

# **A STUDY ON THE MARKETING OF SELECT HORTICULTURAL PRODUCTS OF MIZORAM : PROBLEMS AND PROSPECTS**

**THESIS SUBMITTED IN FULFILLMENT OF THE DEGREE OF  
DOCTOR OF PHILOSOPHY IN MANAGEMENT**

**By  
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### *CERTIFICATE*

This is to certify that “A Study on the Marketing of Select Horticultural Products of Mizoram: Problems and Prospects” by Vanlalhumi has been written under my supervision.

She has fulfilled all the required norms laid down under the PhD regulations of Mizoram University. The thesis is the result of her own investigation. Neither the dissertation as a whole nor any part of it was ever submitted to any University for any research degree.

Aizawl/  
Dated 1/8/2014

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**AUGUST :2014**

**DECLARATION**

I, Vanlalthumi, hereby declare that the subject matter of the thesis entitled “A STUDY ON THE MARKETING OF SELECT HORTICULTURAL PRODUCTS OF MIZORAM: PROBLEMS AND PROSPECTS” is the record of the work done by me, that the contents of this thesis did not form basis for the award of any previous degree to me or, to 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/Institution.

This is being submitted to Mizoram University for the Degree of Doctor of Philosophy in Management.

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Place:

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## **ACRONYMS**

Acre – 1 acre = 100 cents = 0.4046 ha.

DPR - Detail Project Report

FAO - Food and Agriculture Organization

GDP -Gross Domestic Product

GSDP -Gross State Domestic Product

Hectare (ha) - 1 ha = 2.471 acres.

HMNEH - Horticulture Mission for North East and Himalayan States

ICAR -Indian Council of Agricultural Research

MAMCO -Mizoram Agricultural Marketing Corporation

MIFCO -Mizoram Food and Allied Industries Corporation Ltd.

NCPAH - National Committee on Plasticulture Applications in Horticulture

NER - North Eastern Region

NLUP - New Land Use Programme

NMMI - National Mission on Micro-Irrigation

NMMP - National Mission on Medicinal Plants

PFDCs - Precision Farming Development Centres

RKVY - Rastriya Krishi Vikas Yojana

SGS - Societe Generale Surveillance

VIUC - Vegetable Initiative for Urban Clusters

WRC - wet-rice cultivation

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# **Chapter I**

## **Introduction**

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- 1.3 Significance and Scope of the Study
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## 1.1 Introduction to Horticulture

Horticulture is the science or art of cultivating fruits, vegetables, flowers, or ornamental plants. Etymologically, “horticulture” can be broken down into two Latin words: *hortus* (garden) and *cultus* (tilling). As William L. George explains in his definition of horticulture, “Horticulture involves five areas of study. These are floriculture (includes production and marketing of floral crops), landscape horticulture (includes production, marketing and maintenance of landscaping plants), olericulture (includes production and marketing of vegetables), pomology (includes production and marketing of fruits) and postharvest physiology which involves maintaining quality and preventing spoilage of horticultural crops”.

Horticulture, including fruits, vegetables, roots and tubers, spices, mushrooms, floriculture, medicinal and aromatic plants, nuts, and plantation crops, has emerged as an important sector. Horticulture has established its credibility in improving income through increased productivity, generating employment, enhancing exports and providing nutritional security to the people. It has played a significant role in improving the economic status of our farmers and women empowerment.

In terms of total production, India is the fruit and vegetable basket of the world. India has become the largest producer of fruits and the second largest producer of vegetables. Its share in the world production of fruits and vegetables is approximately 11 percent and 7 percent respectively. Because of its varied agro-climatic conditions, temperate sub-tropical and tropical climate, India can produce a variety of fruits and vegetables.

In India, the horticulture sector contributes about 28 percent of the gross domestic product (GDP) from about 13.08 percent of the total land area, and 37 percent of the total exports of agricultural commodities. The annual growth rate of horticulture is more than 6.5



percent. As a result, the horticulture sector has received increased attention of the Government of India in respect of budget allocation, creation of research and development infrastructure, training of manpower and even marketing support. In spite of significant achievements, the potential is still enormous. The Government of India has thus launched a National Horticulture Mission during 2005 for all round development of horticulture sector in the country.

There are several advantages of growing horticultural crops. These crops produce higher biomass than field crops per unit area resulting in efficient utilization of natural resources, are highly remunerative for replacing subsistence farming and thus alleviate poverty level in rain fed, dry land, hilly, arid and coastal agro-ecosystems. Horticulture crops have potential for development of wastelands through planned strategies, require comparatively less water than food crops, provide higher employment opportunity, are important for nutritional security and are environment-friendly. Moreover, they are high-value crops with high potential of value-addition, have high potential for foreign exchange earnings, and make higher contribution to gross domestic product (GDP) from a limited land area under these crops.

However, the export of horticultural products from India has so far been much lower than desired, mainly due to lack of infrastructural facilities for handling storage, processing and marketing of the produce. Almost one-third of our fruits and vegetables are wasted on account of poor cold storage facilities, and other difficulties in handling. Wide fluctuation in the price of horticultural produce during season and off-season, significant difference in prices of same products in various parts of the country and low productivity are also important factors which make our produce uncompetitive in the international market.

As reported by the Indian Council of Medical Research and National Institute of Nutrition, Hyderabad, only 46gm and 130gm of fruits and vegetables respectively is the per capita consumption in India while the minimum requirement is about 92gm and 300gm respectively. In order to reach such level of consumption India requires to produce 32.58 million tonnes of fruits and 83 million tonnes of vegetables per year while the present production is only 28.2 million tonnes of fruits and 66 million tonnes of vegetables respectively. This indicates that there is a vast scope and requirement for production of horticultural crops.

The North-Eastern Region of India has been blessed with agro-climatic conditions pre-eminently suited for a variety of horticultural crops. It is the centre of origin of many horticultural species, has a wealth of orchid species and varieties and plenty of rare herbs. What is lacking is scientific exploitation of this potential with a sound marketing network. To tap this potential, several initiatives have been taken. An ICAR (Indian Council of Agricultural Research) complex for North Eastern Region was established at Shillong Meghalaya, with a number of regional stations devoted to horticultural programmes.

## **1.2 Overview of Horticulture Farming in Mizoram**

Mizoram is an expanse of blue-green hills situated at the southern extreme of North East India. It enjoys a splendid blend of climatic conditions of tropical, sub-tropical and temperate zone climates and the hill ranges run in North-South direction with varying altitudes with an average height of 920m above sea level, coupled with high mean annual rainfall of 2500 mm and high relative humidity up to 90 percent.

The soils are loamy to clay, rich in organic carbon and moderately rich in available potash. The temperature during summer varies from 20<sup>0</sup> C to 34<sup>0</sup> C and during winter season from 8<sup>0</sup> C to 17<sup>0</sup> C. Due to the continuous washing away of topsoil by rainwater, the soil

becomes acidic in nature and has low pH values ranging from 4.5 – 5.5. In view of this, cultivation of fruit and plantation crops is a viable alternative to jhuming to check soil erosion and depletion to provide permanent livelihood with higher income.

Agriculture is the mainstay of the people of Mizoram. The economy of approximately 70 percent of the population in Mizoram is based on farming and majority of the farmers practice jhuming/shifting cultivation. As there is very small area of flat land for practicing wet-rice cultivation (WRC), farmers of Mizoram have no alternative but to practice jhuming which is very detrimental from environment point of view besides being a fragile means of livelihood. To do away with this shifting method of farming, permanent farming in a cluster area with application of modern technology is an ideal approach and need of the hour.

The important crops that are cultivated in Mizoram are mentioned below:

***Fruit Crops:***

The ideal agro-climatic condition of the state is highly suitable for cultivation of all kinds of fruit crops ranging from tropical to temperate fruits except those fruit crops requiring high chilling temperature. The major fruit crops grown in the state are Mandarin Orange, Pineapple, Passion fruit, Grape and Banana. Besides these fruit crops, other fruits like Strawberry, Kiwi, Avocado, Papaya, Mango, Assam Lemon, Plum, Peach, Guava, Litchi etc. are also grown for local consumption as these fruits are of great value in terms of nutrition and are having demand in local markets. Apart from the above mentioned fruit crops presently grown in the state, all other fruit crops can also be grown depending upon the market demand.

Though Mandarin Orange has been successfully grown in the state and has been cultivated for over 100 years, most of the old orchard has become unproductive due to negligence and poor management by the farmers and also due to the effect of Citrus decline.

In order to solve this problem, the department initiated a programme of rejuvenating the senile/declining orchards by adopting proper management practices like pruning, removal of dead branches, application of plant protection measure, nutrient supplements, irrigation during dry period and proper canopy management. Due to these efforts, the declining orchards are becoming productive again thus increasing production and productivity almost as before.

Provision of quality planting materials is a pre-requisite, especially for long gestation crops like fruits, as it normally takes many years to bear fruits. In order to reduce the gestation period, the Department of Horticulture encourages the farmers to plant budded/grafted plants so as to bear fruits early with quality production and productivity. In order to meet the high demand of quality planting materials, nurseries are established at various locations both in public and private sectors to meet the demand as there is no source of desired quality planting materials to be procured from neighbouring states.

The state has a Fruit Juice Concentration Plant at Chhingchhip under Serchhip district which is managed by Mizoram Food and Allied Industries Corporation Ltd. (MIFCO). The capacity of the plant is 2.5 tonnes per hour to process fruits like Passion fruit, Pineapple and Mandarin Orange. This can be utilized at its full capacity provided raw materials required for the plant is available.

### ***Vegetable Crops:***

The state is still bringing in many vegetable crops from neighbouring states particularly during Rabi season. The major vegetable crops grown in the state are Cucurbits such as Cucumber, Watermelon, Muskmelon, Bitter Gourd, Bottle Gourd, Snake Gourd, Ash Gourd, Pumpkin, Chayote; Cole crops such as Cauliflower, Cabbage, Broccoli, Knolkhol; Leguminous crops such as Pea, French Bean, Cow Pea, Winged Bean, etc.; Solanaceous

crops such as Tomato, Brinjal, Chillies, Capsicum; Bulb crops such as Onion, Garlic; Leafy and salad vegetable crops such as Lettuce, Okra etc. As there is no vegetable seeds breeding station in the state, high yielding and improved hybrid seeds are procured from outside the state which enhances vegetable production in Mizoram. It is the intention and desire of the government to produce off season vegetable crops round the year for which variety seeds suitable for off season cultivation such as heat resistant variety of Cabbage and Tomato are introduced and off season production fetches good market price. This has economic benefit besides meeting the market demand.

Of all the vegetables produced in the state, Chayote is being sold in large volume to the neighbouring states. This shows that vegetable production, particularly off season vegetables have to be given priority which will not only bring self-sufficiency, but will enhance and generate income of the growers. As stated, cultivation of all varieties of vegetable crops can be taken up on market demand.

### ***Flower Crops:***

The moderate climate of the hills of Mizoram offer good opportunity for growing almost all types of flowers round the year. Flower varieties such as Rose, Anthurium, Chrysanthemum, and Gladiolus are grown successfully round the year while Anthurium and Rose are being cultivated at commercial scale and being marketed in bulk to outside state and also exported to countries like UAE, Japan, etc. Other than the two major cut flowers being exported, there are many more important flowers being cultivated in the state such as Alstroemeria, Antirrhinum, Calendula, Impatiens, Euphorbia (Christ thorn), Hibiscus, Aster, Bougainvillea, Bird-of-paradise, Orchid (Dendrobium), Lillies, Marigold, Cockscomb, Lisianthus, Heliconia, Poinsettia, Carnation, Dahlia, etc.

Apart from these, various kinds of house plants and shade-loving plants are being grown in the state.

### ***Root and Tuber Crops:***

Root crops like Carrot, Beetroot, Radish and Tuber crops like Potato, Tapioca, Colocasia, Sweet Potato etc. are commonly grown in Mizoram. As it is grown only in a few pockets, the state requirement is not met and the said crops are coming in from the neighbouring states to the local markets.

### ***Spice Crops:***

Of the many spice crops, Ginger, Turmeric, Bird's Eye Chilli and Coriander are the major spice crops grown in Mizoram. It is encouraged to be cultivated on bench terraces which may prevent soil erosion and top soil loss which will facilitate continuous utilization of the same plot year after year by adopting proper crop cycle/crop rotation. Presently, Mizoram state is encouraging organic cultivation and organic production of spice crops due to which organic certification has been obtained specially for spice crops and an organic certification has been obtained for an area of more than 5000 ha. Reputed organic certifying agencies such as SGS, India and One Cert Asia are engaged to do the certification and accordingly organic certificates have been issued to the Department of Horticulture.

### ***Plantation Crops:***

Important plantation crops of the state are Jatropha, Tung, Oil Palm, Coconut, Bamboo, Tea and Coffee. Jatropha is cultivated in large scale in Mizoram for production of bio-fuel by extracting the oil from its seed. For extraction of oil, Jatropha oil expeller units are set up at two locations, New Vervek and Khawzawl. One oil filter unit is also installed in New Vervek. Tung decorticator has been fabricated by IIT, New Delhi and the same is

procured through the manufacturing firm and being installed at Thingdawl where Tung cultivation has been taken up.

Coconut plantation is taken up in the districts of Kolasib, Tuidam and Lunglei under Coconut Board Development Programme and is expected to come up in Lawngtlai and Saiha districts as well. State production cannot meet local consumption requirement till date.

Bamboo plantation is presently being done by Forest Department and oil palm is also presently being taken up under Agriculture Department.

### ***Medicinal Plants:***

With the launching of National Mission on Medicinal Plants by National Medicinal Plants Board, Govt. of India, cultivation of medicinal plants such as Aonla, Stevia, Aloe vera and Cinnamon are taken up by the Horticulture Department. Stevia Growers Association of Mizoram and M/S Anubhav Biotech Ltd. Kolkata have signed a buy-back agreement for dried Stevia leaves.

For Aloe vera processing, aloe gel extraction units have been installed at two locations where aloe vera cultivation is taken up. There is good prospect to encourage various kinds of medicinal plants depending upon assured market outlets and demand.

### ***Aromatic Plants:***

Citronella and Patchouli are being cultivated in Mizoram. Distillation unit for Patchouli is established at Horticulture Centre, Thingdawl. The same unit may be utilized even for Citronella and the cultivation of both crops are taken up in Kolasib district.

### ***Mushroom:***

Mushroom cultivation is becoming a great attraction and there is a significant demand in the market not only because of its good taste and flavour but also for its high nutritional

value. In Mizoram, cultivation of *Pleurotus spp.* is most popular because of its simple cultivation method that does not require large area of land. In spite of all the good facilities like easy availability of spawn, raw materials and simple method of its cultivation, yet mushroom production in Mizoram is still less. Five units for Mushroom Spawn production have been established at five districts such as Lunglei, Champhai, Kolasib, Mamit, and Aizawl districts while two or more units will soon be coming up at other districts as well.

To counter the drastic change of climatic conditions which frequently damage horticulture crops in the open fields, protected cultivation has been taken up. Due to this reason, the Department of Horticulture has constructed green houses at various places which give very positive results. Moreover, in the protected cultivation mainly in green houses, various kinds of vegetables, flowers and fruit crops can be successfully grown and production can be made during off-season as well. Therefore, protected cultivation under green houses with relevant technology may be given importance in days to come which is expected to be the future strategy in horticulture development in a state like Mizoram.

Post harvest losses in fruits and vegetables are very high. Minimizing these losses can increase meeting the demands without bringing additional land under cultivation. Improper handling and storage cause physical damage due to tissue breakdown. In Mizoram, post harvest infrastructure and management is taken up by Mizoram Agricultural Marketing Corporation (MAMCO) while processing is taken up by Mizoram Food and Allied Industries Corporation Ltd. (MIFCO). MAMCO has constructed more than 100 Rural Primary Markets and Wholesale Markets at various strategic locations. They also assist farmers by providing plastic crates and other packaging materials for harvesting and packaging of crops. Many roadside market sheds are constructed at convenient junctions where farmers can sell their farm produce. Multipurpose Packing House imported from Israel in a pre fabricated structure has been installed at Chite, Aizawl by the Department of Horticulture. Two units of wineries



have also been constructed at Hnahlan and Champhai within Champhai district which is still inadequate to process all the grapes produced.

Agriculture and allied sector contributes only 16.17 percent of Gross State Domestic Product. In order to boost up the GSDP in Mizoram, high value crops with value addition and foreign exchange earnings need to be taken up which can only be fulfilled through horticultural crops so that the economic income of farmers can be enhanced manifold.

Human beings normally require 11 lakh calories per annum through the food they consume. This can be obtained from an area of 0.44 ha (4400 sq. m) of wheat while the same quantity can be obtained from an area of 0.03 ha (300 sq. m) of fruits like banana and 0.06 ha of mango. Thus horticultural crops like fruits can go a long way in reducing the pressure on food grains like wheat and rice which require extensive cultivation. In view of the limited area of land available for cultivation of food grains in Mizoram, cultivation of horticultural crops play a vital role in the prosperity of the state and is directly linked with health and happiness of the people.

There are no mineral resources like iron ore, copper, oil, etc. in Mizoram and so there is no prospect of setting up big industries and factories dependent on such minerals/resources. The only viable industry is agro-based industry especially food processing industry as the raw material can be easily obtained within the state. Hence, there is a vast scope for setting up of industries as well as production of various horticultural crops to boost the economy of the state and its people.

The land capability of the different districts of Mizoram is mentioned below:

**Table 1.1: Land capability of Mizoram for horticultural crops**

<b>Sl. No.</b>	<b>Name of District</b>	<b>Area (Sq. Km)</b>	<b>Potential Horticulture Area (Sq. Km)</b>	<b>percent of potential Horticulture Area</b>
1.	Aizawl	3576.31	3213.66	89.86
2.	Lunglei	4538.00	4075.58	89.81
3.	Mamit	3025.75	2848.92	94.16
4.	Champhai	3185.83	2839.22	89.12
5.	Lawngtlai	2557.10	2331.56	91.18
6.	Serchhip	1421.60	1260.24	88.65
7.	Saiha	1399.90	1279.37	91.39
8.	Kolasib	1382.51	1312.58	94.94
	<b>Total</b>	<b>21087.00</b>	<b>19161.13</b>	<b>90.86</b>

*Source: Remote Sensing & GIS Section, Directorate of Agriculture, Govt. of Mizoram.*

From the land capability statistics of different districts of Mizoram, it appears that 90.86 percent of the area i.e. 19161.13 sq. km. accounts for potential horticulture area. However, taking into consideration the different slopes classes of Mizoram, slope percentage of 0-50 percent is presently considered as potential horticulture area. Thus the area for horticulture development can be estimated as 11.56 lakh hectares which accounts for 55 percent of the total land of Mizoram. Of the 11.56 lakh hectares potential cultivable land, 1.10 lakh hectares have been covered under plantation of various horticulture crops, which is a mere 10 percent of the total potential.

The required parameters like suitable climate, rainfall, temperature, soil, etc. present an attractive prospect for cultivation of various horticultural crops ranging from tropical to sub-temperate crops in Mizoram. The development of infrastructure like road communication, transport, market, etc. even in the remote areas pave the way for easy

disposal of horticulture produce at a reasonable price. There is no unreached village and so suitable programmes can be taken up anywhere in the state.

With all these advantages, Mizoram has tremendous scope for cultivation of a wide range of horticultural crops and generating steady income and livelihood for the farmers.

### **1.3 Significance and Scope of the Study**

In terms of total production, India is the fruit and vegetable basket of the world. India has become the largest producer of fruits and the second largest producer of vegetables. Its share in the world production of fruits and vegetables is approximately 11 percent and 7 percent respectively. Because of its varied agro-climatic conditions, temperate sub-tropical and tropical climate, India can produce a variety of fruits and vegetables.

In India, the horticulture sector contributes about 28 percent of the GDP from about 13.08 percent of the total land area, and 37 percent of the total exports of agricultural commodities. The annual growth rate of horticulture is more than 6.5 percent. As a result, the horticulture sector has received increased attention of the Government of India in respect of budget allocation, creation of research and development infrastructure, training of manpower and even marketing support. In spite of significant achievements, the potential is still enormous. The Government of India has thus launched a National Horticulture Mission in 2005 for all round development of horticulture sector in the country.

There are several advantages of growing horticultural crops. These crops produce higher biomass than field crops per unit area resulting in efficient utilization of natural resources, are highly remunerative for replacing subsistence farming and thus alleviate poverty level in rain fed, dry land, hilly, arid and coastal agro-ecosystems. Horticulture crops have potential for development of wastelands through planned strategies, require comparatively less water than food crops, provide higher employment opportunity, are

important for nutritional security and are environment-friendly. Moreover, they are high-value crops with high potential of value-addition, have high potential for foreign exchange earnings, and make higher contribution to GDP from a limited land area under these crops

However, the export of horticultural products from India has so far been much lower than the desired, mainly due to lack of infrastructural facilities for handling storage, processing and marketing of the produce. Almost one-third of our fruits and vegetables are wasted on account of poor cold storage facilities, and other difficulties in handling. Wide fluctuation in price of horticultural produce during season and off-season, significant difference in prices of same products in various parts of the country and low productivity are also important factors which make our produce uncompetitive in the international market.

The North-Eastern Region of India has been blessed with agro-climatic conditions pre-eminently suited for a variety of horticultural crops. It is the centre of origin of many horticultural species, has a wealth of orchid species and varieties and plenty of rare herbs. What is lacking is scientific exploitation of this potential with a sound marketing network. To tap this potential, several initiatives have been taken. An ICAR (Indian Council of Agricultural Research) complex for North Eastern Region was established at Shillong Meghalaya, with a number of regional stations devoted to horticultural programmes.

#### **1.4 Statement of the Problem**

In Mizoram horticulture crops has been grown more than two decades earlier. But there were no significant improvements in production as compared to other regions. As per the available records of Horticulture Mission and Agriculture Department of Mizoram, there are several clusters in Mizoram. Annual production of horticulture products per hectare is not self sufficient for consumption. Therefore, it is important to know why there is low

productivity of horticulture in Mizoram despite favourable climatic conditions and various government schemes and initiatives.

Horticultural products play an important role in the society for generating income and livelihood of the poor section of the society. It also offers huge employment opportunities for local labourers and also contributes to the overall economy of the state. Since, horticultural farming is labour intensive, labour management is very sensitive and critical for success. Since the horticultural products are highly perishable, care needs to be taken during the harvesting and marketing of the products.

Mizoram being of hilly terrain, there is hardly any marketing infrastructure and storage facility for products which also hampers the healthy growth of horticultural products in this part of the country. Therefore, some of the basic questions raised for better understanding of this sector are: What are the problems and issues being faced by these farmers? What are the key priority areas for improving productivity and profitability? The proposed study aims to find answers for these questions. The findings of the study on horticultural products will be useful not only for farmers but also for the policy makers (governments) and academicians.

## **1.5 Review of Literature**

Horticulture is an integral part of our country's economy today. It provides a dynamic tool for enhancing economic returns, attaining nutritional security, creating employment avenues and ensuring ecological sustainability.

According to Chadha (2006), India has favourable climates and soils for growing a larger number of horticultural crops. Soon after Independence, India faced the challenge of providing food security to millions of its people. It was only in the mid-80's that the government identified horticulture sector as a means of diversification for making agriculture

more profitable through efficient land use, optimum utilization of natural resources and creating skilled employment for rural masses especially the womenfolk. Horticulture has emerged as an integral part of food and nutritional security and an essential ingredient of economic security. Adoption of horticulture by farmers has brought prosperity in many regions of India.

Sati (2004), conducted a study on the horticultural development in the Alaknanda Basin of Uttaranchal. He limited his study to the areas of fruit cultivation and the productivity of horticultural land. He said that in the economically backward region, like the Alaknanda basin, where rural underemployment is a big problem, emphasis on horticulture can yield desired results in various directions. The adoption of horticulture also results in more efficient use of scarce land resource. Orchard helps in maintaining ecological balance by checking soil erosion, maintaining soil moisture and better utilization of cultivable wasteland.

According to Prasad and Kumar (2008), there is a great demand for horticulture produce in India as the majority of Indian population is vegetarian. However, India's share in global exports of horticulture produce is negligible being only one percent. But given the volume of world trade in fresh and processed horticulture products and the country's resources, India has the potential of more than doubling the present level of exports within the next five years.

Chadha, Singh and Patel (2010), have observed that past investment has been rewarding in terms of increased production, productivity and export of horticultural produce. But there is a growing competition in open economy, which demand competitive price of standard quality produce. This opens up opportunity and challenges. Critical gap needing attention are low productivity and poor quality of product, inadequacy of infra-structural facilities for post-harvest management and marketing, inadequate efforts for product

diversification and consumption, inadequacy of quality seed and planting material, inadequacy of human resource in horticulture, lack of appropriate database for effective planning, inadequacy of trained manpower and infrastructure in the states, poor delivery system, credit support and price support and slow pace in adoption of improved technology.

According to Sarswathy, Preethi, Balasubramanyan, Suresh, Revathy and Natarajan (2008), the three main objectives of applying postharvest technology to harvested fruits and vegetables are to maintain quality in terms of appearance, texture, flavour and nutritive value, to protect food safety and to reduce losses between harvest and consumption. The reasons for postharvest losses could be due to poor packaging, grading, transportation and marketing of the perishable produce.

Meena and Yadav (2001) have stressed the need for adopting aggressive marketing strategy coupled with adequate export infrastructure. The All India Coordinated Research Project on Post-Harvest Technology of Horticultural Crops had estimated the annual loss of fruits and vegetables at 30 percent in 1993-94 due to poor infrastructure and post-harvest handling. According to the CII-Mckinsey report, farmers in India receive much lower prices for their produce and the consumer pay much higher prices for agricultural commodities as compared to the USA or UK, because of the existence of too many intermediaries between the farmer and the consumer. Meena and Yadav further stated that the cultivation of vegetables is carried out mostly by small farmers, without any organizational set-up for packing, storage, transport and marketing. The farmers face problems of inadequate irrigation due of power shortages and lack of availability of good quality seeds. There exists a gap between potential and actual yields.

As Indian growers typically have a comparatively small quantity of produce with an average holding of less than a hectare of land, Chauhan (2004), suggested a system of

“Pooling” of the produce or co-operative marketing under a common brand name. This would require guaranteed quality, uniformity in size and volume, good packaging and quality standards. To deal with unmarketable surplus of horticultural produce which is an integral part of the industry, he proposed semi-processing the produce in the growing areas itself to improve quality and provide employment in the countryside. Semi-finished produce can be then taken to a centralized facility for final conversion into a finished product.

Peter (2009) has noted that with the economic developments taking place, agriculture is becoming more and more market oriented. Prices of horticultural products fluctuate widely from year to year, season to season, and even day to day. This variance makes horticultural production both profitable and very risky. Often, success depends on marketing skills and obtaining good prices rather than production expertise.

The FAO (Food and Agriculture Organization) Agricultural Services Bulletin 76 (2007) has mentioned that the production/marketing chain for horticulture produce is a two-way process. Produce flows from the rural areas into the cities and money and market information should flow back. As tastes in the city market evolve the rural community can use this market information to target its production accordingly. In horticulture farming, where prices are rarely regulated, financial viability depends as much upon business and marketing skills as on the farmer’s technical expertise.

Goswami (2000) examines the problems and prospects of marketing horticultural crops in the north-eastern hill region of India. The following aspects are examined: area and productivity of horticultural crops, market regulation, enactment of market legislation, market infrastructure, market intelligence and market performance. The discussion reveals that the north-eastern region of India has ample scope for increasing the horticultural sector. However, the main problems in the region are lack of adequate market infrastructure (such as



transportation network, storage, and processing facilities), inadequate market intelligence and extension, and the lack of efficient market legislation and regulation.

Singh (2009) has pointed out that the benefits of increased production and expanding demand of fruits and vegetables can be realized only if the marketing system is adequately responsive to the needs. He has suggested several measures for improvement in this regard. Production should be linked with the buyer's requirement in respect to variety, quantity and application of farm practices. Market infrastructure should be developed in terms of rural markets, market intelligence system, grading and packing facilities, transporting and communication facilities. Organization of cooperatives and self help groups is important to gain economies of scale, bargaining power, quality inputs, etc. There is a need to educate the farmers on aspects of production, quality control, handling practices and distribution aspects.

## **1.6 Research Gap**

From the review of available literature it is found that there exists a research gap in the following areas.

- It emphasised the need for an efficient marketing organisation of the horticultural products.
- Lack of proper management practices is one of the major reasons affecting the productivity in small holdings.
- The industry requires stable price at remunerative levels to sustain it and expand.

There is a lack of systematic management practices and suitable production management system in horticultural farming. The management practices in horticultural farms are different under different types of parameter i.e. ownership pattern, farm size, acreage and production etc. which have to be included.

In a growing economy with increasing demand, to fill the gap in production of agricultural produce in the state, horticultural farming plays an important role.

### **1.7 Objectives of the Study**

The objectives of the study are:

- a) To analyze the horticulture policy of the Government of Mizoram.
- b) To study the present status of development in terms of marketing of the horticulture products selected for the research purpose, namely grape, turmeric and chayote.
- c) To explore the profile of horticulture farmers of Mizoram.
- d) To examine the problems faced by the farmers in developing horticulture in the state.
- e) To offer suggestions for promoting horticulture in Mizoram.

### **1.8 Hypotheses:**

The proposed research study will attempt to prove or disprove the following hypotheses:

The study tested the following hypotheses:

- a) Horticulture farming in chayote, turmeric and grape increases employment, provides higher income and gives quick returns to farmers.
- b) Lack of proper post-harvest management and marketing of horticulture produce leads to loss of crops and lower income for farmers.

### **1.9 Research Methodology**

For the purpose of this research, the following horticulture products that have made significant gains in the recent past have been selected:

### **1. *Grape (Fruit crop)***

The success of grape cultivation with special reference to Hnahlan and Champhai areas, both under Champhai district, has been remarkable. There are more than 1000 grape growers in Mizoram. The main variety grown is “Bangalore Blue” which is a wine variety. There is a need to introduce a good table variety of grape in the state. Present estimated area under grape cultivation in Mizoram is more than 800 hectares. The growers produce local wine by indigenous method for local consumption. However, this local grape wine is not hygienic enough as farmers do not apply any scientific method of crushing and bottling. Two wineries have been set up in Champhai and Hnahlan and the first trial run crushing of grape for wine has been executed on 16<sup>th</sup> July, 2010 at Champhai and 20<sup>th</sup> July, 2010 at Hnahlan. The wine produced through these wineries has been branded as “Zawlaidi”. The Department of Horticulture acts as facilitator while the Grape Growers’ Societies undertake establishment of the wineries. The Mizoram State Legislative Assembly has also amended the Mizoram Liquor Total Prohibition Act so that the scientifically produced wine under hygienic condition can be sold like any other soft drink at retail outlets.

### **2. *Turmeric (Spice crop)***

Turmeric being a short gestation crop, is an ideal crop for the poor farmers and is doing extremely well in Mizoram. A very good variety called ‘RCT-I’ procured from ICAR, Barapani in 2004 for multiplication, has been multiplied by the Department of Horticulture and sizeable quantity of this variety has been produced in Mizoram today for processing and marketing besides the other popular variety known as ‘Lakadong’ variety. The estimated production of turmeric during harvesting season of February to April 2009 was over 40,000 tons within Mizoram. Presently, the

Multifarming Cooperative Society, Reiek is processing turmeric and packed turmeric powder is being marketed in full swing.

### 3. *Chayote (Vegetable crop)*

Cultivation of chayote in Mizoram is believed to have been started since the coming of western missionaries. It is not a very popular crop in India. Large scale cultivation is taken up only in Mizoram. In 1982, farmers of Sihphir village, in order to start a permanent farming, initiated the cultivation of chayote for their livelihood. They were able to export a small quantity to neighbouring states in 1986. Over the years, with the help of the government and Technology Mission, farmers were able to receive support in the form of price subsidy, G.I. wire for trailing support and organic manure. This enhanced the production of chayote to a tremendous extent. Presently, the area under chayote cultivation is more than 2000 acres, and productivity ranges from 100-500 quintals per acre.

The study was conducted with the help of primary and secondary data. A structured questionnaire was developed and administered to horticultural farmers engaged in the cultivation of grape, turmeric and chayote. Simple random sampling method was employed for selection of sampling units. The structured questionnaire was successfully administered on 361 farmers (113 turmeric farmers, 90 chayote farmers and 158 grape farmers).

Primary data was also collected by conducting personal interviews and discussions with stakeholders, policymakers and officers who have been involved in promoting horticulture in Mizoram.

Secondary data was gathered from the records and publications of Department of Horticulture and Department of Agriculture. Various books, newspapers, articles, journals, magazines and web sites were also referred for the purpose of the study.

## **1.10 Chapter Plan**

### **Chapter 1: Introduction**

This chapter deals with the introduction horticulture, overview of horticulture farming in Mizoram, significance and scope of the study, statement of the problem, literature review of the concerned subject, finding the research gap, objectives of the study, hypotheses, research methodology and chapter plans of the study.

### **Chapter 2: Role of Government for Horticulture Development in Mizoram**

The second chapter studies the introduction of the government's roles and policies through horticulture department of Mizoram. The chapter discusses the profile of horticulture department of Mizoram, its mission and vision, as well as schemes and programmes undertaken by the department, recent activities in horticulture as well as research findings regarding role of the Mizoram government.

### **Chapter 3: Marketing of Select Horticultural Products in Mizoram**

The third chapter analyses the marketing and production of select horticultural products of Mizoram viz., Turmeric – spice crop, Chayote – vegetable crop, Grape – fruit crop. The chapter also discusses the concept of marketing mix and its components are analysed through product, price, promotion and placement (distribution). Thus marketing and production of select horticultural products are widely discussed in this chapter.

### **Chapter 4: Profile of the Horticultural Farmers in Mizoram**

The chapter with the title “Profile of Horticultural Farmers in Mizoram” illustrated the findings of the study in detail the profile of existing horticultural farmers of turmeric, chayote and grapes in Mizoram in terms of demographic profiles like age, education, size of the

family, marital status, number of family members etc. along with types of land holding. It also analyses the production, income and economic variables such as financial assistance availed and management of the farmers' accounts.

### **Chapter 5: Analysis and Interpretation of Data**

This chapter analyses the data through reasons for adoption of horticulture farming, permanent settlement and cluster area farming , crop loss, methods for improving yield per hectare, post-harvest management, major problems faced by farmers, horticulture farming as a sustainable source of income for farmers and finally testing of hypotheses.

### **Chapter 6: Summary of Major Findings and Recommendations**

The summary of study conclusions and recommendations as well as for future research is presented in this chapter.

## **Chapter II**

### **Role of Government for Horticulture Development in Mizoram**

2.1 Introduction

2.2 Profile of Horticulture Department

2.3 Mission & Vision of Horticulture Department

2.4 Schemes and Programmes undertaken by Horticulture Department

2.5 Other Recent Developments in Horticulture

2.6 Research findings regarding role of the government

2.7 Conclusion

## **2.1 Introduction**

India's varied climate and soil is suitable for growing a wide range of horticultural crops. After the independence in 1947, a major emphasis was given by the Government of India in achieving the self-sufficiency in food production. The Green Revolution brought about changes in the sixties and seventies. It also brought about that the agro-climate is well suited for horticulture and could be an ideal choice in supporting small farmers. During the eighties the government of India identified horticulture crops as a means for diversification for making agriculture more profitable. India has become one of the largest producers of coconut, arecanut, cashew, ginger, turmeric, black pepper and tea. India has also become the second largest producer of fruits and vegetables. New crops like kiwi, olive crops and palm oil have been successfully introduced for commercial cultivation in the country. With the development and encouragement of private investment, as well as hi-tech horticulture with micro-propagation, protected cultivation, drip irrigation, fertilisation, and integrated nutrient and pest management, horticulture farming has become one of the important avenues for economic development.

## **2.2 Profile of Horticulture Department**

Agriculture department primarily looked after the horticulture division also prior to the bifurcation of Horticulture Department in the year 1993 and ever since has become a full-fledged Department from 2.9.1997. Despite its young existence, the contribution and achievement of the Department towards horticulture development in the state has been tremendous.

The administration of the Department of Horticulture is headed by Director, supported by the Joint Directors at the Directorate Level. In order to facilitate the implementation of



programmes and policies of the government, the state is divided into 8 (eight) Divisions, 4 (four) Sub - Divisions and 38 (thirty eight) circles. The divisions are as follows:-

1. Aizawl Division -

- (1) Aibawk Circle
- (2) Aizawl Circle
- (3) Keifang Circle
- (4) Darlawn Circle
- (5) Suangpuilawn Circle

2. Lunglei Division (1) Hnahthial Sub - Division

- (6) Lunglei Circle
- (7) Tlabung Circle
- (8) Lungsen Circle
- (9) Haulawng Circle
- (10) Thingfal Circle
- (11) Hnahthial Circle
- (12) Thingsai Circle
- (13) S. Vanlaiphai Circle

3. Khawzawl Division (2) Champhai Sub - Division

- (14) Khawhai Circle
- (15) Khawzawl Circle
- (16) Ngopa Circle

(17) Kawlkulh Circle

(18) Champhai Circle

(19) Samthang Circle

4. Tuidam Division (3) Rawpuichhip Sub - Division

(4) Mamit Sub - Division

(20) Tuidam Circle

(21) Zawlnuam Circle

(22) Zamuang Circle

(23) Mamit Circle

(24) Rawpuichhip Circle

(25) W. Phaileng Circle

(26) Reiek Circle

5. Saiha Division -

(27) Saiha Circle

(28) Tuipang Circle

6. Lawngtlai Division -

(29) Lungpher Circle

(30) Lawngtlai Circle

(31) Diltlang Circle

(32) Chawngte Circle

7. Serchhip Division -

(33) Serchhip Division

(34) N. Vanlaiphai Circle

(35) Chhingchhip Circle

8. Kolasib Division -

(36) Bukpui Circle

(37) Lungdai Circle

(38) Kolasib Circle

## **2.2 Mission and Vision of Horticulture Department**

### ***Mission:***

The mission of an organisation is the statement for the reason of existence. The mission statement of the Horticulture Department of Mizoram has been able to spell out its overall goal, provide a path and guide decision making. The following is the mission statement of Horticulture Department:-

- a) Upliftment of farmers by creating employment opportunities.
- b) To encourage commercial cultivation of economically important Horticulture crops as a source of livelihood to the farmers.
- c) To rehabilitate the traditional jhumias on a sustained productive farming for improving their socio-economic conditions.
- d) Import technology in the practice of precision farming like covered cultivation (Hi-Tech Greenhouses etc.) to have quality product and to increase the production and productivity per unit area.

It can be seen that the mission statement has covered the primary area of providing employment, encouraging commercial activities, rehabilitation of *jhuming* cultivation and adoption of new technologies to increase productivity.

***Vision :***

The vision statement is an important component of strategic planning. The strategic planning is focussed on the future and it gives a scenario of where the organisation would like to be or would like to accomplish in the long term. The Vision of Horticulture department is as follows:-

- a) Self sufficiency in horticulture produces to meet the state requirement.
- b) To have surplus production for sale outside the state as well as for exports.
- c) Impart new technologies in horticulture fields and disseminate the same to the cultivators in Mizoram.

The vision statement has identified that Mizoram government wishes to see the state being self sufficient in the long term along with surplus production. The vision statement also sees the adoption of new technology in a large scale.

### **2.3 Schemes and Programmes undertaken by Horticulture Department**

Several important and useful programmes to improve the state economy have been taken up by Horticulture Department of Mizoram. Some have shown noticeable results, while other programmes are still being implemented. Some of the major programmes that have been successfully implemented as well as important on-going programmes being taken up by the department are highlighted:

### **1. New Land Use Programme (NLUP):**

NLUP, the flagship programme of the Mizoram Government, has been implemented by Horticulture Department since 2011-2012 as an important programme for uplifting the economy of Mizoram farmers. The crops selected for cultivation by the farmers under NLUP are orange, grape, pineapple, arecanut, tung, tea, chayote and aloe vera. NLUP is being implemented in a phase-wise manner, Phase I, II, and III. Phase-I had been successfully implemented in which assistance was given to 9327 families.

**Table 2.1: Implementation of Phase-I of New Land Use Policy**

<b>Sl. No.</b>	<b>Name of Crop</b>	<b>No. of families selected</b>	<b>Amount of Govt. Assistance (Rs. lacs)</b>
1.	Orange	4396	4396
2.	Passionfruit	166	199.2
3.	Grape	324	388.8
4.	Pineapple	1217	1217
5.	Arecanut	2753	2753
6.	Tung	151	141
7.	Tea	22	22
8.	Chayote	285	285
9.	Aloevera	23	23
	<b>Total</b>	<b>9327</b>	<b>9425</b>

*Source : Department of Horticulture, Government of Mizoram*

Phase-II has also been started covering 8589 families to whom assistance had been given as 1<sup>st</sup> instalment as shown in the following table:

**Table 2.2: Implementation of Phase-II of New Land Use Policy**

<b>SL. No.</b>	<b>Name of Crop</b>	<b>No. of families selected</b>	<b>Amount of Govt. Assistance (Rs. lacs)</b>
1.	Orange	40048	202.4
2.	Passionfruit	88	4.4
3.	Grape	252	12.6
4.	Pineapple	1041	52.05
5.	Arecanut	2564	128.2
6.	Tung	207	10.35
7.	Tea	225	11.25
8.	Chayote	139	6.95
9.	Aloevera	25	1.25
	<b>Total</b>	<b>8589</b>	<b>429.45</b>

*Source : Department of Horticulture, Government of Mizoram*

Further, selection of beneficiaries to be covered under Phase-III is expected to be completed shortly. The selected beneficiaries under NLUP are to be given assistance to the tune of Rs.1,00,000/- to Rs.1,20,000/- depending upon the crop they choose to take up. By the time NLUP Phase I, II and III are completed, 27,000 households of farmers will have been assisted under horticulture sector alone, which will have profound impact towards attaining self sufficiency in the state in general, and uplifting the farming community in particular.

As a step towards honouring the farmers, the State Government has declared 14<sup>th</sup> January as “Farmer’s Day”, which is to be observed every year. The first ever “Farmer’s Day” in the state was celebrated on 14<sup>th</sup> January, 2013 at the state capital, Aizawl and at all other district capitals as well.

## **2. Horticulture Mission for North East and Himalayan States (HMNEH)**

In order to improve livelihood opportunities and to bring prosperity to the North Eastern Region (NER) including Sikkim, Government of India launched a Technology Mission for North East for Integrated Development of Horticulture in

2001-02. Considering the potential of Horticulture for socio-economic development of Jammu & Kashmir, Himachal Pradesh and Uttarakhand, Technology Mission was extended to these States from 2003-04. The Mission is based on the “end-to-end approach” taking into account the entire gamut of horticulture development, with all backward and forward linkages, in a holistic manner. The mission has now been renamed as Horticulture Mission for North East and Himalayan States (HMNEH).

The objectives of the Mission are:

- To improve the production and productivity of horticulture crops by harnessing the potential of the region.
- Special emphasis on “Low Volume, High Value, Less Perishable Horticulture Crops”.
- A horticulture based farming system to be developed, thereby providing viable and ample opportunities for employment, especially for women, besides improving the productivity of land.

The programmes under the HMNEH have been evolved in consultation with all the stakeholders, including the State Governments. The HMNEH strives to address the following issues:

- Technology & technological development
- Demonstration of technologies
- Production of quality planting material
- Organic farming
- Efficient water management
- Plant health.

The specific areas which have been adopted by the Department of Horticulture, Government of Mizoram are mentioned below:

- i) Production of planting materials
- ii) Establishment of new gardens
- iii) Rejuvenation / replacement of senile plantation.
- iv) Creation of water resources
- v) Protected cultivation
- vi) Mushroom development
- vii) Promotion of Integrated Nutrient Management and Integrated Pest Management
- viii) Organic farming
- ix) Centre of Excellence for Horticulture
- x) Pollination support through bee keeping
- xi) Horticulture mechanization
- xii) Human resource development.

The significant developments and achievements within the state in the Horticulture field have taken place with the implementation of HMNEH as mentioned below:

- a) Commercial scale cultivation of Anthurium: The Department of Horticulture introduced cultivation of Anthurium in the state since November 2002 under Technology Mission. This scheme has been one of the most successful and noteworthy achievement. It is worth mentioning that Anthurium cut flowers from Mizoram is being sold within the state and outside the state through a Bangalore based exporter namely M/S Zopar Export Pvt. Ltd. And exported to United Arab Emirates, United Kingdom, Japan and Australia.
- b) Commercial cultivation of Rose: Cultivation of Rose on commercial scale has been taken up since 2006. The quality of Mizoram rose is world class and its cut flowers



are marketed by Zopar Export Pvt. Ltd. to the metropolitan cities as well as neighbouring states like Assam and Meghalaya.

- c) Protected cultivation for round the year production of flowers and vegetables.
- d) Grape: The success of grape cultivation with special reference to Hnahlan and Champhai areas, both under Champhai district has been remarkable. With the vast area that has been covered under Technology Mission programme, there is high production and results in establishment of two wineries at two locations viz. Champhai and Hnahlan which are first of its kind in the state. The processed wine is being sold with a brand name Zawlaidi and has become the main source of income for grape growers within the district.
- e) Citrus: Technology from Israel in hi-tech nurseries for citrus is an eye opener for production of quality planting material. This has a capacity of producing 20,000 nos. approximately quality planting material per annum. Citrus Scion Bank has been set up at Chite having a capacity of 864 nos. of mother trees from which around 2 – 2.5 lakhs no. of bud woods are expected to be taken from its second year. Moreover, the production of bud wood (scion) is expected to increase year after year for the next 10 – 15 years.
- f) Pilot project at Rulpuihlim etc.: To ensure better production in case of Mandarin orange and eradicate the major problem of die-back faced by the farmers, the Department of Horticulture initiated a Pilot Project of Mandarin Orange at Rulpuihlim in a cluster approach comprising 49 farmers. These farmers were provided with quality budded orange planting material and orchards were provided with drip irrigation facilities with fertilization system to ensure optimum utilization of available water during the lean period and plant nutrient uptake. Cluster area approach is also taken up at some locations like Sialsir, Darzo, etc.

- g) Horticulture Centre: There are five major horticulture centres established by the department viz. Thiak, Thingdawl, Chite, Tuipawl and Maudarh.

### **3. *Rastriya Krishi Vikas Yojana (RKVY)***

The scheme was launched in Mizoram from 2010-2011. The project is funded through the Ministry of Agriculture, Department of Agriculture and Cooperation, Govt. of India.

The major thrust areas of RKVY are:

- a) Vegetable initiatives for Urban Clusters
- b) Establishment of Marketing Infrastructure
- c) Rain Water and Stream Water Harvesting Structure.

Some of the objectives of the scheme are highlighted below:

- To incentivise the farmers of Mizoram so as to increase public investment in agriculture and allied sectors.
- To ensure that the local needs, crops and priorities are reflected.
- To achieve the goal of reducing the yield gaps in important crops.
- To enhance farm income and uplift the economic status of the farmers.
- Generation of employment and food security.
- Elimination of shifting cultivation by permanent means of cultivation.
- Food security and sustainability through vegetable cultivation.
- To maximise returns to the farmers in agriculture and allied sectors.
- To bring about quantifiable changes in the production and productivity of various components of agriculture and allied sectors by addressing them in a holistic manner.
- To increase GDP of the state through the scheme.

Due to high perishability, vegetables and fruits require good post harvest practices to realize better market price. Marketing infrastructure facilities like warehousing, drying, grading, storage and transportation, etc. are essential for increasing the marketability of vegetables, spices and fruits, adding value to the produce, increasing profitability and reducing post harvest losses.

The project will provide assistance as follows:

- Strengthening/establishing of market infrastructure.
- Setting up of rural markets at the appropriate selected locations.
- Strengthening the linkage between the farmers and the ultimate consumers and traders.
- Disseminating information on market price and market trends to enable the farmers in selection of approximate vegetable crops.

#### ***4. National Mission on Micro-Irrigation (NMMI)***

NMMI was launched as a Mission from June 2010. NMMI would boost converge of micro irrigation activities under major government programmes such as National Food Security Mission (NFSM), Integrated Scheme of Oilseeds, Pulses, Oil palm & Maize (ISOPOM), Technology Mission on Cotton (TMC) etc. for increasing water use efficiency, crop productivity and farmers income. The new guidelines would enhance water use efficiency, productivity in crops, and provide answer to water salinity and water logging issues.

The salient features of the scheme are:

- Small & marginal farmers would get subsidy of 60 per cent and for other beneficiaries, 50 per cent for an area up to 5 hectare under the Government of India share.

- Introduction of new components with advanced technologies on micro irrigation like semi permanent sprinkler system, fertigation system, sand filter, different types of valves etc.
- Release of Central share to the State Implementing Agencies instead of districts.

The scheme also has an effective delivery mechanism that calls for close coordination among the beneficiaries, the Panchayats, the State Implementing Agencies and the registered system suppliers for the increased area under gross cultivation.

National Committee on Plasticulture Applications in Horticulture (NCPAH) as the nodal agency provides suitable policy measures for effective implementation of NMMI in the country. NCPAH monitors effectively the performance of 22 Precision Farming Development Centres (PFDCs) and overall development of precision farming methods and hi-tech interventions in general in the country.

In Mizoram, provision of irrigation water to horticultural crops was taken up by the Department of Horticulture under TMNE/HMNEH until 2010-2011, when the central government took up NMMI separately as its flagship programme. The total farm area including greenhouses where irrigation system have been installed are:

- i) Drip irrigation – 455.5 ha.
- ii) Sprinkler irrigation – 67.50 ha.

As a result of the irrigation facility provided by the department, farmers have been able to produce crops round the year, even during off-season. Moreover, provision of irrigation to the crops during dry period when irrigation is most crucial has increased productivity to a great extent.

## **5. *National Mission on Medicinal Plants (NMMP)***

The National Mission on Medicinal Plants (NMMP) scheme was launched in Mizoram in 2008-2009. The scheme is funded by the National Mission on Medicinal Plants Board, Department of AYUSH, Ministry of Health and Family Welfare, Govt. of India.

The objectives of the scheme are as follows:

- To uplift the living standard of the farmers by enhancement of income from the medicinal plants cultivation.
- Linkage with the institution/R&D agencies for technical back-up. A thorough networking of such agencies and institution will bring in more scientific knowledge and experience.
- To create awareness among the farmers the importance of conserving the indigenous available medicinal plants and sustainable utilization of our natural resources.
- To create awareness about traditional usage of medicinal plants among rural and urban households.
- To promote commercial cultivation of herbal and medicinal plants as a viable alternative source of income.
- Setting up of market linkage between growers and producers companies.
- Creation of knowledge amongst the growers and general public regarding the cultivation of medicinal plants, its management, uses and marketing of the products.
- Income generation of the fragile farmers including farm women.
- Promotion and development on the usages of medicinal plants in the state of Mizoram.
- Generation of self-employment.

- To create awareness amongst the people and change their perception towards practices and adoption of medicinal plants in general healthcare.

During 2008-2009, amla and cinnamon verum covering 160 acres and 40 acres respectively were taken up. During 2009-2010, 2000 acres of aloe vera, 600 acres of amla and 320 acres of stevia rebaudiana were taken up. During 2010-2011, cultivation of medicinal plants were again taken up covering 1710 acres of aloe vera and 180 acres of stevia rebaudiana, during 2011-2012, 1250 acres of aloe vera and 200 acres of stevia plantation were also taken up under NMMP scheme.

The farmers are organized into self-help groups, cooperatives, associations, producers' groups/companies, etc and financial assistance will be provided as per project mode within the clusters.

The Department of Horticulture explored some reputed and reliable firms for marketing of medicinal plants produced in Mizoram. The Stevia Growers Association of Mizoram signed a buy back agreement for dried stevia leaves with M/S Anubhav Biotech Ltd., Kolkata. M/S Anubhav Biotech Ltd. has also expressed their readiness to sign a buy back agreement for purchase of aloe vera gel produced by the growers in Mizoram under the facilitation of Department of Horticulture.

The Department of Horticulture department has established two aloe vera gel processing units, one at West Lungdar, Mamit district and another at Baktawng village, Serchhip district. It has also established Supervisory Training Centres at district headquarters and divisional headquarters at Tuidam, Khawzawl, etc. under Technology Mission Programme. The department has also established seven public sector model nurseries and three private sector model nurseries under NMMP at various locations.

**Table 2.3: Action Plan Under NMMP during 2012-2013**

<b>S No.</b>	<b>Component</b>	<b>Rate</b>	<b>Ha.</b>	<b>Rs. In lacs</b>
<b>I</b>	Cultivation:			
	a) Aloe vera (20percent subsidy)	Rs.8500/ha	700 ha	59.50
	b) Stevia (20percent subsidy)	Rs.62500/ha	140 ha	87.50
	c) Acorus calamus (20percent subsidy)	Rs.12500/ha	80 ha	10.00
	<b>Total: I</b>		<b>920 ha</b>	<b>157.00</b>
<b>II</b>	Post-harvest management (100percent assistance)	Rs.5	10 nos.	50.00
	a) Storage godown (SHG/society/public sector etc)	lacs/no.		
	<b>Total: I+II</b>			<b>207.00</b>
<b>III</b>	Management support (5percent of project cost)			10.35
	<b>Grand total (I+II+III)</b>			<b>217.35</b>

Source : Department of Horticulture, Government of Mizoram

#### **6. Vegetable Initiative for Urban Clusters (VIUC)**

The scheme is also known as Cultivation and Production of Vegetables in Peri-Urban Areas of capital city – Aizawl. The project is funded from the scheme of National Vegetables Initiative in Peri-Urban Areas through the Ministry of Agriculture, Department of Agriculture and Cooperation, Govt. of India.

The objectives of the scheme are highlighted below:

- To make available for farmers of the state high quality seeds and seedlings.
- To check import of vegetables from outside the state where large sums of money are spent annually.
- To ensure production of quality vegetable to meet the requirement of the state and country at large.

- To enhance farm income and uplift the economic status of the farmers.
- Generation of employment and food security.
- Elimination of shifting cultivation by permanent means of cultivation.
- Food security and sustainability through vegetable cultivation.

## **2.4 Other Recent Developments in Horticulture**

### ***Citrus Scion Bank***

Citrus scion bank for production of healthy scion buds for budding on rootstock has been established under Hi-tech green house (protected cultivation) at Horticulture Centre, Chite. Under this unit, 846 numbers of healthy, carefully selected plants have been planted and maintained for the purpose of producing not less than one lakh desirable scion buds per year. Though this Citrus Scion Bank was established during 2010-2011 only, the department is already having a huge number of healthy scion buds from the unit. This Citrus Scion Bank has been established using world-class technology, the same technology adopted by Israel in her own country.

### ***Multipurpose Packing House:***

A multipurpose packing house, the first of its kind in Mizoram, has also been established at Horticulture Centre, Chite, employing Israel technology. The machine is capable of sorting and processing any round or oval shaped fruit, giving the fruits a much longer shelf-life. This machine performs the job of cleaning, waxing, sorting and grading of fruits according to size. The capacity of the machine is more than two tonnes of fruits per hour. A cooling chamber of 40 tonnes capacity included in the unit is an added advantage.

### ***Creation of Water Resources***

In order to harvest and store excess rain received during the monsoon for use as irrigation water during the dry spell, the Department of Horticulture has provided more than five hundred community tanks and more than three thousand individual tanks. Many farmers



are utilizing them during the dry spell (extending from December – March) when irrigation is most crucial. Provision of irrigation water during the dry period enables the farmers to cultivate crops during off-season, thereby fetching comparatively higher price in the market which is an important source of income. Geomembrane (1000 micron) designed for use as water storage purpose, has been procured from Israel and Spain. This membrane can be used up to a period of fifteen years for storing water.

### ***Organic Farming/Certified Organic Area***

A total area covering 20,789.4 acres have been certified as “Organic Area” under various crops like turmeric, passion fruit, ginger, aloe vera and stevia.

The first ever organic certification programme in the state had been carried out by “Societe Generale Surveillance” (SGS), an international organic certifying agency, covering an area of 10,500 acres. This was followed by certification of another area covering 2,950 acres which was conducted by “One Cert Asia”, also an international certifying agency. The certified organic area was further increased, covering yet another 7,339 acres under National Council of Organic Farming. Thus, the total certified organic area covered under Department of Horticulture in Mizoram at present is 20,789.40 acres. Many crops produced from certified organic areas have already been marketed by traders using the organic certificates. The organic certificates, as mandated, are renewed every year.

### ***Horticulture Centres***

Horticulture Centres have been established in various places in Mizoram, such as Chite, Thiak, Tupawl (Khawzawl), Maudarh (Lunglei) and Thingdawl. Another one at Serchhip is in progress. Quality planting materials are being produced at these centres every year which are distributed to the farmers for implementation of important government programmes. These centres are equipped with various important facilities and infrastructures

and are continually being strengthened. These centres play a crucial role in supporting developmental programmes taken up by the department.

### ***Horticulture Mechanization***

Carrying out farm work by manual labour alone is tedious, time consuming and inefficient, whereas execution of the same employing machines is much faster and more efficient. Hence, horticulture mechanization is being popularized and promoted by the department. Hillside bench terraces are now easily and efficiently ploughed using Mini-Power Tiller, which is time-saving and enables the farmer more time to work on his farm. Mechanization fits in well in the minds of modern rural youth.

### ***Training***

The technical knowledge of the department officers and field staff must be transferred to the farmers by conducting training frequently. The department gives due importance to conducting trainings to enable the farmers to keep abreast with the latest technologies and recent advances in the field of horticulture and guide them in adopting the technologies and do away with the age old traditional method of farming. For the purpose of conducting such training programmes, well equipped Supervisory Training Centres have been established at Champhai, Tuidam, Thingdawl, Lunglei, Lawngtlai, Khawzawl, Serchhip and Chite. Establishment of Integrated Training Centre at Chite is underway since 2012.

### ***Horticulture College***

Considering the topography and climate of Mizoram, the Central Government recognizes that Mizoram is a potential Horticulture State. For this reason, it has given approval in 2010-2011 for establishment of Horticulture College in the state. Detail Project Report (DPR) in this regard is being prepared by a group of retired Vice Chancellors and other technocrats.

## 2.6 Research findings regarding role of the government

During the course of the study, the respondents were asked their opinion whether the government has a role to play in developing horticulture sector in the state.

**Table 2.4: Opinion of respondents on whether government has a role**

Crop	Does government have a role?		
	Yes	No	Total
Turmeric	111 (98%)	2 (2%)	113 (100%)
Chayote	90 (100%)	0 (0%)	90 (100%)
Grape	155 (98%)	3 (2%)	158 (100%)

*Source : Primary data*

*Figures in parenthesis shows percentages*

It is observed from table 2.4 that out of 361 respondents, 356 (99 percent) are of the opinion that the government has a role to play in developing horticulture sector in the state.

The Department of Horticulture provides support to the horticultural farmers in various forms. An effort was made to find out the number of respondents who has received support from the government in the past five years in various forms such as fertilizer, seeds and seedlings, trailing wire, cash support and irrigation facilities.

**Table 2.5: Number of respondents who received fertilizer support**

Crop	Fertilizer				
	2007	2008	2009	2010	2011
Turmeric	7 (10%)	5 (7%)	5 (7%)	16 (25%)	46 (55%)
Chayote	0 (0%)	3 (4%)	5 (7%)	20 (31%)	11 (13%)
Grape	62 (90%)	60 (88%)	59 (86%)	28 (44%)	26 (31%)
Total	69 (100%)	68 (100%)	69 (100%)	64 (100%)	83 (100%)

*Source: Primary data*

*Figures in parenthesis shows percentages*

From table 2.5, it can be seen that the number of farmers receiving fertilizer support has increased from 69 in 2007 to 83 in 2011. In terms of crops wise distribution the numbers of fertilizer support has increased from 10 percent in 2007 to 55 percent in 2011. The year 2011 in fact saw a quantum jump for the turmeric farmers from 16 recipients in 2010 to 46 recipients in 2011 a jump of 30 percent. For the chayote growers the table shows that fertilizer recipients have gradually increased from 2007 to 2011 from zero to 11. The main reason behind the lesser number of recipients of fertilizer is that the crop totally depends on monsoon. Grapes on the other hand have witnessed a decreasing trend from 62 recipients to 26 recipients during 2007 to 2011 viz., from 90 percent to 31 percent.

**Table 2.6: Number of respondents who received seed/seedlings support**

Crop	Seed/Seedlings				
	2007	2008	2009	2010	2011
Turmeric	25 (89%)	25 (100%)	23 (96%)	24 (96%)	26 (84%)
Chayote	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Grape	3 (11%)	0 (0%)	1 (4%)	1 (4%)	5 (16%)
Total	28 (100%)	25 (100%)	24 (100%)	25 (100%)	31 (100%)

*Source: Primary data*

*Figures in parenthesis shows percentages*

It is observed from table 2.6 that out of 361 respondents 24 to 31 respondents received support of seed/seedlings from the Horticulture department. From the table it can be seen that the turmeric growers have been receiving seed/seedlings in about 84 percent to 100 percent. It was revealed that none of the chayote farmers received seed/seedlings support during 2007-2011. Chayote has been flourishing in Sihphir area for many decades and the cultivators have many years of experience. They do not necessarily need support in the form of seeds and seedlings. Among the grape cultivators, 3 percent received support of seed/seedlings in 2007, 0 percent in 2008, 1 percent in 2009, 1 percent in 2010 and 5 percent in 2011.

**Table 2.7: Number of respondents who received trailing wire support**

Crop	Trailing Wire				
	2007	2008	2009	2010	2011
Turmeric	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Chayote	1 (1%)	7 (9%)	0 (0%)	0 (0%)	1 (1%)
Grape	88 (99%)	67 (91%)	58 (100%)	29 (100%)	0 (0%)
Total	89 (100%)	74 (100%)	58 (100%)	29 (100%)	1 (100%)

Source: Primary data

Figures in parenthesis shows percentages

In total, out of 361 respondents 89 received support in the form of trailing wire in 2007, 74 in 2008, 58 in 2009 and 29 in 2010. As turmeric crop does not require trailing wire, they have not received any support in this regard. Chayote farmers did not receive much support in the form of trailing wire during 2007-2011, except in 2008 when 9 percent received the support. The grape cultivators have received a great deal of support in the form of trailing wire for their crops. 99 percent received trailing wire support in 2007, 91 percent in 2008, 100 percent in 2009 and 2010 while nil in 2011. Grapes require trailing wire to support the grapes plants.

**Table 2.8: Number of respondents who received cash support**

Crop	Cash Support				
	2007	2008	2009	2010	2011
Turmeric	16 (94%)	19 (86%)	17 (77%)	16 (64%)	12 (71%)
Chayote	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Grape	1 (6%)	3 (14%)	5 (23%)	9 (36%)	5 (29%)
Total	17 (100%)	22 (100%)	22 (100%)	25 (100%)	17 (100%)

Source: Primary data

Figures in parenthesis shows percentages

Regarding cash support, it was revealed that turmeric growers receive more in comparison to grape growers. Among the turmeric growers, 94 percent of the total respondents received it in 2007, 86 percent in 2008, 77 percent in 2009, 64 percent in 2010 and 71 percent in 2011 as seen in table 2.8. The chayote farmers revealed that none of them have received cash support during 2007-2011. Among the grape farmers, only 6 percent received cash support in 2007, 14 percent in 2008, 23 percent in 2009, 36 percent in 2010 and 29 percent in 2011. The reason behind the support of cash incentives to turmeric growers in comparison to grape growers is that the turmeric growers are more cash strapped in relation to grape growers.

**Table 2.9: Number of respondents who received irrigation support**

Crop	Irrigation facility				
	2007	2008	2009	2010	2011
Turmeric	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Chayote	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Grape	3 (100%)	2 (100%)	1 (100%)	3 (100%)	6 (100%)
Total	3 (100%)	2 (100%)	1 (100%)	3 (100%)	6 (100%)

*Source: Primary data*

*Figures in parenthesis shows percentages*

Mizoram has high rainfall during monsoon but the rainwater is not retained for a long period of time. Most of the farmers in the state depend on rainwater for irrigation purposes. The turmeric and chayote farmers revealed that they have not received any irrigation support during 2007-2011. Among the grape farmers, 3 respondents received irrigation support in 2007, 2 respondents in 2008, 1 respondent in 2009, 3 respondents in 2010 and 6 respondents in 2011.

Apart from the various tangible supports given by the government to the horticultural farmers, the government conducts training programmes on farming techniques to educate the horticultural farmers for developing their trade.

**Table 2.10: Number of respondents who have attended training programmes**

Crop	Whether attended training programmes		
	Yes	No	Total
Turmeric	42 (37%)	71 (63%)	113 (100%)
Chayote	15 (17%)	75 (83%)	90 (100%)
Grape	68 (43%)	90 (57%)	158 (100%)
Total	125 (35%)	236 (65%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis shows percentages*

The respondents were asked to identify whether they have attended training programmes organised by the Department of Horticulture at least once. It is observed in table 2.10 that from a total of 361 respondents, 125 respondents (35 percent) have attended training programme at least once while 236 (65 percent) have never attended the training programmes organised by the government. Among the turmeric farmers, 37 percent have attended trainings whereas 63 percent have never attended. 17 percent of the chayote farmers have attended training programmes while 83 percent have never attended training programmes. Among the grape farmers, 43 percent have attended the training programmes whereas 57 percent have never attended training programmes.

Regular training is important for the horticultural farmers to keep themselves abreast with modern farming techniques and best practices of the trade. It was found that some of the farmers have attended training programmes multiple times. Of the 125 horticultural farmers who have attended training programmes, 88 farmers have attended the training 1-2 times, 30

farmers have attended training 3-5 times, and 7 farmers have attended training more than 5 times.

Respondents were further asked whether they found the training programmes helpful.

**Table 2.11: Whether training programmes are helpful for respondents**

Crop	Whether training is helpful		
	Yes	No	Total
Turmeric	38 (90%)	4 (10%)	42 (100%)
Chayote	15 (100%)	0 (0%)	15 (100%)
Grape	62 (91%)	6 (9%)	68 (100%)

*Source: Primary data*

*Figures in parenthesis shows percentages*

Of the 125 horticultural farmers who have attended training programmes, 115 (92 percent) revealed that the training programmes are helpful. Only 10 (8 percent) reported that the training programmes are not helpful. It can be seen that all the participants of chayote farmers and turmeric and grape farmers representing 90 percent approximately are satisfied with the training programmes and found it to be useful.

## 2.7 Conclusion

The government of Mizoram has played a vital role in the development of horticultural sector in the state. Although the department was bifurcated in the late 1990s from the Agriculture Department, it has been able to follow its vision and mission. Apart from the schemes of New Land Use Programme (NLUP), Horticulture Mission for North East and Himalayan States (HMNEH), Rastriya Krishi Vikas Yojana (RKVY), National Mission on Micro-Irrigation (NMMI), National Mission on Medicinal Plants (NMMP), Vegetable Initiative for Urban Clusters (VIUC) etc., new schemes has been developed for horticulture. Some of the well known schemes are citrus scion bank, multipurpose packing house, creation of water resources, organic farming/certified organic area, horticulture



centres, horticulture mechanization, training and establishment of a horticulture college in Mizoram. The study also finds that the farmers of select horticultural products have been getting support in the form of fertilizers, seed/seedlings, trailing wire (grape growers), cash support (turmeric growers), irrigation support (grape growers) and training for all the farmers. The main finding is that only 35 percent of sample survey has attended training and 90 percent of them have gained from the training. So it is imperative that more training programmes should be conducted for the beneficiary of the farmers.

## **Chapter III**

### **Marketing and Production of Select Horticultural Products of Mizoram**

3.1 Introduction to Marketing

3.1.1 The Marketing Mix- Definition

3.2 Product

3.2.1 Turmeric – spice crop

3.2.2 Chayote – vegetable crop

3.2.3 Grape – fruit crop

3.3 Price

3.4 Place

3.5 Promotion

3.6 Conclusion

### **3.1 Introduction to Marketing**

Marketing is an important socio-economic activity with a history of many centuries. It is an essential activity for the satisfaction of human wants and for also raising social welfare. Production is the base of marketing. It supplements production activities by distributing goods and services. Marketing links producers and consumers together for mutual benefits. It facilitates transfer of ownership of goods and services to consumers. Production will be meaningless if goods produced are not supplied to consumers through appropriate marketing mechanism.

A social definition of marketing shows the role marketing plays in society. According to Phillip Kotler(2002), the social definition is “Marketing is a societal process by which individuals and groups obtain what they need and want through creating, offering, and freely exchanging products and services of value with others”.

The American Marketing Association defines marketing as “The process of planning and executing the conception, pricing, promotion and distribution of ideas, goods and services to create exchanges that satisfy individual and organisational goals”.

#### **3.11 The Marketing Mix-Definition**

Marketing mix is an important tool used by the marketing professional for formulating marketing strategies for the customers. The term marketing mix was introduced by Neil H. Borden in his article - "The Concept of Marketing Mix". He learned about it in a research bulletin on the management of marketing costs, written by his associate, Prof. James Culliton in 1948. In this study of manufacturers' marketing costs he described the business executive as a "decider," an "artist" and a "mixer of ingredients," who sometimes follows a recipe prepared by others, sometimes prepares his own recipe as he goes along, sometimes

adapts a recipe to the ingredients immediately available, and sometimes experiments with or invents ingredients no one else has tried.

According to Philip Kotler (2002) "Marketing Mix is the combination of four elements, called the 4P's viz., Product, Price, Place and Promotion, that every company has the option of adding, subtracting, or modifying in order to create a desired marketing strategy".

According to Kotler and Armstrong, (2012), "The Marketing Mix is the set of tactical marketing tools - Product, Price, Promotion, and Place - that the firm blends to produce the response it wants in the target market."

### **3.2 Product**

Product is the key element in the marketing mix. The marketing mix planning begins with formulating an offering to meet target customer's needs and wants. A product is anything that can be offered to a market to satisfy a want or need. Product is the article which a manufacturer desires to sell in the open market. It is the first element in the marketing mix. The product mix includes variables such as product line and range, style, shape, design, colour, quality and other physical features of a product, packaging and labelling of a product, branding and trade mark given to the product, services, warranties and returns.

Product is the most powerful competing instrument in the hands of the marketer. It is the heart of the marketing mix. If the product is not sound or attractive to the customers, no amount of sales promotion, appropriate channel selection or price reduction will help to achieve the marketing target. Hence, durability, quality, uses, etc. of the product are important from the marketing point of view.

Horticulture, including fruits, vegetables, roots and tubers, spices, mushrooms, floriculture, medicinal and aromatic plants, nuts, and plantation crops, has emerged as an

important sector The present study involves three horticultural products of Mizoram viz. turmeric, chayote and grape which has been selected on the basis of spice, vegetable and fruit crops.

### **3.2.1 Turmeric – Spice Crop**

Turmeric is one of the major spice crops in the North Eastern hill region. The botanical name is “*Curcuma longa*”. India is the largest producer and exporter of turmeric in the world. Though turmeric has not occupied a significant area in the North East mainly due to the non-existence of processing industry, but now some farmers are growing turmeric and processing at a small scale to generate a sustainable income.

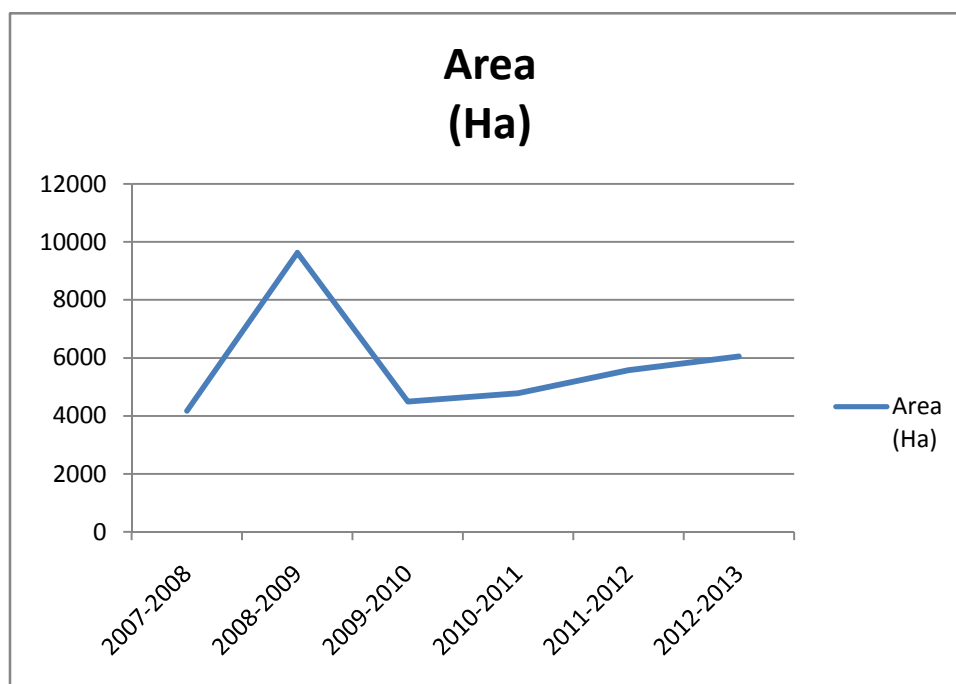
Turmeric has many uses. The most common use is as a colouring and flavouring agent in cooking. It is also used as a food preservative. It contains curcumin which is an antioxidant. Turmeric has medicinal properties and is often used as a natural treatment for ailments such as blood sugar, cataract, heart disease, cholera, bronchitis and for treating wounds. It is also used in skin care and cosmetic purposes in many cultures.

Turmeric prefers warm humid climate with average rainfall of 1500 mm and temperature of 20°C to 30°C. Well drained, sandy loam soil rich in organic matter is required for better growth and development. The varieties that are considered suitable for the North Eastern hill region are Lakadong, RCT-I (Megha Turmeric) and G.L.Puram.

In Mizoram, sowing of turmeric is carried out during March and April. Turmeric is a short gestation crop and is ready for harvesting in about eight to nine months after sowing. In Mizoram, turmeric farmers harvest their crop during the months of February to April. The potential yield per hectare is 200 – 300 quintals.

The pioneering of Multifarming Cooperative Society, Reiek has triggered an incentive to the farmers in other parts of the state, and many such new groups are emerging and starting a similar entrepreneurship business at several strategic locations.

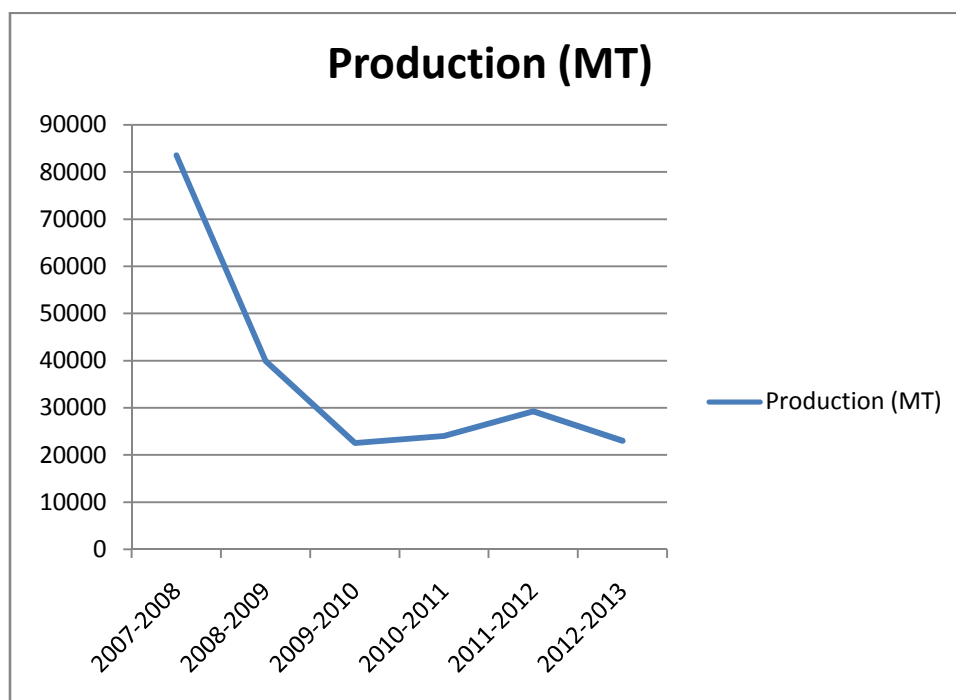
**Figure 3.1: Area under turmeric cultivation**



*Source: Department of Horticulture, Government of Mizoram*

The area under turmeric cultivation in Mizoram was 4175 hectares in 2007-2008. This figure rose sharply to 9625 hectares in 2008-2009. In 2012-2013, the Department of Horticulture recorded a figure of 6050 hectares under turmeric cultivation in Mizoram. Mamit district accounts for the largest area under turmeric cultivation in Mizoram at 28 percent. This is because the main area of turmeric cultivation in Mizoram is at Reiek village in Mamit district. It is estimated that 50 percent of the households in Reiek area are cultivating turmeric today.

**Figure 3.2: Production trend of turmeric in Mizoram**

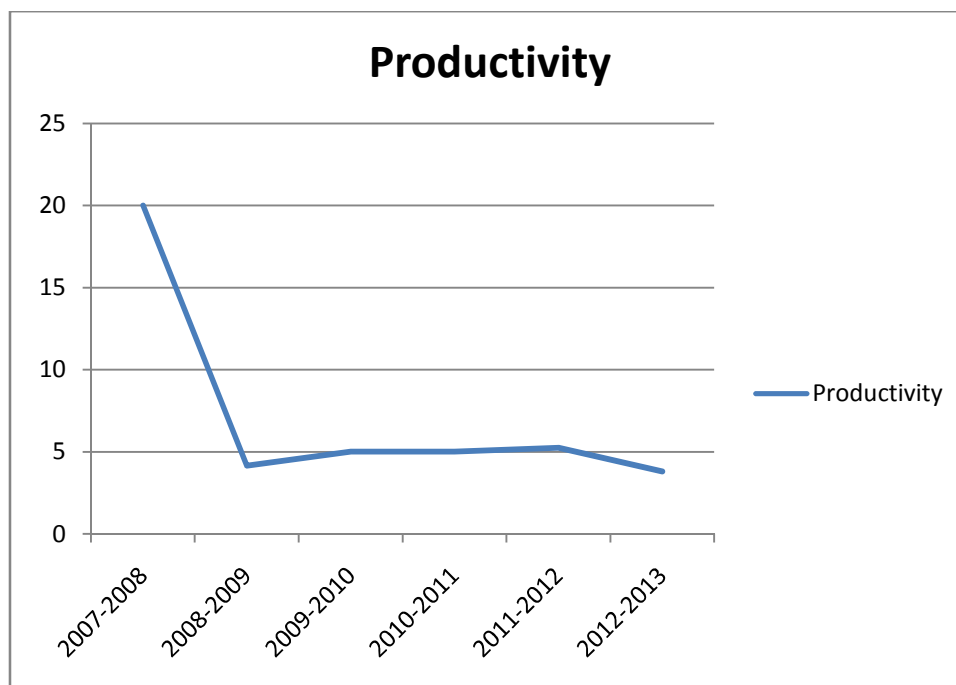


*Source: Department of Horticulture, Government of Mizoram*

Unfortunately, turmeric production in the state has been declining in the past five years. It has declined from 83,500 million tonnes in 2007-2008 to a mere 22,990 million tonnes in 2012-2013. It is interesting to note that even though the area under cultivation has increased by 50 percent, the production has decreased by more than 70 percent.

The yield per hectare of turmeric in Mizoram has also witnessed a sharp decline in the past five years. The productivity was 20 million tonnes per hectare 2007-2008, and has declined to only 3.8 million tonnes per hectare in 2012-2013.

**Figure 3.3: Productivity of turmeric cultivation in Mizoram (million tonnes per hectare)**



*Source: Department of Horticulture, Government of Mizoram*

The productivity, measured in million tonnes per hectare for turmeric crop has witnessed a sharp decline during the period of study, 2007-2011. It has decreased from 20 million tonnes per hectare in 2007-2008 to 4.5 million tonnes in 2008-2009. The productivity remained more or less constant during the next three years and further declined in 2010-2011.

### **3.2.2 Chayote – Vegetable Crop**

Chayote is one of the most important vegetable crops in Mizoram. Mizos use chayote both for human consumption and for animal feed as well. It is a very versatile vegetable as we eat almost all parts of the plant including the leaves, root and the fruit. Among the vegetables grown in Mizoram, chayote is one of the highest exported vegetables. It is mainly exported to our neighbouring state Assam and Bangladesh. The main areas of



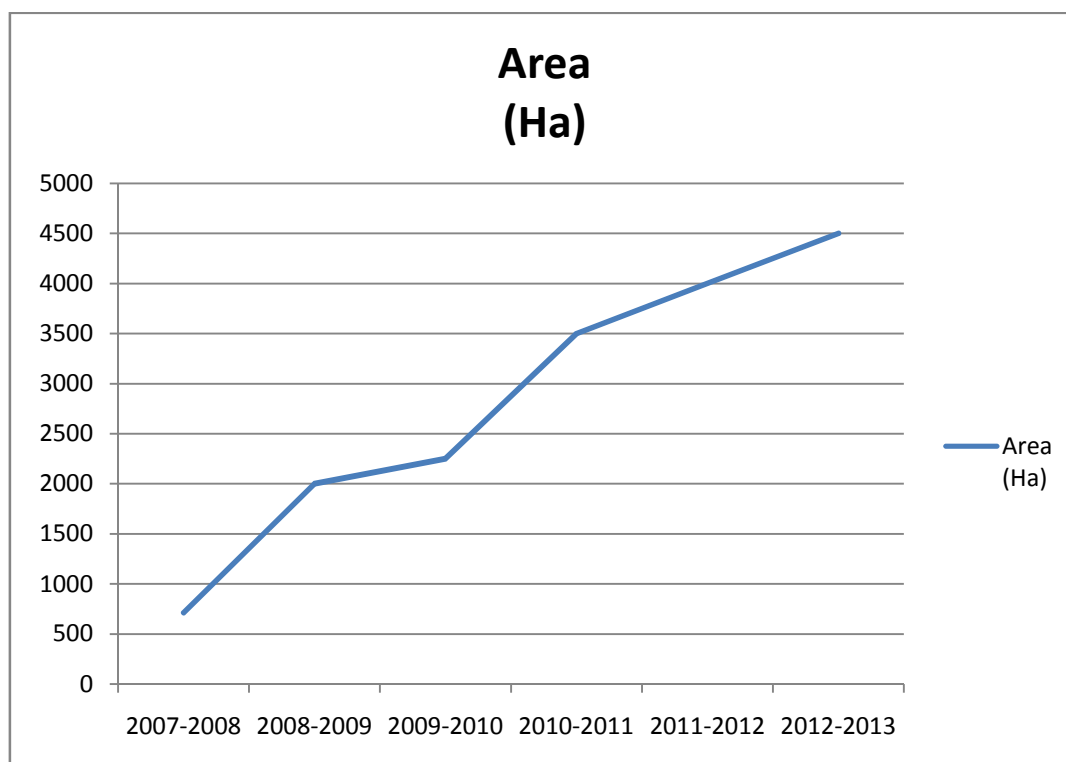
chayote cultivation in Mizoram are Sihphir, Lungdai, Serkhan and Nisapui. Chayote cultivation has provided a sustainable means of income for many households in Mizoram.

The chayote farmers formed a strong association named “Mizoram Iskut Growers Association” which had five branches in the beginning. With the area under chayote cultivation being expanded under the Technology Mission, the number of branches also increased. As the farmers are keen to take up chayote cultivation on a larger scale, the government has provided assistance in the form of G.I. wire for trailing support and organic manure.

Chayote requires a moderate climate between 13°C and 21°C. It grows well in areas of heavy rainfall between 1500 – 2000 mm with relative humidity of 80 – 85 percent. Chayote is a short gestation crop and is ready for harvesting within 3 – 4 months of cultivating. In Mizoram, it can be harvested between April - December, though the prime period of harvesting the crop is during August – September. There are several varieties of chayote viz. green type painted green, brown green, oval green, florida green etc.

The expected yield per hectare is very good for chayote. Depending upon the land capability and area, farmers can harvest 250 – 400 quintals per hectare. If cultivated with care, the same crop can be harvested for up to ten years.

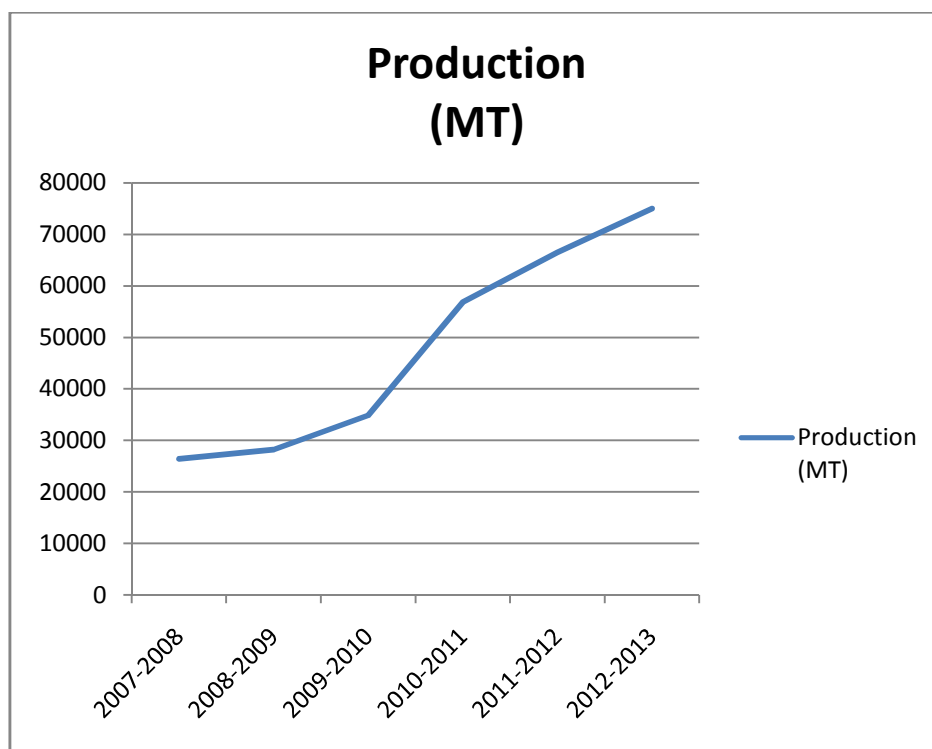
**Figure 3.4: Area under chayote cultivation**



*Source: Department of Horticulture, Government of Mizoram*

The area under chayote cultivation has increased steadily over the years. The total area under chayote cultivation in Mizoram is 4500 hectares 2012-2013 while it was only 704 hectares during 2007-2008. Aizawl district has the highest area under chayote cultivation followed by Serchhip, Lunglei and Kolasib districts respectively.

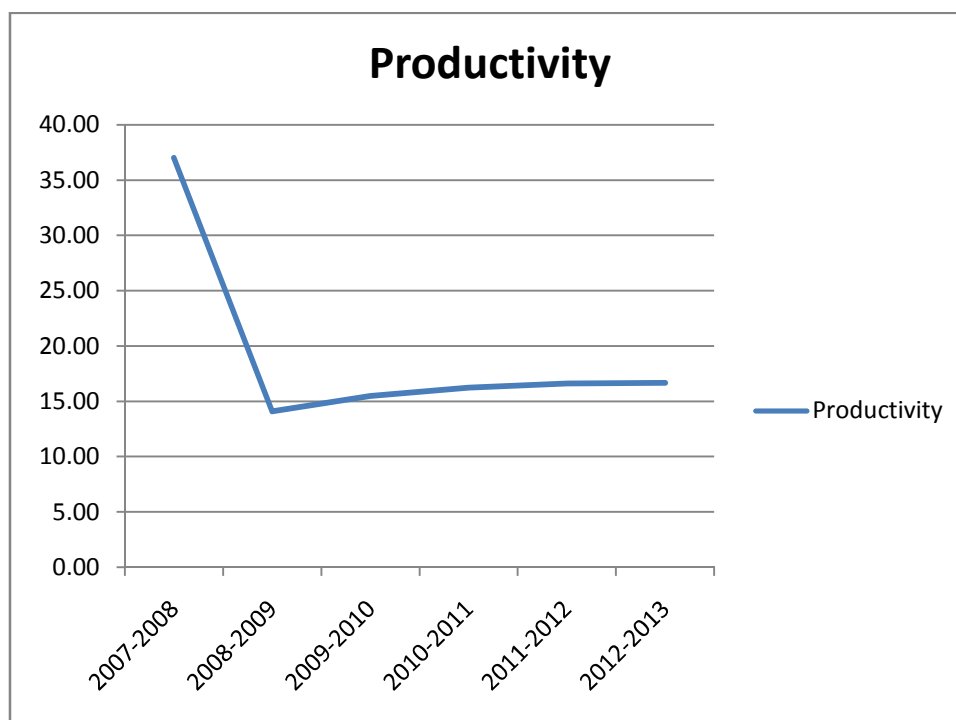
**Figure 3.5: Production trend of chayote**



*Source: Department of Horticulture, Government of Mizoram*

Chayote has proved to be one of the most successful horticultural crops in Mizoram. The rate of increase in production has been increasing year on year. While the production of chayote was 26,418 million tonnes in 20078-2008, it has more than doubled to 75,020 million tonnes in 2012-2013. Chayote cultivation has been included in the government's NLUP (New Land Use Policy) scheme, which should give an added boost to the production of the crop in the coming years.

**Figure 3.6: Productivity of chayote cultivation (million tonnes per hectare)**



*Source: Department of Horticulture, Government of Mizoram*

As per the data recorded by the Department of Horticulture, the yield per hectare of chayote in Mizoram has declined from 37.53 million tonnes per hectare in 2007-2008 to 14.10 million tonnes per hectare in 2012-2013, even though the total production has increased steadily in the state. In 2012-2013, the productivity remained at 16.67 million tonnes per hectare.

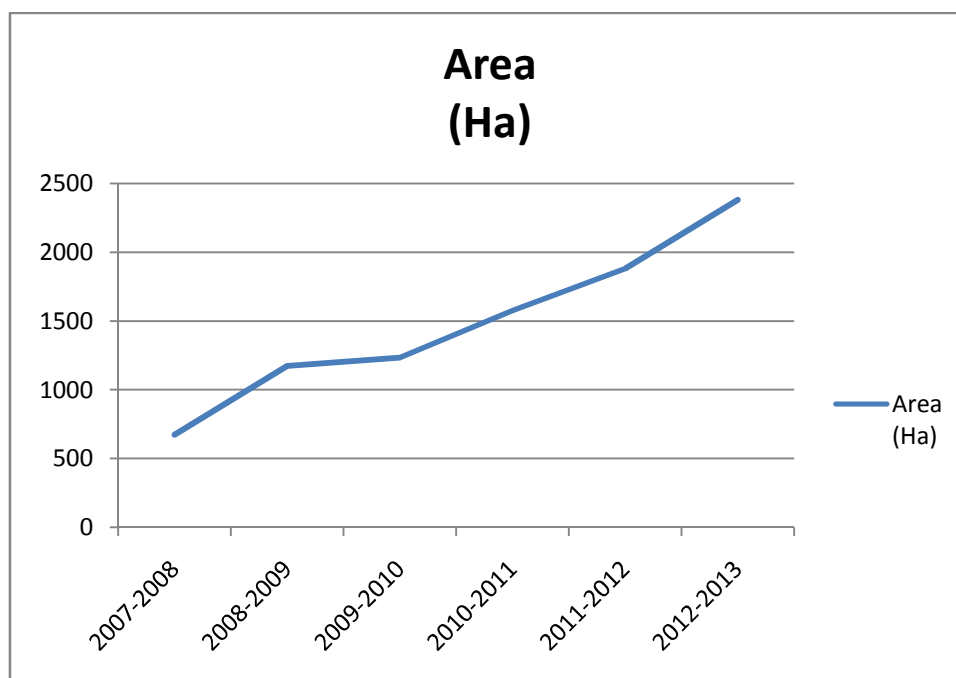
### **3.23 Grape - Fruit Crop**

Grape cultivation has been successfully taken up by Horticulture Department in Mizoram, especially in Champhai and Hnahlan areas of Champhai district. The main variety being cultivated is “Bangalore Blue” (botanical name is *Vitis lubrusca*) which is very suitable for making Red Wine or Port Wine. Recently, the Department of Horticulture has introduced a Spanish grape variety called “Temranillo” for processing into Red Wine. This grape variety

has been given for cultivation to sixty families at Mualkawi, Champhai. Once the fruits are processed, they are expected to be exported to foreign countries. Besides these, two other varieties, viz. “Pusa Navrang” and “Pusa Urvashi” are being tried at present, as advised by the Grape Expert of Indian Agricultural Research Institute, New Delhi. In addition, two Taiwanese varieties, viz. “Kyoho” and “Muscat” are also under trial cultivation. As of now, the state has not successfully produced a table variety of grape for consumption. Grape farmers of Hnahlan and Champhai have formed their own societies, viz. Hnahlan Grape Growers Society and Champhai Grape Growers Society respectively. As a result of the setting up of wineries at Hnahlan and Champhai, bottled wine “Zawlaidi” is available at retail outlets across the state. It is also made available for sale at all the tourist lodges in the state. Many of the grape growers of Mizoram today are not only self-sufficient, but are also in a good economic condition.

The ideal temperature for cultivating grape is between 15°C - 40°C, depending upon the grape variety. In Mizoram, for those farmers who have proper irrigation facilities, February is considered the ideal time for planting the vines. Otherwise, the onset of monsoon is considered a suitable time. Plants can start fruiting after two years of planting. Harvesting is done during July to August. A single plant can yield up to 15 – 20 kg of fruit.

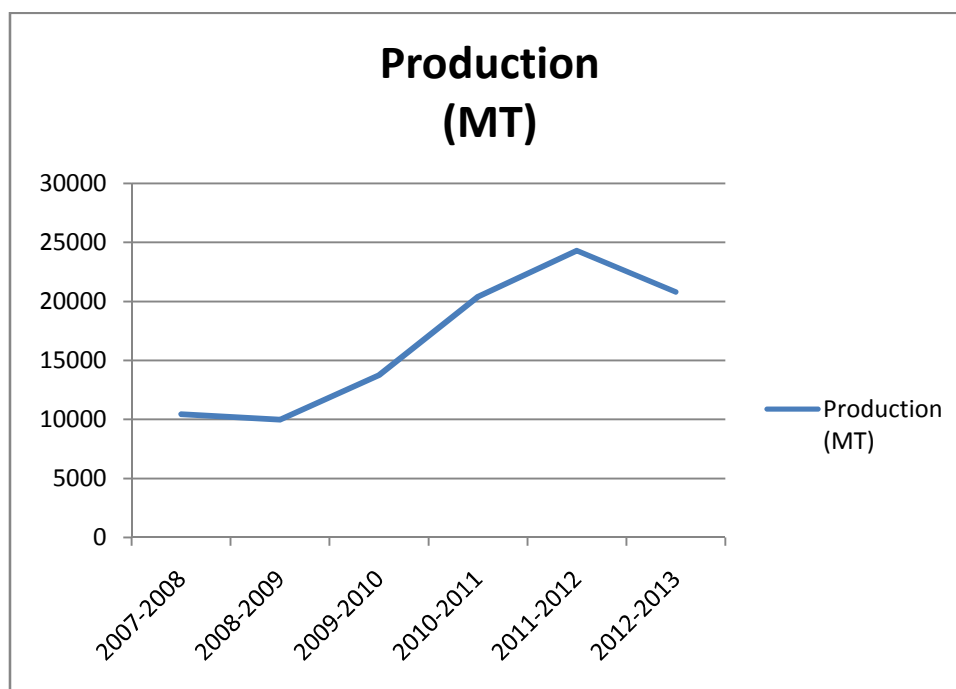
**Figure 3.7: Area under grape cultivation**



*Source: Department of Horticulture, Government of Mizoram*

The graph shows that the area under grape cultivation in Mizoram has been increasing steadily. It has increased from 672 hectares in 2007-2008 to 2380 hectares in 2012-2013. This trend can be largely attributed to the success of grape cultivation in Champhai and Hnahlan areas where wineries have been established. Champhai district has the largest area of land under grape cultivation with a cultivated area of 1069 hectares in 2012-2013. This is approximately 45 percent of the total area under grape cultivation in Mizoram.

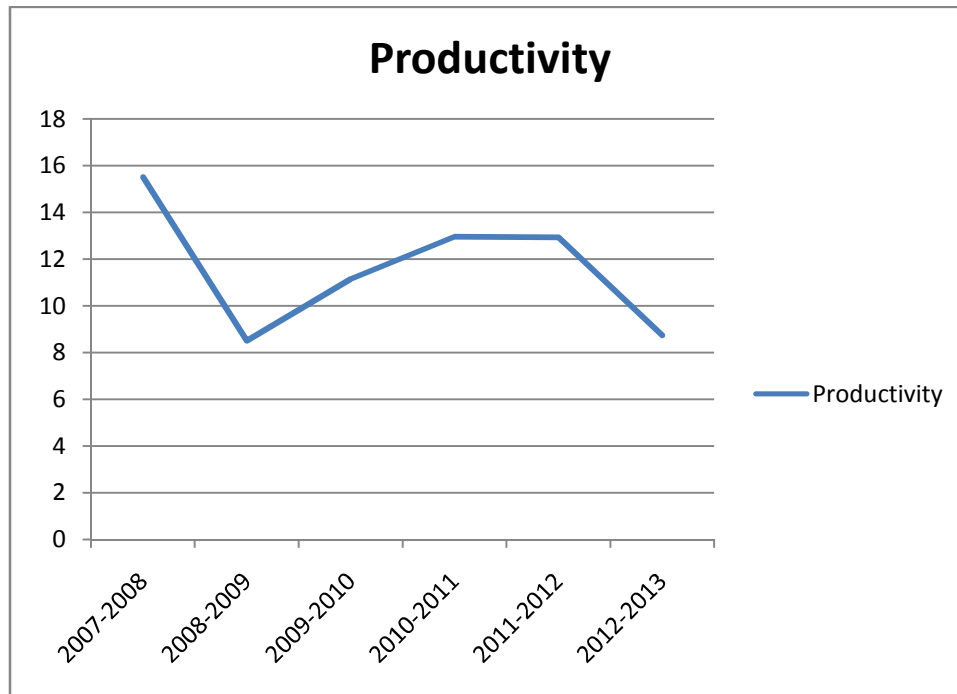
**Figure 3.8: Production trend of grape**



*Source: Department of Horticulture, Government of Mizoram*

The production of grape in Mizoram has also been increasing at a healthy pace. The production of grape was 10,416 million tonnes in 2007-2008 and increased to 24,300 million tonnes in 2011-2012. However, it has decreased to 20,800 million tonnes in 2012-2013. The main area under grape cultivation is in Champhai district which accounts for 56 percent of the total grape production in Mizoram.

**Figure 3.9: Productivity of grape cultivation (million tonnes per hectare)**



*Source: Department of Horticulture, Government of Mizoram*

The yield per hectare of grape cultivation in Mizoram has been inconsistent over the past years. The productivity was 15.5 million tonnes per hectare in 2007-2008, and has fallen to 8.7 million tonnes per hectare in the year 2012-2013.

### **3.3 Price**

The definition of price according to Philip Kotler (2003) is “Price is the amount of money charged for a product or service”. Price is the amount that is charged by the marketer for his offerings or the amount that is paid by the consumer for the use or consumption of the product. Price is crucial in determining the organisation's profit and survival. Price is the marketing mix element that produces revenue, the others produce costs.



The price demanded for a product is influenced by the demand for the product in the market, customer's perception, how much margin is adequate to sustain in the market, the image of the company in the market, the expenditure incurred for producing the goods, and finally, the intensity of competition prevailing in the market.

Traditionally, price has operated as the major determinant of a buyer's choice. This is the case in poorer economies, especially with commodity type products.

An attempt was made to find out whether the respondents think they receive a fair price for their produce. The responses are as follows:

**Table 3.1: Whether horticulture farmers receive a fair price for their produce**

<b>Crop</b>	<b>Whether receive fair price for produce</b>		
	<b>Yes</b>	<b>No</b>	<b>Total</b>
Turmeric	85 (75%)	28 (25%)	113 (100%)
Chayote	69 (77%)	21 (23%)	90 (100%)
Grape	84 (53%)	74 (47%)	158 (100%)
Total	238 (65.93)	123 (34.07)	361 (100%)

*Source: Primary data*

*Figures in parenthesis shows percentages*

It is seen in table 3.1 that 66 percent of the farmers surveyed think that they receive a fair price for their produce. However, 34 percent of the respondents do not think that they receive a fair price for their produce.

Among the turmeric farmers, 75 percent think they receive a fair price for their produce, whereas 25 percent do not think so. 77 percent of the chayote farmers believe they receive a fair price while 23 percent do not think so. Among the grape farmers, 53 percent think they receive a fair price and 47 percent do not think they receive a fair price for their produce.

The respondents were further asked to identify the reasons for not receiving a fair price for their produce. Respondents were asked to select all the reasons that apply to them. The results are presented in the following table 3.2.

**Table 3.2: Reasons for not receiving a fair price for produce**

Reason	Crop							
	Turmeric		Chayote		Grape		Total	
	Nos.	Rank	Nos.	Rank	Nos.	Rank	Nos.	Rank
Lack of support price	23	1	18	1	25	2	66	1
Existence of too many middlemen	9	4	16	2	21	3	46	2
Ignorance of marketing/sales	11	3	0	5	32	1	43	3
High perishability of produce	13	2	2	3	13	4	28	4
Seasonality of crop	8	5	1	4	3	5	12	5

*Source: Primary data*

It is observed from table 3.2 that according to the respondents, the uppermost reason for not receiving a fair price for their produce is the lack of support price from the government, followed by existence of too many middlemen, ignorance of marketing and sales, highly perishable nature of the horticulture produce and lastly, seasonality of the crop.

The order of ranking of the reasons for not receiving a fair price for the produce differs among the various cultivators. Among the turmeric farmers, the uppermost reason cited is lack of support price, followed by highly perishable nature of produce, ignorance of marketing and sales, existence of too many middlemen and lastly, seasonality of crop.

Among the chayote farmers, the uppermost reason is lack of support price, followed by existence of too many middlemen, highly perishable nature of produce, and seasonality of crop. None of the chayote cultivators selected ignorance of marketing and sales as a factor.

Among the grape cultivators, the uppermost reason for not receiving a fair price for their produce is ignorance of marketing and sales, followed by lack of support price,

existence of too many middlemen, the highly perishable nature of produce and lastly, seasonality of crop.

### **3.4 Place (Distribution)**

Place or distribution refers to making the product available for customers at convenient and accessible places. Physical distribution is the delivery of goods at the right time and at the right place to consumers. Physical distribution of product is possible through channels of distribution which are many and varied in character. Place includes variables like types of intermediaries or channels available for distribution, area of coverage, assortment of channels, locations where the product is available, transportation, warehousing and inventory management for making the product available to consumers easily and economically.

Marketing channels facilitates the transfer of ownership and the physical exchange of products and services. This area of business can determine the success or failure. The diverse and complex nature of a variety of marketing channels ranges from a simple channel linking producer directly to the customer, to a complex one where there are several layers of distributors linking the producer to the end consumer. Marketers need to constantly seek to improve existing channels and leverage them as a competitive advantage.

The turmeric farmers of Reiek village mainly sell their produce to the Reiek Multifarming Cooperative Society Ltd where it is processed and packed for marketing under the brand name Reiek Aieng. The society markets their packed turmeric through Mosia Agency in Aizawl. Some of the cultivators retail their own produce in powdered form and liquid form which is thought to be very good for digestion.

The chayote cultivators of Sihphir have been marketing their produce successfully for several decades. All the chayote respondents are engaged in export of their produce to

neighbouring states. Few of the respondents sell their produce in the domestic market as well.

As for the grape cultivators in Champhai and Hnahlan areas, their produce is processed at the wineries established in Champhai and Hnahlan respectively. The processed wine is marketed under the brand name “Zawlaidi” and is currently sold in retail outlets across the state. A large number of the cultivators are also processing and bottling their own wine in unbranded form. These are widely available in the markets across Mizoram.

The respondents were asked to identify the channel partners they are using in distributing their products in domestic and export market. Their responses are presented in the following table.

**Table 3.3 : Type of channel partners used by respondents – domestic market**

<b>Channel Partner</b>	<b>Turmeric</b>	<b>Chayote</b>	<b>Grape</b>	<b>Total</b>
Wholesaler	32 (28%)	1 (1%)	31 (20%)	64 (18%)
Distributor	60 (53%)	3 (3%)	16 (10%)	79 (22%)
Retailer	4 (4%)	0 (0%)	56 (35%)	60 (16%)
Agent	17 (15%)	0 (0%)	55 (35%)	72 (20%)
No channel partner	0 (0%)	86 (96%)	0 (0%)	86 (24%)
<b>Total</b>	<b>113 (100%)</b>	<b>90 (100%)</b>	<b>158 (100%)</b>	<b>361 (100%)</b>

*Source: Primary data*

*Figures in parenthesis shows percentages*

Regarding the type of channel partners used in the domestic market, it is observed from table 3.3 that out of a total of 361 respondents, 64 (18 percent) depend on wholesalers as channel partners, 79 (22 percent) utilize distributors, 60 (16 percent) make use of retailers, 72 (20 percent) employ agents and 86 (24 percent) do not use any type of channel partner.

Among the turmeric farmers, 28 percent revealed that they depend on wholesalers, 53 percent rely upon distributors, 4 percent on retailers and 15 percent rely on an agent.

Most of the chayote farmers are exporting all their produce without selling in the domestic market. 96 percent revealed that they are wholly exporting their produce and that they are not selling in the domestic market. Only 1 percent relies upon a wholesaler and 3 percent rely on a distributor.

Among the grape farmers, 18 percent utilise wholesalers, 22 percent use distributors, 16 percent rely on retailers and 20 percent employ the services of agents.

Regarding export sale, only the chayote cultivators are exporting their produce. The turmeric and grape farmers revealed that they do now export their produce. It was gathered from the study that all the chayote farmers are relying on distributors as channel partners for their export sales.

### **3.4 Promotion**

According to Phillip Kotler (2003), “Promotion includes all the activities the company undertakes to communicate and promote its products to the target market.” Promotion represents the different methods of communication that are used by marketer to inform target audience about the product. Promotional activities are necessary for large scale marketing and also for facing market competition effectively. Such activities are varied in nature and are useful for establishing good rapport with the consumers. Modern marketing calls for more than developing a good product, pricing it attractively, and making it accessible. Marketer must also communicate with present and potential stakeholders, and the general public. The question is not whether to communicate, but rather what to say, to whom and how often.

Promotion consists of five major modes of communication viz. advertising, sales promotion, public relations and publicity, personal selling, and direct marketing.

Advertising is any paid form of non-personal presentation and promotion of ideas, goods or services by an identified sponsor. Advertising helps marketers to create awareness of their products or services, or about the organisation itself, among the target audience. It induces interest, develops a desire and finally motivates consumers to take a purchase decision.

Sales promotion is a variety of short-term incentives to encourage trial or purchase of a product or service. It can include a host of activities like running advertising campaigns, handling public relation activities, distribution of free samples, offering free gifts, conducting trade fairs, exhibitions and competitions, offering temporary price discounts, etc.

Public relations and publicity are a variety of programs designed to promote or protect a company's image or its individual products. According to the Institute of Public Relations (UK), public relations is "the planned and sustained effort to establish and maintain goodwill and mutual understanding between an organisation and its public". Examples of public relations tools are brochures, newsletters, logos, magazines, annual reports, news releases, feature articles, press conferences, etc.

Personal selling is face-to-face interaction with one or more prospective purchasers for the purpose of making presentations, answering questions, and procuring orders. It involves developing customer relationship, discovering and communicating customer needs matching the appropriate products with these needs

Direct marketing is the use of mail, telephone, fax, e-mail or internet to communicate directly with or solicit a direct response from specific customers and prospects. In direct marketing, marketers invite customers to respond to their marketing efforts through telephone, e-mail, etc. Different forms of direct marketing include catalogue marketing, telemarketing, kiosk marketing, home shopping, etc.

In the case of Mizoram, promotion of the horticulture sector is mainly done by the Department of Horticulture, Government of Mizoram. Individual cultivators and societies are still ignorant of the aspect of promoting their trade. Moreover, they do not possess the resources required to promote their trade in a significant manner.

In recent years, the Department of Horticulture has taken several steps to promote horticulture sector in the state. For example, the “Anthurium Festival” which is now held annually in the state, is organised by the Tourism Department in collaboration with Horticulture Department. The department participates in national and international trade fairs and provide a platform for the cultivators to gain exposure at such events. The department publishes a quarterly magazine called “Huan Enkawltu” for the benefit of the horticulture farmers. The department also publishes several pamphlets and brochures for promoting a variety of horticultural crops. Apart from these, the department publishes reports and magazines from time to time documenting the development of horticulture sector in the state.

Likert scale was used to find out the opinion of respondents regarding several marketing variables that are pertinent for horticulture marketing. The results are presented in the following table.

**Table 3.4: Likert scale on opinion of respondents on marketing variables**

<b>Criteria</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>No opinion</b>	<b>Disagree</b>	<b>Strongly disagree</b>	<b>No Response</b>	<b>Total</b>
Customers prefer superior quality of horticulture produce	0	128	2	4	225	2	361
	(0%)	(35%)	(1%)	(1%)	(62%)	(1%)	(100%)
Customers prefer to buy cheaply priced horticulture produce	40	82	114	115	8	2	361
	(11%)	(23%)	(32%)	(32%)	(2%)	(1%)	(100%)
Domestic customers prefer to buy home grown horticulture produce	46	149	116	38	10	2	361
	(13%)	(41%)	(32%)	(11%)	(3%)	(1%)	(100%)
Well established distribution chain is essential for effective marketing of horticulture produce	238	103	12	6	0	2	361
	(66%)	(29%)	(3%)	(2%)	(0%)	(1%)	(100%)
Proper post harvest management (storage, processing etc) is essential for horticulture farming	220	132	6	1	0	2	361
	(61%)	(37%)	(2%)	(0%)	(0%)	(1%)	(100%)

*Source: Primary data*

*Figures in parenthesis shows percentages*

From table 3.4, we can infer that majority (62 percent) of the farmers do not agree that customers prefer superior quality of produce. 23 percent of the respondents agree that customers prefer cheap produce whereas 32 percent disagree. Regarding customers preference for home-grown produce, 13 percent strongly agree, 41 percent agree, 32 percent cannot form an opinion, 11 percent disagree and 3 percent strongly disagree. Regarding the importance of a well established distribution chain, 66 percent strongly agree and 29 percent agree. On the subject of the importance of post-harvest management, 61 percent strongly agree and 37 percent agree.



### **3.6 Conclusion**

The present study reveals the existence and application of marketing management principles in the horticulture production in Mizoram, which is of great importance in the development of economy in the state of Mizoram. To enhance its efficiency, advances in production and marketing management of the select horticulture products, the study has analysed the production process and marketing through the elements of marketing mix viz., product, price, place and promotion. The study has selected three products viz., turmeric, chayote and grapes which are well known products of Mizoram. The study has found that turmeric production has declined from 83,500 million tonnes in 2007-2008 to a mere 22,990 million tonnes in 2012-2013. It has been interesting to note that even though the area under cultivation has increased by 50 percent, the production has decreased by more than 70 percent. Chayote on the other hand has proved to be one of the most successful horticultural crops in Mizoram. The production has increased from 26,418 million tonnes in 2007-2008 to 75,020 million tonnes in 2012-2013. Chayote cultivation has been included in the state government's NLUP (New Land Use Policy) scheme, which can give an added boost to the production of the crop in the coming years. The production of grape in Mizoram has also been increasing at a healthy pace. The production of grape was 10,416 million tonnes in 2007-2008 and increased to 24,300 million tonnes in 2011-2012. The main area under grape cultivation is in Champhai district which accounts for 56 percent of the total grape production in Mizoram.

## **Chapter IV**

### **Profile of Horticulture Farmers in Mizoram**

#### 4.1 Introduction

#### 4.2 Brief Profile of Horticulture Farmers in Mizoram

##### 4.2.1. Age

##### 4.2.2. Education

##### 4.2.3. Size of Family

##### 4.2.4. Marital Status

##### 4.2.5. Other Occupations

##### 4.2.6. Number of Members Engaged in Farming

#### 4.3 Type of land holding

##### 4.3.1. Land ownership

##### 4.3.2. Area of Land under Horticulture Cultivation

#### 4.4 Production and Income

##### 4.4.1. Years of Farming Experience

##### 4.4.2. Amount of Time Invested in Farming

##### 4.4.3 Annual Production

##### 4.4.4 Annual Income

##### 4.4.5 Society Membership

##### 4.4.6 Financial Assistance Availed

##### 4.4.7 Account Management

#### 4.5 Conclusion

#### **4.1 Introduction**

Horticulture farmers are one of the most important segments in terms of agricultural farmers. This group form the weakest link in the chain of rural economy. To understand the impact of labour absorption, it is necessary to have a clear idea of the social and economic conditions of the households of the horticulture farmers. The study of socio-economic conditions generally precedes any attempt on the analysis of cultivation activities by different farm size groups. A study of the economic conditions of these farmers would also help in understanding the investment behaviour of agriculturists on the land. The social and demographic features of the study would throw light on the attitude of the farmers on the adoption of horticultural production and also use of other non-labour inputs for the proper utilisation of labour. This chapter is divided into three sections, section I deals with general profile of horticultural farmers viz., social and demographic variables, and section II presents types of land holdings and section III discusses the production and income, financial assistance availed and management of accounts by the cultivators.

#### **4.2 Brief Profile of Horticulture Farmers in Mizoram**

To study a comprehensive profile of the horticultural farmers, a demographic base becomes more relevant. The social characteristics such as socio-economic segments with varying horticulture crops cultivated, age, education levels, size of family, etc affect the economic conditions and in turn affect social conditions. The significance of the social and demographic variables is discussed below.

First, the farmers are classified on the basis of age. The age structure of the farmers is an important factor in the context of agricultural products or productivity (Rogers, 1977). Education plays an important factor in the development of agriculture. Successful adoption of modern technology is a function of various factors such as knowledge, skill, finance and other factors. Hence educational qualification is a key factor in the process of agricultural

production. It is viewed that the higher the productive age group, higher would be the application of new technology. Hence the productive age group is considered in the study as 15-60 years.

A study in Columbia found that literacy and adoption of innovativeness is positively relative and mass media exposure, social status, farm size, extension change agency contact, empathy and achievement motivation are also found to be positively associated with innovativeness (Rogers, 1969).

#### 4.2.1. Age

Age plays an important role in horticulture and agriculture production. While collecting the primary data, the age of the principal cultivator in the family has been taken into consideration. Farmers are more likely to continue working well beyond the age at which most other workers such as government employees retire. Younger farmers are more open to adopt modern farming techniques. Also, the educational qualification tends to be higher among the younger farmers. To analyse the data, the age group of the respondents has been divided into below 35 years which has been grouped as young farmers, 35 to 50 years group as middle aged farmers and above 50 years category as old farmers.

**Table 4.1: Age wise classification of sample horticulture farmers**

Age group	Turmeric	Chayote	Grape	Total
Below 35 years	14 (12%)	2 (2%)	22 (14%)	38 (10%)
35 - 50 years	40 (36%)	30 (33%)	59 (37%)	129 (36%)
Above 50 years	59 (52%)	58 (65%)	77 (49%)	194 (54%)
Total	113 (100%)	90 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

It is revealed from the above table 4.1 that among the turmeric farmers, 12 percent belongs to age group below 36 years, 35 percent are between 35 to 50 years and 52 percent are above the age of 50 years. The average age of the turmeric farmers is found to be 53.8 years. It can be seen that the majority of the farmers are in old age group represented by 52 percent.

Among the chayote farmers, 2 percent are below 35 years, 33 percent are in the age group of 35-50 years and 65 percent are above 50 years. The mean age of the chayote farmers is 53.5 years. The majority of the farmers for chayote are the older farmers comprising 2/3<sup>rd</sup> of the chayote farmers. The main reason behind this is due to the establishment of chayote farming much earlier than turmeric and grapes.

Among the grape cultivators, 11 percent are below 35 years, 36 percent between 35-50 years and 54 percent are above 50 years. The mean age of the grape farmers is 49.2 years. The grape farmers are relatively young as compared to other select crops for the study. Therefore the mean age is lesser in comparison to the other crops selected.

Overall, all the three types of crops shows that 10 percent of the horticulture farmers are below 35 years, 36 percent are between 35-50 years and 54 percent are above 50 years. The overall mean age of the farmers under study was found to be 51.7 years. It can be concluded that the older age group category form the majority of the farmers who are involved in horticultural farming in Mizoram which is represented by 50 percent of the respondents.

It is imperative to test whether the age factor is related to the selection of horticulture crop.

### Hypothesis Testing:

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between age of sample horticulture cultivators and type of crop cultivated

**Table 4.2: Chi-Square test on age of horticulture farmers by types of crop**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	4	0.05	7.815	0.026912	Failed to reject

*\* Test result through MS Excel*

For testing the above hypothesis Chi-Square test (exact test) was conducted for analysis the dependent data. Chi-square exact test is used due to the reason that some of the cells are either zero or less than 5. The test result is given as above. Since the calculated value (=0.026912) is lesser than the table value 7.815, we fail to reject the null hypothesis. Therefore we can conclude that age groups are not significantly more likely to opt for growing turmeric, chayote or grape in horticulture farming.

#### 4.2.2. Education

Education plays a major role in the development of an economy and eradicating poverty. It improves the quality of labour. Education is thought to be very important in farm production in a rapidly changing technological and economic environment. If the farmers are educated, they are likely to be responsive to training on farming methods, adoption of modern farming techniques and understand the nuances of marketing their produce. Improving the farmer's knowledge of new techniques and technologies, in addition to providing them with any physical resources necessary for implementation, can dramatically increase the farmers' level of productivity. In order to analyse the education level of the respondents, it has been

categorised as Post graduate, graduate, Up to Class 12, Up to Class 10, Upto Class 5 and Illiterate.

**Table 4.3: Education level of sample horticulture farmers**

Criteria	Turmeric	Chayote	Grape	Total
Post graduate	0 (0%)	0 (0%)	4 (2%)	4 (1%)
Graduate	2 (2%)	9 (10%)	20 (13%)	31 (8%)
Upto Class 12	17 (15%)	42 (47%)	31 (20%)	90 (25%)
Upto Class 10	79 (70%)	39 (43%)	65 (41%)	183 (51%)
Upto Class 5	15 (13%)	0 (0%)	38 (24%)	53 (15%)
Illiterate	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	113 (100%)	90 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

The above table reveals that all the respondents are at least literate which is due to the high literacy rate in Mizoram. The overall horticultural farmers consist of 8 percent-graduate, 25 percent upto Class 12 and 51 percent are upto class 10 but have gone through the scholastic system.

Among the 113 turmeric cultivators, it was found that only 2 (2 percent) of the respondents are graduate and 17 (15 percent) are intermediate. 70 percent of the turmeric farmers are matriculate. It can be seen that the majority of the turmeric farmers are matriculate.

Out of the 90 chayote cultivators, 10 percent are graduates and 47 percent are intermediate while 43 percent are matriculate. It can be assumed that the chayote growers in majority belong to intermediate and matriculate levels.

Among the 158 grape cultivators, it was found that 4 farmers (2 percent) are post-graduate level, 20 (13 percent) are graduate level, 31 (20 percent) are intermediate and 65 (41 percent) are matriculate.

### Hypothesis Testing:

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between the education level and type of crop cultivated.

**Table 4.4: Chi-Square test on education level of horticulture farmers by types of crop**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	10	0.05	18.307	1.46303E-12	Failed to reject

*\* Test result through MS Excel*

For testing the above hypothesis Chi-Square test was conducted for analysis the dependent data. Chi-square exact test is used due to the reason that some of the cells are either zero or less than 5. The test result is given as above. Since the calculated value (=1.46303E-12) is lesser than the table value 18.307, we fail to reject the null hypothesis. Therefore we can conclude that education level of the horticultural farmers is not significantly more likely to influence the growing of turmeric, chayote or grape in horticulture farming.



### 4.2.3. Size of Family

The size of the family plays an important role on the production of horticulture products in Mizoram as it indicates the number of manpower. Owing to the rise in labour cost, many farmers cannot afford to hire manpower to work on the land. A family with many family members may find it easier to cultivate their crops whereas a small family may face difficulty in managing their farm land and end up paying heavy wages for manpower.

**Table 4.5: Family size of sample horticulture farmers**

<b>Family Size</b>	<b>Turmeric</b>	<b>Chayote</b>	<b>Grape</b>	<b>Total</b>
Small (Less than 5 members)	34 (30%)	20 (22%)	29 (18%)	83 (23%)
Medium (5 - 8 members)	73 (65%)	66 (73%)	107 (68%)	246 (68%)
Large (More than 8 members)	6 (5%)	4 (5%)	22 (14%)	32 (9%)
Total	113 (100%)	90 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

To analyse the size of family, the respondents have been classified into three categories, viz. small family (less than 5 members), medium size family (5-8 members) and large size family (more than 8 members). Among the sample respondents, 23 percent fall under small family, 68 per cent under medium family and 9 per cent under large family. So it is evident that nearly 2/3<sup>rd</sup> of the farmers belong to the medium size farmers having family members of 5 to 8 members who can contribute to the farming activities.

Table 4.5 reveals that among the turmeric farmers, the largest is the category of medium size family represented by 65 percent, followed by 30 percent which is classified under small family and 5 percent under large family as the lowest category. The table also reveals that among the chayote farmers, 22 percent are small size families, 73 percent are

medium size families and 5 percent are large size families. This also reflects the same pattern of medium size families supporting the farming to a large extent. The table reveals the same for the grape cultivators which are reflected by 18 percent under the category of small family, 68 percent under medium family and 14 per cent under large family.

It is imperative to test whether the size of the family members is related to the type of horticulture crop cultivated.

### **Hypothesis Testing:**

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between size of family and type of crop cultivated.

**Table 4.6: Chi-Square test on family size of horticulture farmers by crop-wise**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	4	0.05	9.488	0.012830336	Failed to reject

*\* Test result through MS Excel*

For testing the above hypothesis Chi-Square test was conducted for analysis the dependent data. Chi-square test is used due to the reason that some of the cells are either zero or less than 5. The test result shows that the calculated value (=0.012830336) is lesser than the table value 9.488, thus it fails to reject the null hypothesis. Therefore it can be concluded that family size of the horticultural farmers is not significantly likely to relate to the growing of turmeric, chayote or grape in horticulture farming.

#### 4.2.4. Marital Status

Marital status is an important factor in horticulture farming. Married farmers are likely to be under pressure to produce more crops to feed the family and sell their produce to support their family. They are also more likely to stick to their trade on a permanent basis. Similarly, the availability of family labour could be an incentive to the married farmer to cultivate more crops and increase their area of cultivation.

**Table 4.7: Marital status of sample horticulture farmers**

Marital Status	Turmeric	Chayote	Grape	Total
Married	84 (93%)	92 (81%)	139 (88%)	315 (87%)
Unmarried	6 (7%)	21 (19%)	19 (12%)	46 (13%)
Total	90 (100%)	113 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

The above table 4.7 shows marital status of the select horticultural farmers. Among the turmeric farmers, 93 percent of the respondents are married while 7 percent are unmarried. Among the chayote farmers, 81 percent are married and 19 percent are unmarried. The grape farmers also show the same pattern viz., 88 percent are married and 12 percent are unmarried. For the entire sample of 361 farmers, 315 (88 percent) farmers are married and 46 (12 percent) farmers are unmarried. This data when related to the size of family members reveals that more than 2/3<sup>rd</sup> of the sample is from medium size family which means most of horticulture farmers are married which is confirmed by the above table.

It is imperative to test whether the marital status is related to the type of horticulture crop cultivated.

### Hypothesis Testing:

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between marital status and type of crop cultivated.

**Table 4.8: Chi-Square test on marital status of horticulture farmers by type of crop**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	2	0.05	5.991	0.038211007	Failed to reject

*\* Test result through MS Excel*

The above table 4.8 shows the Chi-square test which was used to test the hypothesis. The test result shows that the calculated value (=0.038211007) is lesser than the table value 5.991, which shows that it fails to reject the null hypothesis. Therefore it can be concluded that marital status of the horticultural farmers is not significantly likely to relate to growing turmeric, chayote or grape in horticulture farming.

#### 4.2.5. Other Occupations

Agriculture is the mainstay of people of Mizoram. However, in the modern day, many farmers are holding off-farm jobs. Farmers are often engaged in other occupation such as small businesses, daily wage work, and some are even holding government jobs. These occupations supplement their income and help them to invest more resources towards their trade.

**Table 4.9: Other occupations of sample horticulture farmers**

<b>Other Occupation</b>	<b>Turmeric</b>	<b>Chayote</b>	<b>Grape</b>	<b>Total</b>
Only farming	50 (44%)	15 (17%)	57 (36%)	122 (34%)
Govt. service	12 (11%)	13 (14%)	39 (25%)	64 (18%)
Own business	10 (9%)	12 (13%)	16 (10%)	38 (11%)
Daily wage worker	13 (12%)	8 (9%)	9 (6%)	30 (8%)
Privately employed	22 (19%)	32 (36%)	31 (19%)	85 (23%)
Others	6 (5%)	10 (11%)	6 (4%)	22 (6%)
Total	113 (100%)	90 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

The above table 4.9 shows the other occupations of the sample horticulture farmers of Mizoram. Among the turmeric farmers, 44 percent solely depend on farming for their livelihood. 11 percent are in government service, 9 percent own small businesses such as grocery stores and other retail outlets, 12 percent engage themselves in daily wage work, 19 percent are privately employed, and 5 percent practice other forms of trade such as carpentry, masonry, etc.

Among the chayote farmers, 17 percent are solely reliant on farming, 14 percent hold government jobs, 13 percent own small businesses, 9 percent engage in daily wage work, 6 percent are privately employed and 11 percent others. It is interesting to note that among chayote farmers, 36 percent are privately employed which is the highest in other occupations. This is mainly due to the nature of product which needs to be tended only during monsoon.

36 percent of the grape cultivators depend on farming only as a source of income, 25 percent are in government service, 10 percent own small businesses, 6 percent practice daily wage work, 19 percent are privately employed and 4 percent others.

Of the total 361 respondents, 31 percent are solely dependent of farming as a source of income. 18 percent are engaged in government service, 11 percent operate small businesses to supplement their income, 8 percent take up daily wage work, 23 percent are privately employed and 6 percent supplement their income through other forms of trade.

It is imperative to test whether the other occupations are related to the type of horticulture crops cultivated.

### **Hypothesis Testing:**

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between other occupations held and type of crop cultivated.

**Table 4.10: Chi square test of other occupations of sample horticulture farmers by types of crops grown**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	10	0.05	18.307	8.2353E-05	Failed to reject

*\* Test result through MS Excel*

The above table 4.10 shows the Chi-square test which was used to test the hypothesis. The test result shows that the calculated value (=8.2353E-05) is lesser than the table value 18.307, which shows that it fails to reject the null hypothesis. Therefore it can be concluded that other occupations of the horticultural farmers are not significantly likely to relate to growing turmeric, chayote or grape in horticulture farming.

#### 4.2.6. Number of Members Engaged in Farming

An attempt was made to find out the number of family members engaged in farm work from each household. The number of members engaged in cultivation of the horticulture crops can indicate their dedication and dependence on the trade. More number of family members engaged in the trade will also have an impact on the production output of the crops.

**Table 4.11: Number of Members Engaged in Horticulture Farming**

No. of members	Turmeric	Chayote	Grape	Total
Only 1	19 (17%)	4 (4%)	10 (6%)	33 (9%)
Between 2-3	81 (72%)	50 (56%)	82 (52%)	213 (59%)
Between 4-5	9 (8%)	33 (37%)	38 (24%)	80 (22%)
More than 5	4 (3%)	3 (3%)	28 (18%)	35 (10%)
Total	113 (100%)	90 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

From the above table, we can see that out of 361 respondents, 9 percent revealed that only one member from their household is engaged in horticulture farming. 59 percent conveyed that 2-3 members are engaged in farming, 22 percent reported 4-5 members and 10 percent said more than 5 members of the household are engaged in farming.

Among the turmeric farmers, 17 percent responded that only one member is engaged in farming, 72 percent responded 2-3 members, 8 percent responded 4-5 members and 3 percent responded more than 5 members.

Among the chayote farmers, 4 percent said only one member is engaged in farming from their household, 56 percent said 2-3 members, 37 percent said 4-5 members, and 3 percent said more than 5 members.

6 percent of the grape cultivators revealed that only one member is engaged in farming, 52 percent said 2-3 members, 24 percent said 4-5 members and 18 percent said more than 5 members.

### Hypothesis Testing:

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between number of family members engaged in farming and type of crop cultivated.

**Table 4.12: Chi-Square test on Number of Members Engaged in Horticulture Farming**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	6	0.05	12.592	1.08133E-09	Failed to reject

*\* Test result through MS Excel*

For testing the above hypothesis Chi-Square test was conducted for analysis the dependent data. Chi-square exact test is used due to the reason that some of the cells are either zero or less than 5. The test result is given as above. Since the calculated value (=1.08133E-09) is lesser than the table value 12.592, we fail to reject the null hypothesis. Therefore we can conclude that family members engaged in the horticultural farmers are not significantly more likely to influence for growing turmeric, chayote or grape in horticulture farming.



### 4.3 Type of land holding

This section deals with the type of land ownership of the horticulture farmers of turmeric, chayote and grapes surveyed and the area of land under horticulture crop cultivation.

#### 4.3.1. Land ownership

The first and most important asset to a farmer is the land resource for cultivating his crops. It represents the basis of agriculture production by the farmer. Whether or not the farmer owns his own land for cultivating his crops is an important question for the future of the farmer and the security of his trade. If the farmer owns his own land for farming, he is likely to be willing to invest in his trade and make long-term plans for his farming future.

**Table 4.13: Type of Land Ownership**

Type of land ownership	Turmeric	Chayote	Grape	Total
Owned by self	106 (94%)	90 (100%)	155 (98%)	351 (97%)
Leased	6 (5%)	0 (0%)	0 (0%)	6 (2%)
Owned by relative	1 (1%)	0 (0%)	3 (2%)	4 (1%)
Total	113 (100%)	90 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

The above table no. 4.13 reveals that nearly cent percent of the land is owned by the farmers themselves as indicated by the fact that 97 percent of the farmers surveyed have ownership of their farm land. Only 2 percent practice farming on leased land, while 1 percent practice farming on a relative's farm land.

Among the turmeric farmers, 94 percent own their farm land, 5 percent have leased it, and 1 percent has taken up farming on a relative's property. The chayote farmers surveyed

revealed that they own their own land for cultivation. Among the grape farmers, 97 percent own their own land for cultivation, 2 percent have leased the land, and 1 percent practice horticulture farming on a relative's land. One of the main reasons for most of the land being owned by self is that the farmers are required to own their land to become a member of the co-operative society.

### **Hypothesis Testing:**

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between type of land ownership and type of crop cultivated.

**Table 4.14: Chi-Square test on Type of Land Ownership by types of horticultural crops**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	4	0.05	9.488	0.004068359	Failed to reject

*\* Test result through MS Excel*

For testing the above hypothesis Chi-Square test was conducted for analysing the dependent data. Chi-square exact test is used due to the reason that some of the cells are either zero or less than 5. The test result is given as above. Since the calculated value (=0.004068359) is lesser than the table value 9.488 at 5 percent level of significance, we fail to reject the null hypothesis. Therefore we can conclude that types of land ownership engaged in the horticultural farmers are not significantly more likely to influence for growing turmeric, chayote or grape for horticulture farming.

### **4.3.2. Area of Land under Horticulture Cultivation**

India is a land of small and marginal farmers and Mizoram is not an exception to this fact. The area of land available to most farmers is small in size and the terrain of land is often unsuitable for cultivation of crops. This factor is a limitation for farmers in expanding their

area of cultivation and yielding more produce. The area of land under cultivation will indicate the potential output in production of crops by the farmers.

**Table 4.15: Area of Land under Horticulture Cultivation**

<b>Area under Cultivation</b>	<b>Turmeric</b>	<b>Chayote</b>	<b>Grape</b>	<b>Total</b>
Less than 1 hectare	60 (53%)	8 (9%)	9 (6%)	77 (21%)
1 - 2 hectares	50 (44%)	82 (91%)	114 (72%)	246 (68%)
2 - 5 hectares	3 (3%)	0 (0%)	28 (18%)	31 (9%)
More than 5 hectares	0 (0%)	0 (0%)	7 (4%)	7 (2%)
Total	113 (100%)	90 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

The above table exhibits that, of the total 361 horticulture farmers, 21 percent responded that they are cultivating their crop in less than one hectare of land area. 68 percent responded that the cultivated land is between 1-2 hectares, 9 percent are cultivating in 2-5 hectares of land area and 2 percent in more than 5 hectares of land area.

Among the turmeric farmers, 53 percent are cultivating their crop in less than one hectare of land area, 44 percent in 1-2 hectares of land, and 3 percent in 2-5 hectares. None of the turmeric farmers surveyed are cultivating in more than 5 hectares of land area.

9 percent of chayote farmers are cultivating in less than one hectare of land area, and 91 percent within 1-2 hectares. None of the chayote farmers under study are cultivating in more than 2 hectares of land.

21 percent of grape farmers are cultivating in less than one hectare of land area, 68 percent within 1-2 hectares, 9 percent within 2-5 hectares and 4 percent are cultivating in

more than 5 hectares of land. The overall analysis shows that majority of the farmers are farming in 1-2 hectares of land as represented by 68 percent.

### Hypothesis Testing:

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between area of land under horticulture cultivation and type of crop cultivated.

**Table 4.16 : Chi-Square test on area of Land by types of horticultural crops**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	6	0.05	12.592	5.8803E-26	Failed to reject

*\* Test result through MS Excel*

For testing the above hypothesis Chi-Square test was conducted for analysis the dependent data. Chi-square exact test is used due to the reason that some of the cells are either zero or less than 5. The test result is given as above. Since the calculated value (=5.8803E-26) is lesser than the table value 12.592 at 5 percent level of significance, we fail to reject the null hypothesis. Therefore we can conclude that area of land dedicated to horticulture farming by the cultivators is not significantly more likely to influence the growing of turmeric, chayote or grape.

## 4.4 Production and Income

This section dissects the horticulture farming experience of the farmers, the amount of time they invest in their trade, their production and income, financial assistance they have availed and their account management.

### 4.4.1. Years of Farming Experience

Horticulture farming is still in its early stages of development as far as Mizoram is concerned. The Department of Horticulture was made a full-fledged department only in 1997.

Chayote has been flourishing in Mizoram for many decades. Cultivation of turmeric and grape on commercial scale was only taken up in the past decade or so.

**Table 4.17: Number of Years of Horticulture Farming**

<b>Experience in Years</b>	<b>Turmeric</b>	<b>Chayote</b>	<b>Grape</b>	<b>Total</b>
Less than 5 years	20 (18%)	4 (4%)	21 (13%)	45 (12%)
5 - 10 years	89 (79%)	13 (14%)	102 (65%)	204 (57%)
10 - 15 years	4 (4%)	18 (20%)	26 (16%)	48 (13%)
15 -20 years	0 (0%)	23 (26%)	8 (5%)	31 (9%)
More than 20 years	0 (0%)	32 (36%)	1 (1%)	33 (9%)
Total	113 (100%)	90 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

The above table no. 4.17 shows that 12 percent of the total respondents have less than 5 years experience of horticulture farming, 57 percent have 5-10 years experience, 13 percent have 10-15 years experience, 9 percent have 15-20 years experience, and 9 percent have more than 20 years experience. This indicates that majority of the farmers have the experience of farming for the period of 5 to 10 years followed by 10 to 15 years.

Among the turmeric farmers, 18 percent have been cultivating the crop for less than 5 years, 79 percent between 5-10 years, and 4 percent between 10-15 years. The highest 79 percent is having an experience of 5-10 years which indicates that the success of turmeric farmers is very recent.

The chayote cultivators have the maximum amount of experience in years in cultivating the crop. 4 percent have been cultivating for less than 5 years, 14 percent between

5-10 years, 20 percent between 10-15 years, 26 percent between 15-20 years and 36 percent of the chayote respondents have cultivated the crop for more than 20 years.

Among the grape cultivators, 12 percent have less than 5 years experience in cultivating the crop, 57 percent between 5-10 years, 13 percent between 10-15 years, 9 percent between 15-20 years and 9 percent more than 20 years of experience.

### **Hypothesis Testing:**

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between number of years of horticulture farming and type of crop cultivated.

**Table 4.18: Chi-Square test on Number of Years of Horticulture Farming by types of horticultural crops**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	8	0.05	15.507	1.79158E-37	Failed to reject

*\* Test result through MS Excel*

For testing the above hypothesis Chi-Square test was conducted to analyse the dependent data. Chi-square exact test is used due to the reason that some of the cells are either zero or less than 5. The test result is given as above. Since the calculated value (=1.79158E-37) is lesser than the table value 15.507 at 5 percent level of significance, we fail to reject the null hypothesis. Therefore we can conclude that the number of years engaged in horticultural farming is not significantly more likely to influence growing of turmeric, chayote or grape in horticulture farming.

#### **4.4.2. Amount of Time Invested in Farming**

In a state like Mizoram, the level of mechanization involved in farming is minimal. Therefore, the amount of labour time devoted by the farmer directly impacts his production.

An attempt was made to find out the amount of labour time the respondents invest in their trade.

**Table 4.19: Number of Hours Spent on Farm Work per Week on Average**

<b>No. of Hours</b>	<b>Turmeric</b>	<b>Chayote</b>	<b>Grape</b>	<b>Total</b>
Less than 5 hours	0 (0%)	0 (0%)	15 (9%)	15 (4%)
5 - 10 hours	3 (3%)	1 (1%)	50 (32%)	54 (15%)
10 - 20 hours	4 (3%)	0 (0%)	26 (16%)	30 (8%)
20 - 30 hours	20 (18%)	63 (70%)	41 (26%)	124 (35%)
30 - 40 hours	76 (67%)	25 (28%)	15 (10%)	116 (32%)
More than 40 hours	10 (9%)	1 (1%)	11 (7%)	22 (6%)
Total	113 (100%)	90 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

Table 4.19 shows that 4 percent of the total farmers surveyed spend less than 5 labour hours per week on their farms, 15 percent spend between 5-10 hours per week, 8 percent spend between 10-20 hours per week, 35 percent spend between 20-30 hours per week, 32 percent spend 30-40 hours per week and 6 percent spend more than 40 hours per week on their farms.

The study revealed that the turmeric farmers invest more labour hours on their farms compared to the chayote and grape farmers. 3 percent of the turmeric farmers surveyed spend 5-10 hours per week on their farms, 3 percent spend 10-20 hours per week, 18 percent spend 20-30 hours per week, 67 percent spend 30-40 hours per week, and 9 percent said they spend more than 40 hours per week on their farms.

Among the chayote farmers, 1 percent said they spend between 5-10 hours per week on their farms, 70 percent spend between 20-30 hours per week, 28 percent between 30-40 hours per week and 1 percent more than 40 hours per week.

Among the grape farmers, 4 percent said they spend less than 5 hours per week on their farms, 15 percent between 5-10 hours per week, 8 percent between 10-20 hours per week, 35 percent between 20-30 hours per week, 32 percent between 30-40 hours per week, and 6 percent said they spend more than 40 hours per week on their farms.

### Hypothesis Testing:

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between number of hours spent on farming and type of crop cultivated.

**Table 4.20: Chi-Square test on Number of Hours Spent on Farm Work per Week of Horticulture Farming by types of horticultural crops**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	10	0.05	18.307	1.24759E-40	Failed to reject

*\* Test result through MS Excel*

For testing the above hypothesis Chi-Square test was conducted to analyse the dependent data. Chi-square exact test is used due to the reason that some of the cells are either zero or less than 5. The test result is given as above. Since the calculated value ( $=1.24759E-40$ ) is lesser than the table value 18.307 at 5 percent level of significance, we fail to reject the null hypothesis. Therefore we can conclude that number of hours engaged in farming by the horticultural farmers per week is not significantly more likely to influence growing of turmeric, chayote or grape.

### 4.4.3 Annual Production

Increased production of crops enables a farmer to provide more food for his family, and also sell his surplus to sustain his livelihood. Increases in agricultural production lead to agricultural growth and can help to alleviate poverty in poor and developing countries, where agriculture often employs the greatest portion of the population. Increased production also



encourages a farmer to invest more towards his trade and produce even more. It ensures food security as well as a way to sustain the well-being of a community.

**Table 4.21: Annual Production (Average of 3 years: 2009-2011)**

<b>Production in quintals</b>	<b>Turmeric</b>	<b>Chayote</b>	<b>Grape</b>	<b>Total</b>
Less than 10 qtls.	20 (18%)	0 (0%)	32 (20%)	52 (15%)
10 - 50 qtls.	78 (69%)	0 (0%)	117 (74%)	195 (54%)
50 - 100 qtls.	11 (10%)	10 (11%)	6 (4%)	27 (7%)
100 - 200 qtls.	1 (1%)	39 (43%)	3 (2%)	43 (12%)
More than 200 qtls.	3 (2%)	41 (46%)	0 (0%)	44 (12%)
Total	113 (100%)	90 (100%)	158 (100%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

Table 4.21 shows the annual production in quintals taken as an average of three years, 2009-2011. Among all the 361 respondents surveyed, 15 percent said they produced less than 10 quintals per annum, 54 percent said 10-50 quintals per annum, 7 percent said 50-100 quintals per annum, 12 percent said 100-200 quintals per annum and 12 percent said they produced more than 200 quintals per annum.

Turmeric is a crop that is less bulky and light in weight. 18 percent of the turmeric farmers surveyed said they produced less than 10 quintals per annum, 69 percent said 10-50 quintals per annum, 10 percent said 50-100 quintals per annum, 1 percent said 100-200 quintals per annum and 2 percent said they produced more than 200 quintals per annum.

The chayote farmers surveyed have more experience in years compared to the turmeric and grape cultivators. Most of them produce surplus that enables them to export their produce to neighbouring states. 11 percent of the chayote farmers surveyed revealed that

they produce between 50-100 quintals per annum, 43 percent produce 100-200 quintals per annum and 46 percent revealed they produce more than 200 quintals per annum.

Among the grape farmers surveyed, 15 percent said they produce less than 10 quintals per annum, 54 percent said between 10-50 quintals per annum, 7 percent between 50-100 quintals per annum, 12 percent between 100-200 quintals per annum, and 12 percent said they produce more than 200 quintals per annum.

### **Hypothesis Testing:**

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between the farmer's production and type of crop cultivated.

**Table 4.22: Chi-Square test on Annual Production of Horticulture Farming by types of horticultural crops**

Test Used	Degree of freedom	Level of significance	Table value	Calculated value	Result
Chi-Square	8	0.05	15.507	1.63573E-59	Failed to reject

*\* Test result through MS Excel*

For testing the above hypothesis Chi-Square test was conducted to analyse the dependent data. Chi-square exact test is used due to the reason that some of the cells are either zero or less than 5. The test result is given as above. Since the calculated value (=1.63573E-59) is lesser than the table value 15.507 at 5 percent level of significance, we fail to reject the null hypothesis. Therefore we can conclude that annual production of horticultural products is not significantly more likely to influence growing of turmeric, chayote or grape for horticulture farming.

#### 4.4.4 Annual Income

Income of the farmers from the sale of their produce is an important factor that determines his interest in sticking to his trade and investing more to expand his business. The respondents were asked to reveal their income from the sale of their horticultural produce. The result is presented in the following table.

**Table 4.23: Average annual income from sale of horticultural produce**

Crop	Average annual income from sale of horticultural produce (Rs.)				
	2007	2008	2009	2010	2011
Turmeric	38548	50069	69091	76701	53681
Chayote	64532	63962	63319	63758	63308
Grape	235790	242463	131030	151137	130101

*Source: Primary data*

The average income of the farmers was calculated for each year of the period of 5 years of study from 2007-2011. From table 4.23, it is observed that the average annual income of the turmeric farmers steadily increased from Rs.38,548 in 2007 to Rs.76,701 in 2010. However, the figure declined to Rs.53,681 in the year 2011.

For the chayote farmers, their average annual income has been more or less constant during the five years from 2007-2011. It was Rs.64,532 in the year 2007, Rs.63,962 in 2008, Rs.63,319 in 2009, Rs.63,758 in 2010 and Rs.63,308 in 2011.

The average annual income of the grape farmers is quite high as compared to the turmeric and grape farmers. Their average annual income has declined from Rs.2,35,790 in 2007 to Rs.1,30,101 in 2011.

#### 4.4.5 Society Membership

The horticulture farmers cultivating similar crops have formed their own societies and associations with a view to reap maximum benefits from their trade and increase their bargaining power. The turmeric growers have formed a society called Multifarming Cooperative Society which has a limited membership. The chayote farmers have formed the Iskut Growers Association, and the grape cultivators have formed the Champhai Grape Grower's Society and Hnahlan Grape Grower's Society.

The respondents were asked to identify whether they have joined as members of their respective societies.

**Table 4.24: Number of respondents who have society membership**

Crop	No. of respondents who have membership		
	Yes	No	Total
Turmeric	23 (20%)	90 (80%)	113 (100%)
Chayote	90 (100%)	0 (0%)	90 (100%)
Grape	149 (94%)	9 (6%)	158 (100%)
Total	262 (73%)	99 (27%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

From the above table, we observe that from the total 361 respondents, 262 (73 percent) have membership of their respective societies, and 99 (27 percent) do not have memberships.

Among the turmeric farmers, only 20 percent hold membership whereas 80 percent do not have membership of their association. This is because in the case of Multifarming Cooperative Society, the membership is limited. Cent per cent of the chayote farmers hold

membership of their Iskut Growers Association. Among the grape farmers, 94 percent are members of their respective societies and only 6 percent have not joined the societies.

The respondents were further asked to reveal whether they think that there is any benefit in being a member of their respective societies.

**Table 4.25: Number of respondents who think there is membership benefit**

Crop	Whether there is membership benefit			
	Yes	No	NA	Total
Turmeric	20 (18%)	3 (3%)	90 (80%)	113 (100%)
Chayote	28 (31%)	62 (69%)	0 (0%)	90 (100%)
Grape	134 (85%)	15 (9%)	9 (5%)	158 (100%)
Total	183 (51%)	80 (22%)	98 (27%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

Overall, 183 respondents are of the opinion that there exist some benefits in having membership in their respective societies, whereas 80 respondents do not hold that opinion.

Among the 23 turmeric farmers who hold membership in the society, 20 feel that there exists membership benefit whereas 3 respondents do not think so. Among the chayote farmers, 28 (31 percent) feel that there is membership benefit and 62 (69 percent) do not think there is any benefit. Of the 149 grape growers who have membership of their society, 134 think that there is membership benefit and 15 members do not think so.

#### **4.4.6 Financial Assistance Availed**

For many farmers in Mizoram, it is difficult to finance their trade with their own resources. Especially at the initial stages, farmers have to invest in seeds and seedlings, fertilizers, tools and implements. Without availing some form of financial assistance, the horticulture farmers may not be able to practice farming on a relatively large scale and

significantly increase their production and income. An attempt was made to find out the number of respondents who have availed financial assistance in some form.

**Table 4.26 : Number of respondents who availed financial assistance**

Crop	Whether availed financial assistance		
	Yes	No	Total
Turmeric	37 (33%)	76 (67%)	113 (100%)
Chayote	0 (0%)	90 (100%)	90 (100%)
Grape	52 (33%)	106 (67%)	158 (100%)
Total	89 (25%)	272 (75%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

The above table depicts that 25 percent of the total respondents have availed financial assistance and 75 percent have not availed any form of assistance.

Among the turmeric farmers, 33 percent revealed that they have availed financial assistance whereas 67 percent have not availed assistance. None of the chayote farmers have availed any form of financial assistance. Among the grape farmers, 33 have availed financial assistance whereas 67 percent have not availed assistance.

The horticultural farmers have availed financial assistance from different sources like the government through various schemes and programmes such as the popular New Land Use Policy (NLUP), while others have availed assistance from banks, money lenders, and other sources such as relatives and friends. The respondents who have availed financial assistance were asked to identify their source of financial assistance.

**Table 4.27: Source of financial assistance**

<b>Crop</b>	<b>Source of financial assistance</b>					
	<b>Government</b>	<b>Bank</b>	<b>Money Lender</b>	<b>Other</b>	<b>NA</b>	<b>Total</b>
Turmeric	31 (27%)	1 (1%)	1 (1%)	4 (4%)	76 (67%)	113 (100%)
Chayote	0 (0%)	0 (0%)	0 (0%)	0 (0%)	90 (100%)	90 (100%)
Grape	37 (23%)	5 (3%)	4 (3%)	6 (4%)	106 (67%)	158 (100%)
Total	68 (19%)	6 (2%)	5 (1%)	10 (3%)	272 (75%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

Of the 89 respondents who have availed financial assistance, 68 have availed assistance from the government, 6 respondents from a bank, 5 respondents from a money lender, and 10 respondents from other sources such as friends and relatives.

31 turmeric farmers have availed financial assistance from the government, 1 from a bank, 1 from a money lender and 4 from other sources. 37 grape farmers have availed financial assistance from the government, 5 from a bank, 4 from a money lender and 6 from other sources.

#### **4.4.7 Account Management**

It is often said that the Indian cultivator is a good producer rather than a good business man. Present-day farm operations are becoming more and more business oriented than yesterday farm operations. Being a good producer is no longer good enough to remain in business. The key to becoming a successful farmer today is being a good producer as well as a good financial manager. Farmers need to keep good, accurate records and establish a sound record-keeping system. The respondents were asked to reveal whether they keep a record of their accounts.

**Table 4.28: Number of respondents who keep a record of their accounts**

Crop	Whether maintain accounts		
	Yes	No	Total
Turmeric	12 11%	101 89%	113 100%
Chayote	9 10%	81 90%	90 100%
Grape	35 22%	123 78%	158 100%
Total	56 16%	305 84%	361 100%

*Source: Primary data*

*Figures in parenthesis indicates percentages*

From table 4.28, it is observed that out of 361 respondents, only 56 (16 percent) said they maintain a record of their accounts. 305 (84 percent) revealed they do not maintain any accounts regarding their trade.

Among the turmeric farmers, 11 percent said they maintain accounts of their trade whereas 89 percent do not. 10 percent of the chayote farmers maintain a record of accounts while 90 percent do not maintain accounts. 22 percent of the grape farmers said they maintain a record of their accounts whereas 78 percent do not maintain any accounts.

#### **4.5 Conclusion**

Most of the farmers of horticultural products in Mizoram work as groups or co-operatives. It has been found that out of the total 361 horticulture farmers, 21 percent responded that they are cultivating their crop in less than one hectare of land area. 68 percent responded between 1-2 hectares, 9 percent are cultivating in 2-5 hectares of land area and 2 percent in more than 5 hectares of land area. It shows that most of the farmers are farming the horticultural products on marginal lands viz., 1-2 hectares.

The study also finds that 12 percent of the total respondents have less than 5 years experience of horticulture farming, 57 percent have 5-10 years experience, 13 percent have



10-15 years experience, 9 percent have 15-20 years experience, and 9 percent have more than 20 years experience. This indicates that majority of the farmers have the experience of farming for the period of 5 to 10 years followed by 10 to 15 years.

While discussing the production of the horticultural products of turmeric, chayote and grapes, it was found that on an average 15 percent of the respondents indicated that they produced less than 10 quintals per annum, while 54 percent said 10-50 quintals per annum. It was also found that a small group of 7 percent respondents said 50-100 quintals per annum, 12 percent said 100-200 quintals per annum and 12 percent said they produced more than 200 quintals per annum.

The average income of the turmeric farmers from sale of their produce has increased from Rs. 38,548 in 2007 to Rs. 53,681 in 2011. For the chayote farmers, the amount has remained almost constant during the period of study. It was Rs. 64,531 in 2007 and slightly declined to Rs.63,308 in 2011. For the grape farmers, their average income has sharply declined from Rs. 2,35,790 in 2007 to Rs.1,30,101 in 2011.

73 percent of the respondents have joined membership of their respective societies and a majority of them believe that there exist membership benefits.

Finally on the topic of accounts management, the study revealed that only 16 percent of the respondents maintain accounts of their trade and a staggering 86 percent do not maintain any record of their trade.

# **Chapter V**

## **Analysis and Interpretation of Data**

5.1 Introduction

5.2 Reasons for adoption of horticulture farming

5.3 Permanent settlement and cluster area farming

5.4 Crop loss

5.5 Improving yield per hectare

5.6 Post-harvest management

5.7 Major problems faced by farmers

5.8 Horticulture farming as a sustainable source of income for farmers

5.9 Testing of hypotheses

5.10 Conclusion

## **5.1 Introduction**

The study revealed the implications of production and marketing of select horticultural crops viz., turmeric, chayote and grape in Mizoram as per the opinions of the growers in terms of reasons for adoption of horticulture farming, cluster area farming, jhuming /shifting cultivation, crop loss, improving yield per hectare, post harvest management, major problems faced by farmers and as a sustainable source of income. This chapter also tests the hypothesis that horticulture increases employment, provides higher income and gives quick returns to the farmers from the data collected through structured questionnaire. The chapter also analyses the second hypothesis that lack of proper post-harvest management and marketing of horticulture produce leads to loss of crops and lower income for farmers.

## **5.2 Reasons for Adoption of Horticulture Farming**

An attempt was made to find out the reasons that led to the farmers in adopting horticulture farming. Several farmers have shifted from traditional farming (rice cultivation) to horticulture farming. Others have started horticulture farming without any prior farming experience. The government has taken effective steps in promoting horticulture sector in the state and encourage more farmers to adopt horticultural crops in the state. This has given a boost to the sector and the state has witnessed more and more farmers adopting horticultural crops. The prospect of higher income opportunity, success stories of other farmers, support from government etc. play a significant role in attracting more farmers to this sector. The respondents were asked to identify the reasons that made them adopt the trade. Respondents were asked to tick all the reasons that were applicable. Accordingly, ranking was assigned in order of the number of responses against each reason. The result is presented in the following figure.

**Table 5.1: Reasons for adopting horticulture farming**

Reason	Turmeric		Chayote		Grape		Total	
	%	rank	%	rank	%	rank	%	rank
Higher income opportunity	94.7%	1	91.1%	3	67.7%	1	82.0%	1
Shorter gestation period of crop	62.8%	3	93.3%	2	19.0%	6	51.2%	2
Higher yield per hectare	61.1%	4	54.4%	4	38.0%	2	49.3%	3
Success stories of other farmers	38.9%	7	54.4%	4	36.7%	3	41.8%	4
Ready market for sale of produce	71.7%	2	18.9%	6	29.1%	4	39.9%	5
Export opportunity	15.9%	9	98.9%	1	2.5%	8	30.7%	6
Requires low financial investment	53.1%	6	34.4%	5	5.7%	7	27.7%	7
Less labour intensive	56.6%	5	1.1%	7	6.3%	7	20.8%	8
Support from Govt.	26.5%	8	1.1%	7	24.7%	5	19.4%	9

Source : Primary data

From the data collected from the 361 horticulture farmers surveyed, the foremost reason that led to the adoption of horticulture farming by the respondents is the opportunity for attaining higher income, followed by the shorter gestation period of the crop selected by the farmers as compared to cultivation of rice. The third important reason cited is the prospect of higher yield per hectare of land area, followed by the encouragement from success stories of other farmers who have adopted the trade. The fifth reason is the availability of ready market for the sale of the horticulture produce. The sixth reason is the opportunity of exporting the produce, followed by the requirement of low financial investment with regard to the crop. The other reasons cited are the fact that horticulture farming can be less labour intensive and there are avenues for receiving support from the government.

### 5.3 Permanent Settlement and Cluster Area Farming

The traditional practice of jhuming cultivation is detrimental on the environment point of view. To do away with this, the government is keen that the Mizo farmers settle on a permanent plot of land in clusters and practice farming. A cluster of farmers cultivating similar crops have started in several locations in Mizoram, such as chayote cultivators in

Sihphir area, turmeric cultivators in Champhai and Hnahlan areas, turmeric cultivators in Reiek area, etc.

Respondents were asked to identify the method of farming currently employed by them. The responses are as follows:

**Table 5.2: Farming method currently employed**

Crop	Farming method		
	Shifting Cultivation	Permanent Farming	Total
Turmeric	43 (38%)	70 (62%)	113 (100%)
Chayote	0 (0%)	90 (100%)	90 (100%)
Grape	0 (0%)	158 (100%)	158 (100%)
Total	43 (12%)	318 (88%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

Grape as a crop is not suitable for practicing shifting cultivation. Therefore, all the grape farmers surveyed are currently practicing permanent farming. All the chayote farmers surveyed are also practicing permanent method of farming. Out of the 113 turmeric farmers, 38 percent (43 farmers) are still practicing shifting method of cultivation.

Out of the 318 farmers who are currently settled on a permanent land and practicing farming, an attempt was made to find out whether they were previously practicing shifting method of cultivation. The results are presented in the following table.

**Table 5.3: Number of farmers previously practicing shifting cultivation**

<b>Crop</b>	<b>Whether previously practicing shifting cultivation</b>			<b>Total</b>
	<b>Yes</b>	<b>No</b>	<b>Not Applicable</b>	
Turmeric	62 (55%)	8 (7%)	43 (38%)	113 (100%)
Chayote	28 (31%)	62 (69%)	0 (0%)	90 (100%)
Grape	87 (55%)	71 (45%)	0 (0%)	158 (100%)
Total	177 (49%)	141 (39%)	43 (12%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

Referring to table 5.3, it is seen that 177 farmers were previously practicing shifting method of cultivation before adopting permanent method of farming, which comprised of 62 turmeric farmers, 28 chayote farmers and 87 grape farmers. 141 respondents said that they never practiced shifting method of cultivation.

Of the remaining 43 farmers who are still practicing shifting method of cultivation, 37 are planning to settle on a permanent farmland and practice their trade in the near future.

There are several advantages of settling on a permanent land as compared to shifting method of cultivation. Respondents were asked to rank these advantages in order of importance. Kendall's W Test is used to analyze the responses to find the average order of rankings by the turmeric farmers, chayote farmers and grape farmers respectively, of the advantages of adopting permanent farming.

**Table 5.4: Turmeric Farmers**

**Kendall's W Test for the ranking of advantages of permanent settlement method of farming - Descriptive statistics**

<b>Advantage</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Assigned ranks for mean</b>
Higher yield per hectare	97	2.29	.979	1	5	2
Easier maintenance of same plot	97	3.09	.805	1	5	3
More economical	97	4.11	1.241	1	5	5
Optimum use of land	97	3.66	1.126	1	5	4
Less destructive to land	97	1.85	1.460	1	5	1

*Source : Primary data*

It is inferred from table 5.4 that according to the turmeric farmers, the uppermost advantage of adopting permanent settlement method of farming is because it is less destructive to the land, followed by the ability to produce higher yield per hectare. The third reason cited by the turmeric cultivators is the ease of maintaining the same plot year after year, followed by optimum use of land and finally for economical reasons.

**Table 5.5: Test Statistics: Advantages of permanent settlement method of farming by turmeric Farmers**

N	97
Kendall's W test	0.3522
Chi-square	136.68
Degree of freedom	4
Asymp. Significance	0.000

*Source : Primary data*

Table 5.5 suggests that there is a low degree of concordance (agreement among the turmeric farmers in ordering of the advantages of permanent settlement method of farming). The significance value 0.000, which is less than 0.5, indicates that there is a significant difference in the ranking among the five advantages.

**Table 5.6: Chayote Farmers**

**Kendall's W Test for the ranking of advantages of permanent settlement method of farming - Descriptive statistics**

<b>Advantage</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Assigned ranks for mean</b>
Higher yield per hectare	90	2.10	.302	2	3	2
Easier maintenance of same plot	90	2.91	.323	2	4	3
More economical	90	4.82	.413	3	5	5
Optimum use of land	90	3.82	1.001	1	5	4
Less destructive to land	90	1.34	1.051	1	5	1

*Source : Primary data*

According to the chayote farmers, the most significant advantage of permanent method of farming is that it is less destructive to the land, followed by the potential of higher yield per hectare, ease of maintaining same plot, optimum use of land and economical reasons.

**Table 5.7: Test Statistics: Advantages of permanent settlement method of farming by grape Farmers**

N	90
Kendall's W test	0.7555
Chi-square	271.99
Degree of freedom	4
Asymp. Significance	0.000

*Source : Primary data*

It is seen from table 5.7 that there is a high degree of concordance (agreement among the chayote farmers in ordering of the advantages of permanent settlement method of farming). The significance value 0.000, which is less than 0.5, indicates that there is a significant difference in the ranking among the five advantages.



**Table 5.8: Grape Farmers**

**Kendall's W Test for the ranking of advantages of permanent settlement method of farming - Descriptive statistics**

<b>Advantage</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Assigned ranks for mean</b>
Higher yield per hectare	153	2.01	.774	1	5	2
Easier maintenance of same plot	153	3.12	.931	1	5	3
More economical	153	4.14	1.216	1	5	5
Optimum use of land	153	3.80	.843	1	5	4
Less destructive to land	153	1.93	1.509	1	5	1

*Source : Primary data*

According to the grape farmers, the advantages of permanent method of farming in order of significance are less destructive to land, higher yield per hectare, easier maintenance of same plot, optimum use of land and economical reasons.

**Table 5.9: Test Statistics: Advantages of permanent settlement method of farming by grape farmers**

N	153
Kendall's W test	0.4104
Chi-square	251.18
Degree of freedom	4
Asymp. Significance	0.000

*Source : Primary data*

There is a low degree of concordance (agreement among the grape farmers in ordering of the advantages of permanent settlement method of farming). The significance value 0.000, which is less than 0.5, indicates that there is a significant difference in the ranking among the five advantages.

The order of ranking of the advantages of permanent method of farming is consistent among the turmeric, chayote and grape cultivators.

Conversely, the respondents were asked to identify the problems in adopting permanent settlement method of farming. The respondents were asked to tick against all the problems that they encounter.

**Table 5.10: Problems of permanent settlement method of farming**

Criteria	Turmeric		Chayote		Grape		Total	
	Nos.	Rank	Nos.	Rank	Nos.	Rank	Nos.	Rank
Loss of soil fertility	25 22%	3	85 94%	1	110 70%	2	220 61%	2
Requires intensive use of fertilizer	56 50%	1	81 90%	2	126 80%	1	263 73%	1
Requires intensive irrigation	37 33%	2	32 36%	3	50 32%	3	119 33%	3

*Source : Primary data*

Of the 361 respondents, 263 (73 percent) have said the requirement of intensive use of fertilizer is a problem they face in settling on a permanent location, 220 (61 percent) have said that the soil loses its fertility year after year and 119 (33 percent) have said that settling on a permanent location requires them to employ intensive irrigation.

Among the turmeric farmers, 50 percent say that permanent method of farming requires intensive use of fertilizer, 33 percent say it requires intensive irrigation and 22 percent say there is a loss of soil fertility.

94 percent of the chayote farmers say that permanent farming results in loss of soil fertility, 90 percent say it requires intensive use of fertilizer and 36 say it requires intensive irrigation.

80 percent of the grape farmers are of the opinion that permanent farming requires intensive use of fertilizer, 70 percent say it results in loss of soil fertility and 33 percent say it requires intensive irrigation.

## 5.4 Crop loss

Crop loss is a common phenomenon plaguing farmers across the world. There are two major types of crop losses, production losses and post-harvest losses. Production losses occur due to diseases, insects, weeds and pests that plague the crops. It can also be due to climate damage such as rain, snow, hail, draught, etc. Post-harvest losses such as lack of proper post-harvest management of produce, poor harvesting techniques, poor storage conditions, transportation problems, etc.

Of the 361 respondents, 267 (74 percent) have reported that they experienced crop loss in the three years during 2009-2011. The amount of crop loss they experienced is presented in table 5.11.

**Table 5.11: Amount of crop loss per annum (Average of 3 years 2009-2011)**

Crop	Crop loss per annum					
	< 5 qtls	5 - 10 qtls	10 - 20 qtls	> 20 qtls	No response	Total
Turmeric	7 (6%)	7 (6%)	4 (4%)	2 (2%)	93 (82%)	113 (100%)
Chayote	12 (13%)	33 (37%)	43 (48%)	1 (1%)	1 (1%)	90 (100%)
Grape	155 (98%)	0 (0%)	0 (0%)	3 (2%)	0 (0%)	158 (100%)
Total	174 (48%)	40 (11%)	47 (13%)	6 (2%)	94 (26%)	361 (100%)

*Source: Primary data*

*Figures in parenthesis indicates percentages*

While taking the amount of crop loss per annum experienced by the farmers, an average of three years (2009, 2010 and 2011) was taken. The horticulture farmers do experience some amount of crop loss. 48 percent of the respondents said they experience crop loss of less than 5 quintals per annum, 11 percent responded 5-10 quintals, 13 percent said 10-20 quintals, 2 percent said they lost more than 20 quintals, and 26 percent either do not experience crop loss or did not provide response.

Respondents were asked to rank the common causes of crop loss among horticultural crops in Mizoram.

**Table 5.12: Turmeric Farmers**

**Kendall's W test for ranking of reasons attributed to crop loss (Descriptive statistics)**

Reason	N	Mean	Std. Deviation	Minimum	Maximum	Assigned ranks for mean
Poor/low rainfall	109	4.20	1.282	1	6	4
Damage due to heavy rainfall	109	5.87	1.722	1	7	7
Poor harvesting technique	109	4.97	1.109	1	7	5
Lack of proper storage facility	109	5.46	1.273	1	7	6
Poor processing facility	109	3.44	1.542	1	7	3
Lack of market for the produce	109	2.46	1.463	1	7	2
Poor distribution network	109	1.60	1.028	1	6	1

*Source : Primary data*

Table 5.12 depicts the reasons attributed to crop loss by to the turmeric farmers. According to them, the foremost reason is poor distribution network, followed by lack of market for the produce, poor processing facility, poor rainfall, poor harvesting technique, lack of proper storage facility and finally, damage due to heavy rainfall.

**Table 5.13: Test Statistics – Reasons attributed to crop loss by turmeric farmers**

N	109
Kendall's W test	0.5386
Chi-square	352.30
Degree of freedom	6
Asymp. Significance	0.000

*Source : Primary data*

There is a reasonable degree of concordance (agreement among the turmeric farmers in ordering of the reasons attributed to crop loss). The significance value 0.000, which is less than 0.5, indicates that there is a significant difference in the ranking among the five advantages.

**Table 5.14: Chayote Farmers****Kendall's W test for ranking of reasons attributed to crop loss – Descriptive statistics**

Reason	N	Mean	Std. Deviation	Minimum	Maximum	Assigned ranks for mean
Poor/low rainfall	90	1.00	0.00	1	1	1
Damage due to heavy rainfall	90	6.50	1.114	3	7	7
Poor harvesting technique	90	5.88	.747	3	7	6
Lack of proper storage facility	90	4.49	.927	3	7	5
Poor processing facility	90	3.62	1.128	3	7	3
Lack of market for the produce	90	4.36	1.095	2	6	4
Poor distribution network	90	2.16	.495	2	5	2

Source : Primary data

From table 5.14, it is observed that poor or low rainfall is the biggest cause for crop loss among the chayote farmers, followed by poor distribution network, poor processing facility, lack of market for the produce, lack of proper storage facility, poor harvesting technique and lastly, damage due to heavy rainfall.

**Table 5.15 : Test Statistics – Reasons attributed to crop loss by chayote farmers**

N	90
Kendall's W test	0.8102
Chi-square	437.51
Degree of freedom	6
Asymp. Significance	0.000

Source : Primary data

As seen in table 5.15, there is a high degree of concordance (agreement among the chayote farmers in ordering of the reasons attributed to crop loss). The significance value 0.000, which is less than 0.5, indicates that there is a significant difference in the ranking among the five advantages.

**Table 5.16: Grape Farmers****Kendall's W test for ranking of reasons attributed to crop loss – Descriptive statistics**

Reason	N	Mean	Std. Deviation	Minimum	Maximum	Assigned ranks for mean
Poor/low rainfall	142	3.18	1.691	1	7	2
Damage due to heavy rainfall	142	3.56	1.504	1	7	3
Poor harvesting technique	142	4.32	1.523	1	7	4
Lack of proper storage facility	142	5.03	1.378	1	7	6
Poor processing facility	142	5.49	2.003	1	7	7
Lack of market for the produce	142	4.71	1.863	1	7	5
Poor distribution network	142	1.70	1.129	1	6	1

Source : Primary data

According to the grape farmers, the reasons attributed to crop loss in order of significance is poor distribution network, poor or low rainfall, damage due to heavy rainfall, poor harvesting technique, lack of market for the produce, lack of proper storage facility and lastly, poor processing facility.

**Table 5.17 : Test Statistics – Reasons attributed to crop loss by grape farmers**

N	142
Kendall's W test	0.3582
Chi-square	305.24
Degree of freedom	6
Asymp. Significance	0.000

Source : Primary data

It is observed in table 5.17 that there is a low degree of concordance (agreement among the grape farmers in ordering of the reasons attributed to crop loss). The significance value 0.000, which is less than 0.5, indicates that there is a significant difference in the ranking among the five advantages.

## **5.5 Improving yield per hectare**

Productivity in agriculture is a measurement of farmers' total output per unit of land. Agriculture has become much more productive over time. In many parts of the world, modern farmers get far more produce from each unit of land than their predecessors thanks to intensification, i.e. using more technological inputs per acre. In areas where such inputs are not available, output rates remain far below world averages. Whereas land and labour inputs have fallen drastically in industrialized countries, but technological advances such as large-scale irrigation, synthetic fertilizers, pesticides and herbicides, and capital investment (in the form of mechanization) have increased sharply. Scientific advances such as development of higher-yielding crop varieties have also contributed to increased productivity.

According to the Department of Horticulture, Government of Mizoram, turmeric farmers can produce up to 200 – 300 quintals per hectare, chayote farmers can produce 250 – 400 quintals per hectare and grape farmers can produce 15 – 20 kilograms per plant. For the purpose of the study, respondents were asked to rank in order of significance the factors that contribute to producing higher yield per hectare in the case of Mizoram.

**Table 5.18: Turmeric Farmers**

**Kendall's W test for ranking of factors that contribute to higher yields per hectare –  
Descriptive statistics**

Ways	N	Mean	Std. Deviation	Mini mum	Maxi mum	Assigned ranks for mean
Using better quality of seeds	109	1.72	1.187	1	5	1
Using more quality fertilizer	109	2.53	1.309	1	5	2
Improving irrigation	109	3.88	1.477	1	5	5
Regular training on farming techniques	109	3.28	.891	1	5	3
Utilizing more manpower	109	3.60	.944	1	5	4

*Source : Primary data*

From table 5.18, it is observed that according to the turmeric farmers, using better quality of seeds is the biggest factor that can contribute to producing higher yields per hectare, followed by using more quality fertilizer, attending regular training on farming techniques, utilizing more manpower, and lastly, improving irrigation.

**Table 5.19: Test Statistics – Factors that contribute to higher yields per hectare  
by turmeric farmers**

N	109
Kendall's W test	0.3075
Chi-square	134.08
Degree of freedom	4
Asymp. Significance	0.000

*Source : Primary data*

It is observed in table 5.19 that there is a low degree of concordance (agreement among the turmeric farmers in ordering of the factors that contribute to producing higher yields per hectare). The significance value 0.000, which is less than 0.5, indicates that there is a significant difference in the ranking among the five advantages.



**Table 5.20: Chayote Farmers**

**Kendall's W test for ranking of factors that contribute to higher yields per hectare –  
Descriptive statistics**

Ways	N	Mean	Std. Deviation	Mini mum	Maxi mum	Assigned ranks for mean
Using better quality of seeds	90	2.52	.851	1	3	3
Using more quality fertilizer	90	2.06	.505	1	4	2
Improving irrigation	90	1.44	.705	1	3	1
Regular training on farming techniques	90	4.74	.510	2	5	5
Utilizing more manpower	90	4.23	.425	4	5	4

*Source : Primary data*

The study reveals that according to the chayote farmers, the factors that contribute to producing higher yields per hectare in order of significance are by improving irrigation, using more quality fertilizer, using better quality of seeds, utilizing more manpower and attending regular training on farming techniques.

**Table 5.21: Test Statistics – Factors that contribute to higher yields per hectare  
by chayote farmers**

N	90
Kendall's W test	0.8104
Chi-square	291.75
Degree of freedom	4
Asymp. Significance	0.000

*Source : Primary data*

It is observed in table 5.21 that there is a high degree of concordance (agreement among the chayote farmers in ordering of the factors that contribute to producing higher yields per hectare). The significance value 0.000, which is less than 0.5, indicates that there is a significant difference in the ranking among the five advantages.

**Table 5.22: Grape Farmers**

**Kendall's W test for ranking of factors that contribute to higher yields per hectare –  
Descriptive statistics**

Ways	N	Mean	Std. Deviation	Mini mum	Maxi mum	Assigned ranks for mean
Using better quality of seeds	145	1.88	1.285	1	5	1
Using more quality fertilizer	145	2.43	1.052	1	5	2
Improving irrigation	145	3.99	1.394	1	5	5
Regular training on farming techniques	145	3.59	1.235	1	5	4
Utilizing more manpower	145	3.14	.959	1	5	3

*Source : Primary data*

Table 5.22 reveals that according to the grape farmers, using better quality of seeds is the most important factor that contributes to the production of higher yields per hectare. The other important factors in order of their significance are using more quality fertilizer, utilizing more manpower, attending regular training on farming techniques and lastly, by improving irrigation.

**Table 5.23: Test Statistics – Factors that contribute to higher yields per hectare  
by grape farmers**

N	145
Kendall's W test	0.2904
Chi-square	168.47
Degree of freedom	4
Asymp. Significance	0.000

*Source : Primary data*

Table 5.23 reveals that there is a low degree of concordance (agreement among the grape farmers in ordering of the factors that contribute to producing higher yields per

hectare). The significance value 0.000, which is less than 0.5, indicates that there is a significant difference in the ranking among the five advantages.

## **5.6 Post-harvest management**

Horticulture crops are largely perishable commodities and they begin to spoil shortly after harvest. A considerable quantity of these is lost every year after harvest which is a significant economic loss. These losses are known as post-harvest losses which occur at different stages in the chain of harvesting, packaging, storage, transport and marketing. Poor production planning, ill equipped markets, insufficient storage capacity, unsatisfactory transport infrastructure, lack of organizational setup and poor state of processing industries are the important factors responsible for post harvest losses.

Effective management during the post-harvest period, rather than the level of sophistication of any given technology, is the key in reaching the desired objectives. The three main objectives of applying post-harvest technology to harvested fruits and vegetables are to maintain quality (appearance, texture, flavour and nutritive value), to protect food safety and to reduce losses between harvest and consumption.

In the context of Mizoram, we are still very ignorant of post-harvest management of horticultural produce. A vast majority of our farmers are engaged only in the primary activities of the trade, i.e. working the land, sowing and harvesting the produce. The respondents were asked to identify the activities they are engaged in, and the responses are as follows:

**Table 5.24: Activities undertaken by the farmers**

<b>Crop</b>	<b>Activities undertaken</b>					
	Growing/ farming	Harvesting	Processing	Packaging	Wholesaling/ retailing	Exporting
Turmeric	113 (100%)	113 (100%)	90 (80%)	11 (10%)	62 (55%)	0 (0%)
Chayote	90 (100%)	90 (100%)	38 (42%)	87 (97%)	1 (1%)	90 (100%)
Grape	158 (100%)	142 (90%)	64 (41%)	29 (18%)	78 (49%)	0 (0%)
Total	361 (100%)	345 (96%)	192 (53%)	127 (35%)	141 (39%)	90 (25%)

*Source : Primary data*

*Figures in parenthesis indicates percentages*

Out of the 361 horticulture farmers surveyed, 192 (53 percent) are engaged in processing their produce, 127 (35 percent) are engaged in packing, 141 (39 percent) are involved in wholesaling and retailing, and 90 (25 percent) are exporting their produce outside the state.

Among the turmeric farmers, 80 percent are involved in processing activity, 10 percent are involved in packaging activity, 55 percent are involved in wholesaling and none export their produce.

42 percent of the chayote farmers are involved in processing activity, 97 percent are involved in packaging, 1 percent is engaged in wholesaling and retailing, and 100 percent are involved in exporting their produce to neighbouring states.

Among the grape farmers, 41 percent are engaged in processing activities, 18 percent are engaged in packaging activities, 49 percent are retailing and wholesaling their product, and none of them are exporting their product.

## 5.7 Major problems faced by farmers

An effort was made to identify the major problems faced by the horticulture farmers, both at the initial stage of adopting the trade and the problems they are currently facing. Respondents were asked to tick against all the factors that were applicable to them. The results are presented in the following tables:

**Table 5.25: Problems faced by farmers at the initial stage of adopting horticulture farming**

Problem	Turmeric		Chayote		Grape		Total	
	%	rank	%	rank	%	rank	%	rank
Lack of support from govt.	73%	1	94%	2	37%	4	63%	1
Poor irrigation facility	49%	5	96%	1	44%	2	58%	2
Scarcity of fertilizer/manure	48%	6	96%	1	40%	3	56%	3
Lack of start-up capital	70%	2	22%	7	59%	1	53%	4
Poor knowledge of the trade	50%	4	78%	3	18%	7	43%	5
Difficulty in procuring quality seeds/seedlings	56%	3	41%	5	30%	5	41%	6
Lack of technical support	41%	7	50%	4	26%	6	37%	7
Lack of manpower	49%	5	29%	6	9%	8	27%	8
Non-availability of land	23%	8	1%	8	6%	9	10%	9

*Source : Primary data*

As evident from table 5.25, lack of support from the government is the uppermost problem faced by the farmers at the time of starting the trade as agreed by 63 percent of the respondents. The next problem faced by the farmers at the time of starting their trade is poor irrigation facility, followed by scarcity of fertilizer, lack of start-up capital, poor knowledge of the trade, difficulty in procuring quality seeds/seedlings, lack of technical support, lack of manpower and lastly, non-availability of land for cultivation. The farmers were also asked to identify the problems they are currently facing. The responses are as follows:

**Table 5.26: Problems currently faced by farmers**

Problem	Turmeric		Chayote		Grape		Total	
	%	rank	%	rank	%	rank	%	rank
Lack of capital to invest	66%	2	100%	1	39%	2	63%	1
Land unsuitable for farming	51%	5	99%	2	49%	1	62%	2
Limited available land for expansion	47%	6	98%	3	49%	1	61%	3
Poor distribution network	65%	3	0%	10	39%	2	37%	4
Lack of trained manpower	71%	1	17%	7	23%	4	36%	5
Scarcity of fertilizer/manure	43%	7	2%	9	31%	3	28%	6
Lack of support from govt.	52%	4	21%	5	14%	6	28%	7
Inadequate/inefficient processing facility	24%	10	46%	4	14%	6	25%	8
Poor storage facility	43%	7	2%	9	16%	5	21%	9
Poor irrigation facility	30%	9	20%	6	12%	7	20%	10
Poor quality of seed	37%	8	2%	9	14%	6	18%	11
Low profit margins	20%	11	7%	8	9%	8	12%	12
Non-ownership of land	14%	12	0%	10	1%	9	5%	13

Source : Primary data

Table 5.26 presents the problems faced by the farmers at the time of collecting the data. The foremost problem cited by the farmers is lack of capital to invest in their trade, followed by the fact that the terrain of their land is unsuitable for cultivating more crops, and limited available land for expanding their area of cultivation. Other problems faced by the horticulture farmers in order of significance are poor distribution network, lack of trained manpower, scarcity of fertilizer, lack of support from the government, inadequate and inefficient processing facility, poor storage facility, poor irrigation facility, poor seed quality, low profit margins and non-ownership of land.

## 5.8 Horticulture Farming as a Sustainable Source of income for Farmers

An attempt was made to find out the number of respondents who previously practiced traditional farming, i.e., rice cultivation. The results are as follows:

**Table 5.27: Number of respondents previously practicing traditional farming**

Crop	Whether Previously engaged in traditional farming		
	Yes	No	Total
Turmeric	105 (93%)	8 (7%)	113 (100%)
Chayote	29 (32%)	61 (68%)	90 (100%)
Grape	95 (60%)	63 (40%)	158 (100%)
Total	229 (63%)	132 (37%)	361 (100%)

*Source : Primary data*

*Figures in parenthesis indicates percentage*

The above table shows that out of 361 respondents, 229 (63 percent) were previously engaged in traditional farming of rice cultivation, and 131 (37 percent) did not have any prior experience of farming.

Among the turmeric farmers, 93 percent were practicing traditional farming before adopting horticulture farming and 7 percent had no prior farming experience. 32 percent of the chayote farmers practiced traditional farming before adopting horticulture farming while 68 percent had no prior experience with farming other than chayote cultivation. 60 percent of the grape cultivators were previously engaged in traditional farming whereas 40 percent had no prior experience in farming before they adopted grape cultivation.

In the case of Mizoram, there is a general view that horticulture farming is more profitable than traditional farming as the terrain of land is unsuitable for wet-rice cultivation. In this regard, the opinion of the respondents was enquired.

**Table 5.28: Horticulture farming is more profitable than traditional farming**

Crop	Is horticulture farming more profitable than traditional farming?		
	Yes	No	Total
Turmeric	109 (96%)	4 (4%)	113 (100%)
Chayote	90 (100%)	0 (0%)	90 (100%)
Grape	152 (96%)	6 (4%)	158 (100%)
Total	351 (97%)	10 (3%)	361 (100%)

*Source : Primary data*

*Figures in parenthesis indicates percentage*

The study revealed that 97 percent of the total respondents believe that horticulture farming is more profitable than traditional farming. Only 3 percent are of the opinion that horticulture farming is not more profitable than traditional farming.

96 percent of the turmeric farmers think that horticulture farming is more profitable than traditional farming. 100 percent of the chayote farmers and 96 percent of the grape farmers also think that horticulture farming is more profitable than traditional farming.

Horticultural crops being high value crops are important in raising the incomes of the farmers besides creating employment opportunities. As mentioned before, Mizoram is ideal for growing a variety of horticultural crops. Horticulture has the potential to provide sustainable income, nutritional security and gainful employment opportunities, both in rural and urban areas of Mizoram. The survey posed a query to the respondents as to whether horticulture farming can provide a sustainable income for them.



**Table 5.29: Horticulture as a sustainable source of income for farmers**

Crop	Horticulture can provide a sustainable income for farmers		
	Yes	No	Total
Turmeric	108 (96%)	5 (4%)	113 (100%)
Chayote	90 (100%)	0 (0%)	90 (100%)
Grape	140 (89%)	18 (11%)	158 (100%)
Total	338 (94%)	23 (6%)	361 (100%)

*Source : Primary data*

*Figures in parenthesis indicates percentage*

It is observed from the above table that out of a total of 361 respondents, 338 (94 percent) are of the opinion that horticulture can provide a sustainable income for their family, and only 23 (6 percent) do not share the opinion.

96 percent of the turmeric farmers and 89 percent of the grape farmers also believe that horticulture can provide them a sustainable income, while 100 percent of the chayote cultivators agree that horticulture can provide a sustainable income for them.

When the horticulture farmers taste some measure of success in their trade, they are likely to be encouraged and enthusiastic to expand their business and thereby increase their production and income. The respondents were asked whether they have any plans for expanding their trade in the near future. Their responses are presented in the following table.

**Table 5.30: Number of respondents who plan to expand their business**

<b>Crop</b>	<b>Whether Plan to Expand Business</b>		
	<b>Yes</b>	<b>No</b>	<b>Total</b>
Turmeric	89 (79%)	24 (21%)	113 (100%)
Chayote	10 (11%)	80 (89%)	90 (100%)
Grape	95 (60%)	63 (40%)	158 (100%)
Total	194 (54%)	167 (46%)	361 (100%)

*Source : Primary data*

*Figures in parenthesis indicates percentage*

It is observed from the above table that out of 361 respondents, 194 (54 percent) plan to expand their business in the near future and 167 (46 percent) do not plan on doing so.

Among the turmeric farmers, 79 percent plan to expand their trade while 21 percent do not plan to expand their business. 11 percent of the chayote farmers revealed they plan to expand their business in the near future while 89 percent said they have no such plans. 60 percent of the grape farmers plan to expand their trade in the near future whereas 40 percent have no plans to expand their business.

There are several options for the horticulture farmers to expand their business. One way of doing it is to simply increase the area of land under cultivation, as this will likely increase their output. Another option is to include more variety of crops as is the practice of many of the horticulture farmers. For example, many of the respondents are simultaneously cultivating crops like banana, papaya, lime, birds eye chilli and maize as these crops are doing very well in Mizoram. The cultivators can diversify their activities beyond simply growing and harvesting the crop. They can enter into post harvest management of their produce and practice forward integration. The respondents were further asked to reveal the

nature of their expansion plans. Respondents were asked to select all the relevant choices for them.

**Table 5.31: Expansion plans of respondents**

Crop	Expansion plans of respondents				
	Increasing Area of cultivation	Introduce more crop variety	Set up processing facility	Start distribution network	Others
Turmeric	87 (77%)	29 (26%)	18 (16%)	10 (9%)	3 (3%)
Chayote	10 (11%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Grape	79 (50%)	40 (25%)	12 (8%)	22 (14%)	5 (3%)
Total	176 (49%)	69 (19%)	30 (8%)	32 (9%)	8 (2%)

*Source : Primary data*

*Figures in parenthesis indicates percentage*

49 percent of the respondents plan to expand their business by increasing the area of cultivation, 19 percent plan to introduce more crop varieties, 8 percent plan to set up their own processing facility of some nature, 9 percent plan to start their own distribution network and 2 percent have cited other avenues of expanding their trade.

77 percent of the turmeric farmers plan to increase their cultivated area, 26 percent plan to introduce more crop variety, 16 percent plan to set up processing facilities and 9 percent plan to start their own distribution network.

Among the chayote farmers, only 11 percent revealed that they plan to expand their business by increasing the area of horticulture cultivation.

50 percent of the grape farmers plan to increase their area of cultivation, 25 percent plan to introduce more crop variety, 8 percent plan to set up their own processing facility and 14 percent plan to start their own distribution network.

From the survey, it was revealed by 93 percent of the respondents that they foresee a promising future in horticulture farming for themselves and their families. Only 7 percent said that they do not see a promising future in horticulture farming.

Moreover, 93 percent of the respondents disclosed in the course of the study that they would recommend horticulture farming to others whereas only 7 percent said they would not recommend it to others.

## **5.9 Testing of hypothesis**

**Hypothesis 1: Horticulture farming in chayote, turmeric and grape increases employment, provides higher income and gives quick returns to farmers.**

The hypothesis is tested through Multinomial Logistic Regression. The data is analysed by using SPSS ver. 20. The goal of the analysis is to examine the relationship among choices horticulture farming increases employment, provides higher income and quick returns. The dependent variable is horticulture farming consisting of chayote, turmeric and grape. The independent variables which we will use in this analysis are; increased in employment, higher income and quick returns represented by members, highinc and quickret. The method for including the multinomial logistic regression in SPSS is through direct entry, therefore only direct entry has been adopted. No missing data were observed and so the missing data analysis is bypassed in the process. In this stage, the underlying assumptions are also addressed regarding non-metric dependent variables of crops has three categories viz., chayote, turmeric and grapes. In the independent variables, nonmetric highinc and quickret are entered as factors while metric variable members are entered as covariates. Afterwards, the logistic regression model is computed.

The following table 5.30 shows the Model Fit Information. The table shows the initial log likelihood function, (-2 Log Likelihood or -2LL) which is a statistical measure like the total sums of squares in regression.

**Table 5.32: Model Fitting Information**

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	482.352			
Final	150.252	332.100	24	.000

*Source : SPSS output*

The initial log likelihood value (482.352) is a measure of the model with no independent variable i.e only the constant or the intercept. The final log likelihood value (150.252) is the measure computed measured after all the independent variables has been entered into the logistic equation. The difference between these two is the model chi-sqaure value (332.100) that is tested for statistical significance. In this model, the Chi-square value of 332.100 has a significance fit of less than 0.0001, so we conclude that there is a significant relationship between the dependent variable and the set of independent variables.

Table 5.33 shows the strength of relationships between the dependent variables and the independent variables which is analogous to the  $R^2$  measure in multiple regression. Cox and Snell  $R^2$  measure with values close to 1 indicates greater model fit. So Cox and Snell as well as Nagelkerke  $R^2$  is close to 0.7 which indicates that the model is of good fit. As per  $R^2$  it could be characterised that the relationship is strong.

**Table 5.33: Pseudo R-Square**

Cox and Snell	.601
Nagelkerke	.681
McFadden	.429

*Source : SPSS output*

Table 5.34 displays the classification matrix to evaluate the accuracy of the model. The overall percentage of accurate predictions (74.5%) is the measure of the model which can be relied for this analysis which is the percentage of cases for which the model predicts accurately.

**Table 5.34: Classification**

Observed	Predicted			
	Chayote	Turneri c	Grapes	Percent Correct
Chayote	75	4	11	83.3%
Turmeric	18	54	41	47.8%
Grapes	7	11	140	88.6%
Overall Percentage	27.7%	19.1%	53.2%	74.5%

*Source : SPSS output*

The following two tables Likelihood Ratio Tests and Parameter shows that statistical significance of the individual predictor variables. Table 5.35: Likelihood Ratio Tests shows the contribution of the variable and the individual independent variables. The table test the hypothesis that the variables contribute to the reduction in error measured by the 2-Log Likelihood Statistic. In this model, the variables members representing the number of employees, high income and quick returns are the contributors in explaining the choice of crop cultivation in horticulture farming.

**Table 5.35: Likelihood Ratio Tests**

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	150.252 <sup>a</sup>	.000	0	.
Members	189.805	39.553	2	.000
Highinc	204.399	54.147	12	.000
Quickret	349.074	198.822	10	.000

Source : SPSS output

**Table 5.36: Parameter Estimates**

								95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
crps <sup>a</sup>		B	Std. Error	Wald	df	Sig.	Exp(B)		
Chayote	Intercept	-16.651	5024.093	.000	1	.997			
	Members	-.098	.128	.584	1	.445	.907	.705	1.166
	[highinc=8]	-1.612	.990	2.652	1	.103	.199	.029	1.389
Turmeric	Intercept	-14.185	.534	705.042	1	.000			
	members	-.658	.127	26.785	1	.000	.518	.404	.665
	[highinc=3]	-2.758	1.066	6.691	1	.010	.063	.008	.513
	[highinc=8]	2.421	1.104	4.811	1	.028	.089	.010	.773

a. This parameter is set to zero because it is redundant.

Source : SPSS output

The two equations in table 5.36 are labeled by the group category in contrast to the reference group. Due to the limitation of data overflow SPSS is not able to calculate the third group and equation. The first equation is labeled as chayote and second as turmeric. The coefficients for each logistic regression equation are found in the column label B. The hypothesis that is tested here is that the coefficient is not equal to zero i.e., changes the odds of the dependent variable event is tested by the Wald statistic. The variables that have a statistically significant relationship to distinguishing crop choice for chayote is not visible as significance level is more than p value 0.05.. But the variables that have a statistically

significant relationship to turmeric growers are members meaning employees and highinc. The following table 5.37 summarizes the findings of the Multinomial Logistic Regression Model.

**Table 5.37: Summarisation of Findings**

Model Chi Square	Nagelkerke R2	Accuracy Rate for Learning Sample	Significant Coefficients (p<0.05)
332.100	0.681	74.5%	Equation 2 *members *highinc=3 *highinc=8

*Source : SPSS output*

**Hypothesis 2: Lack of proper post-harvest management and marketing of horticulture produce leads to loss of crops and lower income for farmers.**

In order to study the above hypothesis a null hypothesis is set up viz,  $H_0$ : Lack of proper post-harvest management and marketing of horticulture produce does not lead to loss of crops and lower income for farmers.

**Table 5.38: Observation of loss of crops and leading to lower income due to the Lack of facilities in Post Harvesting and Marketing of Horticulture Products**

Crops	Post harvesting		Marketing		Total
	Lack of proper storage facility	Poor processing facility	Lack of market for produce	Poor distribution network	
Chayote	15	16	3	0	34
Turmeric	18	13	9	14	54
Grape	23	17	20	13	73
Total	56	46	32	27	161

*Source : Primary data*



**Table 5.39 : Expected table showing Loss of Crops and lower income due to Lack of facilities in Post Harvesting and Marketing of Horticulture Products**

Crops	Post harvesting		Marketing		Total
	Lack of proper storage facility	Poor processing facility	Lack of market for produce	Poor distribution network	
Chayote	11.83	9.71	6.76	5.70	34
Turmeric	18.78	15.43	10.73	9.06	54
Grape	25.39	20.86	14.51	12.24	73
Total	56	46	32	27	161

Source : Calculated value

The above table 5.38 and table 5.39 shows that observed data and expected data of the lack of facilities for Poor Harvesting and Marketing of Horticulture products of Chayote, turmeric and Grape. From the above two tables chi square is calculated to test the hypothesis as follows:

$$\chi^2 = \sum_{k=0}^n [(fo - fe)^2 / fe]$$

The calculated  $\chi^2$  is found to be 0.003889697 while the table value for chi square for 6 (r-1)(c-1) degrees of freedom at 5% level of significance is 12.592. Since the calculated value is much lesser than the table value, it is insignificant it does not support the null hypothesis that the lack of the marketing facilities and post harvest facilities does not lead to loss of crops and lower income. So it means that proper post harvesting and marketing needs leads to better crop management and more income for farmers.

## 5.10 Conclusion

It is revealed from the study that the horticulture farmers of Mizoram have been able to benefit from adopting horticulture products. The study came to the conclusion that farmers adopted horticulture due to the opportunity for attaining higher income along with the nature of shorter gestation period of the selected crops. The study also finds that some turmeric farmers still practise shifting cultivation while grape and chayote farmers practice permanent farming method. It is also seen that 49 percent of the farmers earlier was practising shifting cultivation and due to the nature of the products chayote and grape requires permanent cultivation. Kendall's W Test finds the select crops viz., chayote, turmeric and grape finds less destruction to land as the first rank for the reason for discarding jhuming cultivation.

The study also concludes that crop loss due to the poor rainfall as the main reason for chayote farmers, while for grape and turmeric farmers the main reason being poor distribution network. It is also concluded that for better yield better quality seeds are required for turmeric farmers and for grape farmers while for chayote farmers irrigation facility is required. Regarding the post harvest management the study finds that only 53 percent of the farmers are involved in processing, 35 percent in packaging and 39 percent in wholesale or retailing.

It was observed that 97 percent of the respondents feel that horticulture farming is more profitable than traditional farming, and 94 percent believe that it can provide a sustainable source of income for their families. 54 percent of the farmers surveyed plan to expand their trade in the near future by increasing their area of cultivation, introducing more crop varieties, and entering into post harvest management and marketing.

Finally the study concludes that higher income and members of the family are the main contributor for the reason for the adoption of horticultural products which has been summarize by the table 5.37.

# **Chapter VI**

## **Summary of Major Findings and Recommendations**

6.1 Introduction

6.2 Chapter-wise Summary of Findings

6.3 Recommendations

6.3.1 Recommendations for Horticultural Farmers

6.3.2 Recommendations for Policy Makers

6.4 Conclusion

## **6.1 Introduction**

The final chapter deals with the summary of major findings of the study and recommendations for horticultural cultivators and policy makers. The key major findings discussed at length in the previous chapters are briefly presented here again for easy reference and better understanding of the study. Chapter-wise summary of findings are presented in the following section. Major recommendations based on the findings of research work are also presented.

## **6.2 Chapter-wise Summary of Findings**

### **6.2.1 Introduction**

- Horticulture is the science or art of cultivating fruits, vegetables, flowers, or ornamental plants. It involves five areas of study. These are floriculture (includes production and marketing of floral crops), landscape horticulture (includes production, marketing and maintenance of landscaping plants), olericulture (includes production and marketing of vegetables), pomology (includes production and marketing of fruits) and postharvest physiology which involves maintaining quality and preventing spoilage of horticultural crops.
- There are several advantages of growing horticultural crops. These crops produce higher biomass than field crops per unit area resulting in efficient utilization of natural resources, are highly remunerative for replacing subsistence farming and thus alleviate poverty level. Horticulture crops require comparatively less water than food crops, provide higher employment opportunity, are important for nutritional security and are environment-friendly. They are high-value crops, have high potential for

foreign exchange earnings, and make higher contribution to GDP from a limited land area.

- Owing to the limited area of land available for cultivation of food grains such as rice in Mizoram, cultivation of horticultural crops play a vital role in the prosperity of the state and is directly linked with health and happiness of the people. There are no mineral resources like iron ore, copper, oil, etc. in Mizoram and so there is no prospect of setting up big industries and factories dependent on such minerals/resources. The only viable industry is agro-based industry especially food processing industry as the raw materials can be easily obtained within the state.
- According to the Department of Horticulture, 55 percent of the total land area of Mizoram can be utilised for horticulture cultivation. Of this, only 10 percent of the total potential is utilised. There is tremendous potential of growing a variety of horticultural crops in Mizoram.
- However, there is still a long way to go towards developing horticulture sector in the state. Many of the farmers are still applying the shifting/jhuming method of cultivation. There is a lack of awareness of the benefits and importance of settling on a permanent location in cluster areas. Non-adoption of scientific cultivation practices, lack of organized marketing structure, and absence of proper post-harvest management of the produce are serious hindrances in developing horticulture sector.

### **6.2.2 Role of the Government**

- The study finds that the mission on the Department of Horticulture, government of Mizoram is to uplift the farmers by creating employment opportunities, encourage commercial cultivation of economically important horticulture crops as a source of livelihood to the farmers, rehabilitate the traditional farmers on a sustained productive farming for improving their socio-economic conditions, and import technology in the

practice of precision farming like covered cultivation (Hi-Tech Greenhouses etc.) to have quality product and to increase the production and productivity per unit area.

- There are several programmes undertaken by the Department of Horticulture such as New Land Use Policy (NLUP), Horticulture Mission for North East and Himalayan States (HMNEH), Rastriya Krishi Vikas Yojana (RKVY), National Mission on Micro-Irrigation (NMMI), National Mission on Medicinal Plants (NMMP), and Vegetable Initiative for Urban Clusters (VIUC).
- Some recent initiatives taken up by the department are the establishment of Citrus Scion Bank for production of healthy scion buds for budding on rootstock at Chite, Aizawl, setting up of Multipurpose Packing House capable of sorting and processing any round or oval shaped fruit, creation of water resources in order to harvest and store excess rain received during the monsoon for use as irrigation water during the dry spell, establishment of Organic Farming/Certified Organic Area with a total area covering 20,789.4 acres which have been certified as “Organic Area” under various crops like turmeric, passion fruit, ginger, aloe vera and stevia. The department has set up Horticulture Centres in various places in Mizoram, such as Chite, Thiak, Tupawl (Khawzawl), Maudarh (Lunglei) and Thingdawl. Horticulture mechanization is promoted by the department which enables hillside bench terraces to be efficiently ploughed using Mini-Power Tiller, which is time-saving and enables the farmer more time to work on his farm. The department conducts training programmes to enable the farmers to keep abreast with the latest technologies and recent advances in the field of horticulture. Establishment of a horticulture college is an important initiative taken up by the department.
- Of 361 respondents surveyed, 356 (99 percent) are of the opinion that the government has an important role to play in developing horticulture sector in the state.

- Tangible supports in the form of fertilizer, seeds and seedlings, trailing wire, cash and irrigation have been extended to the horticulture farmers year on year. 19 percent of the total respondents received fertilizer support in 2007, 19 percent in 2008, 19 percent in 2009, 18 percent in 2010 and 23 percent in 2011. 8 percent received support in the form of seeds and seedlings in 2007, 7 percent in 2008, 7 percent in 2009, 7 percent in 2010 and 9 percent in 2011. 25 percent of the total respondents received support in the form of trailing wire in 2007, 20 percent in 2008, 16 percent in 2009 and 8 percent in 2010.
- The Department of Horticulture provides training to horticulture farmers from time to time to keep them abreast of the latest farming techniques. Out of a total of 361 respondents, 125 (35 percent) have attended training program at least once and 236 (65 percent) have never attended the training programs organised by the government. Of the 125 horticultural farmers who have attended training programs, 115 (92 percent) revealed that the training programs are helpful. Only 10 (8 percent) reported that the training programs are not helpful.

### **6.2.2 Marketing and Production of Select Horticultural Products of Mizoram**

- Turmeric is a short gestation crop and is ready for harvesting in about eight to nine months after sowing. In 2012-2013, According to the Department of Horticulture the total area of turmeric cultivation in Mizoram during 2012-2013 was 6050 hectares. Unfortunately, turmeric production in the state has been declining in the past five years. It has declined from 83,500 million tonnes in 2007-2008 to a mere 22,990 million tonnes in 2012-2013.
- Chayote is a very versatile vegetable which is consumed almost all parts of the plant including the leaves, root and the fruit. Chayote is one of the highest exported vegetables from Mizoram. The total area under chayote cultivation in Mizoram was



4,500 hectares 2012-2013, and the total production was 75,020 million tonnes in the same year.

- The main variety of grape being cultivated in Mizoram is “Bangalore Blue” (botanical name is *Vitis lubrusca*) which is very suitable for making Red Wine or Port Wine. The main areas of grape cultivation are in Champhai and Hnahlan areas. The total area under grape cultivation was 2,380 hectares in 2012-2013, and the total production was 20,800 million tonnes in 2012-2013.
- It was observed from the study that 66 percent of the farmers surveyed think that they receive a fair price for their produce. However, 34 percent of the respondents do not think that they receive a fair price for their produce. The research also revealed that the uppermost reason for not receiving a fair price for their produce is the lack of support price from the government, followed by existence of too many middlemen, ignorance of marketing and sales techniques, highly perishable nature of the horticulture produce and lastly, seasonality of the crop.
- For sale in the domestic market, the horticulture cultivators employ a variety of channel alternatives. It was observed that out of a total of 361 respondents, 64 (18 percent) depend on wholesalers as channel partners, 79 (22 percent) utilize distributors, 60 (16 percent) make use of retailers, 72 (20 percent) employ agents and 86 (24 percent) do not use any type of channel partner.
- Regarding export sales, only the chayote farmers are engaged in export of their produce. It was gathered from the study that all the chayote farmers are relying on distributors as channel partners for their export sales.
- Promotion of the horticulture sector in Mizoram is mainly taken up by the Department of Horticulture, government of Mizoram. Promotion of the sector is done through leaflets, brochures and magazines. The department organizes festivals such as the

annual “Anthurium Festival” to promote the sector. Participation in national and international trade fairs is another important step taken up by the department.

### **6.2.3 Profile of Horticulture Farmers in Mizoram**

- Overall, 10 percent of the horticulture farmers are below 35 years, 36 percent are between 35-50 years and 54 percent are above 50 years. The overall mean age of the farmers under study was found to be 51.7 years. It can be concluded that the older age group are largely involved in horticultural farming in Mizoram which is represented by 50 percent of the respondents.
- Regarding education, the horticultural farmers surveyed consist of 8 percent-graduate, 25 percent upto Class 12 and 51 percent are upto class 10 but have gone through the scholastic system.
- For the entire sample of 361 farmers, 315 (88 percent) farmers are married and 46 (12 percent) farmers are unmarried.
- 31 percent of the respondents are solely dependent of farming as a source of income. 18 percent are engaged in government service, 11 percent operate small businesses to supplement their income, 8 percent take up daily wage work, 23 percent are privately employed and 6 percent supplement their income through other forms of trade.
- 9 percent revealed that only one member from their household is engaged in horticulture farming. 59 percent conveyed that 2-3 members are engaged in farming, 22 percent reported 4-5 members and 10 percent said more than 5 members of the household are engaged in farming.
- The study revealed that nearly cent percent of the land is owned by the farmers themselves as indicated by 97 percent of the farmers surveyed have ownership of their farm land. Only 2 percent practice farming on leased land, while 1 percent practice farming on a relative’s farm land.

- Regarding the area of land the respondents are maintaining under horticulture cultivation, 21 percent responded less than one hectare, 68 percent responded 1-2 hectares, 9 percent said 2-5 hectares and 2 percent said more than 5 hectares.
- On the topic of number of years of horticulture farming experience, 12 percent of the total respondents said less than 5 years, 57 percent said 5-10 years, 13 percent said 10-15 years, 9 percent said 15-20 years, and 9 percent said more than 20 years experience.
- The number of labour hours invested in their trade by the respondents is varied. 4 percent of the respondents spend less than 5 labour hours per week on their farms, 15 percent spend between 5-10 hours per week, 8 percent spend between 10-20 hours per week, 35 percent spend between 20-30 hours per week, 32 percent spend 30-40 hours per week and 6 percent spend more than 40 hours per week on their farms.
- Annual production was taken as an average of past three years (2009-2011). 15 percent of the respondents said they produced less than 10 quintals per annum, 54 percent said 10-50 quintals per annum, 7 percent said 50-100 quintals per annum, 12 percent said 100-200 quintals per annum and 12 percent said they produced more than 200 quintals per annum.
- It was observed that the average annual income of the turmeric farmers steadily increased from Rs.38,548 in 2007 to Rs.76,701 in 2010. However, the figure declined to Rs.53,681 in the year 2011.
- 25 percent of the total respondents have availed financial assistance and 75 percent have not availed any form of assistance. Of the 89 respondents who have availed financial assistance, 68 have availed assistance from the government, 6 respondents from a bank, 5 respondents from a money lender, and 10 respondents from other sources such as friends and relatives.

- The study revealed that out of 361 respondents, only 56 (16 percent) maintain a record of their accounts. 305 (84 percent) revealed they do not maintain any accounts regarding their trade.

#### **6.2.4 Analysis and Interpretation of Data**

- The foremost reason that led to the adoption of horticulture farming by the respondents is the opportunity for attaining higher income, followed by the shorter gestation period of the crop selected by the farmers as compared to cultivation of rice. The third important reason cited is the prospect of higher yield per hectare of land area, followed by the encouragement from success stories of other farmers who have adopted the trade. The fifth reason is the availability of ready market for the sale of the horticulture produce. The sixth reason is the opportunity of exporting the produce, followed by the requirement of low financial investment with regard to the crop. The other reasons cited are the fact that horticulture farming can be less labour intensive and there are avenues for receiving support from the government.
- 177 farmers were previously practicing shifting cultivation before adopting permanent method of farming. Only 43 respondents (12 percent) are still practicing shifting cultivation. Out of these 43, 37 are planning to adopt permanent farming in the near future.
- With regard to the amount of crop loss experienced by the farmers, an average of past three years (2009-2011) was taken. 48 percent of the respondents said they experience crop loss of less than 5 quintals per annum, 11 percent responded 5-10 quintals, 13 percent said 10-20 quintals, 2 said they lost more than 20 quintals, and 26 percent either do not experience crop loss or did not provide response.
- Out of the 361 horticulture farmers surveyed, 192 (53 percent) are engaged in processing their produce, 127 (35 percent) are engaged in packing, 141 (39 percent)

are involved in wholesaling and retailing, and 90 (25 percent) are exporting their produce outside the state.

- At the initial stage of adopting the trade, the horticulture farmers face a variety of problems. According to the respondents, lack of support from the government is the uppermost problem, followed by poor irrigation facility, scarcity of fertilizer, lack of start-up capital, poor knowledge of the trade, difficulty in procuring quality seeds/seedlings, lack of technical support, lack of manpower and lastly, non-availability of land for cultivation.
- Regarding problems they are currently facing, the most prominent problem is lack of capital to invest in their trade, followed by unsuitable land terrain, limited available land for expansion, poor distribution network, lack of trained manpower, scarcity of fertilizer, lack of support from the government, inadequate and inefficient processing facility, poor storage facility, poor irrigation facility, poor seed quality, low profit margins and non-ownership of land.
- Out of the total 361 respondents, 229 (63 percent) were previously engaged in traditional farming of rice cultivation, and 131 (37 percent) did not have any prior experience of farming.
- The study revealed that 97 percent of the total respondents believe that horticulture farming is more profitable than traditional farming. Only 3 percent are of the opinion that horticulture farming is not more profitable than traditional farming. 338 (94 percent) are of the opinion that horticulture can provide a sustainable income for their family, and only 23 (6 percent) do not share the opinion.
- It was observed that out of 361 respondents, 194 (54 percent) plan to expand their business in the near future and 167 (46 percent) do not plan on doing so. 49 percent of the respondents plan to expand their business by increasing the area of cultivation, 19

percent plan to introduce more crop varieties, 8 percent plan to set up their own processing facility of some nature, 9 percent plan to start their own distribution network and 2 percent have cited other avenues of expanding their trade.

### **6.3 Recommendations**

On the basis of the above findings, the following recommendations are made with a view to develop horticultural farming in Mizoram. The analysis of the production and marketing of select horticultural products of Mizoram has lead to the following recommendations.

#### **6.3.1 Recommendations for Horticulture Farmers**

- As many as 65 percent of the respondents have never attended any training programme conducted by the Department of Horticulture. Horticulture cultivators should take advantage of the training programmes to educate themselves on modern farming techniques and keep themselves abreast of latest developments. This will help them to produce higher yields and better quality of produce.
- It was observed from the sample data that the horticulture cultivators have not availed much financial assistance to develop and expand their trade. Only 19 percent of the respondents said they availed financial assistance from the government, 2 percent from banks, 1 percent from money lenders and 3 percent from other sources such as relatives and friends. 75 percent of the respondents have not availed any financial assistance. The cultivators can avail financial assistance from banks and concerned financial institutions such as NEDFI (North Eastern Development Finance Corporation Ltd), SIDBI (Small Industries Development Bank of India), NABARD (National Bank for Agriculture and Rural Development ) etc. and invest in their trade in terms of modern farming tools and implements, quality seeds and fertilizers and

even manpower. This will enable them to increase the quantity and quality of their output.

- Quality control is an important aspect that needs to be adopted and maintained by the cultivators throughout the production and marketing of the products. For example, the turmeric farmers need to improve on hygiene factor especially during cutting and drying of the harvested crop so that the crops are not damaged. For the grape cultivators as well, quality control has to be maintained during the processing of the crop into wine. Unless high quality is maintained, the product cannot be perceived to be attractive for export market. Moreover, the price that a product can fetch in a market is highly dependent on the quality.
- 84 percent of the respondents revealed that they do not maintain accounts regarding their trade. Horticulture cultivators need to maintain accounts of their trade regarding expenditure, production and sales. Unless proper records of their trade are not maintained, the farmers will not be in a position to know the accurate information of their trade and appreciate their output and profits.
- Co-operation and co-ordination among the cultivators of similar crops is required to achieve large scale success. One of the benefits of settling on a permanent location and forming cluster areas where similar crops are cultivated by the farmers is that the farmers can collectively achieve what a single cultivator cannot do so. For one thing, it becomes easier for the government and interested groups such as buyers to formulate strategies and make appropriate investments. The chayote cultivators have achieved some measure of success in this regard and they are able to export large quantities of chayote from Sihphir area. If the cluster cultivators are cohesive and cooperative among themselves, they will have better bargaining power with regard to their trade.

- In this day and age of high market competition and higher consumer demand, marketing is an important aspect that cannot be ignored. The horticulture farmers of Mizoram are largely unaware of the marketing techniques. They need to educate themselves in areas such as sales, distribution, promotion and pricing so that they extract the maximum benefits and profits from their trade.

### **6.3.2 Recommendations for Policy Makers**

- Modernization and mechanization of farming should be taken up on a wider scale by the government. A large number of the horticulture farmers are still practicing farming in the absence of modern tools and implements. More subsidies can be extended in this regard and increased awareness should be created on the available subsidies. Also, the procedure for availing such subsidies should be simplified for the user.
- Certification of the horticulture produce by an appropriate agency is the need of the hour. Quality certification, if achieved, will ensure the export attractiveness of the product in domestic and international export markets.
- Branding and promotion is another area that needs more attention by the government. The government has to work towards developing the horticulture brands of Mizoram. This can be achieved through adoption of high quality variety of horticulture crops, adopting proper farming techniques, stringent quality control coupled with effective marketing efforts. For example, the brand “Zawlaidi” has a good potential for export if quality control is maintained and it is properly promoted. Increased participation in trade fairs, publishing literature regarding the horticulture products, advertising, upgradation of website information and content, and facilitating exposure for the horticulture cultivators are some of the promotional tools that can be taken up by the government.



- Investment in post-harvest technology is still very minimal in Mizoram. The government needs to invest more in facilities such as cold storage, drying, transportation, processing, packaging and marketing to increase the income of the horticulture cultivators. Investment in post-harvest technology will reduce post-harvest losses in for the farmers.
- Motivation of the horticulture farmers is a very important area that the government has to look into. A prominent problem cited by the respondents is the lack of support from the government. Once the cultivators adopt a certain crop, ensuring that they remain positive and motivated is an important task that the government should take up. Horticulture sector is still at its nascent stage in Mizoram. The cultivators need the attention and support of the government to increase their output and productivity.

#### **6.4 Conclusion**

Horticulture sector is an important growth area for the economy of Mizoram. Agro-based industry dependent on horticultural crops is the most viable industry for Mizoram. Although the sector has gained prominence and achieved several success stories due to the efforts of Department of Horticulture, government of Mizoram in the recent years, there is still much to do. There exists a significant gap between the potential and actual yield of the various crops. Widespread adoption of modern farming methods is required by the cultivators. Quality control, branding and promotion are important areas that need improvement. More investment must be made in post-harvest technology. The active involvement and participation of funding institutions and other stakeholders is required for the healthy growth of the horticulture sector in Mizoram.

The present study covers the production and marketing of select horticultural products of Mizoram. The study finds gaps in the production and marketing practices of the select horticultural products viz., chayote, turmeric and grape and has suggested some measures to

improve the productivity and to expand the market. The study may help future researchers to conduct further research, for the farmers, and the government policy makers to improve the management of the horticultural products of Mizoram thereby increase the productivity and efficiency of the farmers. Thus, the farmers of the select horticultural products of Mizoram can benefit and contribute towards the development of the economy of the state.

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## **Appendix-A**

Questionnaire of the Ph.D. work entitled

### **A STUDY ON THE MARKETING OF SELECT HORTICULTURAL PRODUCTS OF MIZORAM: PROBLEMS AND PROSPECTS**

Undertaken at the Mizoram University, Tanhril, Mizoram

To

.....

Subject: Request to fill up research questionnaire

Dear Sir/Madam,

It is my honour to inform you that I am currently undertaking a PhD research entitled 'A Study on the marketing of select horticultural products of Mizoram: Problems and prospects', under the supervision of Dr. L. Shashikumar Sharma, Associate Professor, Department of Management, Mizoram University.

The purpose of my research is to study the status of horticulture development in Mizoram, the problems faced by the government and farmers, and offer suggestions to promote horticulture in Mizoram.

I request you to kindly spare some time and fill the questionnaire so that the valuable information provided by you can be utilised for the writing the Ph.D. thesis.

I declare that the information provided by you will not be disclosed and will be purely used for academic purpose.

Thanking you for your cooperation.

Yours sincerely,

(Vanlalhumi)

Ph. D. Scholar

Department of Management

Mizoram University

**CONFIDENTIAL**

The data collected is purely for research purpose, and will not be used for any other purpose

**QUESTIONNAIRE FOR HORTICULTURAL FARMERS**

**Please answer all the questions.**

1. a. Name of the farmer \_\_\_\_\_  
b. Age of the farmer \_\_\_\_\_  
c. Marital status: Single (     ) Married (     )  
d. Total number of dependents in your family \_\_\_\_\_
2. Educational qualification of the farmer.
  - a. Post-graduate (     )
  - b. Graduate (     )
  - c. Matriculate (     )
  - d. Under-matriculate (     )
  - e. Literate (     )
  - f. Illiterate (     )
3. What type of horticultural crop are you cultivating?
  - a. Chayote (     )
  - b. Turmeric (     )
  - c. Grape (     )
  - d. Others, please specify \_\_\_\_\_
4. How many years have you cultivated this crop?  
\_\_\_\_\_ years, since \_\_\_\_\_
5. How many hours per week do you dedicate to your trade?
  - a. Less than 5 hours (     )
  - b. 5 – 10 hours (     )
  - c. 10 – 20 hours (     )
  - d. 20 – 30 hours (     )
  - e. 30 – 40 hours (     )
  - f. More than 40 hours (     )
6. Were you previously engaged in traditional agricultural farming before you adopted horticultural farming?
  - a. Yes (     )
  - b. No (     )
7. Do you think that horticultural farming is more profitable than traditional agricultural farming?
  - a. Yes (     )
  - b. No (     )

8. Are you currently engaged in any occupation other than horticultural farming?
- Yes ( )
  - No ( )
- If yes, what is/are your other occupation(s)?
- Government servant ( )
  - Own Business ( )
  - Daily wage worker ( )
  - Privately employed ( )
  - Others, specify \_\_\_\_\_
9. How many members in your family are engaged in horticultural farming?
- Total no. of family members: \_\_\_\_\_
  - No. of family members engaged in horticultural farming \_\_\_\_\_
10. Do you think that horticultural farming provides a sustainable income for you and your family?
- Yes ( )
  - No ( )
11. The plot of land under your horticultural cultivation is:
- Owned by self ( )
  - Leased ( )
  - Provided by the government ( )
  - Owned by a relative ( )
  - Others, specify \_\_\_\_\_
12. What were the reasons that made you adopt horticultural farming? Tick all that is applicable.
- Higher income opportunity ( )
  - Ready market for sale of produce ( )
  - Shorter gestation period of crop ( )
  - Higher yield per hectare ( )
  - Export opportunity ( )
  - Support from government ( )
  - Success stories of other farmers ( )
  - Less labour intensive ( )
  - Requires low financial investment ( )
13. What obstacles did you face at the time of starting your trade? Tick all that is applicable.
- Non-availability of land ( )
  - Difficulty in procuring quality seeds ( )
  - Lack of manpower ( )
  - Poor irrigation facility ( )
  - Scarcity of fertilizer/manure ( )
  - Lack of technical support ( )



- g. Lack of start-up capital (      )
- h. Poor knowledge of the trade (      )
- i. Lack of support from government (      )

14. At present, what are the main problems faced by you to further develop your trade? Tick all that is applicable.

- a. Non-ownership of cultivable land (      )
- b. Land unsuitable/not ideal for farming(      )
- c. Limited available land for expansion (      )
- d. Poor quality of seed (      )
- e. Lack of capital to invest (      )
- f. Poor irrigation facility (      )
- g. Scarcity of fertilizer/manure (      )
- h. Lack of trained manpower (      )
- i. Lack of support from government (      )
- j. Low profit margins (      )
- k. Inadequate/inefficient processing facility (      )
- l. Poor storage facility (      )
- m. Poor distribution network (      )

15. What method of farming are you currently practicing?

- a. Jhumming/shifting cultivation (      )
- b. Cluster area farming (      )

16. If you are currently adopting cluster method of farming, were you previously practising jhumming/shifting cultivation?

- a. Yes (      )
- b. No (      )

17. According to you, what are the advantages of practicing cluster method of farming? Rank from 1 to 5, 1 being the most important factor and 5 being the least important reason.

- a. Higher yield per hectare (      )
- b. Easier to maintain the same plot of land year after year (      )
- c. More economical (      )
- d. Optimum use of available land (      )
- e. Less destructive to the land (      )

18. According to you, what are the problems of adopting cluster area approach to farming? Tick all that is applicable.

- a. Loss of soil fertility (      )
- b. Requires intensive use of fertilizer (      )
- c. Requires intensive irrigation (      )
- d. Others, specify\_\_\_\_\_

19. If you have not adopted cluster area approach to farming, are you willing/planning to adopt it in the near future?

- a. Yes (      )
- b. No (      )

20. Do you experience loss of crop due to the following reasons? Rank from 1 to 7, 1 being the most significant reason for crop loss and 7 being the least significant reason.

- a. Poor/low rainfall (      )
- b. Damage due to heavy rainfall (      )
- c. Poor harvesting technique (      )
- d. Lack of proper storage facility (      )
- e. Poor processing facility (      )
- f. Lack of market for the produce (      )
- g. Poor distribution network (      )

21. What is your approximate amount of crop loss in the recent years?

Year	Crop loss (Quintals)
2007	
2008	
2009	
2010	
2011	

22. What is your approximate annual production in quintals of your horticultural produce in the last five years?

Year	Quantity (Quintals)
2007	
2008	
2009	
2010	
2011	

23. How many hectares of land have you utilized for horticultural farming?

Year	Hectares
2007	
2008	
2009	
2010	
2011	

24. In what ways do you think you can improve the quality and quantity of your yield per hectare and income from horticultural farming? Rank from 1 to 5, 1 being the most relevant factor to increase production of your horticultural produce and 5 being the least relevant reason.

- a. Using better quality of seeds (      )

- b. Using more quality fertilizers (      )
- c. Improving irrigation/watering of crop (      )
- d. Regular training on farming techniques (      )
- e. Utilizing more manpower (      )
- f. Other, please specify\_\_\_\_\_

25. What is the approximate annual sale of your horticultural produce in the last five years in the domestic (within Mizoram) and export (outside Mizoram) markets?

Year	Domestic Sale		Export Sale	
	Quintals	Rupees	Quintals	Rupees
2007				
2008				
2009				
2010				
2011				

26. In which of the following activities do you engage yourself? Tick all that is applicable.

- a. Growing/farming (      )
- b. Harvesting (      )
- c. Processing (      )
- d. Packaging (      )
- e. Wholesaling/retailing (      )
- f. Exporting (      )

27. Do you think that the government play an important role in developing horticulture in Mizoram?

- a. Yes (      )
- b. No (      )

28. Please indicate whether you have received support from the government/ Department of Horticulture towards your trade in the last five years. (Yes/No)

Year	Fertilizer	Seeds	Trailing wire	Credit/Cash support	Irrigation/ water tank
2007					
2008					
2009					
2010					
2011					

29. Have you attended any training session/workshop conducted by the government regarding farming techniques?

- a. Yes (      )
- b. No (      )

If yes, how many training sessions have you attended in the last five years?

\_\_\_\_\_

30. Do you find these training sessions/workshops helpful in developing your trade?

- a. Yes (       )
- b. No (       )

31. The following aspects are crucial for horticultural marketing. Tick mark your response against each factor based on the degree of importance/agreement.

Marketing criteria in horticultural products	Strongly agree	Agree	No Opinion	Disagree	Strongly disagree
Customers prefer superior quality of horticultural produce					
Customers prefer to buy cheaply priced horticultural produce					
Domestic customers prefer to buy home grown horticultural produce					
Well established distribution chain is essential for effective marketing of horticultural produce					
Proper post harvest management (storage, processing, etc.) is essential for horticultural farming					

32. Which channel partners are used in distributing horticultural products to domestic and export markets? Tick whichever is applicable.

Domestic market		Export market	
Wholesaler		Wholesaler	
Distributor		Distributor	
Retailer		Retailer	
Agent		Agent	

33. Do you think that you receive a fair price for your horticultural produce?

- a. Yes (       )
- b. No (       )

34. If your answer is no, what are the reasons for this? Tick all that is applicable.

- a. Existence of too many middlemen (       )
- b. Lack of support price (       )
- c. Ignorance of marketing/sales (       )
- d. High perishability of produce (       )
- e. Seasonality of crop (       )

35. Are you a member of the following associations? Tick whichever is applicable.

- a. Champhai Grape Grower's Society (      )
- b. Hnahlan Grape Grower's Society (      )
- c. Iskut Growers Association (      )
- d. Multifarming Cooperative Society (      )

36. Do you think that you have benefited from being a member of the association?

- a. Yes (      )
- b. No (      )

37. Have you procured any financial assistance?

- a. Yes (      )
- b. No (      )

If yes, from where?

- a. Government (      )
- b. Bank (      )
- c. Money lender (      )
- d. Others, specify \_\_\_\_\_

38. Details of your current investment in your trade.

- a. Fixed assets \_\_\_\_\_
- b. Working capital \_\_\_\_\_

39. Do you maintain a book of accounts for your trade?

- a. Yes (      )
- b. No (      )

40. Do you have any plans for expanding your trade in the next five years?

- a. Yes (      )
- b. No (      )

If yes, in what ways? Tick all that is applicable.

- a. Increasing the area under cultivation (      )
- b. Introducing more variety of crop (      )
- c. Setting up own processing facility (      )
- d. Starting own distribution network (      )
- e. Others, specify \_\_\_\_\_

41. Are you able to save money out of your earnings from horticultural farming to plough back into your business?

- a. Yes (      )
- b. No (      )

42. Do you foresee a promising future for you and your family in horticultural farming in the next five to ten years?

- a. Yes (      )
- b. No (      )

43. Would you recommend other people to take up horticultural farming as a means of livelihood?

- a. Yes (      )
- b. No (      )

44. Can you offer any suggestions for developing horticulture in Mizoram?

- a. Suggestions to government

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- b. Suggestions to other horticultural farmers

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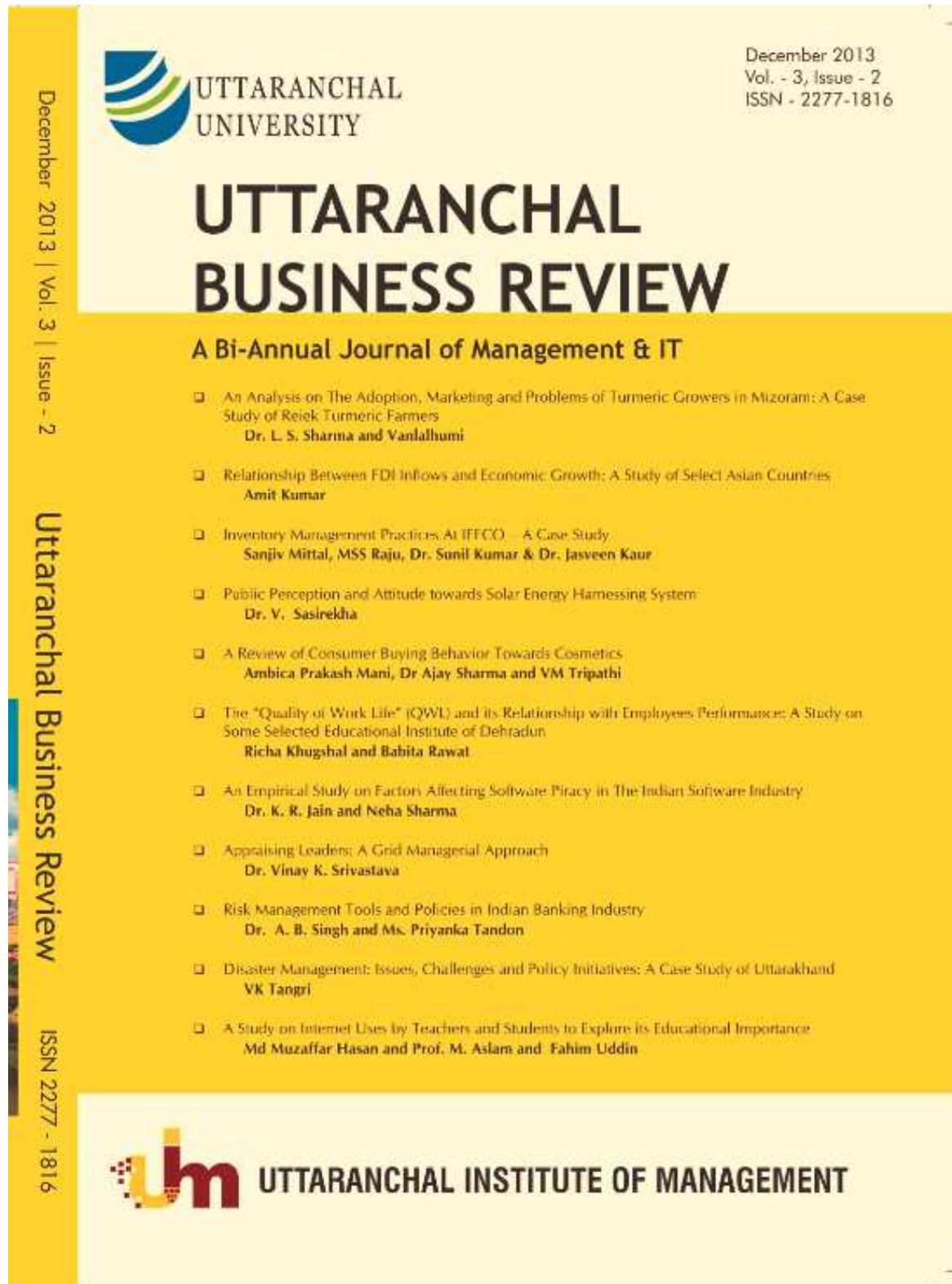
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45. Your contact details:

- a. Address\_\_\_\_\_
- b. Phone no(s)\_\_\_\_\_

## Appendix-B

### Publication



# **AN ANALYSIS ON THE ADOPTION, MARKETING AND PROBLEMS OF TURMERIC GROWERS IN MIZORAM: A CASE STUDY OF REIEK TURMERIC FARMERS**

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## **ABSTRACT**

Horticulture has established its credibility in improving income through increased productivity, generating employment, enhancing exports and providing nutritional security to its growers. It has played a significant role in improving the economic status of our farmers and women empowerment. The North-Eastern Region of India has been blessed with agro-climatic conditions pre-eminently suited for a variety of horticultural crops. One of the major deficiencies is scientific exploitation of this potential with a sound marketing network.

Among the spice crops, turmeric being a short gestation crop, is an ideal crop for the poor farmers and is doing extremely well in Mizoram. A very good variety called 'RCT-I' procured from Indian Council of Agricultural Research, Barapani in 2004 has been successfully multiplied by the Department of Horticulture and a sizeable quantity of this variety has been produced in Mizoram today for processing along with other popular variety known as 'Lakadong'. Presently, the Multifarming Cooperative Society, Reiek is processing turmeric and packed turmeric powder is being marketed. The study is conducted through a sample of 74 turmeric farmers in Reiek area through a structured questionnaire. This paper tries to find the socio-economic profile of the farmers, reasons for producing as a sustainable income and problems faced by the farmers. It also divulges into the management of harvesting and marketing of the produce.

The study finds that Mizoram is still a long way to go in developing its horticulture sector. Skill development is necessary for increasing the productivity and success of this product. The short life of the turmeric produce makes the Mizo farmer vulnerable in absence of proper post harvest processing facilities and marketing infrastructure.

**Keywords:** Horticulture, with agro-climatic conditions, scientific exploitation, Multifarming, Cooperative Society, etc.

## **1. Introduction**

Horticulture has established its credibility in improving income through increased productivity, generating employment, enhancing exports and providing nutritional security to its growers. It has played a significant role in improving the economic status of our farmers and women empowerment. The North-Eastern Region of India has been blessed with agro-climatic



conditions pre-eminently suited for a variety of horticultural crops. Among the producers of horticultural crops, India is famous for its spices (turmeric) which is widely used in industrial productions like pharmaceutical, fragrances and cosmetic industry. India is one of the major suppliers of turmeric to a number of countries for industrial productions.

Turmeric is a short gestation period crop. It can be readied for harvesting in about 8-9 months after sowing. This aspect makes it an ideal crop for the poor farmers and highly suitable for poor farmers in Mizoram. A high yield variety of rhizome called 'RCT-I' procured from Indian Council of Agricultural Research, Barapani, Meghalaya state in 2004 for multiplication in Mizoram, has been acquired by the Department of Horticulture and multiplied into sizeable quantity for plantation in Mizoram today. This variety has been planted in large scale all over Mizoram along with other local rhizome popularly known as 'Lakadong'.

Reiek is a small village about 25 kilometers west from Aizawl city. Turmeric farming has been adopted in this area about a decade ago. The turmeric produced in this region contains high oleoresin and curcumin content. The product is mostly marketed in the fresh form as well as in powder form. A society was established with 25 members called the Multifarming Cooperative Society. With assistance from the Department of Horticulture, Govt. of Mizoram and the Spice Board of India, the Multifarming Cooperative Society is presently producing turmeric and processed turmeric powder is being marketed. It has been estimated by the society that at least half of the total households in Reiek village have taken up turmeric farming, in varying capacities. The success of the Reiek farmers has triggered an incentive to other farmers in other villages across Mizoram to take up turmeric farming as well.

## **2. Present Status of Turmeric production in North East India**

Turmeric grown in North East India covers around 17.27 thousands of ha with a total production of 32.36 thousand tonnes. The productivity of the crop is much lower (1.87 tonne/ha) compared to the national productivity of 3.47 tonnes/ha (Spices Statistics, Spices Board, 2004). The productivity of turmeric is the highest in Mizoram followed by Manipur, Meghalaya, Nagaland and Arunachal Pradesh. The most popular variety cultivated in the North East Region is Lakadong (7.5 per cent) and Megha Turmeric-1 (6.8 per cent) that possesses higher curcumin and is highly demanded. The projected productivity for the year 2010-11 is 5 tonne/ha which has become lower due to the area of production being reduced from 0.96 ('000 ha) in 2008-09 to 0.45 ('000 ha) in 2010-11.

**Table 1. State-wise area, production and productivity of turmeric in the North East Region (2004-05)**

State	Area ('000ha)	Production ('000tonne)	Productivity (tonne/ha)
Arunachal Pradesh	0.40	1.50	3.75
Assam	12.00	8.00	0.67
Manipur	0.37	2.09	5.69
Meghalaya	1.60	8.70	5.44
Mizoram	0.30	2.97	9.9
Nagaland	0.60	3.10	5.17
Sikkim	0.50	1.70	3.40
Tripura	1.50	4.30	2.87
N. E. Region	17.27	32.36	1.87
India	150.50	521.90	3.47

Source: *Statistics of Indian Spices* ([http:// www.indianspices.com](http://www.indianspices.com))

Among the several cultivated types of turmeric grown in the region are named locally and found locally. Indigenous types of turmeric grown in the region are namely Manipur Local, Nagaland Local, Sikkim Local and Jorhat Local of Assam have been reported to the equally good rhizome yield. Dry matter recovery from these rhizome has been found to be equally good as improved variety of turmeric. In Mizoram and Meghalaya the main variety of crop grown is 'Lakodang' and more than 50 percent of area grown is covered under this variety.

### 3. Literature Review

Chadha (2006) opines that India has a favourable climate and soils for growing a larger number of horticultural crops. Horticulture has emerged as an integral part of food and nutritional security and an essential ingredient of economic security. Adoption of horticulture crops by the farmers has brought prosperity in many regions of India.

According to Sarswathy, Preethi, Balasubramanyan, Suresh, Revathy and Natarajan (2008), the three main objectives of applying post-harvest technology to the harvested fruits and vegetables are to maintain quality in terms of appearance, texture, flavour and nutritive value, to protect food safety and to reduce losses between harvest and consumption. They found the reasons for post-harvest losses as due to poor packaging, grading, transportation and marketing of the perishable produce.

Meena and Yadav (2001) have stressed on the need for adopting aggressive marketing strategy coupled with adequate export infrastructure. Farmers in India receive much lower prices for their produce and the consumer pay much higher prices for agricultural commodities as compared to the United States of America or United Kingdom, because of the existence of too many intermediaries between the farmer and the consumer

Peter (2009) studied about the economic developments taking place and its relationship with agriculture and market orientation. Prices of horticultural products fluctuate widely from year to year, season to season, and even day to day. He has opined that this variance makes horticultural production both profitable and very risky. He concludes that success depends on marketing skills and obtaining good prices rather than production expertise.

The FAO (Food and Agriculture Organization) Agricultural Services Bulletin 76 (2007) has mentioned that the production/marketing chain for horticulture produce is a two-way process. Produce flows from the rural areas into the cities and money and market information should flow back to the producers. In horticulture farming, where prices are rarely regulated, financial viability depends as much upon business and marketing skills as on the farmer's technical expertise.

India produces 63 varieties of spices on two million hectares with value exceeding Rs.42000 million (two million tonnes a year) say Sundaram (2000). However, only a small quantity is exported as the bulk of the produce is meant for domestic consumption our domestic market for spices is big total estimated production in 1997-98 was at 3.0 million tonnes with an annual growth rate of 10 percent and with limited scope for area expansion (2,359 million hectare). The world trade in spices by 2001 is projected to be 6,25,000 tonnes value at 83 billion. But, in terms of quantity this is merely 15.56 percent of the Indian production envisaged (4.018 million tonnes).

Goswami (2000) examines the problems and prospects of marketing horticultural crops in the hill regions of North East India. In the study the following aspects are examined: area and productivity of horticultural crops, market regulation and enactment of market legislation, market infrastructure, market intelligence and market performance. The discussion reveals that the north-eastern region of India has ample scope for increasing the horticultural sector. However, the main problems in the region are lack of adequate market infrastructure (such as transportation network, storage, and processing facilities), inadequate market intelligence and extension, and the lack of efficient market legislation and regulation.

#### **4. Objectives of the Study**

The objectives of the study are:

- (i) To assess the socio-economic profile of the turmeric farmers
- (ii) To review the generation of income of the turmeric farmers
- (iii) To analyse the reasons for adoption of turmeric farming
- (iv) To find out the problems faced by turmeric farmers.

## 5. Research Methodology

The study is conducted through a sample of 70 turmeric farmers in Reiek area through a structured questionnaire. It is estimated that there are approximately 200 turmeric farming families in Reiek village. Therefore, the sample size covers 35 percent of the total turmeric farmers in the area under study. Face to face interview was conducted among the Multifarming Cooperative Society members. This paper tries to find the socio-economic profile of the farmers, reasons for producing turmeric as a sustainable income and problems faced by the farmers. It also divulges into the role of harvesting and marketing of the produce.

## 6. Results and Discussion

### *Socio-economic profile of the farmers:*

The following Table 2 shows the general profile of the turmeric farmers in Reiek village. Owing to the high literacy rate of Mizoram, it was found that all the farmers were literate and 17 percent of the farmers were matriculate and above. The study showed that 64 percent of the farmers are in the category of 50 years and above. Out of the farmers surveyed, 47 percent solely depend on farming as a means of livelihood, whereas 14 percent were in government service, 4 percent manage their own business such as grocery store, 11 percent take up daily wage work from time to time, and 23 percent undertake “other” occupations such as carpentry and masonry. It can be seen that majority of the respondents are farmers as full occupation (47 percent) in the age group of 50 and above.

**Table 2. Demographic Factors of the Respondents**

Characteristics	Respondents	Percentage
<b>1. Age</b>		
Less than 40 years	9	13%
40 to 50 years	16	23%
50 and above	45	64%
<b>2. Education</b>		
Post-graduate	0	0%
Graduate	2	3%
Matriculate	10	14%
Below matriculate	47	67%
Literate	11	16%
Illiterate	0	0%
<b>3. Other occupations of the farmers</b>		
Farming only	33	47%
Govt service	10	14%
Business	3	4%
Daily labour	8	11%
Others	16	23%

*Source: Primary Data*

Table 3 shows the activities carried out by the farmers during the production and marketing of turmeric in Reiek village. The survey shows that 99 percent of the respondent farmers are involved in production and harvesting. The survey also indicates that 86 percent of the respondents are involved in processing of the turmeric while only 6 percent are involved in packing of the product. Nearly about 50 percent of the farmers are involved in the selling in the form wholesale or retail of their products as indicated by the survey. As the Multifarming Cooperative Society is involved in marketing the product, it is thus reflected in the survey. It is also revealed that the products are not exported to any other foreign country.

**Table 3. Activities of Farming taken up by farmers**

Characteristics	Respondents	Percentage
Production	69	99%
Harvesting	69	99%
Processing	60	86%
Packing	4	6%
Retailing/Wholesaling	34	49%
Exporting	0	0%

*Source: Primary Data*

## 7. Land holding pattern of the farmers

Land in the hilly regions of Mizoram is very difficult to be readied for farming and irrigation. Hills of Mizoram are steep in nature and finding slopes is difficult. Reiek situated in the western part of Aizawl is blessed with slope gradient hills and rainfed with monsoon during May to September. This condition has made it suitable for growing turmeric in the region. The survey also tried to find the landholding pattern of the farmers as well as the ownership pattern. In terms of land holding, it was found that 93 percent of the farmers are cultivating turmeric crop in their own land while 6 percent have leased or rented from private land owners. The survey indicated that most of the farmers have small land holdings. As shown in Table 4, two-third of the farmers cultivate turmeric in less than 1 hectare of land area. The table also shows that a minority viz., only 12 percent grows turmeric in areas above 1.5 hectares. As the area of production is lower the production per hectare tends to be low.

**Table 4: Type of Land Holding and Ownership Pattern**

Characteristics	Respondents	Percentage
<b>1. Area under turmeric cultivation</b>		
Less than 0.5 hectare	5	7%
0.5 - 1.0 hectare	43	61%
1.0 - 1.5 hectare	14	20%
1.5 - 2.0 hectare	4	6%
More than 2 hectare	4	6%
<b>2. Ownership of cultivated land</b>		

Owned land	65	93%
Private leasing	4	6%
Government leasing	0	0%
Leased from a relative	1	1%
Others	0	0%

Source: Primary Data

## 8. Production and Income Generation for the Turmeric Farmers of Reiek

The survey also enquired about the production of turmeric and income generated from the turmeric growers of Reiek village in Mizoram. Table 5 shows the number of years involved in turmeric production, annual production of turmeric and income generated from the sale of turmeric products. The table shows that maximum 73 percent of the respondent farmers have been practicing turmeric farming for more than 5 years. No new farmers have adopted the turmeric farming in the last two years. This is due to the unavailability of the suitable land for growing turmeric. The second part of the table shows the annual production of turmeric in quintals. It has been found that 53 percent of the farmers produce less than 20 quintals of turmeric while 27 percent produces about 20 – 40 quintals per annum. It also has been found that more than 60 quintals are produced by 17 percent of the respondents. The income generated from turmeric is shown in part 3 of the Table 5. The survey shows that 41 percent of the respondent farmers earns about less than Rs. 20000/- per annum while 23 percent earns about Rs. 20,000 - 40,000/- per annum. About 17 percent of the farmers earns about Rs. 40,000 to 1,00,000/- per annum. Around 19 percent of the farmers earn more than Rs. 1,00,000/- per annum. The low income is reflected due to the small area of land possessed by the farmers. Those farmers who are earning more than Rs. 1,00,000/- is due to the large holding of land for cultivation.

**Table 5. Production and Income Generation in Reiek Village**

Characteristics	Respondents	Percentage
<b>1. No. of years of turmeric farming</b>		
Less than 2 years	0	0%
2 - 4 years	11	16%
5 - 7 years	51	73%
More than 8 years	8	11%
<b>2. Annual production in quintals*</b>		
Less than 20 quintals	37	53%
20-40 quintals	19	27%
40-60 quintals	2	3%
60-80 quintals	8	11%
More than 80 quintals	4	6%
<b>3. Annual income*</b>		

Less than Rs. 20,000	29	41%
Rs. 20,000 - 40,000	16	23%
Rs. 40,000 - 60,000	8	11%
Rs. 60,000 - 80,000	2	3%
Rs. 80,000 - 1,00,000	2	3%
More than Rs.1,00,000	13	19%

\* Average of 2010, 2011 and 2012

Source: Primary Data

## 9. Reasons for adopting turmeric farming:

Many of the farmers at Reiek have converted their trade from traditional farming, i.e. rice cultivation using jhumming technique, to turmeric farming. Furthermore, persons engaged in other occupations other than farming have also taken up turmeric farming at Reiek. An attempt was made to find out the reasons for this trend. The biggest reason attributed to this preference for turmeric farming is the opportunity for higher income. Turmeric is a short gestation crop as compared to other crops. Because of this factor, farmers of Reiek switched to turmeric along with the availability of ready market for sale of produce. The Multifarming Cooperative Society purchases the produce of the farmers for processing, packing and marketing of the produce. The yield potential per hectare of turmeric is excellent. A good crop may yield around 200 quintals per hectare. Yet another motive for turmeric farming lies in the fact that it requires low financial and manpower investment as compared to other crops such as rice. Moreover, the Horticulture Department provides assistance to the farmers in terms of seeds, fertilizers and cash incentives.

## 10. Major Problems Faced by Turmeric Farmers

Turmeric farming was introduced at Reiek only a decade ago. The research threw light on the major problems faced by the farmers presently. These problems can be classified under the following points:

1. **Scarcity of cultivable land** – Majority of the farmers have very small land holdings. There is a dearth of land for expansion of their area for cultivation to increase their volume of production. Moreover, the terrain of land is often unsuitable for high yields of produce.
2. **Financial constraint** – It has been found that most of the turmeric farmers are poor and do not have the financial resources to invest in their trade. The farmers requires resources for purchase of tools and technology, manpower, fertilizer, irrigation, etc.
3. **Lack of knowledge of proper farming techniques** – The farmers do not have right skills for correct farming techniques for turmeric cultivation and do not take enough care in preparing their land for

cultivation. Techniques such as ‘mulching’ and ‘weeding’ are not properly practiced by the farmers. Out of the farmers surveyed, only 35 percent have attended the training programs organized by the Department of Horticulture. Using correct techniques, 200-300 quintals can be produced from one hectare of land area.

4. ***Absence of adequate post-harvest management facilities*** – Turmeric farmers do not have proper access to facilities for storage, drying and processing of their produce. Presently, the turmeric farmers at Reiek are employing crude and rudimentary methods of drying and processing their produce. There is only one processing and packing machine under the Multifarming Cooperative Society, which is inadequate.
5. ***Absence of proper sales and marketing network*** – Most of the turmeric farmers do not possess the business savvy experience to explore the market potential for their produce. There is heavy reliance on middlemen and agents to sell their produce.
6. ***Lack of government support*** – Many of the turmeric farmers feel that there is a lack of government support towards expanding their trade. For instance, government assistance is required for obtaining the appropriate certification for the produce so that it can be marketed on a wider scale.

## 11. Conclusion

India’s turmeric sector faces stiff challenges in increasing the efficiency in several of its sub-sectors: improving the technology in turmeric cultivation and processing, reforms in the marketing of turmeric products domestically and internationally.

The potential of turmeric farming is very good for the hilly region of Mizoram. However, as of now, the income generated from turmeric farming alone is not adequate to provide a satisfactory means of livelihood for most of the farmers. Nevertheless, it provides a good supplement to their income.

Most of the turmeric farmers of Mizoram are small scale farmers. There is a lack of systematic approach to their farming, and they do not maintain a proper book of accounts for their trade. Of the farmers surveyed, only 9 percent admitted of having maintaining accounting records pertaining to their trade. Moreover, majority of the farmers are yet unable to set aside their earnings to plough back into their trade. In spite of these facts, majority of the farmers see turmeric farming as a worthwhile occupation and 85 percent of the farmers said they would recommend turmeric farming to other farmers.

There is a dire need for investing in post harvest management, particularly facilities for storage, drying, processing and packing facilities.



Skill development activities specially in the field of production, harvesting, post harvesting, storage, processing and marketing skills are needed to be imparted. Lastly, proper branding and advertisement of the product and exploring markets for the variants of the product is required.

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