuing greater share in consumer's rupee are pocketed by market intermediaries in Channel III. The analysis further reveals that marketing cost across marketing Channel increases while producers share in consumer's rupee decline with increase

in market intermediaries. As a result, as the number of dealers' increases, marketing costs rises, producers' share of the consumer's rupee falls, market intermediary profit margins rises, and the price gap between producer and consumer widens.

5.8 MARKETING EFFICIENCY

The degree of market performance is referred to as marketing efficiency. It's the proportion of market output to marketing input; the higher the ratio, the more efficient the market. Any increase in this ratio indicates increased marketing efficiency, whilst a reduction indicates decreased marketing efficiency. The efficiency of marketing is measured by a decrease in cost per unit of output or an increase in output at a given cost (Khols and Uhl, 1980) 30. Marketing efficiency refers to lowering marketing costs while maintaining the same level of service to customers (Thamizhselvan and Murugan, 2012). Thus, even at higher marketing costs, a higher level of consumer satisfaction implies marketing efficiency. A cost-effective marketing technique ensures an increase in agricultural productivity, actual income, and consumer satisfaction. As a result, an effective marketing system is a pre-requisite for all- round development because it allows farmers and producers to gain better prices in exchange for producing more.

Any agricultural commodity's marketing efficiency is determined, among other things, by the price received by the producer. One of the most concerns in agriculture sector in Mizoram is a wide gap of marketing margin. While consumers experience high price for agricultural product, producer receive a low price for their product. Market practices and poor mode of transportation at the time led to a significant reduction in the producer's portion of the price paid by consumers. The emergence of more market intermediaries for agricultural commodities is one of the key factors for agriculturists receiving low prices and consumers paying comparatively high costs. The study uses the Acharya-Agarwal methodologies to assess the marketing efficiency of ginger and chilli.

Table 5.6 Marketing Efficiency Index of Ginger and Chilli in Different Marketing Channels

Particular	Channel-I		Channel-II		Channel-III	
	Ginger	Chilli	Ginger	Chilli	Ginger	Chilli
Net price received by producer	3175	31005	3495	36243	2785	29980
Marketing cost	125	395	810	1112	659	785
Marketing margin	575	4600	895	4645	1756	11235
Value added by the marketing system	700	4995	1705	5757	2415	12020
Consumer price	4000	36000	5200	42000	5200	42000
Marketing Efficiency (Acharya- Agarwal Method)	4.54	6.21	2.05	6.23	1.15	2.49

Source: Own Calculation from Field Survey Data

Marketing efficiency index according to Acharya-Agarwal methods in Channel-I, Channel-II and Channel-III is illustrated in Table 5.6. The marketing efficiency indexes for ginger in Channel-I, Channel II and Channel III are 1.54, 2.05 and 1.15 respectively. Thus, it is revealed that Channel-II has the most efficient marketing system in ginger marketing followed by Channel-I. Channel-III is the most inefficient marketing channel. In like manner, marketing channels for chilli also shows the same pattern in which Channel-II has highest index followed by Channel-I and Channel-III. From the result of the analysis, marketing channel having more numbers of intermediaries has less marketing efficiency, while marketing channel with less intermediaries shows more efficient marketing system. Marketing Channel-I and Channel-II are similar in that in both channels, producers sold their produce directly to the retailers and the retailers sold to the consumers. However, Channel-I is linked with retailer within the state while Channel-II is related to retailers to consumer outside the state. It is evident that direct selling to the retailers outside the state is more efficient that selling to the retailers within the state. This implies that the local retailers pocketed more of the producers' shares than that of retailers

outside the state. One interesting fact is that even though Channel-III is less efficient than both Channel-I and Channel-II for ginger and chilli, majority of the produce were sold in this Channel. This is because of the fact that, in Channel-I, there is limited demand in the local market. As such, many producers could not opt for Channel-I. Only some producers who have good connection with retailers in Aizawl city could choose Channel-I. In case of Channel-II, many producers with poor financial access cannot bear marking cost. As such, majority of the producers sold their produce in Channel-III where agents collect their produce at the collection center in their village.

5.9 MARKETING PROBLEM IN THE STUDY AREA

Marketing problems are also very important factors which can hinder the producers of cash crops. In the process of marketing the ginger and chilli growers face several types of difficulties in relation to processing, market organisation, storage, price fluctuation and transportation. The details of marketing problems as responded by the producers were presented in Table 5.7.

The rank scale showed that high fluctuation in market price had highest index value of 0.9 in case of ginger marketing and 0.87 in case of chilli. The least indexed value for ginger marketing was 'lack of processing facilities with index value of 0.43, while in case of chilli marketing lack storage facilities is the least indexed problem with 0.33 indexed value. Relative seriousness of the problems faced by ginger growers followed the sequence of price fluctuation, unorganized market, and transportation problems, lack storage facilities and lack of processing facilities, while chilli growers follows the same sequence for the first three problems with an interchange of the last two problems. Fluctuation on market price as the major marketing problem was similar to the finding of D Chalise *et.al* (2019).

Table 5.7. Index of Marketing Problems

Index of Marketing Problems								
Items (1-5)	**Total Score**		**N**		**Index**		**Rank**	
	Ginger	**Chilli**	**Ginger**	**Chilli**	**Ginger**	**Chilli**	**Ginger**	**Chilli**
Unorganized Market	1336	1227	1770	1610	0.75	0.76	2	2
Unpredictable Price	1598	1407	1770	1610	0.90	0.87	1	1
Lack Transportation Facilities	964	959	1770	1610	0.54	0.60	3	3
Lack Storage Facilities	919	539	1770	1610	0.52	0.33	4	5
Lack of Processing Facilities	738	668	1770	1610	0.42	0.41	5	4

Source: Own Calculation from Field Survey Data

CHAPTER-VI

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS LITERATURE

6.1 INTRODUCTION

This chapter will conclude the study by summarizing the key research findings in relation to the research objectives and hypotheses. It will also highlight the study's limitations and propose avenues for future research.

6.2 FINDINGS

- Despite certain fluctuations in the area under cultivation, production and productivity of ginger and chilli, these variables on average are increasing during 2009-2010 except the productivity of chilli. The area under ginger and chilli cultivation in Mizoram has been increasing over the years with a Compound Annual Growth Rate (CAGR) of 3.6 percent and 2.8 percent respectively. Similarly, the production of ginger and chilli also increase with a CAGR of 7.8 and 9.6 respectively during the same period. As regard to productivity, we found a significant difference between ginger and chilli. While ginger has witnessed a consistent growth rate in its productivity with a CAGR of 3.9 over the years, chilli has recorded a decreasing productivity with a negative CAGR of 17 during 2009-2010.

- The results of regression show that there is no significant positive relation between ginger cultivation area and lagged price of the ginger since the P-value is greater than 0.5. However, we have a contrasting result when we investigate the case of chilli. The area under chilli cultivation and the lagged price has a positive significant relation with the coefficient of 0.001 indicating that the price of chilli has influenced its area of cultivation. Thus, it can be concluded that lagged price of ginger is not a good predictor of changes in the area under cultivation of ginger unlike chilli where lagged price has significant impact on its area.

- Both ginger and chilli in the study area have shown a gradual increase in terms of production over the years with a CAGR of 10 percent and 23 percent respectively despite certain fluctuations during 2014-15 to 2019-20. The mean production of ginger is 13,170.08 quintals which is significantly higher than the mean production of chilli, which is 2,139.77 during the reference periods. Likewise,

the average productivity (quintal /hectare) of ginger, which is 5.98, is also higher than the average productivity of chilli, i.e. 0.98, from 2014-15 to 2019-2020.

- The Coefficient of Variation (CV) of ginger production and productivity is 0.18 and 0.11 respectively while it is 0.36 and 0.13 in the case of chilli. Thus, the CV of ginger has a lower value than chilli in both production and productivity indicating a lower degree of fluctuations over the years. A huge fluctuation in chilli production and productivity indicates that certain factors that effectively influence the production and productivity of chilli while the lower CV of Ginger infers that the production and productivity of ginger are very unresponsive to change in some factors.

- Among the components of cost of cultivation of ginger, the cost of seed topped the list with 20 percent of the total cost followed by expenses on weeding and maintenance with 17 percent. Harvesting cost is the third-highest cost of ginger farming in the study area. It accounts for 15 percent of the total cost of cultivation. Transportation of ginger from the farms' site to villages is another cost item that induced farmers to incur huge expenditures and accounted for 11.7 percent of the total cost. It is vital to note that the cost of transportation includes the imputed cost of family labor engaged in transportation work. The cost of slashing forest, building a jhum house, and sowing or planting are roughly the same, accounting for 7-8 percent of the overall cost of cultivation in the study area. Owing to the traditional practices in agriculture, the cost incurred by the farmers on irrigation, tools and implements has a negligible share in the overall cost of ginger cultivation.

- Regarding the cost of chilli cultivation, the harvesting cost has the highest share of the total cost with 23.68 percent followed by weeding and maintenance with a share of 21.31 percent. These two items are significantly higher than the rest of the cost items accounting for almost half of the overall cultivation costs. The third and fourth largest cost items are slashing of forest and construction of jhum house with a share of 10.37 and 9.81 percent respectively. The percentage share of the rest of the

cost components ranges between 7.10 percent and 1.80 percent with irrigation costs being the lowest share.

- The overall average cost of cultivation of ginger was Rs 101,100 per hectare which is higher than the average cost of cultivation of chilli cultivation which was Rs 88,700 per hectare in the study area. It was noticed that the per hectare cost in ginger cultivation was lower than in chilli cultivation although the area under chilli cultivation is typically larger than the area under ginger cultivation. This is mainly because of the significant differences in cost seed of ginger and chilli. Chilli cultivation does not require a large quantity of seed, unlike ginger cultivation which makes the cost of chilli cultivation less expensive compared to ginger cultivation. Apart from that the process of sowing or planting seed in ginger and chilli cultivation differs significantly. Sowing of chilli takes no more than 6 men days per hectare of land, whereas sowing of ginger may take more than 16 men days.

- The gross income from ginger and chilli cultivation has consistently increased over the years. In 2014-15, the gross income from ginger production per hectare was Rs 144,432, which increased to Rs 208,311.90 in 2019-20, a 1.5-fold increase in just 6 years. Similarly, chilli experienced a similar trajectory, with a gross income per hectare of Rs 207,931 in 2014-15 which increase to Rs 383,662.13 in 2019-20, representing an increase of more than 1.8 times in 6 years.

- The net income of ginger and chilli cultivation increased significantly over the years. The net income of ginger is Rs 52,390.35 in 2014-15 which increased to more than double in 2019-20. The net income of chilli cultivation shows a more robust result which increased from Rs 90,676.54 in 2015-16 to Rs 319,569.20 in 2019-20, which is more than 3 times the initial value.

- The benefit-cost ratio reveals that chilli cultivation is relatively profitable compared to ginger cultivation. The average B-C ratio of chilli during the reference periods was 3.56 while the average B-C ratio of ginger was only 1.83. The higher B-C ratio of chilli cultivation is mainly due to the fact that while chilli cost of

cultivation per hectare declined from Rs 117,254.93 in 2014-15 to Rs 88,700 in 2019-20, its market price per kilogram has dramatically increased from Rs. 264.77 to Rs 360.23 during the same period. Such situations have not been observed in ginger cultivation, where, despite rising cultivation costs, the market price was relatively stable over time, hovering around Rs 26-31.

- The value derived from the rank scale revealed that lack of credit facilities had an index value of 0.82 in ginger cultivation and was ranked as the most serious problem, followed by disease and insect problem while fertilizer was ranked as the least significant problem with an index value of 0.42. In chilli cultivation, disease and insect has the highest index value of 0.83 followed by credit facilities with an index value of 0.70. Relative seriousness of the problems experienced by the ginger growers followed the sequence of lack of credit facilities, disease and insect problems, skilled labor, irrigation, and fertilizer while chilli has a sequence of disease and insect problems, credit facilities, lack of skilled labor, fertilizer, and irrigation.

- The reason for the low index value of fertilizer and irrigation in both ginger and chilli cultivation indicates that the agro-climatic condition in the study area is favorable for growing crops. Since Mizoram has a good rainfall with predominance of shifting cultivation, a proper irrigation system is not considered the problem in ginger and chilli cultivation. Likewise, with the farming system being organic and the soil being fertile, farmers did not treat the lack of fertilizer as a serious problem.

- The overall regression models of ginger and chilli are a good fit for the data as indicated by F- values and p-value indicating that the independent variables significantly predict the dependent variable for both ginger and chilli productivity with $F(5, 339) = 39.087$, $p(.001) < .05$ for ginger and $F(5,253) = 21.83$, $p(0.001) < 0.5$ for chilli.

- The R-square for ginger and chilli is not very high. In the case of ginger, 36.6 percent of the change in productivity is explained by the predictors in the model whereas it is 30.1 percent in the case of chilli. Although the overall regression

models are statistically significant for studying ginger and chilli, the values of R-square are very low indicating that the productivity of ginger and chilli is greatly affected by many factors such as soil quality, rainfall, temperature, and other climatic conditions. As such, our regression model could explain only about 36 percent of the variation in ginger productivity and 30 percent of the variation in the productivity of chilli.

- The regression results show that ginger productivity is influenced by the number of agricultural laborers in the family, quantity of seed and fertilizer, gender of the household head, and size of the farm, which are statistically significant at a 5 percent level of significance. The same inputs were statistically significant in the case of the productivity of chilli except for the amount of agricultural labor. This may be attributed to the more susceptibility of chilli against diseases and unfavorable climate compare to ginger. With such vulnerability, a household having many agricultural laborers may also experience low production and productivity.

- The study also found a positive relationship between the amount of seeds of ginger and chilli and their productivity. In the case of ginger, the coefficient is 0.148, while in the case of chilli it is 0.555.

- The coefficient of fertilizer is equal to 0.63 and 1.207 for ginger and chilli respectively indicating the change in ginger and chilli productivity when fertilizer used increased by 1 kilogram. The ginger productivity increased by 0.63 quintals and chilli productivity by 1.207 compared with none fertilizer users when all other predictor variables were constant in the regression model.

- Gender also has influenced the productivity of ginger and chilli, since both these variables are significant at a 5 percent level of significance indicating that a household headed by a male is more likely to have a higher yield in the cultivation of ginger and chilli.

- The study found an inverse relationship between farm size and productivity. This clearly highlights the peculiarity of shifting cultivation practiced in the study area. The reason we have an inverse relationship between farm size and yield is that when the farm area increased by one hectare, the farm size is beyond the farmer's manageable level given his existing resources. This is the case of diseconomies of scale where expansion of operation or scale leads to lower yield. The study found that when farm size increased by 1 hectare, the level of yield decreased by 1.855 for ginger and 1.024 for chilli keeping all other variables constant.

- There are three marketing channels in the study area. In Channel-I, the farmer/producer directly sold their produce to the retailer in the local market mainly in Aizawl city. Since only a small portion of the producer is directly sold to the retailer within the state, the relative share of Channel-1 in terms of volume of the total produce is very small and negligible. In most cases, the farmers bear all the marketing costs in Channel-1. In Channel-II, the producers or representatives of producers collect the produce and sold directly to the retailer at Bagha at a negotiated price. However, the farmers with weak bargaining power have little control over the price and hence, the price mostly favors the retailers. Usually, the relative share of Channel-II in the total produce is slightly higher than Channel-I but much lower than Channel-III. However, Channel-II required producers to bear all the marketing costs and necessitate them to make transportation arrangements up to the point of selling outside the state. This poses difficulty to the producers who have limited knowledge of the market price, demand conditions outside the state. As a result, only a small portion of producers can follow Channel-II despite its prices being relatively better.

- In Channel-III, itinerant traders from outside states appear to be the key actors at the village level. However, itinerant traders also employ local agents to procure farmers' produce by providing requisite funds. Generally, the itinerant and commission agents collected the farm produces (i.e. ginger and chilli) in the villages at the price determined by the itinerant traders.

- Out of the total respondent of ginger farmers, 88.98 percent of the ginger farmers follow Channel-III, 7.63 percent follow Channel-II and the rest 3.39 percent follow Channel-I. Chilli market also witnessed the same pattern where Channel-III is the most prevalent channel and Channel-I is the least opted channel. More than 94 percent of the total respondent of chilli producers followed Channel-III, 6.51 percent followed Channel-II and the remaining 3.11 percent of producers chose Channel-I.

- It is found that only 1.18 percent of the total production of ginger and 1.43 percent of chilli were disposed of in Channel-I. Channel-II shows disposal of slightly higher volume in both ginger and chilli with 4.13 percent and 4.21 percent of the total produce respectively. In Channel-III, 94.69 percent of the total produce of ginger and 94.66 percent of the total produce of chilli are sold.

- In the case of Channel-I, the producer has borne all the marketing costs till the commodity reach its destination. However, in the case of Channel-II and Channel-III, the marketing costs are shared by the producer and agent. The total marketing cost turned out to be highest in Channel-III in the destination of Silchar and followed by Channel-II with the destination of Bagha, while it is lowest in the case of Channel-I. It is, thus, clear that the total marketing cost is directly related to the distance the commodity must travel to reach its destinations.

- The marketing cost in Channel-I for fresh ginger and dry chilli is estimated to be Rs 125 and 395 per quintal respectively. In Channel-II the marketing cost is estimated to be Rs. 605 per quintal in case of fresh ginger and Rs 757 in case of dry chilli. The total charges of the destinations in Channel-III are estimated to be Rs.659 per quintal for ginger and Rs.765 per quintal for dry chilli.

- The marketing cost of chilli is relatively higher than that of ginger marketing cost. This is because of the difference in the density of the products. Ginger being a heavier commodity requires fewer gunny bags for packing 1 quintal while chilli requires more bags for packing 1 quintal. Apart from that the carrying capacity of a

truck for ginger and dry chilli also shows a significant difference. Dry chilli being a light commodity requires more space unlike fresh ginger, which limited the carrying capacity of motor vehicles leading to higher per quintal transportation costs.

- In Channel-1, the farmer received Rs.3, 175 per quintal as the net price in the case of ginger. The producer's share of consumers' rupee of ginger in this channel is 82.5 percent. While in the case of chilli the farmer received Rs 31,005 per quintal as net price with a producer share of 86.12 percent in the same Channel. In Channel-I, the shares of marketing margin in consumers' price for ginger and chilli have shown a difference of about 2 percentage points with ginger being 14.37 percent and chilli being 12.77 percent respectively.

- In Channel-II, out of the total marketing cost, the farmer/producer obtains 74.6 percent while the percentage cost incurred by retailers is 26.4 percent. In this Channel, the producer of ginger and retailer received Rs 3495 and Rs 895 as net prices respectively. The farmer/producer receives 72.81 percent of the consumer's rupee, while the retailers keep the remaining 10.31 percent as a business margin after deducting 4.27 percent of the cost.. The difference in price paid by the consumer and the price received by the producer of ginger is Rs.1400 per quintal showing a wide price spread with an additional intermediary. Regarding chilli, the producer and retailer received Rs 36,243 and Rs 4,645 as a net price respectively. The farmer/producer share in the consumer's rupee is 86.29 while the retailer received 11.30 as business margin. The price spread in the case of chilli is Rs 5,000 which is much wider than the price spread of ginger.

- Out of Rs. 659 per quintal total marketing cost of ginger in channel III, wholesaler incurred 66.62 percent of the total cost followed by retailer and farmer-producer with 31.11 percent and 2.27 percent respectively. In the case of chilli, the whole seller accounted for 63.10 percent of the total marketing cost while the retailer and producer incurred 34.40 percent and 2.54 percent respectively. The net price received by ginger producers is Rs. 2,785 which is 53.55 percent of the consumer price in Channel-III. Chilli producers received a net price of Rs. 29,980 which is

71.38 per cent of the consumer price. Thus, chilli marketing has a higher producer share in Channel-III than ginger marketing. The net margin of wholesalers and retailers in ginger marketing are Rs.439 per quintal and Rs. 895 per quintal, while the net margin of wholesalers and retailers in chilli marketing are Rs 6,505 per quintal and Rs 4,730 per quintal, ensuing greater share of consumer's rupee is pocketed by market intermediaries in Channel III. The analysis further reveals marketing cost across marketing channel increases while producer's share in the consumer's rupee decline with an increase in market intermediaries. As a result, as the number of dealers increases, marketing costs rise, producers' share of the consumer's rupee falls, market intermediary profit margins rise, and the price gap between producer and consumer widens.

- The marketing efficiency indexes for ginger in Channel-I, Channel II, and Channel III are 1.54, 2.05, and 1.15 respectively. Thus, it is revealed that Channel-II has the most efficient marketing system in ginger marketing followed by Channel-I. Channel-III is the most inefficient marketing channel. In like manner, marketing channels for chilli also show the same pattern in which Channel-II has the highest index followed by Channel-I and Channel-III. From the result of the analysis, a marketing channel having more numbers of intermediaries has less marketing efficiency, while a marketing channel with fewer intermediaries shows a more efficient marketing system.

- Marketing Channel-I and Channel-II are similar in that in both channels, producers sold their produce directly to the retailers, and the retailers sold to the consumers. However, Channel-I is linked with retailer within the state while Channel-II is related to a retailers to a consumer outside the state. Direct selling to retailers outside the state is more efficient than selling to the retailers within the state. This implies that the local retailers pocketed more of the producer's shares than those retailers outside the state.

- One interesting fact is that even though Channel-III is less efficient than both Channel-I and Channel-II for ginger and chilli, the majority of the produce were sold

on this channel. This is because in Channel-I, there is limited demand in the local market. As such, many producers could not opt for Channel-I. Only some producers who have a good connection with retailers in Aizawl city could choose Channel-I. In the case of Channel-II, many producers with poor financial access cannot bear the marketing cost. As a result, the majority of producers sold their produce in Channel-III, where agents collected it at the collection center in their village.

- Among all the marketing problems, unpredictable prices emerged as the major marketing problem for the producer in the case of both ginger and chilli marketing. Price fluctuation, unorganized market, and transportation problems are the top three marketing problems faced by producers of ginger and chilli in the study area.

- The rank scale showed that high fluctuation in market price had the highest index value of 0.9 in the case of ginger marketing and 0.87 in case of chilli. The least indexed value for ginger marketing was 'lack of processing facilities with an index value of 0.43, while in the case of chilli marketing lack of storage facilities is the least indexed problem with a 0.33 indexed value. Relative seriousness of the problems faced by ginger growers followed the sequence of price fluctuation, unorganized market, transportation problems, lack of storage facilities, and lack of processing facilities, while chilli growers follows the same sequence for the first three problems with an interchange of the last two problems.

6.3 LIMITATIONS OF THE STUDY

The main problem relating to the present study is that farmers do not maintain record books relating to farming and marketing activities, and they were unable to respond to the questions with accuracy and confidence. Because of this, the scholar took plenty of time to get reliable information from the respondents which make the survey time-consuming. Similarly, prices of ginger and chilli in the retail markets are fluctuating and unpredictable, capturing these changes in prices are difficult especially when the markets are outside the state.

Limited access to data is another issue that the present study faced during the collection of secondary data. Updated data were not available. In some cases, data were easily accessible but the authenticities of the sources were doubtful. Finding the original source of those data requires a long span of time and effort which was a hindrance in pursuing the research work.

Studies on ginger and chilli are quite minimal in Mizoram. This posed certain limitations to the present study since no fruitful comparison between the results of the present study and prior studies can be carried out. Apart from that, ideas and research gaps that have to be obtained from the previous studies on the same topic cannot be formulated.

6.4 RECOMMENDATIONS

Mizoram has a significant agricultural potential across the country and agriculture is the major provider of employment for the people. Despite having a wide range of favorable agro-climatic conditions for growing ginger, chilli and other agricultural products in Mizoram, there are still various obstacles for farmers and producers in the state. To tackle these constraints the following recommendations were made based on the study:

1. Value addition and mechanical processing of ginger and chilli are not popular in the study area as well as in the state. The traditional method of processing and unfavorable climate during the processing period generally raises costs and lower quality. Thus, the success of ginger farming in the state is inextricably related to the performance of spice processing units, value addition and marketing. Therefore, value addition and processing of ginger and chilli are essential to convert the low-value ginger and chilli into high-value products to make the crops more remunerative. Value addition and processing will not only convert ginger and chilli into high-value products and more remunerative products but will further generate employment for the masses and contribute to the growth and welfare of the state. Thus, the State Government intervention in the field of processing of ginger and chilli is one of the promising steps to uplift the farmers as it is abundantly available

not only in the state but also in the north-eastern region. Apart from that, the state has high potential and conducive agro-climatic conditions for these two crops.

2. The practice of shifting cultivation is very expensive and unsustainable. It also has an adverse impact on our environment since farmers move on and clear another area of the forest when soil fertility is exhausted. Thus, a new and better system of cultivation such as settle cultivation, and terrace cultivation, must be introduced in the study area. This will not only reduce the cost of cultivation but also contribute to preventing soil erosion, desertification and degradation of soil fertility thus contributing farmers to reaping higher productivity and profitability. However, the initial cost of terrace farming is very expensive and requires a huge investment. In this respect, government intervention through programs and schemes is the best option since farmers with no financial power are unable to meet the requisite expenditure. Abandonment of shifting cultivation is the need of the hour considering recent climate change, water scarcity and the rapid rate of desertification in the state. Furthermore, farmers in the study area are also using outdated tools and equipment. Quality farm equipment is difficult to avail for the poor farmers. The supply of modern tools and equipment is very important for upgrading farm practices since the farmers are not in a position to buy those tools and machines. Thus, to increase production and productivity, the government needs to refocus the agriculture sector, and pay more attention to supplying modern tools and equipment to the farmers.

3. It is undeniable that small and marginal farmers have always had a problem with access to credit facilities. Inadequate support from government and financial institutions in terms of credit facilities has been noted as one of the primary issues affecting farming operations, particularly those of small and marginal farmers. Even though there is credit support from the central government such as Kisan Credit Card (KCC) scheme, **Interest Subvention Scheme,** Investment Loan, etc., the facilities provided under these schemes are inadequate. Apart from that, these facilities especially agricultural loans are very difficult to access for those in need since they are unable to provide security or a mortgage against the loan. Thus, providing credit facilities to needy farmers must be emphasized more than any other problem since

credit has the potential to help poor farmers with a variety of agricultural issues such as heavy dependence on monsoons, inability to mitigate uncertainty, and lack of access to suitable technology, etc. As such, easy accesses to credit facilities, more financial inclusion of small farmers, and investment in agriculture are the key to improving the performance of farmers in the study area.

4. One of the major constraints to the development of agriculture in Mizoram as well as in India has been the lack of all-weather roads. Most villages in the study area still lack road connectivity to agriculture sites and settlements, as well as village-to-village linked roads since procurement of the produce from the farm sites to villages in the study area are mostly done by headload. This significantly led to higher costs of production, higher marketing cost and longer procurement periods. Besides this, the lack of road connectivity discourages the use of more productive inputs and farming techniques since procuring such high-tech inputs from the market is not cost-effective. Thus, the government may give special attention to providing link roads for the farmers. Improvement in road connectivity would lead to a decline in both average and marginal costs of production and gradually exposes farmers to modern agricultural practices. It is a well-known fact that good transportation encourages agricultural market expansion, economies of scale, and easy operations of the factor market which in turn will expose the rural economy to more outside competition.

5. Agricultural markets in most states of India are established and regulated under State Agriculture and Marketing Committee (APMC) Acts. These led to the creation of regulated markets, also called mandis. Farmers were compelled to sell their produce via licensed intermediaries or market officials under the APMC Acts, which forbade them from dealing directly with unauthorized intermediaries. This has eliminated several intermediaries and provided reasonable prices to the farmers and producers. However, the mandis system is absent in the state of Mizoram which compels farmers to sell their produce to the intermediaries and itinerants from outside the state. In this respect, the government may intervene in establishing a regulated market within the state or find a channel through convergence with other

states where the farmer can sell their produce directly to the regulated markets. Recently Mizoram Agriculture Marketing Solution (MAMSOL) was established in 2016 as a private company. This company has started purchasing ginger in Serchhip district and selling directly to the retailer.

6. Another important recommendation is the need for a survey and identification of soils and other climatic conditions suitable for ginger and chilli not only in the study area but also in other parts of Mizoram. This is required to introduce better-quality varieties of ginger and chilli suitable for the state. The survey and identification will enable the application and development of an area-specific farming system model in a cluster approach in the state. This will ensure higher productivity and profitability since the cluster approach farming system has the advantage of applying scientific methods of cultivation, farm mechanization, construction of irrigation systems, and road connectivity.

7. The production of ginger and chilli in the study area is organic by default because only a negligible percentage of the farmers used chemical fertilizers or herbicides on their crops. Since the state has favorable agro-climatic conditions for growing different crops, the majority of the famers solely use locally available manures (cow dung, pig manure, poultry manure, and so on) in the entire state. In this way, farmers' ignorance in using fertilizers and herbicides turned out to be a blessing as their produces can be graded as organic. However, the state government must take active steps for awareness campaigns among the negligible portion of the fertilizer users to abandon fertilizer use and practice organic farming. Then, the state must take up the responsibility of exposing the ginger and chilli production in the state to be organic and chemical-free. At the same time, the State must also take up necessary measures for grading and certification. Considering the increasing demand for organic produce all over the world, there are a lot of scopes to promote organic ginger and chilli products for export in foreign countries. Thus, if the state government intervenes in the process and takes action, there is a potential to transform the state into an organic hub of ginger and chilli in the country.

8. The study found that diseases and pest attacked is the most serious problem in the case of chilli and the second most serious problem in the case of ginger. This clearly signifies that farmers need proper training on how to control diseases and insects. Even though the Directorate of Agriculture and Horticulture frequently provides training to the farmers, there is still a need to focus on problems related to diseases and insects in the case of ginger and chilli. Thus, farmers must be provided training on diseases and pest attacks, selection of good quality seeds, high yielding and disease-resistant varieties and seed, which will significantly improve production and productivity in the study area, since this training is likely to reduce the cost of cultivation on the one hand and increase the income of the farmers on the others

9. Commercialization of agricultural products has gradually increased even in the state. When the commercialization of the agriculture sector is initiated, farmers not only produce for subsistence but also the marketable surplus. Ginger and chilli growers in Mizoram have to undergo a huge loss in times of unfavorable circumstances such as drought, landslide, attacks of pests, and fluctuation in the price of the products since ginger and chilli are commercial crops that are produced in large quantities. As a result, insurance is one of the most effective strategies to safeguard farmers from such losses and provides relief to the farmers. In this respect, the government may seek trusted insurance provider companies that could offer appropriate coverage schemes which include a minimum support price guarantee. Since the socio-economic status of farmers is generally weak, the government may share the premium for the insurance companies that the farmers are obliged to pay.

10. Although the average production per hectare of ginger and chilli in this state is lower than in many other states, there is always room for improvement. To boost the yields of ginger and chilli, timely delivery of disease-free seeds to farmers is crucial. Apart from that, extension agencies such as Agriculture Extension Officer and Horticulture Extension Officer in the production areas must be more proactive in identifying and recommending timely and appropriate solutions to producers' field difficulties that can boost yield. The Government should also undertake the responsibility of distribution of healthy seeds through the concerned department's

intervention and village council level involvement. An increase in productivity is desirable not only to increase the output but also to improve the cost competitiveness and profitability of ginger and chilli cultivation.

The proposed recommendations are expected to improve not only the present state of ginger and chilli production and marketing but also the agricultural sector in Mizoram as a whole. These actions would eventually lead to a thriving and transformed economy, fulfilling the wish of the agrarian population in the state.

6.5 CONCLUSIONS

Despite a decline in the share of the agricultural sector in the country's Gross Domestic Product (GDP), the sector remains an exclusive sector in which the modes of life and business enterprise are combined. From the results of the analysis, it is revealed that, only small portion (about 3 percent) of the total ginger and chilli produce are consumed in the state. Major portion of the surplus produce were sold outside the state through middlemen at a very low price. In most cases, the farmers are forced to sell their produce even at an unfavorable price since there is no local market big enough to absorb the produce in large quantities.

It can be concluded that adequate production and marketing facilities in the rural areas in Mizoram are an urgent necessity. Predominantly, a larger portion of the state's population lives in rural areas, and limited access to various economic and social facilities and services adversely affects the socio-economic conditions and quality of life of those rural people in the state, as reflected in the living conditions of most of the households in surveyed villages that fall into the below-poverty line category.

Appendix-I

GINGER: AREA, PRODUCTION AND PRODUCTIVITY IN INDIA

(Area: '000 ha, Production : '000 tonnes, Yield: kg/ha)

State	2017-18			2018-19			2019-20			2020-21 (2nd Adv. Est.)		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Andhra Pradesh	0.381	1.437	3771	0.296	2.492	8419	0.294	2.944	10014	0.789	7.097	8995
Arunachal Pradesh	3.936	23.571	5989	4.001	23.766	5940	4.001	23.766	5940	5.109	35.276	6904
Assam	18.105	161.604	8926	17.865	166.272	9307	19.351	183.157	9465	17.786	167.803	9435
Bihar	0.259	2.269	8761	0.452	3.897	8621	0.381	3.283	8617	0.368	3.172	8627
Chhattisgarh	1.933	10.955	5668	1.886	10.574	5607	2.064	8.723	4226	1.930	10.129	5248
Gujarat	4.870	108.249	22228	5.037	110.401	21918	5.038	113.224	22474	4.800	105.207	21918
Haryana	0.592	4.468	7547	0.092	0.720	7826	0.074	0.623	8419	0.315	2.953	9389
Himachal Pradesh	2.505	15.947	6366	2.223	10.359	4660	2.264	10.675	4715	2.266	10.688	4717
Jammu & Kashmir	0.025	0.029	1156	0.027	0.054	2000	0.019	0.037	1953	0.020	0.391	19380
Karnataka	20.809	249.916	12010	15.858	244.065	15391	22.388	234.171	10460	20.536	249.911	12170
Kerala	4.370	86.270	19741	3.275	70.327	21474	2.819	55.414	19657	2.752	55.014	19991
Madhya Pradesh	23.431	377.471	16110	24.964	414.282	16595	27.480	438.394	15953	28.348	458.073	16159
Maharashtra	9.595	140.663	14660	8.101	115.510	14259	7.835	113.144	14441	9.659	134.352	13909
Manipur	2.400	17.856	7440	5.493	79.647	14500	5.470	77.809	14225	3.941	48.148	12218
Meghalaya	9.944	66.195	6657	9.953	66.273	6659	9.939	66.156	6656	10.040	67.924	6765
Mizoram	8.553	60.131	7030	8.553	60.130	7030	8.553	61.001	7132	8.553	61.001	7132
Nagaland	4.871	48.654	9989	4.749	35.630	7503	4.790	35.964	7508	4.718	35.284	7479
Orissa	16.575	128.020	7724	16.575	128.020	7724	16.575	128.020	7724	16.573	128.002	7723
Rajasthan	0.113	0.269	2381	0.138	0.461	3341	0.107	0.373	3486	0.117	0.342	2925
Sikkim	12.300	55.900	4545	15.638	85.116	5443	15.643	85.152	5443	13.970	70.517	5048
Tamil Nadu	0.380	7.425	19539	0.377	7.279	19308	0.193	3.038	15741	0.645	11.015	17078
Telangana	1.840	12.982	7055	1.623	11.221	6914	2.409	15.903	6601	1.972	13.549	6870
Tripura	1.876	15.743	8392	1.855	15.601	8410	1.875	15.938	8500	1.897	16.126	8501
Uttar Pradesh	0.877	4.167	4751	0.904	4.294	4750	0.880	4.620	5250	0.900	4.128	4585
Uttarakhand	2.325	25.711	11058	4.911	48.468	9869	5.061	49.689	9817	5.094	50.683	9950
West Bengal	12.250	133.750	10918	12.418	135.591	10919	12.510	136.610	10920	12.522	136.740	10920
Andaman & Nicobar	0.160	1.900	11875	0.126	0.637	5061	0.122	0.607	4994	0.144	1.252	8675
Total	**165.275**	**1761.552**	**10658**	**167.389**	**1,851.088**	**11059**	**178.135**	**1,868.435**	**10489**	**175.764**	**1,884.775**	**10723**

Source: DASD, Calicut, June 2021

Appendix-II

DRY CHILLI: AREA, PRODUCTION AND PRODUCTIVITY IN INDIA

(Area: '000 ha, Production : '000 tonnes, Yield: kg/ha)

State	2017-18			2018-19			2019-20			2020-21 (2nd Adv. Est.)		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Andhra Pradesh	119.262	618.348	5,185	158.428	501.407	3,165	153.082	805.026	5,259	180.000	836.000	4,644
Arunachal Pradesh	0.220	0.807	3,675	0.165	0.851	5,164	0.165	0.851	5,164	1.062	2.377	2,238
Assam	20.242	18.994	938	19.847	18.984	957	22.359	21.867	978	20.749	19.513	940
Bihar	1.510	2.733	1,810	2.260	4.756	2,104	2.196	4.713	2,146	1.933	3.806	1,969
Chhattisgarh	4.243	1.498	353	5.220	3.049	584	5.415	3.249	600	4.985	3.029	608
Gujarat	11.348	22.072	1,945	11.335	21.444	1,892	11.299	18.905	1,673	12.000	22.702	1,892
Haryana	2.200	4.000	1,818	2.222	4.080	1,836	2.207	4.027	1,825	2.207	4.027	1,824
Himachal Pradesh	0.663	0.239	361	0.578	0.199	344	0.583	0.276	473	0.587	0.277	472
Jammu & Kashmir	0.664	0.346	522	0.672	0.540	804	0.690	0.556	806	0.685	0.556	812
Karnataka	100.336	191.475	1,908	157.587	194.758	1,236	74.078	129.238	1,745	114.901	193.904	1,688
Madhya Pradesh	94.415	232.699	2,465	87.839	217.548	2,477	88.675	208.634	2,353	113.366	292.616	2,581
Maharashtra	7.053	14.134	2,004	5.698	14.025	2,461	6.508	22.434	3,447	6.753	25.517	3,779
Manipur	6.500	3.900	600	0.000	0.001	9,400	0.000	0.001	9,800	-	0.001	
Mizoram	11.196	10.918	975	11.200	10.918	975	11.196	10.918	975	11.197	10.918	975
Nagaland	0.182	0.805	4,423	1.372	1.798	1,310	1.379	1.754	1,272	1.373	1.743	1,269
Orissa	71.700	69.280	966	71.700	69.280	966	71.700	69.280	966	72.000	69.000	958
Punjab	7.501	14.084	1,878	8.770	16.656	1,899	8.776	16.955	1,932	8.137	15.445	1,898
Rajasthan	7.991	13.282	1,662	8.480	14.356	1,693	9.832	20.033	2,038	9.358	16.613	1,775
Tamil Nadu	44.119	18.108	410	45.949	14.000	305	47.991	29.618	617	55.716	25.648	460
Telangana	73.777	340.804	4,619	82.521	369.016	4,472	80.579	436.378	5,416	90.300	407.268	4,510
Tripura	2.767	6.312	2,281	2.797	6.545	2,340	2.812	6.664	2,370	2.825	6.698	2,371
Uttar Pradesh	13.636	12.578	922	13.763	12.716	924	13.547	11.808	872	13.677	12.068	882
Uttarakhand	9.000	7.200	800	2.803	9.474	3,380	2.848	9.632	3,382	2.869	9.685	3,375
West Bengal	65.552	105.750	1,613	5.292	8.300	1,568	5.450	8.576	1,574	5.460	8.567	1,569
Pondicherry	0.007	0.064	9,143	0.006	0.076	12,667	0.007	0.093	13,286	0.001	0.014	14,000
Andaman & Nicobar	0.065	0.300	4,651	0.206	0.781	3,800	0.073	0.313	4,288	0.073	0.313	4,288
Total	**676.148**	**1,710.731**	**2,530**	**706.709**	**1,515.557**	**2,145**	**623.446**	**1,841.799**	**2,954**	**732.213**	**1,988.304**	**2,715**

Source: DASD, Calicut, June 2021

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DATE OF ADMISSION	**27.08.2014**

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2. BOS: 06.04.2015
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ABSTRACT

PRODUCTION AND MARKETING OF GINGER AND CHILLIES IN CHAMPHAI DISTRICT, MIZORAM

AN ABSTRACT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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DEPARTMENT OF ECONOMICS

SCHOOL OF ECONOMICS, MANAGEMENT AND INFORMATION SCIENCE

JUNE, 2022

PRODUCTION AND MARKETING OF GINGER AND CHILLIES IN CHAMPHAI DISTRICT, MIZORAM

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In partial fulfillment of the requirement of the Degree of Doctor of Philosophy in Economics of Mizoram University, Aizawl

INTRODUCTION

Agriculture is both an art and science of raising plants and animals, and it involves choices about the use of resources to grow the animal foods and the plants we eat. The term agriculture is derived from two Latin words *ager* (field) and *cultura* (cultivate), which form the Latin *Agricultura*: field or land tillage (Harris and Fuller, 2014). A farmer is a person who manages the farmland ecosystems and biological processes needed for plant and animal production (Power, 2010). However, in addition to the farm production systems, agriculture includes all the business that converts raw farm commodities into food and fiber products that people want to eat and use. It also involves processing, transportation, storage, and other business activities typically referred to as marketing. Thus agriculture includes a wide gamut of activities, many of which do not occur on farms and are not managed by farmers (FAO, 2017).

A country in its stages of economic growth cannot afford to ignore the progress in agricultural sector and it is especially crucial in the early stages of economic growth. The existence of a substantial agricultural surplus is a precondition for the general economic development of a country (Nelson, 2008). Like in most developing economies, agriculture is the primary source of income for the vast majority of Indian families, accounting for more than 58 percent of rural households (Giri, 2021; Pearce, 2001). It is the core of planned economic development in India as the trickledown effect of agriculture is significant in reducing poverty and regional inequality in the country. It has been for centuries, playing an instrumental role in shaping the thought, outlook, culture, and economic life of the people of India (Thirtle, 2001). The agriculture sector has undergone a dramatic evolution over the last two decades, with globalization and liberalization policies opening up new opportunities for its modernization. The Agriculture and Allied sector accounts for 20.19 percent of total India's Gross Value Added (GVA) of 179.15 lakh crores Indian rupees at current prices and 16.38 percent at 2011-12 prices (NSO, 2021). The contribution of the agriculture sector to national income has decreased over time; it is an unavoidable consequence of economic progress (Byerlee, de Janvry and Sadoulet, 2009; Cervantes and Brooks, 2009).

Most agricultural practices in India are limited to a few monsoon months. During the monsoon season, India received abundant rain; however, on several occasions, this bountiful monsoon turns into terror, causing uncontrollable floods in various parts of the country and ultimately affecting agricultural production (Singh and Parihar, 2015). Major crop-growing seasons in India are classified into two groups based on these monsoon seasons: summer crop-growing season, or 'Kharif,' and winter crop-growing season, or Rabi. Rice, maize, sugarcane, cotton, jute, groundnut, soybean, Bajra, etc., are important Kharif crops. Depending on crop duration, the Kharif crops can be harvested in the autumn (October–November) or winter (December–February). The winter crop-growing season, also known as Rabi begins after the summer monsoon and lasts until the next spring or early summer. Rainfall at the end of the monsoon season replenishes stored soil moisture and, in some cases, irrigation water for the Rabi crop, as seen in the post-monsoon season (October–November). Some of the Rabi crops are Wheat, mustard, barley, potato, onion, gram, etc., (Mall, *et al*., 2006; Selvaraju, 2003).

Marketing is the exchange, conversation, and intervention of goods and services to improve their quality and obtain some benefits (Gervase, 2009). An effective marketing system is critical to a country in any condition and at any stage of development (Duhaime, McTavish, and Ross, 1985). Agriculture marketing, in the strict sense, includes the farmer's transactions both in buying and selling, but it is generally confined to the selling side of his business and is used to cover all activities entailed from the time the product leaves the farm until it reaches the consumer (Acharya, 2004; Kherallah, 2000). Storage and processing are essential marketing functions in modern agricultural product marketing, and the most important activity in the marketing process is buying and selling (Pandey and Tiwari, 2022). Hence, agricultural marketing entails a variety of activities such as collecting and storing agricultural goods, transporting them to sale points, processing and grading them, settling bargains, and so on (Hayami, *et al.*, 1987)

Given the inadequacy and lack of rural markets and the increasing prevalence of market distortion, the role of government in agriculture becomes even more critical in developing countries (Ramakumar, 2012). As a result, the government of India has taken several initiatives to improve the agriculture sector. The

implementation of the Interest Subvention Scheme (ISS) for providing credit for crop production at a lower interest rate, Soil Health Cards (SHC) for improving agricultural productivity, Pradhan Mantri Krishi Sinchai Yojana (PMKSY) for ensuring irrigation facilities, Pradhan Mantri Fasal Bima Yojana (PMFBY) for providing a safety net against natural calamities, and National Agriculture Market Scheme (e-NAM) are some of the important initiatives taken by the Government. There is also a renewed emphasis on allied activities to supplement farmers' income (Sahni, 2020).

REVIEW OF LITERATURE

Production and Marketing of Ginger

Ginger is an important spice that shows a great diversity of uses, such as in dietary supplements, beverages, and food products such as curry powder, confectionaries, soups, jams, and baked goods (Abubakar *et al.,* 2020). In addition, it has also been used as a traditional and herbal medicine in many parts of the world, particularly for the treatment of nausea, vomiting, cough, arthritis, muscle pain, and asthma (Li *et al.,* 2019). It is one of the most important and earliest known oriental spices and is being cultivated in India both as a fresh vegetable and as a dried spice since time immemorial (Pavithra, 2021).

Ginger is usually grown on forest fringe lands. It grows well in red sandy and deep soils that are less exploited (Balamatti *et al.,* 2016). Labor and planting material are principal variables to be considered in ginger production in the guinea savannah of Nigeria (Ewuziem and Onyenobi, 2012). Availability of labor, land under cultivation, training received by farmers, and provision of subsidies are the major socio-economic factors affecting ginger production in Surkhet, Nepal (Mahat, *et al.,* 2019).

India is the largest grower of Ginger in the world, (Bheemudada and Natikar, 2016) followed by Nigeria, China, Nepal and Indonesia (FAOSTAT, 2020). For many decades ginger farming has played an important role in employment and income generation (Gogoi, 2020). It was a very profitable enterprise (Ezra *et al.*

2017). There is an increase in ginger cultivation in the rainforest zone of Nigeria. This is mainly due to the high demand for ginger in recent years (Egbuchua and Enujeke, 2013). Aside from that, with improved income, ginger farming also improved the socio-economic status of women (Yiridomoh *et al.*, 2021).

Production and Marketing of Chillies

Chilli (Capsicum annuum L. Solanaceae) is an economically important vegetable grown by farmers around the world (Setiawati et al., 2021). It is a resilient plant that is easy to grow and can be harvested twice a year if farmers manage the field properly. Rural farmers can easily earn a decent income from their small plot of land, especially when the population grows and agricultural land becomes increasingly scarce (Acaye and Odongo, 2018). Chilli can be consumed raw or processed. It is also rich in nutrients and vitamins, such as calories, protein, fat, carbohydrates, calcium, vitamins A, B1, and C. In addition, chilli is a also common ingredient in medicine and beverages (Orobiyi et al., 2015, Saleh et al., 2018, Karyani et al., 2021).

The world's chilli crop production is estimated to be around 7 million tonnes, with 1.5 million hectares under cultivation. Although chilli is produced all over the world, Asian countries produce the majority of it (Balra and Arockiasamy, 2018). It is one of the most important horticultural commodities in Indonesia as most Indonesians enjoy spicy dishes made with chilli as the main ingredient, resulting in high demand for commodities (Sumarno *et al*., 2021). Fresh chilli consumption in the United States has increased from slightly over three pounds per person in 1980 to over 7 pounds per person in 2020 (Lilywhite and Tso, 2021) . Andhra Pradesh, Telangana, Maharashtra, Karnataka, Madhya Pradesh, and Tamil Nadu are some of the most important chilli-growing states in India (Shaker *et al*., 2021).

SIGNIFICANCE OF THE STUDY

The dominance of marginal and small farmers is one of the issues confronting the agricultural economies of developing countries, including India. They are a significant entity in terms of both numbers and cultivated areas. These households account for the majority of India's rural poor (Hazra, 2001). Ginger and chilli production is primarily a family farm enterprise of smallholder farmers who face numerous challenges such as increased production costs, suboptimal resource use, a lack of market information, and inefficient marketing channels. Efficient marketing with a dynamic supply chain is critical for the agricultural sector. Markets in Mizoram are not commodity-specific; they are typical rural hats that cater to all of the daily needs, both agricultural and non-agricultural. Cash crop producers are not receiving adequate returns commensurate with the labor and investments they put in because it is evident that traders from other states who make collective purchases of our farm produce collude with wholesalers and act against the interests of the producers.

Agriculture is the most important occupation of the people of Mizoram, as the state has no major industry. Studies on the production and marketing of important crops are critical for farmers and those who rely on agriculture and its related activities. Despite the enormous potential of ginger and chilli to alleviate rural poverty, no specific and elaborated research has been carried out on the economic aspects of ginger and chilli cultivation. Keeping this in mind, the study was carried out with a specific goal to provide a framework for the state to address problems and improve ginger and chilli cultivation by recommending a suitable policy package, efficient farm management, and regulation and marketing activities.

STATEMENT OF THE PROBLEM

In Mizoram, agriculture, like other parts of India, plays a significant role in the rural economy, and the commercialization of agriculture appears to have gained traction over time. Although the production of chillies and ginger has increased over the years, the marketing chain has often been unable to keep up with supply. Most of

the time, producers-farmers do not have enough buyers for their products due to a lack of proper markets. In the absence of a manufacturing or wholesale market for these products, most sales occur in villages through chance encounters with floating traders. Prospective buyers visit villages shortly after harvest to make group purchases, and farmers are helpless to dispose of their commodities unless such buyers come their way.

In many situations, producers-farmers become price takers rather than price makers. As price movements affect the growth of these crops, farmers frequently have to resort to distress sales. However, with few options for crop substitution, a sizable producer-farmer must continue to cultivate ginger and chilies to supplement their meager income from jhum cultivation. As a result, to improve the production and marketing of ginger and chillies in the state, it is critical to conduct a study to identify the various problems associated with these crops and suggest solutions. The contributing factors to the ever-lower ruling prices for these products, which arise from a lack of proper market, must be identified. Keeping these in mind, the current study examined trends in the production of ginger and chillies, flaws in the existing marketing organization, and suggested recommendations for improvement of the state's agriculture sector.

OVERVIEW OF AGRICULTURE IN MIZORAM

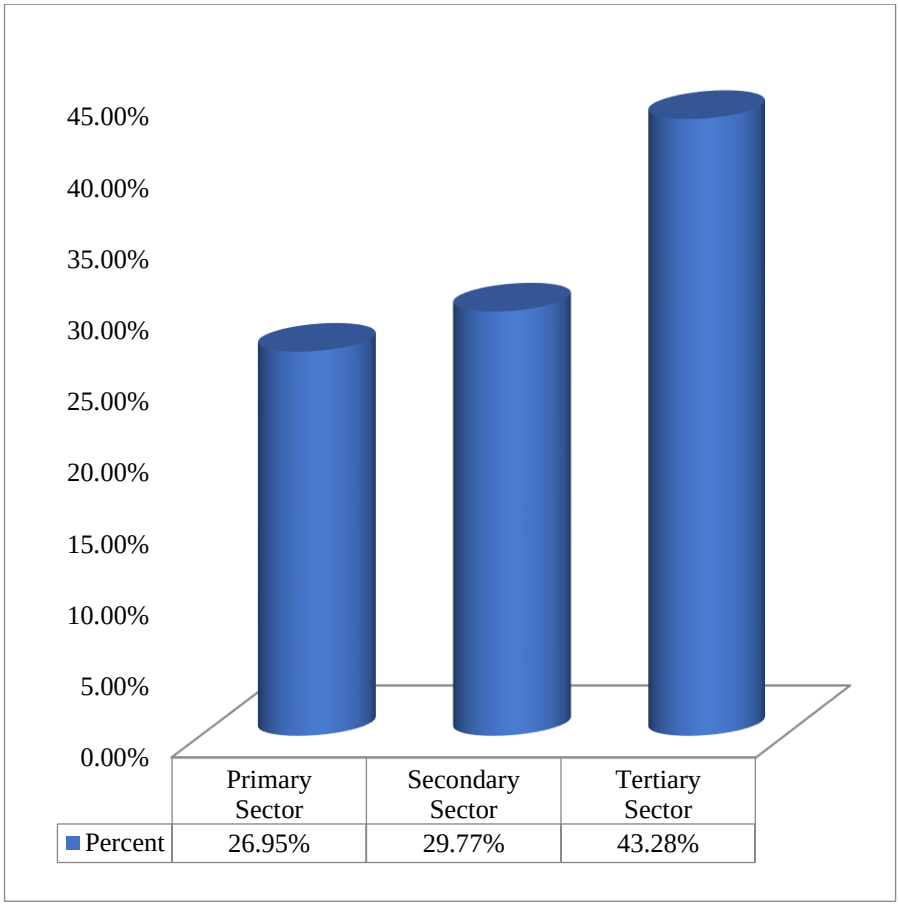
Mizoram is one of the youngest states in India; it became the 23rd state of the Indian Union in February 1987. It is located between 92^{0}15' to 93^{0}29' East Longitude and 21^{0}58' to 24^{0}35' North Latitude. The total geographical area of the state is 2108.700 thousand hectare. With its picturesque landscape, hilly terrains, meandering streams, deep gorges, and a rich wealth of flora and fauna, Mizoram is a treasure trove of natural beauty. Mizoram shares a 404 kilometer international border with Myanmar and a 318 kilometer border with Bangladesh. The state has been divided into 8 districts, 23 rural development blocks,24 sub-divisions and 3 Autonomous district councils and the agro-climatic conditions of these districts in Mizoram are ideal for growing fruits, vegetables, spices, plantation crops, flowering, medicinal and aromatic plants. Fruit crops, such as Mandarin Orange, banana,

passion fruit, grapes, hatkora, pineapple, citrus, papaya, are the most important horticulture crops in Mizoram. Flowers like Anthurium, orchid, Roses, and other subsidiary seasonal flowers, and Spices such as ginger, turmeric, Black Pepper, and Bird's eye Chillies are also grown. In many parts of the state, people have also begun to plant oil palm, medicinal, and aromatic plants.

In Mizoram there are eight agricultural districts, viz., Aizawl, Lunglei, Champhai, Kolasib, Saiha, Lawngtlai, Mamit and Serchhip districts. Under these eight agricultural districts, there are 14 sub-divisions and 53 Agricultural circles/ Sub-circles. There are four minor irrigation divisions, viz., Aizawl, Lunglei, Champhai and Kolasib. Under these divisions, there are nine minor-irrigation sub-division and nine Krishi Vigyan Kendra (KVK) Centre.

As per 2011 census, Mizoram has a population of 1,097,206 of which 555,339 (50.61%) are males and 541,867 (49.39 %) are females. The population growth rate was 47.89% and the density of population was 52 per sq km. The sex ratio in the state was 975, which is higher than the national average of 940 (2011 census). In Mizoram, 5, 25,435 (47.89 %) are living in rural areas and 5, 71,771 (52.11 %) are living in urban areas. The population of Mizoram constituted 0.09 percent of the Indian population in 2011. Literacy rates in Mizoram have seen an upward trend and are 91.33 percent as per the 2011 census, with male and female literacy rates of 93.35 percent and 89.27 percent, respectively. In actual number, Mizoram has 848,175 literates, with males accounting for 438,529 and females accounting for 409,646 (Statistical Handbook Mizoram, 2020).

Figure 1.1: Sector-Wise Share in GSVA at Current Price (2019-20)



Source: Statistical Handbook, Mizoram 2020

Sector wise share in GSVA at current price was illustrates in Figure 1.1. It shows the remarkable contribution of the tertiary or service sector, which accounts for approximately 44 percent of the total GSVA. The secondary sector contributed 29%, while agriculture and allied industries contributed 27% to the GSVA (***Statistical Handbook, Mizoram 2020***). Though the share of agriculture and allied activities has come down, it continues to be an important sector and provides livelihood to around 52 percent of the populations.

Table 1.1: Land Use Statistics of Mizoram (*Area in thousand hectares*)

Sl No	Particulars	2017-18	2018-19
1	*2*	*3*	*4*
I	**Geographical Area**	**2108**	**2108**
II	**Reporting Area for Land Utilization Statistics (1-5)**	**2108**	**2058**
	Forests	**1585.01**	**1493**
	Not available for cultivation (a+b+c+d)		**114**
	Water logged land	100	102
	Social Forestry		
	Land under still water		
	Other land		
	2 (a) Barren & unculturable land		
	Total (2 + 2 a)		
	Other uncultivated land excluding fallow land (a+b+c)		
	Permanent pastures and other	5.02	5
	Land under miscellaneous tree	74	70
	Culturable waste	7.01	10
	Total of 3 (a+b+c)	**86.03**	**85**
	Fallow land (a+b)		
	Fallow land other than current	107.01	102
	Current fallow	37.99	47
	Total of 4 (a+b)	**145.000**	**149**
	Net Sown Area	**173.99**	**213.67**
	Total Crop Area	**176.990**	**217**
	Area Sown more than once	**3**	**3.33**
III	**Net Irrigated Area**	**18.8**	**19.08**
IV	**Gross Irrigated Area**	**20.46**	**20.8**
V	**Current Jhum**	**19.60**	**18.90**

Source: Statistical Handbook, Mizoram, 2020

Table 1.1 shows the land-use statistics of Mizoram. As per the table, the state's total cropped area is 217 thousand hectares out of a total geographical area of 2108 thousand hectares, accounting for 10.29 percent of the total area. Of the total cropped

area, the gross irrigated area was 20.8 thousand hectares and the rest was under rain fed cultivation. The net sown area increased from 173.99 thousand hectares in 2017-18 to 213.67 thousand hectares in 2018-19. The current fallow land was 47 thousand hectares in 2018-19, while the fallow land other than current decreased from 107.01 thousand hectares in 2017-18 to 102 thousand hectares in 2018-19.

AREA OF THE STUDY

Champhai, a bustling trading district on the Indo-Myanmar border, is a beautiful place with many tourist attractions. A chain of green hills encircles lush rice fields, adding to the beauty of this place. In addition to its breathtaking beauty, it is a treasure trove of ancient relics, monuments, legends, and folklore. Champhai valley, also known as the "Rice Bowl of Mizoram," is located in the district. The small towns and villages in the district are studded with monuments and monoliths depicting war success, valorous hunting, personal distinctions, and achievements.

As per the record of Directorate of Agriculture, Mizoram, in 2020-21, 6,092 hectares were used for rice cultivation, out of which 3162 hectares were under Wet rice cultivation. The total production of rice in 2020-21 was 12611 million tonnes. Maize and pulses were grown on 480 and 284 hectares of land, respectively. 1857 million tonnes of sugarcane was produced in 2020-21 from an area of 59 hectares. The area under potato cultivation was 35 hectares and the total production was 50 million tonnes. Since agriculture and allied sectors are critical for the people, particularly for small and marginal farmers, its progress and development should be prioritized.

Livestock rearing is an important occupation of many households to meet their daily needs and supplement their household income. Piggery and poultry framings are primarily for meat and egg production, and in a few areas, people are also engaged in cattle rearing and dairy farming. Horticulture vegetables such as cabbage, brinjal, onion, beans, and spices like ginger, chilli, turmeric, and several plantation crops and fruits were grown in Champhai. Almost all horticultural crops survive in Mizoram's climate. As a result, maximum output and productivity can be expected if the ideal input requirements are available (Economic Survey Mizoram 2019-20).

Though ginger and chillies are grown in other districts of Mizoram, this study confine itself to the erstwhile Champhai district only as it is the most important agricultural center of the state and is one of the largest producers of ginger and chilies in the state. Champhai has an international border with Myanmar and thus had a great trading advantage compared to other parts of the State.

LIMITATION OF THE STUDY

The main problem relating to the present study is that farmers do not maintain record books relating to farming and marketing activities, they were unable to respond to the questions with accuracy and confidence. Because of this, the scholar took plenty of time to get reliable information from the respondents which make the survey time consuming. Similarly, prices of ginger and chilli in the retail markets are fluctuating and unpredictable, capturing these changes in prices are difficult especially when the markets are outside the state.

Limited access to data is another issue that the present study faced during the collection of secondary data. Updated data were not available. In some cases data were easily accessible but the authenticities of the sources were doubtful. Finding the original source of those data requires long span of time and effort which was a hindrance in pursuing the research work.

Study on ginger and chilli are quite minimal in Mizoram. This posed certain limitations to the present study since no fruitful comparison between the results of the present study and prior studies can be carried out. Apart from that, ideas and research gaps which have to be obtained from the previous studies on the same topic cannot be formulated.

OBJECTIVES OF THE STUDY

The objectives of the study are as presented below

1. To analyze the production and productivity of ginger and chillies in Champhai district.
2. To study the marketing arrangements and also the channels involved in the marketing of ginger and chillies.

3. To examine per hectare returns, Cost, and Benefit-Cost (BC) ratio during the study period.
4. To analyze factors affecting the productivity of ginger and chilli in the study area.
5. To compare and contrast ginger and chilli production, productivity, cost of cultivation, and profitability.
6. To compare and contrast marketing margin, marketing cost, producer's share and price spread in ginger and chilli marketing.
7. To estimate the marketing efficiency of ginger and chillies in different marketing channels.
8. To identify production and marketing problems faced by producers in the study area.

HYPOTHESES

1. There is a significant relationship between the ginger area of cultivation and lagged price of ginger and the chilli area of cultivation and lagged price of chili.
2. The numbers of agricultural labor in the family, the quantity of seeds used,and the amounts of fertilizer input in both the spices significantly determine the productivity of ginger and chilli.
3. There is an inverse relationship between the area of farm size and its productivity.

METHODOLOGY

The study is based on both primary and secondary data. The primary data were obtained through structured questionnaire and secondary data was obtained from sources such as Statistical Abstracts, Handbooks, articles, journals and other e-resources.

Survey Design and Data Collection:

A multistage sampling technique was adopted in this study. In the first stage, Champhai district was selected among the eleven districts of Mizoram. In the second stage, two rural development blocks out of three rural development blocks, were selected so as to represent Champhai district. The third stage involved random selection of six villages from each block. In the last stage, requisite data were collected randomly from household in each village with a total number of 676 randomly selected farmers' i.e, 354 respondents for Ginger and 322 respondents for Chilli. Data were also obtained through face to face interview and key informants interview. A field survey was conducted covering six years as a reference period starting from 2014-15 to 2019-20.

Methods and Techniques of Data Analysis

Cost of Production:

The variable cost components were taken into account while calculating the cost of production. This is mainly because of the fact that agriculture in Mizoram is still traditional in nature and no machine or tools were applied in the agriculture system. Moreover, the nature of agriculture system is mainly shifting cultivation under which labour, seed, fertilizer, pesticides, irrigation and weeding are the main cost components. Keeping this, expenditure on seed, land preparation, fertilizers and manure, pesticides, weeding, irrigation, harvesting, labour, are included in the variable cost while the fixed cost was left in the analysis since fixed cost has no considerable share in the cost structure. Total cost of production was calculated by adding all the expenditures on variable inputs and can be expressed as:

Total cost = $\sum$ Cost incurred on all the variable items

Benefit Cost Analysis:

For benefit cost analysis, total cost of production of the selected crop and total gross return from the products were used. For calculating gross return, income from produce sale was accounted. So the B/C ratio was calculated using the following formula:

B/C ratio = Gross Return/Total Cos

Profitability Analysis:

The profit is the difference between total revenue and total cost incurred. Thus, net profit for any farm business can be written as:

$\Pi = TR - TC$ Where, Π = net profit, TR = total revenue, TC = total cost.

Marketing Margin and Producer's Share:

Marketing margin is the difference between farm gate price received by the farmers and the price paid by the consumer (Tomek 1984). A wider price spread signifies a higher marketing cost and, as a result, an inefficient market. It was calculated by subtracting the farm gate price from the retailer's price and is mathematically expressed as

Marketing Margin (MM) = Selling Price (SP) – [Purchase Price (PP) + Marketing Cost (MC)]

Similarly, producer's share is the price received by the farmer expressed as a percentage of the retail price, which is the price paid by the consumers. It was calculated using following formula.

$$\text{Producer Share} = \frac{\text{Farm Gate Price (FGP)}}{\text{Consumer Price (CP)}} \times 100$$

Marketing Efficiency:

Producers' share of the consumer price, on the other hand, is simply the producer's price as a proportion of retail pricing. The magnitude of the producer's share of the consumer price is directly proportional to marketing efficiency.

The Modified Marketing Efficiency (MME) as suggested by Acharya (1999) was employed as an index of marketing efficiency. It is defined as

$$\text{MME} = \frac{\text{FP}}{\text{MC} + \text{MM}}$$

Where, FP is the net price received by farmers, MC is the total marketing cost and MM is the total marketing margins.

Indexing / Scaling:

For finding the importance of different production and marketing problems five point scale was used based on the farmer's perception about them. It comprises very high

importance, high importance, normal importance, less importance and the least importance to the different problems. The highest important problem was assigned a scale value of 5 followed by high importance with a scale value of 4 and so on. Production and marketing problems were ranked using the following formula:

Index of Importance = $\sum \frac{SiFi}{AN}$

Where, Iimp = index of importance $\sum$ = summation Si =ith scale value Fi = frequency of ith importance given by the respondents, A = highest scale value N = total number of respondents.

Factors affecting Yield of Ginger and Chilli:

In order to estimate the factors affecting yield of ginger and chilli a Multiple Linear Regression method was applied to determine significant factors from potential explanatory variables. Productivity (production/hectare) was accounted as the dependent variable while area under cultivation, amount of seed, fertilize, gender of the household head and labour are considered as the explanatory variables.

The mathematical specification is given as,

$Y = \alpha + \beta_1 A + \beta_2 S + \beta_3 F + \beta_4 L + \beta_5 G$

where, A is area under cultivation, S is amount of seed, F is expenditure on fertilizer and L is amount of labour employed and G is gender of the household head. α, β1…….β_4 are Coefficient to be estimated.

Growth Rate Analysis:

To compute the growth rate of area, production and productivity major spices of state and district the exponential function was used, which is as follows:

$Y = AB^t$

Equation (1) was converted into the logarithmic form in order to facilitate the use of linear regression. Taking logarithm on both sides of the equation (1).

$\log Y = \log A + t \log B$

Assuming as:

$\log Y = Y$

$\log A = a$

logB = b,

We get, $Yt = a + bt$ (t = 1, 2, 3……...n)

Yt= area/production/productivity in the year‘t’

a = intercept term indicating Y in the base period (t = 0)

b = Regression coefficient

t = Time variable (t = 1, 2, 3.....n)

After regression analysis we got value of a and b.

Since, b = 1+ r,

Hence, r = b – 1

r = Compound growth rate = antilog of b-1 * 100

Where, r is coefficient of correlation, n is size of sample. X and Y are variables.

CHAPTERIZATION

The Study has been organized into six chapters.

CHAPTERI: Introduction

In this chapter, we have addressed the background of the study and the overview of agriculture in the state. This chapter also incorporates the significance, objectives, and hypotheses of the study and methodology.

CHAPTERII: Literature Review

Chapter II provides a detailed account of the existing literature related to the study. The review of the literature is carried out in three parts: a review of existing literature on the history and origin of ginger and chillies, ginger production and marketing, and a review of existing literature on chilli production and marketing. The last section of the chapter contains a summary of the chapter.

CHAPTERIII: An Overview of Ginger and Chilies in India

The third chapter deals with an overview of ginger and chillies in India.

CHAPTER IV: Production of Ginger and Chillies: Data Analysis

The fourth chapter analyses data on acreage response to price, production and productivity trends, growth rates, the cost of ginger and chilli cultivation, and profitability. The chapter also discusses the productivity determinants of ginger and chilli, as well as a comparative analysis of ginger and chilli cultivation.

CHAPTER V: Marketing of Ginger and Chillies: Data Analysis

Chapter V examines the characteristics of agriculture markets in the study area by exploring marketing practices and constraints, the marketing channels, and disposal patterns. The chapter also analyses the marketing cost of ginger and chillies, the marketing margin, producer's share, and price spread. In addition, the various marketing problems in the study area have been presented in the last part of the chapter.

CHAPTER VI: Summary of Findings, Conclusions, and Recommendations

Chapter VI provides the summary of findings, conclusions, and recommendations.

Bibliography

FINDINGS

- Despite certain fluctuations in area under-cultivation, production and productivity of ginger and chilli, these variables on average are increasing during 2009-2010 except the productivity of chilli. The area under ginger and chilli cultivation in Mizoram has been increasing over the years with Compound Annual Growth Rate (CAGR) of 3.6 per cent and 2.8 per cent respectively. Similarly, the production of ginger and chilli also increase with a CAGR of 7.6 and 9.6 respectively, during the same period. As regards productivity, we found a significant difference between ginger and chilli. While ginger has witnessed a consistent productivity growth with a CAGR of 3.9 over the years, chilli has recorded a decreasing productivity with a negative CAGR of 17 during 2009-2010 to 2018-2019.

- Both ginger and chilli in the study area have shown a gradual increase in terms of production over the years with a CAGR of 10 per cent and 23 per cent

respectively despite certain fluctuations during 2014-15-2019-20. The mean production of ginger is 13170.08 quintals which are significantly higher than the mean production of chilli, which are 2139.77 during the reference periods. Likewise, the average productivity (quintal /hectare) of ginger, which is 5.98, is also higher than the average productivity of chilli, i.e. 0.98, from the 2014-15 to 2019-2020.

- The Coefficient of Variation (CV) of ginger production and productivity is 0.18 and 0.11 respectively while it is 0.36 and 0.13 in the case of chilli. Thus, the CV of ginger has a lower value than chilli in both production and productivity indicating a lower degree of fluctuations over the years. A huge fluctuation in chilli production and productivity indicates that there are certain factors effectively influence the production and productivity of chilli while lower CV of Ginger infer that the production and productivity of ginger are very unresponsive to change in some factors.

- Among the components of cost of cultivation of ginger, cost of seed topped the list with 20 per cent of the total cost followed by expenses on weeding and maintenance with 17 per cent. Harvesting cost is the third highest cost of ginger farming in the study area. It accounts for 15 per cent of the total cost of cultivation. Transportation of ginger from the farms site to villages is another cost item that induced farmer to incur huge expenditure and accounted for 11.7 per cent of the total cost.

- Regarding the cost of chilli cultivation, the harvesting cost has the highest share of the total cost with 23.68 percent, followed by weeding and maintenance with a share of 21.31 percent. These two items are significantly higher than the rest of the cost items accounting for almost half of the overall cultivation costs. The third and fourth largest cost items are slashing of forest and construction of jhum house with a share of 10.37 and 9.81 percent respectively. The percentage share of the rest of the cost components ranges between 7.10 percent and 1.80 percent, with irrigation costs being the lowest share.

- The gross income from ginger and chilli cultivation has consistently increased over the years. In 2014-15, the gross income from ginger production per hectare was Rs 144432, which increased to Rs 208311.90 in 2019-20, a 1.5 fold increase in just six years. Similarly, chilli experienced a similar trajectory, with a gross income per hectare of Rs 207931 in 2014-15, which increases to Rs 383662.13 in 2019-20, representing an increase of more than 1.8 times in 6 years.

- The net income of ginger and chilli cultivation increased significantly over the years. The net income of ginger was Rs 52390.35 in 2014-15, which increased to more than double in 2019-20. The net income of chilli cultivation shows a more robust result which increased from Rs 90676.54 in 2015-16 to Rs 319569.20 in 2019-20, which is more than three times the initial value.

- The benefit-cost ratio reveals that chilli cultivation is relatively more profitable than ginger cultivation. The average B-C ratio of chilli during the reference periods (i.e., 2014-15 to 2019-20) was 3.56, while the average B-C ratio of ginger was only 1.83. The higher B-C ratio of chilli cultivation is mainly because while chilli cost of cultivation per hectare declined from Rs 117254.93 in 2014-15 to Rs 88700 in 2019-20, its market price per kilogram has dramatically increased from Rs. 264.77 to Rs 360.23 during the same period. Such situations have not been observed in ginger cultivation, where, despite rising cultivation costs, the market price was relatively stable over time, hovering around Rs 26-31.

- The value derived from the rank scale revealed that lack of credit facilities had an index value of 0.82 in ginger cultivation and was ranked as the most serious problem, followed by disease and insect problem, while fertilizer was ranked as the least significant problem with an index value of 0.35. In chilli cultivation, disease and insect have the highest index value of 0.83 followed by credit facilities with an index value of 0.70. Relative seriousness of the problems experienced by the ginger growers followed the sequence of lack of credit facilities, disease, and insect problems, skilled labor, irrigation, and fertilizer, while chilli has a sequence of

disease and insect problems, credit facilities, lack of skilled labor, fertilizer, and irrigation.

- The R-square for ginger and chilli is not very high. In the case of ginger, the predictors in the model explain 36.6 percent of the change in productivity, whereas it is 30.1 percent in the case of chilli. Although the overall regression models are statistically significant for studying ginger and chilli, the values of R-square are very low indicating that the productivity of ginger and chilli is greatly affected by many factors such as soil quality, rainfall, temperature, and other climatic conditions. As such, our regression model could explain only about 36 percent of the variation in ginger productivity and 30 percent of the variation in the productivity of chilli.

- The regression results show that ginger productivity is influenced by the number of agricultural laborers in the family, quantity of seed and fertilizer, gender of the household head, and size of the farm, which are statistically significant at a 5 percent level of significance. The same inputs were statistically significant in the case of the productivity of chilli except for the amount of agricultural labor. This may be attributed to the more susceptibility of chilli against diseases and unfavorable climate compare to ginger. With such vulnerability, a household having many agricultural laborers may also experience low production and productivity.

- There are three marketing channels in the study area. In Channel-I, the farmer/producer directly sold their produce to the retailer in the local market, mainly in Aizawl city. Since only a small portion of the producer is directly sold to retailers within the state, the relative share of Channel-1 in terms of volume of the total produce is very small and negligible. In most cases, the farmers bear all the marketing costs in Channel-1. In Channel-II, the producers or representatives of producers collected the product and sold it directly to the retailer at Bagha at a negotiated price. However, the farmers with weak bargaining power have little control over the price, and hence, the price mostly favors the retailers. Usually, the relative share of Channel-II in the total produce is slightly higher than Channel-I but

much lower than Channel-III. However, in Channel-II, producers have to bear all the marketing costs and need to make transportation arrangements up to the point of selling outside the state. This poses difficulty to producers who have limited knowledge of the market price and demand conditions outside the state. As a result, only a small portion of producers can follow Channel-II despite its prices being relatively better.

- Out of the total respondent of ginger farmers, 88.98 percent of the ginger farmers follow Channel-III, 7.63 percent follow Channel-II, and the rest 3.39 percent follow Channel-I. The chilli market also witnessed the same pattern, where Channel-III is the most prevalent channel, and Channel-I is the least opted channel. More than 94 percent of the total respondent of chilli producers followed Channel-III, 6.51 percent followed Channel-II, and the remaining 3.11 percent of producers chose Channel-I.

- It is found that only 1.18 percent of the total production of ginger and 1.43 percent of chilli production were disposed of in channel-I. Channel-II shows a slightly higher volume of disposal in both ginger and chilli, accounting for 4.13 percent and 4.21 percent of the total production. In Channel-III, 94.69 percent of the total production of ginger and 94.66 percent of the total production of chilli are sold.

- The marketing cost in channel-I for fresh ginger and dry chilli is estimated to be Rs 125 and 395 per quintal, respectively. In Channel-II, the marketing cost is estimated to be Rs. 605 per quintal in case of fresh ginger and Rs 757 in case of dry chilli. The total charges of the destinations in Channel-III are estimated to be Rs.659 per quintal for ginger and Rs.765 per quintal for dry chilli.

- In channel-1, the farmer/producer received Rs.3175 per quintal as the net price in the case of ginger. The producers' share of consumers’ rupee of ginger in this channel is 82.5 percent. While in the case of chilli the farmer received Rs 31005 per quintal as net price with a producer share of 86.12 percent in the same channel. In

Channel-I, the shares of marketing margin in consumers' price for ginger and chilli have shown a difference of about two percentage points, with ginger being 14.37 percent and chilli being 12.77 percent, respectively.

- In Channel-II, out of the total marketing cost, the farmer/producer obtains 74.6 percent, while the percentage of costs incurred by retailers is 26.4 percent. In this channel, the producer of ginger and retailer received Rs 3495 and Rs 895 as net prices, respectively. The farmer/producer receives 72.81 percent of the consumer's rupee, and the remaining 10.31 percent is obtained as a business margin after deducting 4.27 percent of the cost by retailers. The difference in price paid by the consumer and the price received by the producer of ginger is Rs.1400 per quintal, showing a wide price spread with an additional intermediary. Regarding chilli, the producer and retailer received Rs 36243 and Rs 4645 as a net price, respectively. The farmer/producer share in the consumer's rupee is 86.29, while the retailer received 11.30 as a business margin. The price spread in the case of chilli is Rs 5000, which is much wider than the price spread of ginger.

- Out of Rs. 659 per quintal total marketing cost of ginger in channel III, wholesaler incurred 66.62 percent of the total cost followed by retailer and farmer-producer with 31.11 percent and 2.27 percent, respectively. In the case of chilli, the whole seller accounted for 63.10 percent of the total marketing cost, while the retailer and producer incurred 34.40 percent and 2.54 percent, respectively. The net price received by ginger producers is Rs. 2785, which is 53.55 percent of the consumer price in Channel-III. Chilli producers received a net price of Rs. 29980, which is 71.38 percent of the consumer price. Thus, chilli marketing has a higher producer share in Channel-III than ginger marketing. The net margin of wholesalers and retailers in ginger marketing is Rs.439 per quintal and Rs. 895 per quintal, while the net margin of wholesalers and retailers in chilli marketing is Rs 6505 per quintal and Rs 4730 per quintal, ensuing greater share of consumer's rupee is pocketed by market intermediaries in Channel III. The analysis further reveals marketing cost across marketing channel increases while producers' share in the consumer's rupee decline with an increase in market intermediaries. As a result, as the number of

dealer increases, marketing costs rise, producers' share of the consumer's rupee falls, market intermediary profit margins rise, and the price gap between producer and consumer widens.

- The marketing efficiency indexes for ginger in Channel-I, Channel II, and Channel III are 1.54, 2.05, and 1.15, respectively. Thus, it is revealed that Channel-II has the most efficient marketing system in ginger marketing, followed by Channel-I. Channel-III is the most inefficient marketing channel. Similarly, the marketing channels for chilli show the same pattern, with Channel-II having the highest index, followed by Channel-I and Channel-III. From the result of the analysis, a marketing channel having more numbers of intermediaries has less marketing efficiency, while a marketing channel with fewer intermediaries shows a more efficient marketing system.

- One interesting fact is that even though Channel-III is less efficient than both Channel-I and Channel-II for ginger and chilli, the majority of the produce was sold on this channel. This is because there is limited demand in the local market in Channel I. As such, many producers could not opt for Channel-I. Only some producers who have a good connection with retailers in Aizawl city could choose Channel-I. In the case of Channel-II, many producers with poor financial access cannot bear marking costs. As a result, the majority of producers sold their produce in Channel-III, where agents collected their produce at the collection center in their village.

- Among all the marketing problems, unpredictable prices emerged as the major marketing problem for the producer in the case of both ginger and chilli marketing. Price fluctuation, unorganized market, and transportation problems are the top three marketing problems faced by producers of ginger and chilli in the study area.

- The rank scale showed that high fluctuation in market price had the highest index value of 0.9 in the case of ginger marketing and 0.87 in the case of chilli. The least indexed value for ginger marketing was 'lack of processing facilities, with an index value of 0.43, while the least indexed problem for chilli marketing is 'lack of storage facilities,' with an index value of 0.33.

- Relative seriousness of the problems faced by ginger growers followed the sequence of price fluctuation, unorganized market, transportation problems, lack of storage facilities, and lack of processing facilities, while chilli growers follows the same sequence for the first three problems with an interchange of the last two problems.

RECOMMENDATIONS

Mizoram has a significant agricultural potential across the country and agriculture is the major provider of employment for the people. Despite having a wide range of favorable agro-climatic conditions for growing ginger, chili and other agricultural products in Mizoram, there are still various obstacles for farmers and producers in the state. To tackle these constraints the following recommendations were made based on the study.

1. From the results of the analysis, it is revealed that, only small portion (about 3 per cent) of the total ginger and chilli produce are consumed in the state. Major portion of the surplus produce were sold outside the state through middlemen at a very low price. In most cases, the farmers are forced to sell their produce even at an unfavorable price since there is no local market big enough to absorb the produce in large quantities. Value addition and mechanical processing of ginger and chilli is not popular in the study area as well as in the state. Traditional method of processing and unfavorable climate during the processing period generally raises costs and lower quality. Thus, the success of ginger farming in the state is inextricably related to the performance of spice processing units, value addition and marketing. Therefore, value addition and processing of ginger and chilli is essential to convert the low

value ginger and chilli into high value products to make the crops more remunerative. Value additions such as, drying, grading and labeling, cleaning and peeling of fresh ginger, packing, etc. may be done. In case of ginger, different products like ginger oil, ginger beer, ginger oleoresin, ginger powder, etc. may be produced through government intervention which can be exported to outside the state. Ginger oil is primarily used as a flavoring agent in confectionary and for soft drinks. Ginger is also used for several medicinal purposes. The oleoresin and oil are known as high value and low volume products, which have great demand in western countries. Thus, processing of ginger within the state will lead to higher demand in the local market, eliminate middle man, higher prices, creation of export product, and ensure higher income to the farmers and producers. Chilli can also be processed and converted into chilli sauce, chilli powder, chilli paste, etc. Value addition and processing will not only convert ginger and chilli into high value product and more remunerative product, but will further generate employment to the masses and contribute to the growth and welfare of the state. Thus, the State Government intervention in the field of processing of ginger and chilli is one of the promising steps to uplift the farmers as it is abundantly available not only in the state, but also in the north eastern region. Apart from that, the state has a high potential and conducive agro-climatic condition for these two crops.

2. The practice of shifting cultivation is very expensive and unsustainable. It also has adverse impact of our environment since farmers move on and clear another area of the forest when soil fertility is exhausted. Thus, a new and better system of cultivation such as settle cultivation, terrace cultivation, must be introduced in the study area. This will not only reduce the cost of cultivation, but also contribute to prevent soil erosion, desertification and degradation of soil fertility thus contributing farmers to reap higher productivity and profitability. However, the initial cost of terrace farming is very expensive and requires huge investment. In this respect, government intervention through programmes and schemes is the best option since farmers with no financial power are unable to meet the requisite expenditure. Abandonment of shifting cultivation is the need of the hour considering recent climate change, water scarcity and rapid rate of desertification in the state. Furthermore, farmers in the study area are also using outdated

tools and equipment. Quality farm equipment is difficult to avail for the poor farmers. Supply of modern tools and equipment is very important for upgrading farm practices since the farmers are not in position to buy those tools and machine. Thus, in order to increase production and productivity, the government needs to refocus agriculture sector, pay more attention in supplying modern tools and equipment to the farmers.

3. It is undeniable that small and marginal farmers have always had a problem of access to credit facilities. Inadequate support from government and financial institution in terms of credit facilities has been noted as one of the primary issues affecting farming operations, particularly those of small and marginal farmers. Even though there are credit support from the central government such as Kissan Credit Card (KCC) scheme, Interest Subvention Scheme**,** Investment Loan, etc., the facilities provided under these schemes are inadequate. Apart from that, these facilities especially agricultural loans are very difficult to access for those in need since they are unable to provide security or mortgage against the loan. Rather, an individual with better security or the relatives of the high government officials mostly enjoy the fruit of various government schemes related to agriculture. This is one of the major problems for effective implementation of credit support schemes provided by the central government in uplifting the poor farmers. Thus, providing credit facilities to the needy farmers must be emphasized more than any other problems since credit has the potential to help poor farmers a variety of agricultural issues such as heavy dependence on monsoons, inability to mitigate uncertainty, lack of access to suitable technology, etc. As such, easy access to credit facilities, more financial inclusion of small farmers and investment in agriculture are the key to improve the performance of farmers in the study area.

4. One of the major constraints to development of agriculture in Mizoram as well as in India has been the lack of all-weather road. Most villages in the study area still lack road connectivity to agriculture sites and settlements, as well as village-to-village linked roads since procurement of the produce from the farm sites to villages in the study area are mostly done by headload. This significantly led to higher cost of production, higher marketing cost and longer procurement periods. Besides this, lack

of road connectivity discourage the use of more productive inputs and farming techniques since procuring such high-tech inputs from the market is not cost effective. Thus, the government may give special attention in providing link roads for the farmers. Improvement in road connectivity would leads to a decline in both average and marginal costs of production and gradually exposes farmers to modern agricultural practices. It is a well-known fact that good transportation encourages agricultural market expansion, economies of scale, and easy operations of factor market which in turn will exposes the rural economy to more outside competition.

5. Agricultural markets in most states of India are established and regulated under State APMC (Agriculture and Marketing Committee) Acts. These led to the creation of regulated markets, also called mandis. Farmers were compelled to sell their produce via licensed intermediaries or market officials under the APMC Acts, which forbade them from dealing directly with unauthorized intermediaries. This has eliminated number of intermediaries and provide reasonable price to the farmers and producers. However, the mandis system is absent in the state of Mizoram which compels farmers to sell their produce to the intermediaries and itinerant from outside the state. In this respect, the government may intervene in establishing regulated market within the state or find a channel through convergence with other states where farmer can sell their produce directly to the regulated markets. Recently Mizoram Agriculture Marketing Solution (MAMSOL) was established in 2016 as private company. This company has started purchasing ginger in Serchhip district and sold directly to the retailer.

6. Another important recommendation is the need for survey and identification of soils and other climatic conditions suitable for ginger and chilli not only in the study area, but also in other parts of Mizoram. This is required to introduce better-quality varieties of ginger and chili suitable for the state. The survey and identification will enable application and development of area specific farming system model in cluster approach in the state. This will ensure higher productivity and profitability since cluster approach farming system has the advantage of applying scientific methods of

cultivation, farm mechanization, construction of irrigation system and road connectivity.

7. The production of ginger and chilli in the study area is organic by default, because only negligible percent of the farmers used chemical fertilizers or herbicides on their crops. Since, the state has favorable agro-climatic condition for growing different crops, majority of the famers solely use locally available manures (cow dung, pig manure, poultry manure, and so on) in the entire state. In this way, farmers' ignorance in using fertilizers and herbicides turned out to be a blessing as their produced can be graded as organic. However, the state government must take active steps for awareness campaign among the negligible portion of the fertilizer users to abandon fertilizer uses and practice organic farming. Then, the state must take up the responsibility of exposing the ginger and chilli production in the state are totally organic and chemical free. At the same time, the State must also take up necessary measures for grading and certification. Considering the increasing demand for organic produce all over the world, there is a lot of scope to promote organic ginger and chilli products for export in foreign countries. Thus, if the state government intervenes in the process and takes actions, there is a potential to transform the state as organic hub of ginger and chilli in the country.

8. The study found that diseases and pest attacked is the most serious problem in case of chilli and second most serious problem in case of ginger. This clearly signifies that farmers need proper training on how to control diseases and insects. Even though the Directorate of Agriculture and Horticulture frequently provides training to the famers, there is still a need to focus on problems related to diseases and insects in case of ginger and chilli. Thus, farmers must be provided training on diseases and pest attack, selection of good quality seed, high yielding and disease resistance varieties and seed, which will significantly improve production and productivity in the study area, since this training is likely to reduce cost of cultivation on the one hand and increase the income of the farmers on the others Thus, the government must take an efforts in helping the farmers to move forward through various training programmes.

9. Commercialization of agricultural products has gradually increased even in the state. When commercialization of agriculture sector is initiated, farmers not only produce for subsistence, but also for marketable surplus. Ginger and chilli growers in Mizoram have to undergo a huge loss in times of unfavorable circumstances such as drought, landslide, attack of pests and fluctuation in the price of the products, since ginger and chilli are commercial crops which are produced in large quantity. As a result, insurance is one of the most effective strategies to safeguard farmers from such losses and provides a relief to the farmers. In this respect, the government may seek trusted insurance provider companies that could offer an appropriate coverage schemes which includes minimum support price guarantee. Since, the socio-economic status of farmers are generally weak, the government may share the premium for the insurance companies which the farmers are obliged to pay.

10. Although the average production per hectare of ginger and chilli in this state is lower than many other states, there is always room for improvement. To boost the yields of ginger and chilli, timely delivery of disease-free seeds to farmers is crucial. Apart from that, extension agencies such as Agriculture Extension Officer (AEO) and Horticulture Extension Officer (HEO) in the production areas must be more proactive in identifying and recommending timely and appropriate solutions to producers' field's difficulties. The Government should also undertake the responsibility of distribution of healthy seeds through the concerned department's intervention and village council level involvement. Increase in productivity is desirable not only to increase the output but also to improve the cost competitiveness and profitability of ginger and chilli cultivation.

CONCLUSION

Despite a decline in the share of the agricultural sector in the country's Gross Domestic product (GDP), the sector remains an exclusive sector in which the modes of life and business enterprise are combined. From the results of the analysis, it is

revealed that, only small portion (about 3 percent) of the total ginger and chili produce are consumed in the state. Major portion of the surplus produce were sold outside the state through middlemen at a very low price. In most cases, the farmers are forced to sell their produce even at an unfavorable price since there is no local market big enough to absorb the produce in large quantities

It can be concluded that adequate production and marketing facilities in the rural areas in Mizoram are an urgent necessity. Predominantly, a larger portion of the state's population lives in rural areas, and limited access to various economic and social facilities and services adversely affects the socio-economic conditions and quality of life of those rural people in the state, as reflected in the living conditions of most of the households in surveyed villages that fall into the below-poverty line category.

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