LIVELIHOOD AND LIVING CONDITIONS OF DRAGON FRUIT CULTIVATORS IN AIZAWL DISTRICT, MIZORAM

A dissertation submitted in partial fulfilment of the requirements for the
Degree of Master of Master of Philosophy in Social Work

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Certificate

This is to certify that the dissertation work **"Livelihood and Living Conditions of Dragon Fruit Cultivators in Aizawl District, Mizoram"** submitted by **Mr Michael Vanromawia, Regno.MZU/M.Phil./617 of 12.06.2020** for the award of Master of Philosophy in Social Work is carried out under my guidance and incorporate the student's bonafide research.

The scholar has fulfilled all the required means laid down for the M.Phil Regulations by the Mizoram University. The dissertation has not been submitted for award of any degree in this or any other university or institute of learning

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Declaration

I, Michael Vanromawia hereby declare that the subject matter of the dissertation is the record of work done by me, that the contents of the dissertation did not form basis of the award of any previous degree to me or to the best of my knowledge, to anybody else; and that the dissertation has not been submitted by me for any research degree in any other University Institute.

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LIST OF ABBREVIATIONS

AAY	: Antyodaya Anna Yojana
APL	: Above Poverty Line
BPL	: Below Poverty Line
CAU	: Central Agriculture University
DFID	: Department for International Development
HYV	: High Yielding Variety
LSC	: Land Surveying Certificate
MHIP	: Mizo HmeichhiaInsuihkhawm Pawl
MUP	: Mizo Upa Pawl
NGO	: Non-Government Organisation
NPK	: Nitrogen, Phosphorus and Potassium
PLP	: Periodic Land Patta
SHG	: Self Help Group
SLF	: Sustainable Livelihood Framework
SPSS	: Statistical Packages for the Social Sciences
UG	: Under Graduate
VC	: Village Council
YMA	: Young Mizo Association

CHAPTER I

INTRODUCTION

The present study explicatesthe livelihood and living condition of dragon fruit cultivators in Aizawl District, Mizoram.

Horticulture is the cultivation and administration of gardens. It is the science and art of developing, producing, selling, and using high-value, intensively farmed food and ornamental plants in a sustainable manner. In the last two decades, horticultural land has nearly doubled, and total horticulture production has overtaken food grain production in India. Horticulture production is labour-intensive and necessitates reliable access to water, accurate information, and well-developed supply systems. It is highly on market inputs and outputs, posing major risks to horticultural farmers*(Pooja Prasad, 2018).*Horticultural farming, namely fruit production, is the people's primary occupation, and they are completely reliant on it for their survival. Regions with favourable agro-climatic conditions are known for increasing the output and productivity of fruit crops*(Sati, Wei, Xue-Qian, 2015).*

The dragon fruit is a prominent tropical fruit that has grown in popularity in recent years. Pitaya or pitahaya is another name for it. It is one of the many cactus species native to the United States. Hylocereusundatus is the scientific name for the Dragon Fruit. It's also known as the Honolulu queen because its flower only blooms at night. Pitaya or dragon fruit refers to fruit from the genus Stenocereus, whereas pitahaya or dragon fruit refers to fruit from the genus Hylocereus, both of which belong to the Cactaceae family. The two most prevalent varieties feature brilliant red skin with green scales, giving them the name dragon. Although a less common kind with red pulp and black seeds exists, the most generally accessible variation has white pulp with black seeds. Yellow dragon fruit is another variation with yellow peel and white pulp with black seeds.*(Sanoamuang, 2019).*

Currently, the market contributes worldwide four types of dragon fruit (Hylocereusundatus): red skin, white flesh, Hylocereuspolyrhizus (red skin, crimson flesh) is primarily found in Israel and Malaysia. Guatemala, Nicaragua, Ecuador, and Israel (Hylocereuscostaricensis) have red skin and purple flesh, while Colombia and Ecuador have yellow skin and white flesh(*Hylocereus (Selenicerus)* megalanthus). The worldwide market shares of red–skin with white flesh, red–skin with red flesh, red–skin with purple flesh, and yellow–skin with white flesh are around 94, 4.0, 1.5, and 0.5 percent, respectively.Estimates put current global dragon fruit output at more than 2.1 million tonnes over 1.12 lakh acres

(2017–18). The leading manufacturers are Vietnam, China, Indonesia, Thailand, Taiwan, Malaysia, Philippines, Comodia, India, and the United States*(Chen and Paull, 2018).*

The flavours of dragon fruit are similar to those of other fruits, despite their unusual appearance. In terms of flavour, it's been compared to a slightly sweet cross between a kiwi and a pear. This plant's native habitats are southern Mexico and Central America. Dragon fruit is produced in Southeast Asia, Florida, the Caribbean, Australia, and other tropical and subtropical regions around the world. Three big countries, Vietnam, China, and Indonesia, produce more than 93 percent of the world's dragon fruit. With an average productivity of 22–35 metric tonnes (MT)/hector (ha)/year and a land area of 55, 419 hectares, Vietnam accounts for more than half (51.1%) of global output. In Vietnam, the volume of dragon fruit produced reaches 1 million metric tonnes, with a value of US$ 895.70 million.*(Chen and Paull, 2018).*Dragon fruit is grown in almost all of Vietnam's provinces, but the BinhThaun, TeinGiang, and Long An regions are the most densely populated. China is the second largest producer, producing about 7,00,000 MT worth US$ 397 million over 40,000 ha of growing regions with an average yield of 17.5 MT/ha/year, accounting for 33.3 percent of global dragon fruit output. *(Hein, 2018).*

Dragon fruit can be grown in a range of conditions, but sandy soils with plenty of water are optimal. The soil ph should be between 5.5 and 6.5 for a productive production. The height of the bed should be at least 40-50 cm.The first option is to begin with seeds, while the second option is to begin with a cutting from a plant sample. Farmers prefer to employ the cutting approach since it takes three years for seeds to develop into a large enough plant to be used. The seedling should be 20 cm long and plucked from the mother plant before being planted in the shade for 5-7 days. Whether the support is vertical or horizontal determines the space between dragon fruit plants when planted. In vertical support, the space between the plants should be 2-3 metres, while in horizontal support, the distance is decreased to about 50 centimetres, allowing for more intensive farming. Vertical support should be between 1 and 1.20 metres tall, and horizontal support should be between 1.40 and 1.60 metres long for healthy growth. Fertilizer from mounds should be spread over the ground. The usage of organic fertilisers weighing 20 kg is recommended. A total of 0.5 kilogrammes of superphosphate and 1 kilogramme of NPK16-16-8 should be used per 50 postings before to the actual planting of dragon fruit plants.Three times a year, 50 grammes of Urea and 50 grammes of phosphate should be administered during the first year of cultivation. Because the plant needs less water, watering should be done once a week, and drip irrigation should be

used for maximum efficiency. The fruit takes 27-30 days to completely mature. Even a 4-5-day wait could cause the fruit to deteriorate. The estimated yield per hectare might range from 10 to 30 hectares, depending on the conditions and processes used. Twisting and plucking it in a clockwise direction are examples of picking techniques. *(Tripathi, 2020)*.

Dragon fruit can be grown from seed or by cutting the plant in the same way that flowers are cut. When the seed is used to cultivate it, the seed is scooped out of the fruit, washed, and dried overnight. The seed is then easily sown in compost or potting mix, where it germinates in about two weeks. Dragon fruit cultivation from seed can take five to seven years for the plant to bear fruit, which is why it is the least preferred alternative. Propagating a dragon fruit tree, on the other hand, is rather simple. Simply clip off a 30cm part of the tree and leave it to dry for 5-6 days, or until the cut end turns white. Simply insert cut side down in sandy cacti soil and water monthly once it has dried. Within a month, the plant will send out roots and establish itself, after which it will continue to develop and bear fruit for one to three years. *(Dalziel, 2019).*

Dragonfruitcultivation in India was first introduced in the late 1990s. Following that, between 2005 and 2017, the area under cultivation was gradually grown from 4 to 400 ha in several states. Farmers from Karnataka, Maharashtra, Gujarat, Kerala, Tamil Nadu, Orissa, West Bengal, Andhra Pradesh, Telagana, and the Andaman and Nicobar Islands were the first to cultivate dragon fruit.Rajasthan, Punjab, Haryana, Madhya Pradesh, Uttar Pradesh, and the North Eastern States are among the states where it is grown. According to recent predictions, India's dragon fruit output will more than double to more than 12,000 MT in 2020, covering an area of 3,000–4,000 ha.These projections are based on firsthand information gathered by the ICAR–NIASM from progressive growers, entrepreneurs, consultants, and officials from state agricultural departments across the country.States like Karnataka, Maharashtra, Gujarat, Telegana, Andhra Pradesh, and West Bengal, which have taken measures to boost commercial production after 2018, are primarily responsible for the significant increase in production and cultivated area. More than 80% of the total 3,085 ha (2,468 hectares) is under fresh cultivation with a plantation age of less than 18 months.Furthermore, these areas' average productivity ranges from 1.5 to 3.1 MT/ha. While the remaining 20% of the crop area (617 ha) is well-established and has reached full maturity, with an average production of 8–13.5 MT/ha.Farmers in India who use appropriate cultivation procedures and drip irrigation can get up to 4.5 tonnes of fruit per hectare in the first year after planting, 7.5–10 tonnes in the second year, and 16–24 tonnes per hectare in the third year*(Wakchure et, al., 2020)*.

Overview of Dragon Fruit Cultivation in Mizoram

Dragon fruit cultivation in the state of Mizoram had started with the initiative of Mr. Samuel Rosangliana who was the Director of the Department of Horticulture in Mizoram. They had sent delegates to Israel for training on the cultivation of dragon fruit and the planting material was imported from Thailand. The commercial cultivation started in 2014-2015 in Aizawl, Kolasib, Tuidam, Lunglei, Lawngtlai and Serchhip Divisions.The cultivation of Dragon fruit had grown so much in the state of Mizoram that the concerned government and non-government organisations also had worked to improve the quality and quantity of the production of the dragon fruit. In Mizoram approximately the total land area of 430ha is under dragon fruit cultivation. In Aizawl District alone out of the total 430ha of land 210ha is under dragon fruit cultivation *(CAU, Imphal, 2017).*

In the state of Mizoram, the Department of Horticulture, Government of Mizoram had made a tremendous contribution in this field for the development of horticulture within the state. With the help of certain Schemes and Programmes, the Department of Horticulture had made contributions by emphasizing the cultivation of anthurium, dragon fruits, passionfruit, areca nuts, etc.Dragon fruit cultivation had been initialised so that there can be available high-value fruits and crops within the local market and also to promote the practice of cultivation of exotic fruits within the state that can be beneficial for the farmers. Since the market price of the dragon fruit is relevantly high, this ranges from Rs 200/- to Rs. 400/- according to the quality of the fruit and also the availability in terms of harvest season.This makes it a good prospect for the farmers too. The climatic condition of Mizoram is suitable for the cultivation and also that Mizoram is the pioneer of the cultivation of dragon fruit on a large scale. The Department of Horticulture had chosen the beneficiaries in terms of the area of land which the farmer had and the kind of techniques which had been practiced in the past *(CAU, Imphal, 2017).*

From the report prepared by the Central Agriculture University, Reiek Cluster was studied where they had mentioned that the supporting framework structure of dragon fruit plantation needs to be strong and durable to sustain the plantation. The Department of Horticulture had also established a large-scale production through programmes and schemes by distribution to farmers for massive production. A recommendation for standardization of spacing for optimum and sustainable production is also given and also mentioned the requirement for promotion and strengthening of water management as well*(CAU, Imphal, 2017).*

The construction of a Zero Energy Cool Chamber at the growing site for temporary storage until the fruits are transferred to the cool warehouses will also be started, as well as a Mobile Processing Van. Initiatives for credit linkage with financial institutions will be launched, and growers may be eligible for financial help for the development of supporting facilities. The state government must create market links with other state agencies, and the government agency (Dept. of Horticulture, Govt. of Mizoram) must encourage the buyback system of dragon fruits from growers. *(CAU, Imphal, 2017).*

The present study is focused on the livelihood of the dragon fruit farmers within Aizawl District. It will give emphasis on the study of the demographic profile of the respondents, living conditions and also keeping in mind the social capital and financial capital. In this study four villages within Aizawl District were randomly selected where several government interventions took place. The study also encompasses the support which the dragon fruit cultivators received from the services provided by the government. It also studies the opportunities and prospects as well as the challenges faced by the farmers and the certain strategies that have been adopted in order to overcome their challenges.

Overview of literature

There are scholars who had made their studies and definitions on livelihood such as (see Chambers & Conway, 1992; Niehof& Price, 2001; Engberg, 1996; Hussein & Nelson, 1999; Ellis, 2000; Thompson, 1995; Janvry, 1981; Sarma, 2004; Drinkwater &Rusinow, 1999; De Haan&Zoomers, 2003) livelihood is the constructed basis of income resource which are derived from the basis of their livelihood resources. The scholars have made their contributions to define livelihood, their way of interpretation has differed. They have advocated that livelihood is the main formal or non-formal occupation in which individuals and families derived their income for their basic amenities. The livelihood may differ accordingly with the presence of skills, knowledge, education and health. (seeScoons, 1998; Dercon&Krishan, 1996; Dolan, 2002; Lucas, 1997)

There are also many studies on sustainable livelihood as well. Sustainable livelihood encompasses the livelihood practice which entails goal achievements through physical, human, financial, natural and social assets and capitals to have income, production and distribution (see Saha, Singha and Xaxa, 2017; Carney, 1998). Sustainable livelihood also means having a strategy that must be inclusive, connected, equitable, prudent and secure to

attempt to go beyond conventional definitions and approaches to poverty eradication (see Krantz, 2001; Gladwin et al., 1995)

There have been studies on horticulture and how to make it active among farmers. It needed sustained technical help and guidance because it is an art, a science, and a business (seeKrumbiegal, 1920; Edwinna von Baeyer, 1930). It is also the science and technique of production, processing and merchandising of fruits, vegetables, flowers, spices, plantations, medicinal and aromatic plants which further stress on studying the post-harvest losses and its impact on the economy (see Swamy&Auxcilia, 2015; Subarhamanyam et al., 1981; Overgaauw, 1992;Harold Hume, 1951; IIbery, 1986) where rootstock, picking, cost, dimensions, distribution, norms and preferences, shelf life, microclimate, box specification, compression test, recycling and labelling, describing the cost of packaging are discussed along with direct marketing, local market, distant market, grower cooperative, and contracts farming.

In the study of horticulture, the formal finance is confined almost exclusively to well establish large exporters along with the role of horticultural cooperative and role of the government in assisting to overcome the market failure and role of horticultural sector of the country and its prospects (see Ouattara, Graham, Meyer &Nagarajan, 1995; Trupo, 1997; Singh &Mathur, 2008)

There are studies on dragon fruit in the Philippines and Nepal that is related to the current status prospects, constraints and opportunities. All are focused on the production, market and the future possible outcome that mentioned the possibility for the future (see Eusebio&Alaban, 2018; Tepora, 2019; Pascua, Pascua & Gabriel, 2015; Tagay, 2017; Rijal, 2019). The focus of their study is concerned on the rate and growth in production, impact on the economy and the comparison with other horticulture fruits on the market by taking into account the value of the dragon fruit.

Research Gap

The overview of literature shows that there is an ever growing literature on the cultivation of dragon fruit which is based on varied context in certain developing. In the context of India there is hardly any literature to be found on the topic study. The research gaps can also be noted as the following.

Firstly, there is absence of the study of the livelihood conditions of the farmers the only literatures that can be found within India especially in the state of Mizoram is the progress reports of the departmental works and not of the farmers (for instance see Central Agriculture University, 2017). This may be due to the importance given on the quantity of product rather than giving importance on the condition of living of the farmers who are dragon fruit growers since the cultivation of dragon fruit is still emerging in Mizoram.

Secondly, among the few studies conducted, most focus is on the prospect, opportunities and constraints (for instance see Eusebio&Alaban, 2018; Tepora, 2019; Pascua, Pascua & Gabriel, 2015; Tagay, 2017; Rijal, 2019). None have done any study on the livelihood and living conditions of dragon fruit growers who are mostly laborers working in the farms who are landless and marginal workers in the context of Mizoram. This is also evident from the studies of other countries that there is no study to be found that the farmers are the subject of the study, rather, the farming itself is studied for the economic and promotion of dragon fruit cultivation.

Lastly, most of the studies are quantitative in methodological orientation and the use of qualitative or participatory methods to study the vulnerable contexts, livelihood challenges, and livelihood strategies are rarely seen. The roles of institutions such as cooperatives as well as livelihood outcomes of the farmers are also rare.

The study will try to fill the research gaps which can be seen from these literatures especially in the context of Mizoram. The study will be based on the Sustainable Livelihood Framework in order to understand the patterns of livelihood and the problems of the dragon fruit cultivators

Statement of the Problem

The progress of the cultivation of dragon fruit within the state of Mizoram can be seen through the reports of the work of the government agency. Since Dragon Fruit is a kind of horticulture crop which is also a kind of luxurious fruit. There are many who have also grown it in their own garden on a small scale. However, these are not viable for the study to know the impact on the livelihood of the grower.

The Government of Mizoram had done work to promote the cultivation of dragon fruit within the state. Through the help of certain central sponsored schemes such as Mission for Integrated Development of Horticulture (MIDH/HMNEH),

RashtryaKrishiVikasYojana(RKVY), and PradhanMantriKrishiSinchaiYojana (PMKSY), the Department of Horticulture, Government of Mizoram had chosen farmers and introduced the cultivation of dragon fruit in a large scale within the state of Mizoram. With the help of Programme under Article 275 (1) during 2016 – 2017, the department also had done work in Aizawl, Serchhip and Lunglei Districts with the total of 113 beneficiaries and a financial target of Rs. 115.40 lakh. The beneficiaries have been assisted in terms of planting materials and other necessary inputs including cash assistance for inter culture and trellis erection. *(Department of Horticulture, 2018)*

However, although the government had done their work for the farmers, there are farms owned by the officers themselves in several places bypassing the real farmers who are really in need of such privilege. While in other places the farms are solely owned by private farmers who fall under the criteria for beneficiary. It is the aim of the study to probe into the scenario and study whether the services had reached the beneficiaries and whether it is benefitted by them.

The main concern lies within the persons and individual households who are concerned with the large-scale cultivation and production of the dragon fruit. The farmers who have grown it in their farm for their primary source of income would be the main concern for the study. It is most important to know the impact on the livelihood of the farmers of the cultivators. It is also evident that there is rarely a study that would depict the living condition and the impact of dragon fruit production on the livelihood of the farmers within Aizawl District.

The present study employs the sustainable livelihood framework to comprehend the livelihood and living conditions of the Dragon Fruit growers in Mizoram. The study will try to understand the living conditions of dragon fruit growers especially the role of seasonality and the challenges faced. It will explore the role of government agencies and cooperatives in addressing the challenges faced by farmers and promoting their livelihood. It will probe into the livelihood patterns of the farmers in terms of their natural, physical, financial, human and social capitals. It will also assess the bearing of these livelihood assets on the livelihood outcomes such as household income.

The findings and results of the study will also be useful for policy makers and practitioners in the field in their work for promotion of sustainable livelihood and rural as well as urban development in the field of Horticulture. The current study will also be able to

provide the evidence needed for better and smoother intervention planning for the dragon fruit growers and to make policies so that it can be more sustainable and enhance livelihood.

Objectives

The following are the objectives of the study:

1. To understand the vulnerability context of dragon fruit cultivators.
2. To probe into the role played by the Government in promoting dragon fruit cultivation in Mizoram.
3. To study the challenges of dragon fruit cultivators and the strategies employed to manage these challenges.
4. To assess the livelihood assets and living conditions of households cultivating dragon fruit.
5. To assess the relationship between the livelihood assets and living conditions of dragon-fruit cultivators.

Hypotheses

The hypothesis for the study has been formulated which are:

1. Living conditions of the farmer household are directly related to its access to natural resources.
2. Living conditions of the farmer household are directly related to its access to physical capital.
3. Living conditions of the farmer household are directly related to its access to human capital.
4. Living conditions of the farmer household are directly related to its access to social capital.

These hypotheses were derived from the earlier studies on sustainable livelihood framework and studies on livelihood conducted in the department of social work (see Sailo, 2014; Zaitinvawra, 2014; Malsawmtluangi, 2013)

Chapter Scheme

I. Introduction

II. Review of Literature

III. Methodology

IV. Livelihood And Living Conditions of Dragon Fruit Cultivators In Aizawl District

4.1 Structural Base of the Respondents

4.2 Livelihood Assets of the Dragon Fruit Cultivator Households

V. Pattern of Dragon fruit cultivation

VI. Opportunity and Prospects in dragon fruitcultivation

VII. Conclusion

Reference

The present chapter includes the introduction of the study. The overview if literatures and research gaps are also given along with the objectives and hypothesis. The chapter scheme of the present study is also presented in this chapter. The next chapter discusses the review of literature of the present study.

CHAPTER II

REVIEW OF LITERATURE

This chapter contains literature reviewed which are incorporated in the present study.The literature reviewed could be categorised under certain areas viz., studies on livelihood, livelihood diversification, sustainable livelihood, livelihood and human capital, livelihood and infrastructure, livelihood and financial capital, livelihood and social capital, livelihood and natural capital, horticulture, dragon fruit and industries.

The sources of literaturereviewed were from books, articles, journals, research works and other online sources.The literature contains 7 reviews on literature relating to livelihood, 3 literatures relating to livelihood diversification, and 6 reviews of literature on sustainable livelihood. It also comprises of literatures of livelihood and other different aspects where 4 literatures on livelihood and human capital, 2 literatures on livelihood and infrastructure, 2 literatures on livelihood and financial capital, 1 literature on livelihood and social capital, and 3 literatures on livelihood and natural capital are reviewed in a particular area. Besides these, there are 8 literatures reviewed on Horticulture, 5 literatures on Dragon Fruit its prospects and impact in income generation in other countries and lastly, 1 literature on industries has also been reviewed in order to have a glimpse in the study. It also includes the Sustainable Livelihood Framework which is given by the Department for International Development.

Livelihood

Chambers and Conway (1992) in their research "Sustainable Rural Livelihoods: Practical Concepts for the Twenty-First Century," defined livelihood as "sufficient stocks and flows of food and currency to meet fundamental requirements." This means that, according to Chambers and Conway, what livelihood essentially meant was the availability of food in connection to money resources without stagnation and to satisfy their demands.

Niehof and Price (2001) in their paper "Rural Livelihood Systems: A Conceptual Framework," stated that "livelihood generation comprises all actions conducted by people to meet their basic requirements, and the term livelihood is used for the results or outcome of those activities."

Engberg, Varjonen and Steinmuller (1996) in their study “Finding a livelihood alternative: An example of family resource management in action” has defined livelihood as

the mix of individual and household survival strategies, developed over a given period of time that seeks to mobilize available resources and opportunities.

Scoons (1998) in his study "Sustainable rural livelihood: A framework for analysis: defines livelihood as the constructed basis of income resources which are derived from the basis of their livelihood resources. According to him, livelihood strategies themselves must not be subject to analysis, and they often consist of combinations of activities which he calls "livelihood portfolios".

Ellis (2000) in his study "Rural Livelihoods and Diversity in Developing Countries" defined that a livelihood offers a more complete picture of the complexity of survival in low income countries than terms formerly considered adequate like substances, income and employment. He further says that it is the maximization of return per unit of labour. He also mentioned that diversification is a key feature of livelihood strategies. It is defined as the process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and to improve their standards of living.

Thompson (1995) in his study "Reconceptualizing the private/public spheres: A basis for home economics theory" had also mentioned that the concept of a livelihood system suggests an integrated household economy with individual members who participate in market or non-market economic activities where the members of the households often live in two systems of action, namely the private and public spheres that are both socially constructed.

Drinkwater and Rusinow (1999) on their paper "Application on CARE's livelihood approach"had mentioned a shift from a materialist perspective focused on food production to a social perspective which focuses on the enhancement of people's capabilities to secure their own livelihoods.

Livelihood Diversification

Janvry (1981) in his study "The Agrarian Questions and Reformism in Latin America" had stated that all the classifications such as farm vs. non-farm; on-farm vs. off-farm activities; local vs. migratory; self-employment vs. wage labour are useful to make sense of the nature of choices entailed by livelihoods diversification process.

Dercon and Krishnan (1996) in their journal "Income Portfolios in Rural Ethiopia and Tanzania: Choices and Constraints" stated that the availability of key assets (such as savings, land, labour, education and/or access to market or employment opportunities, access to CPRs

and other public goods) is an evident requisite in making rural households and individuals more or less capable to diversify. The investment of a proper mix of the above endowments is the starting move of any independent activity.

Hussein and Nelson (1999) in their study "Sustainable Livelihoods and Diversification" suggests that though exogenous trends and shocks play an important role in pushing rural people towards a diversified livelihood strategy, diversification choices are also firmly rooted in the micro-economic logic of farming households.

Sustainable Livelihood

Xaxa, Saha, andSingha (2017)in their work *"Work, Institutions and Sustainable Livelihood"* where the issues and challenges of transformation is the main concern. They hadmentioned that a sustainable livelihood encompasses three main components which are income, production and distribution. They further said that this may be achieved by economic, human, physical and social capital.

Carney (1998) in his study "Sustainable Rural Livelihoods: What contribution can we make?" has said that a sustainable livelihood framework is built around five principal categories of livelihood assets namely physical, human, financial, natural and social and their ability to put these to productive use.

Krantz (2001) in his study "The Sustainable Livelihood Approach to Poverty Reduction" explains the concept of sustainable livelihood is an attempt to go beyond conventional definitions and approaches to poverty eradication. These had been found to be too narrow because they focused only on certain aspects or manifestations of poverty, such as low income.

Gladwin et al. (1995) in their study "Shifting Paradigm for Sustainable Development: Implications for Management Theory and Research" also defines that a sustainable livelihood strategy should be inclusive, connected, equitable, prudent and secure.

Department for International Development (DFID) (2000) in their book published "Achieving Sustainability: Poverty Elimination and the Environment: Strategies for Achieving the International Development Targets" had discussed sustainable development by the framework of vulnerability context which describes the external environment that the poor people live in. This includes critical trends, such as technological trends or population trends. It also includes shocks such as natural disasters or economic inflation, and seasonality which

refer to the way prices, employment opportunities and production might shift with the seasons. All of these factors will affect the assets that people have and thereby the sustainability of their livelihoods.

Singh and Titi (1995) emphasizes that when trying to evaluate whether the results of the project meet the goal of sustainable livelihood it would be useful to have a set of indicators with which to measure the results by. The following are indicators; Food security, Nutritional security, Economic security, Health Security and Educational Security.

Livelihood and Human Capital

Lucas (1997) in his study "International Migration in developing countries: An Overview" identified education, skills, knowledge and health as human capital which spurs the access to gainful livelihoods. This individual human capital has been looked upon as a decisive factor of migration probability. It is blatant that people, who are gifted with education, knowledge, and skills have relatively better advantages in destination labour markets and they do show remarkable probability to migrate.

Sarma (2004)when talking about livelihood in his study "Is rural Economy Breaking Down? Farmers' Suicides in Andhra Pradesh"had observed that the social infrastructure for the elements of human capital such as education, skills and training is to be improved so that people will become capable of achieving gainful employment. He also hinted that care should be paid to spur self-employment on a macro level through the provision of micro credits.

According to De Haan and Zoomers (2003) in their study "Exploring the Frontiers of Livelihood Research", livelihood is about individuals, households, or groups making a living, attempting to meet their various consumption and economic necessities, coping with uncertainties, and responding to new opportunities.

Dolan (2002)in his study "Gender and Diverse Livelihoods in Uganda" had discussed livelihood as Social organization and culture can significantly influence the relative access of diverse gender to a household's capital assets or constraint or promote their mobility.

Livelihood and Infrastructure

Escobal (2001) in his study "The determinants of nonfarm income diversification in rural Peru" had discussed that small enterprise development can become a viable path towards sustainable livelihoods only if some basic conditions are made available to rural households.

These include the availability of a reasonable start-up capital, which depending on the nature of the enterprise may comprehend natural, human labour and know-how, financial like saving and credit, physical such as infrastructure and social cooperative networks assets like cooperative networks; some degree of protection against shocks and negative trends such as social welfare and insurance schemes; supportive structures and processes including rural enterprise enabling policies, business development services, credit, transport and communication infrastructures.

According to the International Federation of Red Cross (IFRC), in their blog "What is Livelihood", a livelihood is sustainable when it enables people to cope with and recover from shocks and stresses (such as natural disasters and economic or social upheavals) and enhance their well-being and that of future generations without undermining the natural environment or resource base.

Livelihood and Financial Capital

Reddy (2001) through his study on "Watershed development and livelihood security: An assessment of linkage and Impact Project Report", reached the finding that improvements in the household income and employment are statistically significant in all the sample villages with the total livelihood assets (financial capital); while fuel wood and water availability were not found significant in all the villages.

Lalitha and Nagaranjan (2002) in their study "Self-Help Groups in Rural Development" are of the view that microcredit studies in India done on groups dealing with dairy farming have noted positive profit levels and short payback periods for loans.

Livelihood and Social Capital

Putnam (2000) in his study, "Bowling Alone: The Collapse and Revival of American Community" on the perspective of social capital had mentioned that a related aspect is that self-help groups have facilitated the formation of social capital, where people learn to work together for a common purpose in a group or organization basically for the promotion of their livelihood.

Livelihood and Natural Capital

Foster (2003) in his study "Living options: ecological capital as 'real options' defined that natural capital is one way that we can account for the various ecological components of

the environment and provide a framework to guide assessment of its current state as well as changes over time.

Wilcox et al. (2003) in their study “Public relations strategies and tactics” argued that natural capital is a useful concept to discuss environmental sustainability for developing indicators that measure ecosystem viability.

Chena et al., (2013) in their study “Measurement and evaluation of livelihood assets in sustainable forest commons governance”, came to the conclusion that, in the process of sustainable forest commons governance, this research employs case studies to quantify and evaluate livelihood assets. The study's objectives are based on two main hypotheses: The livelihood assets of local community inhabitants in the research region have altered as a result of Community Based Co-Management (CBCM), and the changes in livelihood assets differ between CBCM participants and non-participants. The study's findings show that the total value of livelihood assets was 0.56 in 2006 and climbed to 0.71 in 2010, demonstrating that the value of livelihood assets changed significantly between 2006 and 2010. The findings show that the circumstances of livelihood assets change significantly between participants and non-participants in CBCM projects. Physical capital does not rise significantly, but the use of energy-efficient stoves, mash gas pools, and alternative energy sources optimizes the family energy structure and reduces the amount of firewood consumed. The shift in natural capital shows that the majority of local citizens are willing to safeguard forest resources and biodiversity in their subjective perception. Local people's human capital is improving, but their health and medical situation are plagued by a slew of issues that must be addressed. In terms of financial capital, household income and expenditures have both improved significantly, and a variety of new and well-developed livelihood options have emerged. In some areas, such as the status of women and the interaction between the government and communities, social capital has improved significantly. Finally, in the process of sustainable livelihood development and forest common governance, we propose incurring the lowest natural resource costs in order to receive the biggest benefits.

Horticulture

Horticulture is thus presented as an art, a science, and a business. Edwinna von Baeyer (1930) wrote that the horticulture historians believed that horticulture began in the Egyptian temple gardens where fruit trees, palms and grape vines were cultivated. Egyptian horticultural advances however did not happen in isolation, but were borrowed and refined from the

horticultural innovations already found in the Near East and the Middle East. They were one of the most important technologies developed in agriculture and horticulture.

Swamy and Auxcilia (2015) in their internet blog "Fundamentals of Horticulture" are of the view that horticulture is the science and technique of production, processing and merchandising of fruits, vegetables, flowers, spices, plantations, medicinal and aromatic plants. It is also the cultivation of garden plants within a protected enclosure.

Subarhamanyam et, al.(1981) in their study "A study of fruit and vegetable-cold storage unit in Bangalore city" mentioned that horticultural problems like post-harvest losses and its impact on the economy, per capita availability, improved methods to reduce losses, transportation of horticultural crops by rail and roadways and how to avoid wastage in transit, importance of cold storage units.

Hume (1951) comprehensively discusses all aspects of production of horticulture crops in his book entitled "The cultivation of Horticulture crops" comprising thirty-one chapters. In the beginning critical analysis of classifications of horticulture crops is given followed by a detailed description of almost all aspects of production of horticulture crops, from development of root stock to picking.

IIbery (1986) in his study "Horticulture Marketing: The Case of the Vale of Evesham" stated the different marketing channels in the horticulture sector that are produced in Britain and an insight into five marketing channels were also analysed. These are direct marketing, local market, distant market, grower cooperative, and contracts farming.

Ouattara, Graham, Meyer and Nagarajan (1995) in their study "Financing and Marketing Horticulture Products in Ghana: The prospect for Export Growth" stated that several heterogeneous participants are involved in financing and marketing horticultural products in Ghana. Financial arrangements in the sub-sector are dominated by self-finance with funds obtained from friends and family, retained earnings from other businesses or participation in informal groups. However formal finance is confined almost exclusively to well establish large exporters.

Trupo (1997)in his study "Agriculture Cooperation and Horticultural Produce Marketing in Southwest Virginia by Paul Trupo" stated the key issues relevant for successfully establishing a horticultural cooperative and role of the government in assisting to overcome the market failure. He also focuses on the various aspects of organizing & operating

horticulture. Where he mentioned that cooperative will increase the livelihood of a long-life span for cooperative and profitable return for the cooperative members. The research also implies that small farmers can compete with the larger, well established producer of fresh horticultural produce if they exploit a local marketing advantage and organize themselves in a manner that allows them to pool resources, reduce costs and share risk.

Singh and Mathur (2008) in their journal "Structural changes in horticulture sector in India: Retrospect and prospect for XIth five-year plan" stated the role of the horticultural sector of the country and its prospects during the eleventh five-year plan period. They mentioned in their study that high value commodities contributed substantially in national agricultural export and around half of this is shared by horticultural commodities. The growth and variability of area, production and yield of major horticultural sub-sector indicate that substantial growth has occurred in the area of all the sub-sector during the entire period (1991-92 to 2005-06). It is suggested that diversification of agriculture would increase through inclusion of horticultural crops in the cropping pattern

Dragon Fruit

Eusebio and Alaban (2018) in their study, "Current status of Dragon Fruit and its Prospects in the Philippines" had mentioned that due to the production and economic importance, the fruit is categorised under a high value crop which showed a competitive advantage for the local fruit industry.

Tepora (2019) had done a study in the Philippines on the "Problems and Opportunities of Dragon Fruit Production in the Philippines" where he had found out that the plant has a great potential as a commercial crop due to its continuously increasing plantation area. But despite the increasing amount of harvest, the fruits have been infected and damaged from the inside by insects which can still look fresh from the outside. In some cases,this rendered the fruit unmarketable due to its unattractive appearance. He also suggested that an Integrated Pest Management program utilizing environmentally friendly control measures that will reduce risk to human health and environment must be developed to address emerging problems on pests and diseases. Minimizing post-harvest losses can increase meeting the demands for fresh fruits, and post-harvest infrastructure and management must be given ample attention.

Pascua, Pascua and Gabriel (2015) in their study "Dragon Fruit Production and Marketing in the Philippines: Its Status, Constraints and Prospects" has come to the conclusion that, low yield, prevalence of insect pests and diseases, short shelf life of fruits, no

standardization of fruit quality, no continuous supply of fruits, problems on marketing among others are identified as the major constraints in the production of the fruit.

Tagay (2017) in his study in the Philippines identifies the key players of the supply chain where she includedinput suppliers, dragon fruit growers, transporters, wholesalers and final consumers under the supply chain. She also mentioned that a total of 2,405,104 kg of dragon fruit were harvested in the past five years, with an average yearly increase of about 500,000 kg from the total land area of 70 ha under dragon fruit cultivation with 1,008 farmers as beneficiaries. A modest forecast of 1,414,714 kg of dragon fruit was determined for the year 2016 alone.

Rijal (2019) in his study "Dragon Fruit: Fruit for Future Nepal" has mentioned that the price of Dragon fruit is 3-4 times higher than any other horticulture crops. This has enabled farmers to have a good amount of income from their production and also add value to the agro-tourism in Nepal. He further mentioned that it is beneficial for small landholders and marginal farmers to improve their livelihood. However, he further mentioned that normal Nepalese farmers are unable to invest huge money because agriculture is a risk itself. So, he suggested that the government must also provide subsidy, training, related various extension works through NARC, INGOs, NGOs for better results.

Industries

Overgaauw (1992) in his journal "Packaging for fresh fruits and vegetables" mentioned that packaging of fresh fruits and vegetables is both difficult and costly. Different aspects of packaging of fresh fruits and vegetables are discussed including cost, dimensions, distribution, norms and preferences, shelf life, microclimate, box specification, compression test, recycling and labelling, describing the cost of packaging. He also pointed out two main reasons for high packaging cost i.e. import of carton material and low cost of produce. In most of the cases, the packing material, usually called "Kraft lies" has to be imported and as the cost of produce itself is very low, the proportion of packaging cost in the total cost is usually high.

The overview of literature shows that there is an ever growing literature on the cultivation of dragon fruit which is based on varied context in certain developing. In the context of India there is hardly any literature to be found on the topic study. The research gaps can also be noted as the following.

Firstly, there is absence of the study of the livelihood conditions of the farmers the only literature that can be found within India especially in the state of Mizoram is the progress reports of the departmental works and not of the farmers (for instance see Central Agriculture University, 2017). This may be due to the importance given on the quantity of product rather than giving importance on the condition of living of the farmers who are dragon fruit growers since the cultivation of dragon fruit is still emerging in Mizoram.

Secondly, among the few studies conducted, most focus is on the prospect, opportunities and constraints (for instance see Eusebio&Alaban, 2018; Tepora, 2019; Pascua, Pascua & Gabriel, 2015; Tagay, 2017; Rijal, 2019). None have done any study on the livelihood and living conditions of dragon fruit growers who are mostly labourers working in the farms who are landless and marginal workers in the context of Mizoram. This is also evident from the studies of other countries that there is no study to be found that the farmers are the subject of the study, rather, the farming itself is studied for the economic and promotion of dragon fruit cultivation.

Lastly, most of the studies are quantitative in methodological orientation and the use of qualitative or participatory methods to study the vulnerable contexts, livelihood challenges, and livelihood strategies are rarely seen. The role of institutions such as cooperatives as well as livelihood outcomes of the farmers are also rare.

The study will try to fill the research gaps which can be seen from these literatures especially in the context of Mizoram. The study will be based on the Sustainable Livelihood Framework in order to understand the patterns of livelihood and the problems of the dragon fruit growers.

Sustainable Livelihood Framework

Sustainable Livelihood Framework (SLF) has been developed by the Department for International Development (DFID) in the year 1997 to eliminate poverty in poor countries. The DFID makes use of livelihood approaches in planning the programme, project, monitoring and in reviewing existing activities. The principles of Sustainable Livelihood Approach (SLF) include people-centred, holistic, dynamic, sustainability, building on strengths and macro-micro links, these principles help in fulfilling the objectives. The use of Framework can be understood as a tool or checklist to understand poverty from the perspectives and

understanding of poverty from the poor people. The key elements of the Sustainable Livelihood Framework (see Figure 1) are:

Vulnerability Context: It is the environment where people live, and the trends, seasonality, shocks which affect the livelihood of people and people have no control over them. The vulnerability occurs when people have to face thread or shocks with inadequate capacity to respond to them.

Livelihood Assets: The livelihood approach concerned first with the people, it tries to understand the strengths like assets or capital that people have. The Framework outlines five types of assets like human capital, social capital, natural capital, financial capital and physical capital.

Policies, Institutions and Processes: The policies, laws, institutions and processes cannot be overemphasized because they operate at every level and play a vital role. They determine access to assets and influence decision making.

Livelihood Strategies: It comprises the activities and choices people make to fulfil the goals of their livelihood. It is a dynamic process in which activities are combined to meet their needs on time. It directly depends on asset status, policies, institutions and processes.

Livelihood Outcomes: It is the achievements or results of livelihood strategies such as more income, increased well-being, reduced vulnerability, improved food security and more sustainable use of natural resources.

The Sustainable Livelihood Framework focuses mainly on the poor as well as involving them in the processes with respecting their opinions. They aim to bring short and long term changes and it allows pointing out the various processes which influence one another.

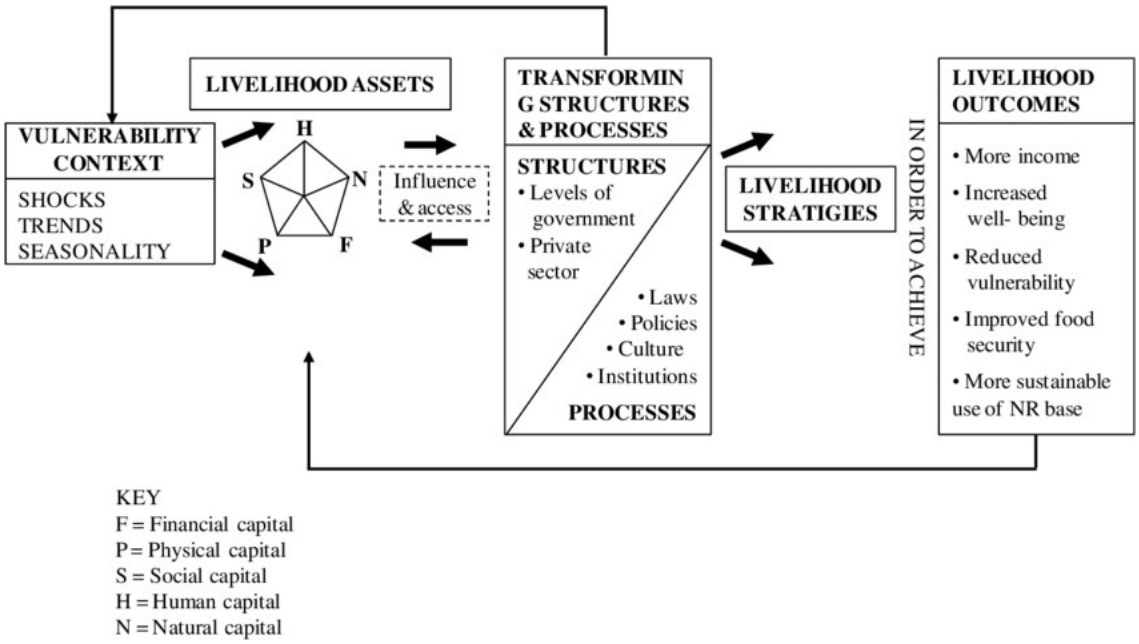

Figure 1 Sustainable Livelihood

Source: Department for International Development (DFID)

CHAPTER III

METHODOLOGY

The methodology chapter includes the research methodology and design of the present study. The methodology chapter is presentedas research design, sampling, tools of data collection, data processing andanalysis of processed data.

Research Design

The present study isexplanatoryindesign and it adopted a quantitative method. The primary data is collected throughquantitative method where pre-tested structured household interview schedule. The secondary data will be collected through articles, journals and other forms of publications

Sampling

The universe of the study includes all the dragon fruit cultivators under Aizawl Horticulture division in Aizawl District.The unit of the study will be an individual dragon fruit cultivator household.

A multistage sampling procedure is employed to select Circles, villages and households in Aizawl District of Mizoram. Sample size is 40 household.

1. In the first stage, two circles were purposefully chosen from the Aizawl Horticulture Division namely, Aizawl South Circle and Thingsulthliah Circle as they are the circle with higher number of dragon fruit cultivators.
2. In the second stage, four villageswith large number of dragon fruit cultivators are selected. From Thingsulthliah circle two village namely ThingsulthiahvillageandSesawngvillage were selected.From Aizawl South CircleSamtlangvillage and Hlimenvillage were selected.
3. In the third stage, Tendragon fruit cultivator household are randomly selected from each villages.

Tools of Data Collection

Primary data is collected using survey and secondary data include information from books, research articles, government records and online resources. Field surveywas conducted to collect quantitative data using a pretested structured household interview schedule. The interview schedule includes socio-demographic and economic characteristics of respondent

households, assets and living conditions. It also probed into the challenges and coping strategies used by the households in the process of dragon fruit cultivation.

Data Processing and Analysis

The quantitative data collected were processed using Microsoft Excel and SPSS (Statistical Packages for the Social Sciences)andanalysed using simple percentages, ratios, average. Apart from this 't' test andKarl Pearson's product moment correlationwere also used to test hypotheses. Analysed data has been presented in the form of a table.

Ethical Consideration

Consent has been taken from the farmers who are selected for respondents and in case if the farmers are a member of any kind of association or society related to Dragon Fruit cultivation, the consent of the respective association or society was also taken to conduct survey among them.The identity of the respondent are confidential and information collected will only be used for academic purpose.

Limitation of the study

The present study represents only a fraction of the whole dragon fruit cultivation of Mizoram since the study area is confined to Aizawl District. Whatever the limitations may be, all efforts are given so that the selected samples depict the right information of Aizawl District. Moreover the process of dragon fruit cultivation is in its initial stage so it may be immature to draw conclusion on its impact on livelihood and living condition.

CHAPTER IV
LIVELIHOOD AND LIVING CONDITIONS OF DRAGON FRUIT CULTIVATORS

The previous chapter describes the profile of the study area and the methodology of the present study. This chapter presents the analysis of the data collected through field surveys. The livelihood and living condition of dragon fruit cultivators are analysed by studying the social structural base of the respondents and livelihood assets of the dragon fruit cultivator households.

4.1. Structural Base of the Respondents

The social structural base of respondents consists of the profile of the respondents and the family profile of the respondents.

4.1.1. Profile of the Respondents

The profile of the respondents consists of certain variables such as the tribe, subtribe, religion, and denomination while the educational profile is presented as the educational qualification of the respondents (see Table4.1.1).

All the respondents in the present study belongs to the Mizo tribe.The sub-tribes observed in the present study areLusei, Paite, Ralte and Hmar. Among the sub tribe observed majority belongs to Lusei (94%) followed by Ralte, Hmar and Paite who constitute 2% each. Lusei tribe accounts for the highest in Mizoram which is reflected in the present study.

As Christianity is the main religion in Mizoram majority of the respondents in the present study belongs to Christianity (98%) and the remaining respondents belongs to other religion (2%) such as Muslim and Hindu. Christianity is further divided into different religious denomination in Mizoram. The denomination of the respondents observed in the present study are Presbyterian, United Pentecostal Church (Mizoram), United Pentecostal Church (North East India) Salvation Army, Seventh Day Adventist, Roman Catholic and Local Denominations. Among the denominations, Presbyterian (70%) constitute the largest followed by Salvation Army (16%), Seventh Day Adventist (4%) and Local Denomination (4%) and UPC Mizoram (2%), UPC North East(2%) and Roman Catholic (2%).

The education qualification of the respondents arecategorised as Illiterate, Primary School, Middle School, High School, Higher Secondary School, and Graduate and Above. Most of the respondents belongs to Middle School (35%) and High School (30%) followed by Primary School (17%), Graduate and above (10%), and Higher Secondary School (4%). Only 2% of the respondents belong to illiterate.

Table4.1.1 Profile of the Respondents

Sl. No	Particulars	N=40 f	Percentage
I	**Tribe**		
	Mizo	40	100
II	**Sub Tribe**		
	Lusei	37	94
	Paite	1	2
	Ralte	1	2
	Hmar	1	2
III	**Religion**		
	Christian	39	98
	Others	1	2
IV	**Denomination**		
	Presbyterian	28	70
	UPC (M)	1	2
	UPC (NEI)	1	2
	The Salvation Army	5	16
	Seventh Day Adventist	2	4
	Roman Catholic	1	2
	Local Denomination	2	4
V	**Educational Qualification**		
	Illiterate	1	2
	Primary	7	18
	Middle	14	36
	High School	12	30
	Higher Secondary	2	4
	UG &above	4	10

Source: Computed

4.1.2. Family Profile

To study the family profile in the present study certain variables are taken into account viz., types of family, forms of family and size of family while the socio-economic profile consisted of the socio-economic category (see Table 4.2) and the family occupation of the respondents (see Table 4.1.2).

The types of family observed in the present study are classified as Nuclear and Joint Family. Majority of the respondent family belongs to nuclear family (62%) while Joint family constitute only 38%.Nuclear family is higher as Mizo have the tradition of only the youngest staying with parents and the other brothers moved out of the house.

The forms of family in the present study are classified as broken, reconstituted and stable. In the present study, all the respondent family declare that they belong to a stable form of family.

The size of the family in the present study was categorised as Small (Less than 3 members), Medium (4 to 7 members) and Large (Above 7 members). The mean score of size of family shows that Dragon fruit cultivators belong to medium size family. Among the respondent's family medium (40%) constitute the largest followed by large (33%)and small (20%).

The Socio-Economic category observed in the present study is classified into Antyodaya Anna Yojana (AAY), Below Poverty Line (BPL) and Above Poverty Line (APL). Dragon Fruit Cultivators family belong to a diverse socio-economic background where Above Poverty Line (47%)constitutes the largest followed by Below Poverty Line (43%)and Antyodaya Anna Yojana (10%).

Table4.1.2: Family Particulars

Sl. No	Family Particulars	N=40 f	Percentage
I	**Type of Family**		
	Nuclear	25	62
	Joint	15	38
II	**Form of Family**		
	Stable	40	100
III	Size of Family		
	Small (1-3)	8	20
	Medium (4-7)	19	47
	Large (7 and above)	13	33
	Mean	5.1	
IV	Socio Economic Category		
	AAY	4	10
	BPL	17	43
	APL	19	47

Source: Computed

The family occupation of the respondent family was categorised into Primary Occupation, Secondary Occupation and Tertiary Occupation. The occupation of the respondent families is further classified into Government Servant, Animal Husbandry, Cultivator, Labour and business (see Table 4.1.3).

Among the primary occupation observed in the present study majority of the respondents are cultivators (78%) followed by Government Servant (10%) and Animal Husbandry (10%) 2% are categorised as other Occupation.

Among the respondent family's majority do not engaged in any kind of occupation as a Secondary Occupation (68%). Only a few families have secondary occupation like Government Servant (15%) and Cultivator (15%) and 2% were engaged as Daily Labour.

Only 4% of the respondent families in the present study have Tertiary Occupation where 2% engaged in Animal Husbandry and Business respectively.

Table4.1.3: Family Occupation

Sl. No	Source of Income	N=40 F	Percentage
I	Primary Occupation		
	Govt. Servant	4	10
	Cultivator	31	78
	Animal Husbandry	4	10
	Others	1	2
	Mean	271500	
II	Secondary Occupation		
	No Occupation	27	68
	Govt. Servant	6	15
	Cultivator	6	15
	Labourer	1	2
	Mean	65500	
III	Tertiary Occupation		
	No Occupation	38	96
	Animal Husbandry	1	2
	Business	1	2
	Mean	7500	

Source: Computed

4.2. Livelihood Assets of the Dragon Fruit Cultivator Households

To understand the livelihood assetsof dragon fruit cultivators in the present study, the physical capital, financial capital and social capital of respondenthouseholdsare explored.

4.2.1. Physical Capital

The physical capital of the dragon fruit cultivators is probed in the form of amenities owned by respondent households in the present study where different household properties are takin into account. The household amenities observed in the present study are Water Connection, Electricity, Septic Tank, LP Gas, Land, Ration Card, Mobile Phone, Two Wheelers, Four Wheelers and Housing (See Table 4.2.1).

All the respondent households ownedration card, septic tank,mobilephone,electricityconnectionand Gas connection in their house. Majority of the respondent households owned Land (98%),two wheelers (85%) and 98% household in the present study live in their own home. In the meantime, 72% households do not have water connection and 77% of respondents household do not own four wheelers.

Table No 4.2.1: Physical Capital

Sl. No	Household Amenities	N=40	
		Owned	Not Owned
1	Water connection	11	29
		(28)	(72)
2	Electricity	40	0
		(100)	(0)
3	Septic tank	40	0
		(100)	(0)
4	LP Gas	40	0
		(100)	(0)
5	Land	39	1
		(98)	(2)
6	Ration card	40	0
		(100)	(0)
7	Mobile Phone	40	0
		(100)	(0)
8	Two Wheelers	34	6
		(86)	(14)
9	Four Wheelers	9	31
		(23)	(77)
10	Housing	39	1
		(98)	(2)

Source: Computed **Figures in parenthesis are percentage**

4.2.2. Financial Capital

Since most Mizo family are unwilling to share their financial information as they believed to be a taboo, debt and household saving activityespecially are not shared openly therefore many of the information may not be accurately measured. However, the financial capital might reflect the pattern and outline of financialcapital owned. Financial Capital of Dragon fruit cultivators are probed in terms of the household incomeand household expenditure.

4.2.2.1.Household Income

The source of household income of dragon fruit cultivators in the present study observed are Govt. Servant, daily waged labourer, cultivation,Business, animal husbandry (see Table 4.2.2.1).

It is observed that majority households use cultivation (78%) as their primary source of income and the rest also use animal husbandry (10%) and Govt. Servant (10%) as a source of income and the remaining 4% household used other type of occupation as a primary source of income. The mean annual household income from a primary source of income is Rupees 2,71,500/-.Only a few households have secondary source of income that is Govt. Servant (15%), cultivation (15%), and labourer (2%). The mean household income from secondary source is Rupees 65,500/-. Only animal husbandry (2%) and business (2%) were used as a tertiary source and the mean annual households' income from the tertiary source is also only Rupees 7,500/-.

The amount of household income of dragon fruit cultivators from all sources are categorisedasBelow 1 Lakh, 1 lakh to 5 lakh, 5 lakh to 10 lakh, and Above10 lakh.Among the dragon fruit cultivator's household majority belongs to income between 1 Lakh to 5 lakh (77%) followed by 5 Lakh to 10 lakh (13%), Above 10 lakh (8%) and Below 1 lakh (3%). The average household income of dragon fruit cultivators from all sources is Rupees 3,44,500/-.

Table 4.2.2.1: Household Income

Sl. No		N=40 f	Percentage
I	**SOURCE OF INCOME**		
A	**Primary Source**		
	Govt. Servant	4	10
	Cultivator	31	78
	Animal Husbandry	4	10
	Others	1	2
	Mean	271500	
B	**Secondary Source**		
	No Occupation	27	68
	Govt. Servant	6	15
	Cultivator	6	15
	Labourer	1	2
	Mean	65500	
C	**Tertiary Source**		
	No Occupation	38	96
	Animal Husbandry	1	2
	Business	1	2
	Mean	7500	
II	**ANNUAL HOUSEHOLD INCOME**		
		N=40	
	Amount of Income	f	Percentage
	Below 1 Lakh	1	3
	1 Lakh to 5 Lakh	31	77
	5 Lakh to 10 Lakh	5	13
	Above 10 Lakh	3	8
	Mean	344500	
	Std. Dev.	325474	

Source: Computed

4.2.2.2. Household Expenditure

The monthly household expenditure of the dragon fruit cultivators in the present studyobserved are expenditure on Food, Electricity, Water, Phone, Clothing Transport, Medication, Religious & Cultural Contribution and others (see Table4.2.2.2).

The pattern of average monthly household expenditure of dragon fruit cultivators in the present study shows that it is highest on expenditure on food (Rs. 5842) followed by Religious & Cultural contributions (Rs. 3482), Electricity bill, Clothing (Rs 1570), Transport (Rs 1355), (Rs. 738), Phone Bill (Rs 643), medical expenses (Rs 616), and Water (Rs. 553). The dragon fruit cultivatorhousehold also have expenditure on other areas (Rs957)not listed above.

There are some households which do not have expenditure on phone, clothing and water as they don't owned phone and water connection. Family with good health condition do not have expenditure on medication.

Table 4.2.2.2: Household Expenditure

	Monthly Household Expenditure	**N=40**			
Sl. No		**Minimum**	**Maximum**	**Mean**	**Std. Dev**
1	Food	1800	20000	5842.5	4872.4
2	Electricity	150	14200	738.75	2196.0
3	Water	0	6000	553.75	1121.0
4	Phone	0	2000	643.75	426.6
5	Clothing	0	5000	1570	929.9
6	Transport	200	10000	1355	1592.3
7	Medication	0	5000	616.25	890.4
8	Religious and Cultural contributions	300	20000	3482.5	3942.9
9	Others	100	10000	957.5	1766.2

Source: Computed

4.2.3. Social Capital

The social capital of the dragon fruit cultivators isstudied in terms of their participation in the community. As Mizo society is communitarian in nature participations in different community-based organisations and religious institutions are highly valued.A part from this participation in elections is also regarded as involvement in political endeavour. To understand political contribution as a citizen participation in the general, assembly and village council elections are analysed.

4.2.3.1. Community Participation

In the present study the major organisation taken for measuring social capital are Young Mizo Association (YMA), MizoUpa Pawl (MUP), MizoHmeichhiaInsuihkhawm Pawl (MHIP), Games & Sport, Church, Church based Youth Association, Self-Help Group (SHG) and others small groupswhich are measured in a four-point scale viz., never, sometimes, mostly, always (See Table No 4.2.3.1).

Dragon fruit cultivatorsalways participated in Church (2.7).Mizo regarded religion as important therefore participation in church is rated the highest. They also mostly participated in YMA (2.2), and Church based youth association(2.1). The participation is also rated as sometimes in someorganisations which have specific membership viz., MUP (1.0), MHIP (1.4), Games and Sports (1.2), SHGs (1.3).

Participation in church is rated as Always (67%) by majority followed by Mostly (33%).This shows how religion and church is important in social life of the Mizos. As Church youth organisation is also a part of church the rate of participation is Always (47%) followed by Mostly (30%), Never (13%), Sometimes (10%).

YMA is one of the largest NGO and deemed important by every individual because of its role in community.Participation in YMA is rated by majority as Mostly (52%) followed by always (35%), Sometimes (8%) and Never (5%).

MHIP is a women organization where women Mostly (52%) participated when there is opportunity. 20% declare that they sometimes participated and only few (5%) always participated. 23% never participated because they are not a member of MHIP.

Self Help Groups is also one of the social institutions for women but associated with micro finance.So the level of participation is also rated as Always (27%), Sometimes (23%), and Mostly (5%). But 43% declare that they are not involved in Self Help Groups.

Games and Sports Associationis recreational in nature and mostly youth are participating in it. The respondents rated their participation asMostly (32%), Sometimes (32) and Always (8%). But 28% never participated in Games and Sport activities.

MizoUpa Pawl is an organisation of Elderly whose activity confined to certain limitations. 37% of the respondents are not a member and never participated in MUP. The level of participation is rated as Sometimes (35%), Mostly (23%) and Always (5%).

Table 4.2.3.1: Community Participation

Sl. No	Community Participation Particulars	N=40					
		Never	Sometimes	Mostly	Always	Mean	Std. Dev.
1	YMA	2	3	21	14	2.2	0.8
		(5)	(8)	(52)	(35)		
2	MUP	15	14	9	2	1.0	0.9
		(37)	(35)	(23)	(5)		
3	MHIP	9	8	21	2	1.4	0.9
		(23)	(20)	(52)	(5)		
4	Games and Sports Association	11	13	13	3	1.2	0.9
		(28)	(32)	(32)	(8)		
5	Church	0	0	13	27	2.7	0.5
		(0)	(0)	(33)	(67)		
6	Church based Youth Association	5	4	12	19	2.1	1.0
		(13)	(10)	(30)	(47)		
7	SHGs	18	9	2	11	1.3	1.3
		(43)	(23)	(5)	(27)		
8	Others	20	14	5	1	0.7	0.8
		(50)	(35)	(12)	(3)		

Source: Computed **Figures in parenthesis are percentage**

4.2.3.2. Voting in Elections

Voting and participation in election is regarded as an obligation for responsible citizens and therefore occupy an important part in social life. Participation of Dragon Fruit Cultivation in voting is measured in terms of voting in General, Legislative Assembly,and Local/Village Councilwhich is rated with 4 point scale viz., None, Some, Most, All (See Table No 4.2.3.2).

Dragon Fruit Cultivator household members allvoted in General election (2.5) and Village Council (2.5) where most of the family members voted in Legislative Assembly (2.3).The level of participation in voting is relatively high.

In terms of voting in General election 67% respondent families declare that they all voted in where 20% declare that the family members mostly voted. 8% respondent family

declare that some of the family member voted and 5% declare that they never voted in General Election.

In Legislative Assembly Election62% of the family declare that all family member voted and 15% declare that most of the family members voted. 8% family declare that only some of them voted and 15% family declare that they never voted in Legislative Assembly Election.

Voting in Local/Village Council Election is regarded as important. 67% respondent families declare that they all voted Local/Village Council Election where 23% declare that the family members mostly voted. 5% respondent family declare that some of the family member voted and 5% declare that they never voted in Local/Village Council Election.

Table 4.2.3.2: Participation in Election

Sl. No	Members voting for Election Particulars	N=40					
		None	Some	Most	All	Mean	Std. Dev
1	General	2	3	8	27	2.5	0.8
		(5)	(8)	(20)	(67)		
2	Legislative Assembly	6	3	6	25	2.3	1.1
		(15)	(8)	(15)	(62)		
3	LocalCouncil/Village Council	2	2	9	27	2.5	0.8
		(5)	(5)	(23)	(67)		

Source: Computed **Figures in parenthesis are percentage**

Hypothesis1: Living conditions of the farmer household are directly related to its access to natural resources.

The hypothesis is to find out whether there is a relation between the household and the access to natural resources. Here we have taken both the household income and the household expenditures for the living conditions along with domestic animals owned to represent the natural resources.

As for the correlation between income and natural resources, the primary income is correlated with the ownership of Fish (.0556) at 0.01 level of significance and it is not correlated with Pig (0.101), Poultry (-0.006) and Cow (0.017) and they are not significant. The secondary income does not have correlation with any of the natural resources which are Pig (-0.007), Poultry (0.007), Cow (0.112) and Fish (0.065) which shows that they are not significant to each other. The tertiary income also tends to have correlation with Fish (0.421) at 0.01 level of significance and does not have correlation and are not significant with Pig (0.054), Poultry (-0.048) and Cow (-0.035).

However, the household expenditure and natural resources does not have a significant relationship even at 5 percent level of significance.

Table4.9: Living Conditions and natural capital

		Pig	Poultry	Cow	Fish
Household Income	**Primary Income**	0.104	-0.006	0.017	**.556****
	Secondary Income	-0.007	0.007	0.112	0.065
	Tertiary Income	0.054	-0.048	-0.035	**.421****
Household Expenditure	**Food**	-0.267	-0.035	-0.128	0.122
	Electricity	0.034	-0.047	-0.04	-0.007
	Water	-0.192	-0.103	-0.066	0.196
	Phone	-0.266	-0.121	-0.017	0.04
	Clothing	-0.273	-0.131	-0.099	0.147
	Transport	-0.031	-0.048	-0.087	-0.038
	Medication	-0.174	-0.118	-0.058	0.056
	Religious and Cultural contributions	-0.134	-0.132	-0.123	0.214
	Others	-0.08	-0.083	-0.065	-0.005

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

* Correlation is significant at the 0.05 level (2-tailed).

Source: Computed

Hypothesis2: Living conditions of the farmer household are directly related to its access to physical capital.

The living condition and physical capital are taken into account in order to the whether there is a relation between the living condition and the access to the physical capital. The household expenditure and household income are both taken into account in order to represent the living conditions and the amenities owned by the dragon fruit cultivators are considered to represent the physical capital.

The household expenditure on Food is significantly correlated to Electricity (0.437) at 0.01 level of significance while the expenditure on Food is does not have a significant relationship with Water Connection (0.089), Toilet (0.218), LPG (0.265), Land Owned (0.028), Ration Card (0.028), Mobile Phone (0.24), Two Wheelers (0.096) and Four Wheelers (0.278) even at 5 percent level of significance.

The household expenditure on electricity has a significant relationship with Toilet (0.514) and Mobile Phone (0.425) at 0.01 level of significance and Two Wheelers (0.320) at 0.05 level of significance. The expenditure on electricity is not correlated with the remaining amenities such as, Water Connection (-0.104), Electricity (-0.025), LPG (0.302), Land Owned (0.01), Ration Card (-0.003) and Four Wheelers (0.252) even at 5 percent level of significance.

The expenditure on water has a correlation with Toilet (0.544) and Mobile Phone (0.425) at 0.01 level of significance and does not have a significant relationship with Water Connection (0.141), Electricity (0.103), LPG (0.272), Land Owned (0.066), Ration Card (-0.066), Two wheelers (0.256) and Four Wheelers (0.207) even at 5 percent level of significance.

The expenditure on Phone has a significant relationship with Ration Card (0.516) at 0.01 level of significance and Toilet (0.327) at 0.05 level of significance. It does not have a significant relationship with Water Connection (-0.011), Electricity (0.031), LPG (0.142), Land Owned (0.245), Mobile Phone (0.309), Two Wheelers (0.076) and Four Wheelers (0.123) even at 5 percent level at significance.

The expenditure on Clothing is correlated with Mobile Phone (0.324) at 0.05 level of significance and the expenditure on Clothing do not have any correlation with the remaining amenities such as; Water Connection (-0.12), Electricity (0.17), Toilet (0.01), LPG (0.132), Land Owned (-0.075), Ration Card (-0.187), Two Wheelers (0.05) and Four Wheelers (-0.263) even at 5 percent level of significance.

The expenditure on Transport is correlated with Toilet (0.635), LPG (0.436), Mobile Phone (0.534) and Two wheelers (0.435) at 0.01 level of significance. While on the other hand, it does not have significant relationship with Water connection (-0.207), Electricity (0.021), Land Owned (0.067), Ration Card (-0.036) and Four Wheelers (0.23).

The expenditure on Medication does not have any significant relationship with the amenities even at 5 percent level of significance.

The expenditure on Religious and Cultural Contributions has a significant relationship with Toilet (0.423) and LPG (0.415) at 0.01 level of significance and it does not have any correlation with Water connection (-0.309), Electricity (0.237), Land Owned (0.123), Ration Card (-0.061), Mobile Phone (0.226), Two Wheelers (0.02) and Four Wheelers (0.184) even at 5 percent level of significance.

Other expenditure has a significant correlation with Toilet (0.374) and Mobile Phone (0.327) at 0.05 level of significance. While on the other hand, it does not have any correlation with Water Connection (-0.203), Electricity (-0.054), LPG (0.28), Land Owned (0.07), Ration Card (-0.06), Two wheelers (0.063) and Four wheelers (0.126) even at 5 percent level of significance.

Table4.10: Amenities and Household Expenditure

		Amenities								
		Water Connection	**Electricity**	**Toilet**	**LPG**	**Land Owned**	**Ration Card**	**Mobile Phone**	**Two Wheeler**	**Four wheelers**
Household Expenditure	**Food**	0.089	**.437****	0.218	0.265	0.028	-0.028	0.24	0.096	0.278
	Electricity	-0.104	-0.025	**.514****	0.302	0.01	-0.003	**.425****	**.320***	0.252
	Water	-0.242	0.103	**.544****	0.272	0.066	-0.066	**.469****	0.256	0.207
	Phone	-0.011	0.031	**.327***	0.142	0.245	**.516****	0.309	0.076	0.123
	Clothing	-0.23	0.17	0.01	0.132	-0.075	-0.187	**.324***	0.05	-0.263
	Transport	-0.207	0.021	**.635****	**.436****	0.067	-0.036	**.543****	**.435****	0.23
	Medication	-0.171	0.035	-0.044	-0.017	0.021	-0.112	0	-0.304	-0.158
	Religious and Cultural contributions	-0.309	0.237	**.423****	**.415****	0.123	-0.061	0.226	0.02	0.184
	Other Expenditure	-0.203	-0.054	**.374***	0.28	0.07	-0.06	**.327***	0.063	0.126

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Source: Computed

The Primary income is related to Electricity (0.592), Toilet (0.613) and Four Wheelers (0.547) at 0.01 level of significance and also related to LPG (0.349) at 0.05 level of significance. On the other hand, it does not have any correlation with Water Connection (-0.001), Land Owned (-0.077), Ration Card (-0103), Mobile Phone (0.212) and Two Wheelers (0) even at 0.05 level of significance.

The Secondary income is significantly correlated to LPG (0.497), Mobile Phone (0.516) and Two Wheelers (0.580) at 0.01 level of significance. Its does not have any significant relationship with Water Connection (0.018), Electricity (0.009), Toilet (0.288), Land Owned (-0.019), Ration Card (0.046) and Four Wheelers (-0.049) even at 0.05 level of significance.

The Tertiary income is correlated with Toilet (0.564) at 0.01 level of significance and also correlated with Mobile Phone (0.386) and Four Wheelers (0.334) at 0.05 level of significance. Tertiary income does not have any significant relationship with Water Connection (-0.134), Electricity (0.282), LPG (0.281), Land Owned (0.035), Ration Card (-0.035) and Two wheelers (0.132) even at 0.05 level of significant.

Table4.11: Amenities and Financial Capital

		Household Income		
		Primary Income	**Secondary Income**	**Tertiary Income**
Amenities	**Water Connection**	-0.001	0.018	-0.134
	Electricity	**.592****	0.009	0.282
	Toilet	**.613****	0.288	**.564****
	LPG	**.349***	**.497****	0.281
	Land Owned	-0.077	-0.019	0.035
	Ration Card	-0.103	0.046	-0.035
	Mobile Phone	0.212	**.516****	**.386***
	Two Wheelers	0	**.580****	0.132
	Four wheelers	**.547****	-0.049	**.334***

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Source: Computed

Hypothesis3: Living conditions of the farmer household are directly related to its access to human capital.

The living condition and human capital are taken into account in order to the whether there is a relation between the living condition and the access to the human capital. The household expenditure and household income are both taken into account in order to represent the living conditions and the educational qualification, source of orientation for dragon fruit cultivation, training attended, ownership of manual books and no. of years cultivated by the dragon fruit cultivators are considered to represent the human capital.

The Primary income is significantly related with Educational qualification (0.706) at 0.01 level of significance and it does not have a significant relationship with Source of orientation (0.062), Attended training (-0.128), Ownership of manual book (-0.133) and No of years cultivated (-0.204) even at 5 percent level of significance.

The Secondary income does not have any significant relationship with the Human Capital even at 5 percent level of significance.

The Tertiary income is correlated with Educational Qualification (0.455) at 0.01 level of significance and it is not correlated with Source of orientation (-0.117), Attended training (0.109), Ownership of manual book (0.019) and No of years cultivated (0.081) even at 5 percent level of significance.

The expenditure on Food is correlated with Educational Qualification (0.460) at 0.01 level of significance and it is does not have any significant correlation with Source of orientation (0.136), Attended training (-0.101), Ownership of manual book (-0.073) and No of years cultivated (-0.131) even at 5 percent level of significance.

The expenditure on Electricity is correlated with Educational Qualification (0.340) at 0.01 level of significance and it is does not have any significant correlation with Source of orientation (-0.098), Attended training (0.093), Ownership of manual book (0.095) and No of years cultivated (0.112) even at 5 percent level of significance.

The expenditure on Water is significantly correlated with Educational Qualification (0.331) at 0.01 level of significance and it is does not have any significant correlation with Source of orientation (-0.118), Attended training (0.211), Ownership of manual book (-0.009) and No of years cultivated (0.112) even at 5 percent level of significance.

The expenditure on Transport is significantly related with Educational Qualification (0.419) at 0.01 level of significance and it is does not have any significant correlation with Source of orientation (-0.099), Attended training (0.18), Ownership of manual book (0.08) and No of years cultivated (0.167) even at 5 percent level of significance.

The Expenditure on Phone, Clothing, Medication and Religious and Cultural contributions does not have any significant relationship with the Human Capital even at 5 percent level of significance.

Table4.12: Living Conditions and Human Capital

		Human Capital				
		Educational Qualification	**Source of orientation Dragon Fruit cultivation**	**Attended training**	**Own any manual or book on Dragon fruit**	**No of years Cultivated**
Household Income	**Primary Income**	**.706****	0.062	-0.128	-0.133	-0.204
	Secondary Income	0.215	-0.128	0.085	0.189	0.042
	Tertiary Income	**.455****	-0.117	0.109	0.019	0.081
Household Expenditure	**Food**	**.460****	0.136	-0.101	-0.073	-0.131
	Electricity	**.340***	-0.098	0.093	0.095	0.112
	Water	**.331***	-0.118	0.211	-0.009	0.112
	Phone	0.203	0.072	0.245	-0.3	-0.06
	Clothing	-0.093	-0.106	0.174	0.087	0.117
	Transport	**.419****	-0.099	0.18	0.08	0.167
	Medication	-0.171	-0.064	0.159	0.114	0.066
	Religious and Cultural contributions	0.187	-0.182	0.263	0.132	0.12

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

* Correlation is significant at the 0.05 level (2-tailed).

Source: Computed

Hypothesis4: Living conditions of the farmer household are directly related to its access to social capital.

The living condition and social capital are taken into account in order to the whether there is a relation between the living condition and the access to the social capital. The household expenditure and household income are both taken into account in order to represent the living conditions and the Participation in Community and Participation in Voting of the dragon fruit cultivators are considered to represent the social capital.

The primary income is correlated with Participation in MHIP (-0.456) at 0.01 level of significance and it does not have any significant relationship Participation in YMA (-0.106), MUP (-0.283), Games and Sports (-0.024), Church (0.032), Church Based Youth Association (0.248), SHGs (-0.144), General Election (0.086), Assembly Election (-0.113) and Village Council Election (-0.083) even at 5 percent level of significance.

The secondary income is significantly related with Participation in Church (-0.325) at 0.01 level of significance and it does not have anu significant relationship with Participation in YMA (0.158), MUP (0.079), MHIP (0.026), Games and Sports (0.233), Church Based Youth Association (0.111), SHGs (-0.109), General Election (0.049), Assembly Election (0.125) and Village Council Election (0.042) even at 5 percent level of significance.

The tertiary income does not have any significant relationship with either Participation in Community and Participation in Voting even at 5 percent level of significance.

Expenditure on Clothing has a correlation with Participation in MHIP (0.333) at 0.05 level of significance and it does not have any significant relationship with YMA (-0.091), MUP (-0.008), Games and Sports (-0.005), Church (-0.139), Church Based Youth Association (-0.258), SHGs (-0.178), General Election (0.059), Assembly Election (0.108) and Village Council Election (0.008) even at 5 percent level of significance.

Expenditure on Medication has a significant correlation with Participation in MHIP (0.315) at 0.05 level of significance and it does not have any significant relationship with YMA (-0.185), MUP (-0.099), Games and Sports (-0.105), Church (0.116), Church Based Youth Association (-0.31), SHGs (-0.132), General Election (0.106), Assembly Election (0.02) and Village Council Election (0.078) even at 5 percent level of significance.

The remaining variables such as Expenditure on Food, Electricity, Water, Phone, Transport, Religious and Cultural Contributions and Other contribution does not have any

significant relationship with the variables of Participation in Community and Participation in Voting even at 5 percent level of significance.

Table4.13: Living Condition and Social Capital

		Participation in Community							Participation in Voting		
		YMA	**MUP**	**MHIP**	**Games and Sports**	**Church**	**Church based Youth Association**	**SHGs**	**General**	**Assembly**	**Local Council/Village Council**
Household Income	**Primary Income**	-0.106	-0.283	**-.456****	-0.024	0.032	0.248	-0.144	0.086	-0.113	-0.083
	Secondary Income	0.158	0.079	0.026	0.233	**-.325***	0.111	-0.109	0.049	0.125	0.042
	Tertiary Income	-0.049	-0.231	-0.179	0.109	-0.004	0.114	-0.206	0.13	0.146	0.128
Household Expenditure	Food	-0.065	-0.15	-0.176	0.04	0.003	0.052	0.191	0.202	0.151	-0.176
	Electricity	-0.026	-0.148	-0.063	-0.034	0.112	0.164	-0.134	0.098	0.103	0.104
	Water	0.017	-0.072	-0.013	-0.098	0.014	0.118	-0.289	0.013	0.061	0.188
	Phone	0.1	0.042	0.224	0.25	0.135	0.1	0.082	0.105	0.019	0.194
	Clothing	-0.091	-0.008	**.333***	-0.005	-0.139	-0.258	-0.178	0.059	0.108	0.008
	Transport	0.062	-0.112	-0.016	-0.085	0.16	0.248	-0.227	0.093	0.034	0.163
	Medication	-0.185	-0.099	**.315***	-0.105	0.116	-0.31	-0.132	0.106	0.02	0.078
	Religious and Cultural contributions	-0.111	-0.114	0.126	-0.154	0.157	-0.091	-0.281	0.257	0.114	0.199
	Others	-0.146	-0.172	0.171	-0.106	0.174	-0.129	-0.171	0.135	0.108	0.157

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

* Correlation is significant at the 0.05 level (2-tailed).

Source: Computed

CHAPTER V
PATTERN OF DRAGON FRUIT CULTIVATION

The Pattern of dragon fruit cultivation is studied to understand the vulnerability context which is analysed with certain variables viz., cropping pattern, input use and financial implications.

5.1 Cropping Pattern

The cropping pattern for dragon fruit cultivation is studied by analysing number of years cultivated, crops cultivated, number of dragon fruit cultivated and amount of dragon fruit harvested.

5.1.1 Number of Years cultivated

Dragon fruit cultivation observed in the present study started since 2014 and the mean number of years is 3.7 years in Aizawl District (See Table No 5.1.1). Majority of the household cultivated Dragon fruit for five years (40%) followed by 1 year (17%), 4 Years (15%), 3 years (12%), 6 years (8%), 2 years (5%) and 3% have started this year.

Table 5.1.1: No of Years Cultivating Dragon Fruit

		N=40	
Sl No	**Particulars**	**F**	**Percentage**
1	Started this Year	1	3
2	1 year	7	17
3	2 Years	2	5
4	3 Years	5	12
5	4 Years	6	15
6	5 Years	16	40
7	6 Years	3	8
	Mean	**3.7 Years**	

Source Computed

5.1.2 Crops cultivated

The crops cultivated from the respondent were classified into different crops with Vegetables, Fruits, Cereal and Tree Crops. Other crops cultivated are analysed as purpose and number of crops.

The purpose of cultivating other crops are categorised as for consumption, for market and for both consumption and market (See Table No 5.1.2A).Majority of the dragon fruit cultivators in the present study cultivated Fruits (70%) and Vegetables (80%) for bothconsumption and market.On the other hand, Cereals (97%) and Tree Crops (90%) are cultivated for consumption alone by almost all the cultivators.

Regarding the number of crops cultivated at least two crops of vegetables (1.6) and Fruits (1.5) are cultivated by dragon fruit cultivators (See Table No 5.1.2B).

Table5.1.2A: Other Crops Cultivated and Purpose

	Other Crops	N=40		
Sl. No		Consumption	Market	Both
1	Vegetables	7	1	32
		(17)	(3)	(80)
2	Fruits	10	2	28
		(25)	(5)	(70)
3	Cereal	39	0	1
		(97)	(0)	(3)
4	Tree Crops	36	3	1
		(90)	(7)	(3)

Source: Computed **Figures in parenthesis are percentages**

Table5.1.2B: Other Crops Cultivated: Number of crops

Sl. No	Crops	Mean	Std. Dev
1	Vegetables	1.6	0.8
2	Fruits	1.5	0.9
3	Cereal	0.1	0.3
4	Tree Crops	0.1	0.4

Source: Computed

5.1.3 Number of dragon fruit Seedlings cultivated

The number of dragon fruit seedlings cultivated are classified as Below 100 Seedlings, 100 to 500 Seedlings, and Above 500 Seedlings (See Table No 5.1.3). As Dragon fruit cultivation is in the initial stage the average number of seedlings cultivated by farmers is 286 seedlings which are still few.

Among the dragon fruit cultivators in the present study majority farmer cultivate 100 to 500 Seedlings (70%) followed by Below 100 Seedlings (20%) and Above 500 Seedlings (10%).

Table No 5.1.3: No of Seedling cultivated

		N=40	
Sl. No	**Particular**	**F**	**Percentage**
1	Below 100 Seedlings	8	20
2	100 to 500 Seedlings	28	70
3	Above 500 Seedlings	4	10
	Mean	***286 Seedlings***	

Source Computed

5.1.4 Number of times harvested

The number of harvest made by the dragon fruit cultivators is studied to understand how it contributed to livelihood of farmers which is categorised as Not yet harvested, 1 to 3 times, 3 to 6 times, and above 6 times (See Table No 5.1.4).

Dragon fruit cultivators on an average have harvested nearly 3 times since they started cultivation. Among the dragon fruit cultivators largest farmers harvested 3 to 6 times (38%) closely followed by farmers harvesting 1 to 3 times (35%), more than 6 times (2%). 25% of farmers have not yet harvested since beginning.

Table No 5.1.4: Number of times harvested

		N=40	
Sl No	**Particular**	**F**	**Percent**
1	Not yet Harvested	10	25
2	1 to 3 Years	14	35
3	3 to 6 times	15	38
4	Above 6 times	1	2
	Mean	***2.6 times***	

Source Computed

5.1.5 Amount of dragon fruit harvested in a year

The amount of dragon fruit harvested in a year is classified as Not yet harvested, Below 500 kg, 500 kg to 1000 kg, Above 1000 Kg (See Table No 5.1.5).

The average quantity of harvest in a year is 1821kilogram. Most of the dragon fruit cultivators harvested 500 to 1000 kg (35%) followed by Below 500 kg (25%) and only a few harvested Above 1000 kg (15%). In the meantime some family (25%) have not yet harvested from their dragon fruit cultivation.

Table No 5.1.5: Amount of dragon fruit harvested in a year

		N=40	
Sl No	**Particular**	**f**	**Percentage**
1	Not Yet harvested	10	25
2	Below 500 Kg	10	25
3	500 kg to 1000 kg	14	35
4	Above 1000 Kgs	6	15
	Mean	1821kg	

Source Computed

5.2 Input Use

Input used in Dragon Fruit Cultivation is studied to understand the amount of efforts needed for dragon fruit cultivators. Input use in dragon fruit cultivation is probed into by analysing land used, tool used and other forms of input.

5.2.1 Land used for cultivation

To study the land used for cultivation ownership of land and type of land and area of land used for cultivation are analysed (See Table No 5.2.1).

The Ownership of land was classifies as owned and borrowed and majority of dragon fruit cultivators in the present study owned (95%) the land for cultivation and the rest borrowed (5%) land for cultivation.

The types of land used for cultivation observed in the present study are Garden LSC, Periodic Land Pass (PLP), VC Pass. The types of land used for cultivation are evenly distributed among PLP (37%), VC (37%) and Garden LSC (26%).

Area used for cultivation observed in the present study is classified as below 1 Acres, 1 Acres, 2 Acres, 3 Acres. The mean area of land used for cultivation is 1.1 Acres. Majority of the dragon fruit cultivators cultivated in 1 Acres (72%) followed by below 1 Acres (15%), 2 Acres (8%), 3 Acres (5%). The land used for cultivation is relatively small.

Table5.2.1: Land Used for cultivation

		N=40	
Sl. No	**Particulars**	**Frequency**	**Percentage**
1	**Ownership of Land**		
	Owned	38	95
	Borrowed	2	5
2	**Type of land**		
	Garden LSC	10	26
	PLP	15	37
	VC Pass	15	37
3	**Area of Cultivation (Area in Acres)**		
	Below 1 Acres	6	15
	1 Acres	29	72
	2 Acres	3	8
	3 Acres	2	5
	Mean Area used for Cultivation (in Acres)	***1.1 Acres***	

Source: Computed

5.2.2 Tool used for cultivation

There are several kinds of tool used by the farmers for cultivating dragon fruit which could be categorised as land preparation and weeding tool, irrigation tool and cultivation and harvesting tool (See Table No 5.2.2).

The land preparation and wedding tool used are chempui, tuthlawh, plough, spade, tractor tiller, digging hoe, digging fork, weeding hoe, and hand hoe. Dragon fruit cultivator in the present study owned and uses Chempui (2.5), Tuthlawh (2.7), Plough (1.8), Spade (1.6), and Thirtiang (1.0). As the cultivation of dragon fruit is in the initial stage certain tools viz., Tractor (0.1), Digging Hoe (0.2), Digging Fork (0.3), Weeding Hoe (0.3), Hand Hoe (0.4), were not owned.

Irrigation tools observed in the present study are water pipe, water pump, mechanical motor pump set, drip irrigation, sprinkler irrigation and rainwater harvesting pond. Among the irrigation tools Water pipe (1.4), Drip Irrigation (20.8) are used by the farmers where Water pump (0.1), Mechanical Motor Pump Set (0.1), Sprinkler Irrigation (0.8), Rainwater Harvesting Pond (0.7) are not owned.

Cultivation and Harvesting tools observed in the present study are Basket, Knife, Secateurs, Basket, Pruning shear, Em, Dawrawn and Iptepui. Among the cultivating and harvesting tools Iptepui (2.7), Secateur (1.8), Basket (9)andEm (1.7) are utilised. On the other hand, basket knife (0.1), Pruning shear (0.3), and Dawrawn(0.6) are not utilised by the farmers.

Table 5.2.2: No of tools used for cultivating Dragon Fruits

	No. of Tools	N=40		
Sl. No		Minimum	Maximum	Mean
	LAND PREPARATION AND WEEDING			
1	Chempui	0	6	2.5
2	Tuthlawh	1	7	2.7
3	Plough	0	4	1.8
4	Spade	0	4	1.6
5	Tractor tiller	0	1	0.1
6	Thirtiang	0	4	1.0
7	Digging Hoe	0	1	0.2
8	Digging Fork	0	2	0.3
9	Weeding Hoe	0	2	0.3
10	Hand Hoe	0	3	0.4
	IRRIGATION TOOL			
11	Water Pipe	0	10	1.4
12	Water Pump	0	1	0.1
13	Mechanical Motor Pump Set	0	1	0.1
14	Drip Irrigation	0	400	20.8
15	Sprinkler Irrigation	0	8	0.8
16	Rainwater Harvesting Pond	0	4	0.7
	CULTIVATION AND HARVESTING			
17	Basket Knife	0	2	0.1
18	Secateur	0	5	1.8
19	Basket	0	20	9.0
20	Pruning Shear	0	3	0.3
21	Em	0	5	1.7
22	Dawrawn	0	4	0.6
23	Iptepui	0	6	2.7

Source: Computed

5.2.3 Input used for cultivation

The input use for the cultivation of dragon fruit differ among farmersand the input use is classified as seed, labour, machine, fertilizer, irrigation and pesticides (See Table No 5.2.3).

Among the input use Female Hired labour (1.1), Male Hired Labour (1.3), Male Family labour (1.8), Female FamilyLabour (1.8), Organic Manure (1.7), River/Stream Water (1.8)is always used by the dragon fruit cultivators. Apart from these Local seeds or nursery (0.5), HYV Seed from government (0.5), Chemical Fertilizers(NPK) (0.7), Chemical Fertilizers(Minor) (0.6), Organic Pesticides (0.9), Chemical Pesticides (0.9), Seasonal Rain Fall (0.8), and Rain Water Harvesting (0.5) are also sometimes used. HYV Seed from market (0.1), Owned Animal Labour (0.1), Hired Animal Labour (0.1), Owned Machinery (0.2), and Hired Machinery (0.1) are declared never used by the farmers.

Seed is one of the Input Use taken for study which includes Local Seed or nursery, HYV Seed from Government, and HYV Seed from Market.The respondents in the present study declare theuse Local Seeds/Nursery as never (60%) followed by sometimes (35%) and always (5%). Majority that is 67% of the respondent do not use HYV from the government, 18% always used it while 15% used it sometimes. Almost all respondentsthat is90% of the respondent do not HYV from the Market while 7% used sometimes and 3% always use HYV from market.

Labour constitutes a huge portion of input use among dragon fruit cultivator. Labour used by the dragon fruit cultivators are male hired labour, female hired labour, male family member, female family member, owned animal labour, and hired animal labour. 62%of the respondent sometimes use hired male labour while 33% always use hired labour (male) and 5% never hire malelabour. 65% of the respondents sometimes use female hired labour while 20% always hired and 15% never hired female labour. Majority (82%) of the respondent always use Family labour (male) while 18% are usingforsometimes only. Majority 80% of the respondent always use female family labour while 17% input sometimes and 3% never use family labour.97% of the respondent never owned Animal for labour while 3% always use owned animal labour. 97% of the respondent never use hired animal labour while 3% always hired animal labour.

Use of Machinery is almost absent among farmers in Mizoram. Use of machine is categorised as hired and owned.90% of the respondent never use owned machinery while 7% always use owned and 3% use owned machinery for sometimes. 92% of the respondent never use hired machinery while 5% always use and 3% sometimes use hired machinery.

Manure and fertilizer are an important component of settled cultivation. Input use in the form of manure and fertilizer are categorised as Organic Manure, chemical fertilizer NPK, chemical fertilizer Minor, Organic Pesticides, and Chemical Pesticides.65% of the respondents always use Organic Manure and 27% also use it sometimes while 8% never use Organic manure as an input. Half of the respondent 50% sometimes use chemical fertilizer NPK while 40% never use Chemical fertilizer NPK but 10% always use it. 47% of the respondent never use chemical fertilize (minor) while 43% use it sometimes but 10% always use chemical fertilizer (minor). 37% of the respondentsuseorganic pesticides sometimes while 35% never use and 28% always use organic pesticides. Half 50% of the respondent use Chemical pesticides sometimes while 32% never use but 18% always use chemical pesticides.

Irrigation is also one of an important input needed for cultivation. Irrigation as an input is categorised as seasonal rainfall, rain water harvesting, and River/stream water. 45% of the respondents never depend on seasonal rainfall while 35% sometimes use it but 20% always depend on seasonal rain fall. More than half 57% never utilise rain water harvesting but 33% sometimes use rain water while 20% always depend on rain water harvesting. Majority 85% of the respondent always utilises River/stream water for cultivation while 15% only use it sometimes meanwhile 5% never use river/stream water for cultivation.

Table5.2.3: Other Input Used

	Other Input Used		**N=40**			
Sl. No	**Particulars**	**Never**	**Sometimes**	**Always**	**Mean**	**Std. Dev**
1	Local seeds or nursery	24	14	2	0.5	0.6
		(60)	(35)	(5)		
2	HYV Seed from government	27	6	7	0.5	0.8
		(67)	(15)	(18)		
3	HYV Seed from market	36	3	1	0.1	0.4
		(90)	(7)	(3)		
4	Hired Labour(Male)	2	25	13	1.3	0.6
		(5)	(62)	(33)		
5	Hired Labour (Female)	6	26	8	1.1	0.6
		(15)	(65)	(20)		
6	Family Labour (Male)	0	7	33	1.8	0.4
		(0)	(18)	(82)		
7	Family Labour (Female)	1	7	32	1.8	0.5
		(3)	(17)	(80)		
8	Owned Animal Labour	39	0	1	0.1	0.3
		(97)	(0)	(3)		
9	Hired Animal Labour	39	0	1	0.1	0.3
		(97)	(0)	(3)		
10	Owned Machinery	36	1	3	0.2	0.5
		(90)	(3)	(7)		
11	Hired Machinery	37	1	2	0.1	0.5
		(92)	(3)	(5)		
12	Organic Manure	3	11	26	1.7	0.6
		(8)	(27)	(65)		
13	Chemical Fertilizers(NPK)	16	20	4	0.7	0.6
		(40)	(50)	(10)		
14	Chemical Fertilizers(Minor)	19	17	4	0.6	0.7
		(47)	(43)	(10)		
15	Organic Pesticides	14	15	11	0.9	0.8
		(35)	(37)	(28)		
16	Chemical Pesticides	13	20	7	0.9	0.7
		(32)	(50)	(18)		
17	Seasonal Rain Fall	18	14	8	0.8	0.8
		(45)	(35)	(20)		
18	Rain Water Harvesting	23	13	4	0.5	0.7
		(57)	(33)	(10)		
19	River/Stream Water	2	4	34	1.8	0.5
		(5)	(10)	(85)		

Source: Computed **Figures in parenthesis are percentage**

5.3 Financial Implications

The financial implications encompass the nature of income and expenditure incurred on dragon fruit cultivation and how it impact living condition of dragon fruit cultivators.

5.3.1 Expenditure on dragon fruit cultivation

The Annual expenditure on Dragon Fruit Cultivation isanalysed to understand the living condition of dragon fruit cultivator. The expenditure on dragon fruit cultivation is analysed based on certain heads of expenditure viz., Land preparation, Seeds, labour Cost, Transportation, Weeding, Equipment, preparation of supporting pole, manure, pesticide, irrigation, Harvesting and packing (See Table No 5.3.1).

The annual expenditure ondragonfruit cultivation on an average is highest on labour cost (Rs8682) followed by preparation of supporting pole (Rs.7725), Manure (Rs.4712), Weeding (Rs.4087), irrigation (Rs.2462), pesticide (Rs.1537), Equipment (Rs.1122),transportation(Rs.912), Land preparation (Rs.575), harvesting and packing (Rs.220),Seeds (Rs.205). The average household expenditure on dragon fruit cultivation is Rs.32,242/- which clearly indicated that dragon fruit cultivation requires more financial capital.

Table 5.3.1: Annual Expenditure on Dragon Fruit Cultivation

	Annual Expenditure	**N=40**		
Sl. No	**Particulars**	**Minimum**	**Maximum**	**Mean**
1	Land Preparation	0	10000	575
2	Seeds	0	4200	205
3	Labour cost	0	90000	8682.5
4	Transportation	0	5000	912.5
5	Weeding	0	95000	4087.5
6	Equipment	0	10000	1122.5
7	Preparation of supporting pole	0	95000	7725
8	Manure	0	50000	4712.5
9	Pesticide	0	5000	1537.5
10	Irrigation	0	50000	2462.5
11	Harvesting and packing	0	3000	220
	Total		417200	32242

Source: Computed

5.3.2 Income from dragon fruit cultivation

The annual income of the dragon fruit cultivators differs according to the number of plants they cultivated and the number of times they have harvested.The duration of the cultivation of dragon fruit also contributed significantly. The income from dragon fruit cultivation in the present study is categorised as Not yet harvested, Below 50000, 50000 to 100000, 100000 to 150000, and Above 150000 (See Table No 5.3.2).

The average annual income from dragon fruit cultivation is Rs 88,500. The income from dragon fruit cultivation is evenly distributed where income 100000 to 150000 (28%) constitute the largest group followed by 50000 to 100000 (23%), Above 150000 (12%) and Below 50000 (12%). Apart from these 25% of the respondents have not made any harvest so far.

Table5.3.2: Annual Income from Dragon Fruit Cultivation

		N=40	
Sl No	**Particular**	**f**	**Percentage**
1	No yet harvested	10	25
2	Below 50000	5	12
3	50000 to 100000	9	23
4	100000 to 150000	11	28
5	Above 150000	5	12
	Mean	**Rs88,500**	

Source: Computed

CHAPTER VI
OPPORTUNITY AND PROSPECTS IN DRAGON FRUIT CULTIVATION

The opportunity and prospect in dragon fruit cultivation is analysedto understand the pulling factor for farmers to cultivate dragon fruit. The opportunity and prospect of cultivating dragon fruit in Mizoram in the present study is studied by analysing Awareness, government support, Reason of cultivating Dragon Fruit, Challenges and Coping strategy.

6.1 Awareness

The awareness of the dragon fruit cultivators is studied on the basis of training received from the government, ownership of cultivation manual book and the soured of orientation (See Table No 6.1).

6.1.1 Training received

Among the dragon fruit cultivators in the present study majority that is 80% of the respondents received training while 20% of the respondents were without training. Such trainings are provided by the government agencies to the farmers. In the meantime there are few respondents who did not attend any training as they have just started their farm and also due to the outbreak of the pandemic.

6.1.2 Owned manual

Manual books on how to grow dragon fruit are mostly published and distributed on free of cost by the service providing agency of the government namely Department of Horticulture. Among the dragon fruit cultivators in the present study more than half which is 62% of the respondents owned a manual book on how to grow dragon fruit while 38% of the respondents were not having manual book and any other material on how to grow dragon fruit.

6.1.3 Source of orientation

Among the dragon fruit cultivators in the present study majority that is 77% of the respondents received orientation about dragon fruit cultivation from the Government Advertisement while 23% of the respondent receive orientation from their friends. This clearly indicated that dragon fruit cultivation is initiative is taken by the government agency in the form of orientation and as service provider.

Table6.1: Opportunity and Prospects

		N=40	
Sl. No	**Particulars**	**Frequency**	**Percentage**
1	**Source of orientation about Dragon Fruit cultivation**		
	Govt. Advertisement	31	77
	Friends	9	23
2	**Training attended**		
	No	8	20
	Yes	32	80
3	**Do you own any manual or book on how to grow Dragon fruit**		
	No	15	38
	Yes	25	62

Source: Computed

6.2 Government Support

Government is the agency who initiated the cultivation of dragon fruit cultivation in Mizoram and is currently the main source of support for farmers.There supports given by the government to dragon fruit cultivators observed in the present study are in different areas viz., Financial support, Supply of Dragon Fruit Plant cutting/seeds, Training for cultivation process, Exposure tour, Supply of fertilizers, Supply of pesticides, Irrigating facilities, Supply of equipment, Loan through banks, Systematic market (See Table No 6.2).

Among the government support observed Financial support (2.2), Supply of cutting/seeds (2.5), Training for cultivation process (2.2), Supply of fertilizers (2.0) are rated as a service always available from the government. Supply of equipment (1.8), Irrigating facilities (1.3), Supply of pesticides (1.8) are also support which is sometimes received from the government. In the meantimeExposure tour (1.1) and Loan through banks (1.0) are government support never received by the respondents.

52% of the respondents sometimes receive financial support from Government and 33% always receive financial support while 15% of the respondents never receive financial support from the Government. Although the initiative is taken by the government alone the financial support from the government is insufficient for the farmers.

Regarding the supply of seeds 52% of the respondentsstate that they sometimes receive Government support while 48% get always get supply of seeds from the Government. The supply of seed from the government is adequate for the farmers.

Training is sometimes received by 40% of the respondents and always received by 40% of the respondents from Government in support for cultivation while 20% never receive training. The government support in the form of training is received by majority.

Majority of the respondents never have exposure tour which is 95%of the respondent supported by the Governmentwhile 5% sometimes went for exposure.

Supply of fertilizers is always received by only 5% of the respondents. Majority (92%) of the respondents sometimes received supply of fertilizers.

More than half which is 60% of the respondent sometimes get support from the government in the form of supply of pesticides, 32% never get support while 8% always get support from the government.

Majority of the respondents which is 75% of the respondent never receive Irrigation Facilities from the government while 25% sometimes get support.

Majority which is 80% of the respondent sometimes receive supply of equipment from government as a support while 20% never get support.

Majority which is 97% of the respondent never receive Loan through Bank with the government support while 3% get support sometimes.

Majority of the respondents that is 47% declare that the government never provide systems for setting up systematic market and 38% on the other hand mentioned that the government had always provide a proper and systematic market. The remaining 15% declare that the government provide systematic market sometimes or occasionally.

Table6.2: Government Support

			N=40			
Sl. No	**Particulars**	**Never**	**Sometimes**	**Always**	**Mean**	**Std. Dev.**
1	Financial support	6	21	13	2.2	0.7
		(15)	(52)	(33)		
2	Supply of Dragon Fruit Plant cutting/seeds	0	21	19	2.5	0.5
		(0)	(52)	(48)		
3	Training for cultivation process	8	16	16	2.2	0.8
		(20)	(40)	(40)		
4	Exposure tour	38	2	0	1.1	0.2
		(95)	(5)	(0)		
5	Supply of fertilizers	1	37	2	2.0	0.3
		(3)	(92)	(5)		
6	Supply of pesticides	13	24	3	1.8	0.6
		(32)	(60)	(8)		
7	Irrigating facilities	30	10	0	1.3	0.4
		(75)	(25)	(0)		
8	Supply of equipment	8	32	0	1.8	0.4
		(20)	(80)	(0)		
9	Loan through banks	39	1	0	1.0	0.2
		(97)	(3)	(0)		
10	Systematic market	19	6	15	1.9	0.9
		(47)	(15)	(38)		

Source: Computed **Figures in parenthesis are percentages**

6.3 Reasons of cultivating Dragon Fruit

The reason for cultivating dragon fruit observed was classified into different reasons viz., High value for money, Dragon fruit being an exotic fruit, Good prospect because of Govt. Support and market, Persuaded by friends, Intimidation from Government, Easy process of cultivation, Low cost of cultivation, Health benefit of the fruit and Easy availability of market opportunities (See table No 6.3).

The respondents in the present study strongly agree that the reason for cultivating dragon fruit was High value for money (3.2), Good prospect because of Govt. Support and market (3.0), and Intimidation from government (3.1). They also agree that Dragon fruit being an exotic fruit (2.7), Health benefit of the fruit (2.7), and Easy availability of market opportunities (2.9) were the reasons for cultivating dragon fruits. But they disagree that Persuaded by friends (2.0), Easy process of cultivation (2.0), and Low cost of cultivation (2.0) were their reason for cultivating dragon fruits.

Majority that is 65% of the respondents agree that they cultivated dragon fruit for its high value for money. 27% strongly agree while 8% disagree.

47% of the respondents agree and 13% strongly agree that dragon fruit is an exotic fruit but disturbingly 37% disagree and 3% strongly disagree it is an exotic fruit.

Among the respondents 70% agree and 15% strongly agree that there is Good prospect because of Govt. Support and market in dragon fruit cultivation. Where 15% disagree that there is good prospect because of government intervention.

Among the respondents 55% disagree and 25% strongly disagree that they are persuaded by friends but 17% agree and 3% strongly agree that they are persuaded by friends to cultivate dragon fruits.

Among the respondents 60% Agree and 25% strongly agree that they cultivated dragon fruit because of the intimidation from government but 15% disagree.

Among the respondents 35% disagree and 33% strongly disagree that they cultivate dragon fruit due to easy process of cultivation and only 32% agree that the process is easy.

Among the respondents 62% disagree and 20 strongly disagree that they cultivated dragon fruit because of the low cost of cultivation whereas 18% agree that the cost of cultivation is low.

Health benefit of the fruit is agreed by 50% and strongly agreed by 13% as the reason of cultivation among the respondents while 27% disagree and 10% strongly disagree.

Easy availability of market opportunities is agreed by 82% and strongly agreed by 5% of the respondents. But it is disagreed by 10% and strongly disagreed by 3%. The production were still less and there is still a lot of demand in market.

Table6.3: Reasons of cultivating Dragon Fruit

		N=40					
Sl. No	**Particular**	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**	**Mean**	**Std. Dev**
1	High value for money	0	3	26	11	3.2	0.6
		(0)	(8)	(65)	(27)		
2	Dragon fruit being an exotic fruit	1	15	19	5	2.7	0.7
		(3)	(37)	(47)	(13)		
3	Good prospect because of Govt. Support and market	0	6	28	6	3.0	0.6
		(0)	(15)	(70)	(15)		
4	Persuaded by friends	10	22	7	1	2.0	0.7
		(25)	(55)	(17)	(3)		
5	Intimidation from government	0	6	24	10	3.1	0.6
		(0)	(15)	(60)	(25)		
6	Easy process of cultivation	13	14	13	0	2.0	0.8
		(33)	(35)	(32)	(0)		
7	Low cost of cultivation	8	25	7	0	2.0	0.6
		(20)	(62)	(18)	(0)		
8	Health benefit of the fruit	4	11	20	5	2.7	0.8
		(10)	(27)	(50)	(13)		
9	Easy availability of market opportunities	1	4	33	2	2.9	0.5
		(3)	(10)	(82)	(5)		

Source: Computed **Figures in parenthesis are percentages**

6.4 Challenges and Coping strategy

The challenges faced by farmer in the process of cultivating of dragon fruit are studied and analysed how challenges are faced with different strategies to overcome these challenges.

6.4.1 Challenges faced by farmers

Challenges faced by dragon fruit cultivators observed in the present study are Complex survival chance of Dragon Fruit, Lack of government support, Improper market linkage, Harvest is low, Pest and insect problems, Lack of technical knowhow, Lack of proper training, Insufficient subsidy from the government, Lack of irrigation and water supply, Non remunerative price, Lack of transport facilities, Poor link roads, Lack of information on market, Lack of storage facilities, Lack of agro based industries, Lack of capital, Tools are not available in market, Damaged products in process of transport, High expenditure for maintenance, Topographical problems (See Table No 6.4.1).

Among the problem faced observed dragon fruit cultivators in the present study strongly agreed that Lack of agro based industries (3.0), Lack of information on market (3.0), Non remunerative price (2.9), Pest and insect problems (2.9), Complex survival chance of Dragon Fruit (2.9), High expenditure for maintenance (2.9), Lack of irrigation and water supply (2.8), Poor link roads (2.8) and Lack of capital (2.8) are problems faced. In the meantime, they also agreed that Lack of government support (2.2), Improper market linkage (2.4), Harvest is low (2.1), Lack of technical knowhow (2.5), Lack of proper training (2.2), Insufficient subsidy from the government (2.7), Lack of transport facilities (2.2), Lack of storage facilities (2.6), Tools are not available in market (2.5), Damaged products in process of transport (2.8) and Topographical problems (2.1) are problems faced.

From the total respondents 32% disagree that there is complex survival chance dragon fruit and 8% also strongly disagree with it, while 32% strongly agree that there is complex survival chance of dragon fruit and 28% agree with it.

Majority that is 62%of the respondents disagree that problem is due to lack of government support and also 8% strongly disagree with it, while 30% of the respondent agree that lack of government support is a problem for them.

Majority that is 60% of the respondents disagree that proper market linkage is a problem and 3% strongly disagree with them. In the meantime30% of the respondents agree that lack of proper market linkage is a problem faced by them also joined by 7% who strongly agree with it.

A majority of 82% of the respondents disagree that low harvest is a problem while 8% agree that low harvest is a problems faced by them.

Among the respondents in the present study more than half that is 57% agree and 15% strongly agree that pest and insect problems is a problem faced by them while 28% disagree that pest and insect problem is a problem for dragon fruit cultivators.

Lack of technical knowhow is rated as disagree by 55% of the respondents while 45% of the respondents agree that lack of technical know is a problem.

Lack of proper training a problem is disagreed by majority that is 77% of the respondents while 23% agree that lack of proper training is a problem.

Insufficient subsidy from the government is a problem agreed by more than half of the respondents that is 55% joined by 5% who strongly agree with it. In the meantime40% of the respondents disagree that insufficient subsidy from the government is a problem faced by them.

Lack of irrigation and water supply as a problem is agreed by majority of the respondents that is 72% of the respondents and 3% strongly agree with it. In the meantime, 25% disagreed that lack of irrigation and water supply is a problem.

Non-remunerative price as a problem is agreed by majority of the respondents that is 70% of the respondents joined by 8% who strongly agreed that it is a problem. In the meantime 22% of the respondents disagree that non-remunerative price is a problem.

Lack of transport facilities as a problem is disagreed by majority that is 75% of the respondents joined by 2% who strongly disagreed that it is a problem. In the meantime22% of the respondents agree lack of transport facilities is a problem and even 2% strongly agree to it.

Poor link road as a problem is agreed by majority that is 60% of the respondents joined by 8% who strongly agreed that it is a problem. In the meantime,32% disagree that it poor link road is a problem.

Lack of information on market is a problem agreed by majority of the respondents that is 76% of the respondents joined by 12% respondents who strongly agreed that it is a problem. In the meantime 12% of the respondents disagree that lack of information is a problem for the farmers.

Lack of storage facilities as a problem is agreed by 45% of the respondents joined by 5% respondents who strongly agreed that it is a problem faced by farmers. On the other hand, half of the respondents which is 50% disagree that lack of storage facilities is a problem.

Lack of agro-based industries is a problem agreed by more than half of the respondents which is 75% of the respondents joined by 10% respondents who strongly agree with it. On the other hand15% respondents disagree with lack of agro-based industries as a problem.

Lack of capital as a problem is agreed by 75% of the respondents joined by 5% respondents who strongly agree with it. On the other hand 17% respondents disagree joined by 3% respondents who strongly disagree that lack of capital is a problem faced by the farmers.

Non availability of tools as a problem is disagreed by 47% of the respondents joined by 3% respondents who strongly disagree that it is a problem. On the other hand45% respondents agree that Non availability of tools is a problem joined by 5% respondents also who strongly agree with it.

Damaged product in process of transportis a problem agreed by majority that is 75% of the respondents joined by 2% respondents who strongly agree that it is a problem. On the other hand23% disagree that damaged product in process of transport is a problem faced by farmers.

High expenditure for maintenance as a problem is agreed by majority that is 72% of the respondents joined by 8% respondents who strongly agree with it. On the other hand22% of the respondent disagree that high expenditure for maintenance is a problem.

Topographical problems is a problem disagreed by majority that is 80% of the respondents joined by 5% respondents strongly disagree with it. Only 12% of the respondents agree that they faced topographical problems joined by 3% respondents who strongly agree with it.

Table6.4.1: Challenges faced by Farmers

	Challenges Faced By Farmers	**N=40**					
Sl. No	**Particulars**	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**	**Mean**	**Std. Dev**
1	Complex survival chance of Dragon Fruit	3	13	11	13	2.9	0.98
		(8)	(32)	(28)	(32)		
2	Lack of government support	3	25	12	0	2.2	0.58
		(8)	(62)	(30)	(0)		
3	Improper market linkage	1	24	12	3	2.4	0.68
		(3)	(60)	(30)	(7)		
4	Harvest is low	0	37	3	0	2.1	0.27
		(0)	(92)	(8)	(0)		
5	Pest and insect problems	0	11	23	6	2.9	0.65
		(0)	(28)	(57)	(15)		
6	Lack of technical know how	0	22	18	0	2.5	0.50
		(0)	(55)	(45)	(0)		
7	Lack of proper training	0	31	9	0	2.2	0.42
		(0)	(77)	(23)	(0)		
8	Insufficient subsidy from the government	0	16	22	2	2.7	0.58
		(0)	(40)	(55)	(5)		
9	Lack of irrigation and water supply	0	10	29	1	2.8	0.48
		(0)	(25)	(72)	(3)		
10	Non remunerative price	0	9	28	3	2.9	0.53
		(0)	(22)	(70)	(8)		
11	Lack of transport facilities	1	30	8	1	2.2	0.53
		(2)	(75)	(21)	(2)		
12	Poor link roads	0	13	24	3	2.8	0.59
		(0)	(32)	(60)	(8)		
13	Lack of information on market	0	5	30	5	3.0	0.51
		(0)	(12)	(76)	(12)		
14	Lack of storage facilities	0	20	18	2	2.6	0.60
		(0)	(50)	(45)	(5)		
15	Lack of agro based industries	0	6	30	4	3.0	0.50
		(0)	(15)	(75)	(10)		
16	Lack of capital	1	7	30	2	2.8	0.55
		(3)	(17)	(75)	(5)		
17	Tools are not available in market	1	19	18	2	2.5	0.64
		(3)	(47)	(45)	(5)		
18	Damaged products in process of transport	0	9	30	1	2.8	0.46
		(0)	(23)	(75)	(2)		
19	High expenditure for maintenance	0	8	29	3	2.9	0.52
		(0)	(20)	(72)	(8)		
20	Topographical problems	2	32	5	1	2.1	0.52
		(5)	(80)	(12)	(3)		

Source: Computed **Figures in parenthesis are percentages**

6.4.2 Coping strategy applied

The coping strategy applied by farmers in the present study are Preparing own tools, Preparing rain water harvest tank, Adopting traditional style of protection from pest, Selling to the market by self when linkage is not properly organised, Preparing water ways from stream/river, New techniques were learned from other farmers and friends, Use of internet to acquire new knowledge and methods, Selling through the internet, Developing nursery is needed for self-sufficiency of seeds, Organic manure prepared by self is required when there shortage of supply, There is a need to develop supply chain of seed by individual/society, Depending on rain water, Supports from NGOs are reliable, Use fertilizers for higher products, Use pesticides when plants are infected, and Mixed with other crops for sustenance (See Table No 6.4.2).

Dragon Fruit cultivators in the present study always cope with certain strategy such as Mixed with other crops for sustenance (3.3), Organic manure prepared by self is required when there shortage of supply (2.9), New techniques were learned from other farmers and friends (2.9), Preparing water ways from stream/river (3.1), Preparing own tools (3.0), Preparing rain water harvest tank (2.8) and Selling to the market by self when linkage is not properly organised (2.8). The respondents also mostly cope with their problems in cultivation by Use pesticides when plants are infected (2.7), Use fertilizers for higher products (2.2), Depending on rain water (2.7), There is a need to develop supply chain of seed by individual/society (2.4), Developing nursery is needed for self-sufficiency of seeds (2.3) and Use of internet to acquire new knowledge and methods (2.2). On the other hand respondents sometimes cope with their problem with certain strategies such as Supports from NGOs are reliable (1.7), Selling through the internet (2.0) and Adopting traditional style of protection from pest (1.9).

A majority of 77% of the total respondents agree with preparing own tools, also 10% had strongly agree and disagree with it while 3% had strongly disagree with it.

Majority of 75% agreed that preparation of rain water harvesting tank is helpful and17% disagreed the application of preparation of rain water harvesting tank followed 5% who strongly agreed and 3% who strongly disagreed in preparation of rain water harvesting tank.

A majority of 67% disagree with application of traditional way of protection from pest and 23% strongly disagree while 10% agree with traditional practices.

From the total respondent 77% agree to have applied selling to market by self when linkage is not properly organised,20% disagree to it and 3% of the respondent strongly agree with it.

A majority of 75% of the respondent agree with preparing water ways from stream or river, also 15% strongly agree it while 10% disagree to adopt of preparing water ways from stream or river.

A majority of 80% of the respondents agree that new techniques were learned from other framers and friends 3% strongly agree it while 17% disagree with it.

From the respondents, 45% disagreed that use of internet to acquire new knowledge and method also 20% strongly disagrees while 35% agree with it.

Majority of 70% of the respondents disagree that selling through internet which is followed by 15% who strongly disagree to it while 15% agree of selling through internet.

Half of the respondent which is 50% disagree that developing nursery is needed for self-sufficiency of seeds followed by 10% who strongly disagree while 40% agree of developing nursery is needed for self-sufficiency of seeds.

A majority of 80% agree that organic manure prepared by self is practiced when there is shortage of supply, followed by 7% who strongly agree while 10% disagree and 3% strongly disagree it.

A majority of 47% disagree that there is a need to develop supply chain of seed by individual/society followed by 8% who strongly disagree while 45% of the respondent agree that it is need to develop supply chain of seed by individual/society.

A majority of 70% of the respondents agree to depending on rain water while 26% disagree followed by 2% who strongly disagree.

More than half which is 62% of the respondent disagree that support from NGO are reliable followed by 35% who strongly disagree while 3% agree of support from NGO are reliable.

A majority of 60% of the respondents disagree that use of fertilizers for higher product followed by 13% who strongly disagree while 22% agree to usefertilizers for higher product with 5% who strongly agree.

A majority of 72% of the respondents agree to use pesticides when plants are infected followed by 3% who strongly agree while 20% disagree to used it and 5% also strongly disagree.

More than half which is 70% of the respondents agree that cultivation of other crops for sustenance followed by 30% who strongly agree while there is no disagree and strongly disagree in these strategies.

Table 6.4.2: Coping strategies

	Coping strategies	**N=40**					
Sl. No	**Particulars**	**Never**	**Sometimes**	**Mostly**	**Always**	**Mean**	**Std. Dev.**
1	Preparing own tools	1	4	31	4	3.0	0.55
		(3)	(10)	(77)	(10)		
2	Preparing rain water harvest tank	1	7	30	2	2.8	0.55
		(3)	(17)	(75)	(5)		
3	Adopting traditional style of protection from pest	9	27	4	0	1.9	0.56
		(23)	(67)	(10)	(0)		
4	Selling to the market by self when linkage is not properly organised	0	8	31	1	2.8	0.45
		(0)	(20)	(77)	(3)		
5	Preparing water ways from stream/river	0	4	30	6	3.1	0.50
		(0)	(10)	(75)	(15)		
6	New techniques were learned from other farmers and friends	0	7	32	1	2.9	0.43
		(0)	(17)	(80)	(3)		
7	Use of internet to acquire new knowledge and methods	8	18	14	0	2.2	0.74
		(20)	(45)	(35)	(0)		
8	Selling through the internet	6	28	6	0	2.0	0.55
		(15)	(70)	(15)	(0)		
9	Developing nursery is needed for self-sufficiency of seeds	4	20	16	0	2.3	0.65
		(10)	(50)	(40)	(0)		
10	Organic manure prepared by self is required when there shortage of supply	1	4	32	3	2.9	0.53
		(3)	(10)	(80)	(7)		
11	There is a need to develop supply chain of seed by individual/society	3	19	18	0	2.4	0.63
		(8)	(47)	(45)	(0)		
12	Depending on rain water	1	10	28	1	2.7	0.55
		(2)	(26)	(70)	(1)		
13	Supports from NGOs are reliable	14	25	0	1	1.7	0.61
		(35)	(62)	(0)	(3)		
14	Use fertilizers for higher products	5	24	9	2	2.2	0.72
		(13)	(60)	(22)	(5)		
15	Use pesticides when plants are infected	2	8	29	1	2.7	0.60
		(5)	(20)	(72)	(3)		
16	Mixed with other crops for sustenance	0	0	28	12	3.3	0.46
		(0)	(0)	(70)	(30)		

Source: Computed **Figures in parenthesis are percentages**

6.5 Relationship between Opportunities and Prospects

The Prospect of Dragon Fruit Cultivation has been identified using the correlation where the relationships among Reason of Cultivation, Government Support, Opportunities, Problems and Coping Strategies are taken into account.

The Reason for Cultivation is correlated with the Coping Strategies (0.313) at 0.05 level of significance while the other aspects such as Government Support (-0.136), Opportunities (0.266) and Problems (-0.311) does not have any relationship with Reason for Cultivation at any level of significance.

Government Support also have a correlation with Opportunities (-0.392) at 0.05 level of significance and the remaining aspects such as Reason for Cultivation (-0.136), Problems (-0.15) and Coping Strategies (-0.055) does not have any correlation at any level of significance.

The Opportunities is correlated with Coping Strategies (0.503) at 0.01 level of significance and also correlated with Problems (-0.331) at 0.05 level of significance and it does not have any relationship with Reason for Cultivation (0.266) at any level of significance.

Therefore, there is a relationship between Coping Strategy and Opportunities (0.503), Problems and Coping Strategies (-0.492) at 0.01 level of significance. However, there is also a relationship between Reason for Cultivation and Coping Strategies (0.313), Opportunities and Problems (-0.331), and Government Support and Opportunities (-0.392) at 0.05 level of significance.

Table 6.5 Correlation between Opportunities and Prospects

	Reason for Cultivation	**Government Support**	**Opportunities**	**Problems**	**Coping Strategy**
Reason for Cultivation	1	-0.136	0.266	-0.311	**.313***
Government Support	-0.136	1	**-.392***	-0.15	-0.055
Opportunities	0.266	**-.392***	1	**-.331***	**.503****
Problems	-0.311	-0.15	**-.331***	1	**-.492****
Coping Strategy	**.313***	-0.055	**.503****	**-.492****	1

* Correlation is significant at the 0.05 level (2-tailed).

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

Source: Computed

CHAPTER VII

CONCLUSION

The chapter consist of two main sections; the first section consists of Major Findings from the study and the second section is the conclusion ofthe study.

7.1 Major Findings:

The major findings in the present study are presented into sub sections viz., structural base of farmers; the vulnerability context; role played by the government; the challenges and the strategies employed; livelihood assets; and the relationship between the livelihood assets and living conditions.

7.1.1. Structural base of the Respondents

The structural bases of respondents are discussed with the social, educational, family and economic profile. The respondents belong to Mizo tribe, where Lusei sub-tribe is a dominant sub tribe. Christianity is the most common religion among the respondents where majority belongs to Presbyterian denomination. The respondents are mostly educated with majority having an educational qualification up to middle school. Majority of the respondents belongs to a nuclear family with a Medium sized family (4 to 7 members).All the respondents declare that they belong to a stable form of family.

The economic profile of the respondents assessed from type of ration card which they possessed and socio economic category they belong shows that the respondents mostly belong to the category Above Poverty Line(APL) and Below Poverty Line (BPL). The respondents are primarily cultivators which show that crop cultivation is their main source of income and government servant is a source of their secondary income.

7.1.2. Pattern on Dragon Fruit Cultivation

Dragon fruit cultivation in Aizawl District started in 2014 with government undertaking through schemes under the Department of Horticulture. Most of the dragon fruit cultivators have cultivated the fruit for a period of 5 years. Other crops such as vegetables crops, fruits, tree crops and cereals were also cultivated in order to have income throughout the year. The other crops were cultivated for both consumption and market. Most of the cultivators have a 100 to 500 dragon fruit seedlings or plants with an average of 286

seedlings. The majority of the cultivators also harvested the fruit 3-6 times with an average of 2.6 times by all the dragon fruit cultivators. The average quantity of harvest in a year is 1821 kg, where most of them harvested 500 to 1000 kg annually.

There are certain kinds of input that have been used such as land, tool and other material inputs. The majority of the dragon fruit cultivators owned the land which they cultivated. These lands are owned in a form of Periodic Land Pata and VC Pass. It is also observed that the cultivators also owned 1.1 acres of land each. Different types of land preparation and weeding tools, irrigation tools and harvesting tools were also used. Chempui, Tuthlawh, Plough, Spade, and Thirtiang are used and owned by every household for land preparation and weeding purpose. Water pipe and drip irrigation is also used as an Irrigation tool and Iptepui, Secatuer, Basket and Em are most commonly used for harvesting tool. Several other forms of inputs were also made by the farmers such as Hired labour both male and female, Family labour both male and female, Organic Manure and River/Stream Water for irrigation is also used by the dragon fruit cultivators.

The financial implications encompass the expenditure and income incurred from dragon fruit cultivation. The dragon fruit cultivators have an expenditure on Land Preparation, Seeds, Labour Cost, Transportation, Weeding, Equipment, Preparation of Supporting Pole, Manure, Pesticide, Irrigation, Harvesting and Packing with an overall average expenditure of Rs. 32,242/- annually. The annual average income from dragon fruit cultivation is Rs. 88,500/-. This shows that the dragon fruit cultivators have a handsome amount of income and profit taking into account the annual expenditure and annual income.

7.1.3. Livelihood and living conditions of Dragon Fruit Cultivations

The livelihood assets and the living conditions include the physical capital, financial capital and social capital of the respondents.

Dragon fruit cultivators owned most of the physical capital owned by most family in Mizoram viz., Water Connection, Electricity, Septic Tank, LP Gas, Land, Ration Card, Mobile Phone, Two Wheelers, Four Wheelers and Housing.

The financial capital includes the household income and the expenditure. The source of household income of dragon fruit cultivators in the present study observed are cultivation, Govt. Servant, daily waged labourer, Business, and animal husbandry. The average annual household income is Rs. 3,44,500/- which shows that the respondents are having a

handsome amount of income for their livelihood. The monthly household expenditures mostly go on expenditure on food and the least amount of expenditure is on water and other expenses are expenses on Food, Electricity, Phone, Clothing Transport, Medication, and Religious& Cultural Contribution.

As Mizo society is a close knit society the respondent's participation in community events and group activities form social capital. The social capitals of the respondents are taken into account in the form of their participation in the community and voting in elections. The participation on YMA and the church is the most where SHG and MUP are the least participated organisations. As for members voting in election, it is found put that most of the adult family members of the household voted for all the elections conducted.

7.1.4. Vulnerability context of Dragon Fruit cultivators

The challenges faced by the dragon fruit cultivators are the main factors that determine their vulnerability. There are different challenges that a farmer faces in the cultivation of dragon fruit such that, there is a complex survival chance of dragon fruit, problems of pest and insects, lack of technical know-how, sometimes it is difficult to maintain the drip irrigation which is subsidised by the government, the non-remunerative price of dragon fruit, poor linkage of road to the farms, improper information to the market causing problems to the farmers, lack of proper storage facilities, lack of agro-based industries, lack of capital for further extension of the cultivation, damaging product in process of transportation, high expenditure requirement for its cultivation, and the financial support from the government is insufficient.

7.1.5. Role of Government as Agency

The government also plays a vital role in promoting the cultivation of dragon fruit in Mizoram which is still in an initial stage. The government gave support and services to the dragon fruit cultivators in terms of financial and other resources. The dragon fruit cultivators receive dragon fruit seedling distributed by the government and training. They sometimes get the supply of pesticides, manures and provide systematic market to the dragon fruit cultivators of Aizawl district. However, equipments are also given to the dragon fruit cultivators in a subsidised rate, financial support is insufficient and the government also did not provide any kind of loans to the farmers through bank services.

7.1.6. Challenges Faced and Coping Strategies Employed

There are several challenges that the dragon fruit cultivators faced and they also tend to address these challenges by applying certain strategies which they practiced in their cultivation process. The challenges have been discussed before in the vulnerability context where mostly; the complex survival chance of dragon fruit, problems of pest and insects, lack of technical know-how, difficulty in maintaining drip irrigation, the non-remunerative price, poor linkage of road, communication barrier between farmersand the market, lack of proper storage facilities, lack of agro-based industries, lack of capital, damaging product in transportation, and high expenditure requirement for its cultivation.

However, certain strategies are adopted and practiced in order to address these challenges. The strategies adopted are preparation of own tools, preparation of rain water harvesting tank for irrigation, selling of the fruit by self to the market when linkage is not properly organised, preparation of water ways from streams and rivers for water supply, learning of new techniques from other farmers and friends, they apply the use of organic manures on the dragon fruits for better health of the fruit, dependent on rainwater for irrigation purpose, relying on the government support, use of pesticides when plants are infected, and cultivation of other crops for sustaining the income throughout the year.

7.1.7. Livelihood assets and living conditions

One of the objectives of the study is to find out and assess the relationship between livelihood assets and living conditions of the dragon fruit cultivators. The main source of livelihood of the dragon fruit cultivators is cultivation although there are few secondary incomes observed. The human capital concerns with the educational status of the farmer where it is known that the dragon fruit cultivators are literate. The farmers also have a decent knowledge on the process of cultivation through orientation, training and manual book which is provided by the government service providers.

The social capital, which are participation in the society and election shows that there is good participation in the society as well as in election which also made a good contribution in their living condition as a part of the society and also as a duty is a good citizen. The physical capitals such as the household amenities and certain types of tools are also owned. Tools used for cultivation, harvesting and irrigation are utilised in such a manner that it also have impact in earing their livelihood. As for the financial capital, the

average annual income stands at Rs. 3,44,500. Which is a very decent amount for the part of the dragon fruit cultivators. Besides this, the average annual income incurred from dragon fruit alone is Rs. 88,500/- and the average annual expenditure on dragon fruit cultivation is Rs. 32,242/-. This shows that the income exceeds the expenditure which means that the dragon fruit cultivators are able to make a handsome profit for their livelihood annually to make a better living condition. This enables the farmers to acquire certain household amenities such as Water Connection, Electricity, Septic Tank, LP Gas, Land, Ration Card, Mobile Phone, Two Wheelers, Four Wheelers and Housing.

7.2 Conclusion

The present study attempts to assess the livelihood and living conditions of the dragon fruit cultivators in Aizawl District Mizoram. The study also highlights how the patterns of cultivation, vulnerability context, livelihood assets, policies, institutions and processes, livelihood strategies interacted to develop the livelihood of the dragon fruit cultivators.

Dragon fruit cultivation in Aizawl District started some few years back approximately in the year 2014 where initiative was taken by the government and beneficiaries were also selected by the government. However, it is systematically implemented the next year where cultivation has grown and expanded. As it is in the initial stage only handful of farmers were selected as a beneficiary to start dragon fruit cultivation. Almost all the beneficiary cultivates other crops to sustain themselves apart from the government support. Dragon fruit is not primary crop cultivated hence other crops such as Fruits, Vegetables, Tree Crops and Cereals are also cultivated for the purpose of consumption and for market. In the process of cultivation, the tool used for cultivation could not be classified from other tools used for other crops as the cultivator cultivated others crops before cultivating dragon fruit. Since dragon fruit cultivation has only started approximately 5 years back, the average seedlings cultivated were also less which comprises only 286 seedlings per farmers. Cultivation of dragon fruit is not done in a large scale as it only in a beginning phase, even the amount of fruit produced is also not at a large quantity. As the rate of production is still low, marketing is also still manageable at local market. Although there is no systematic market established for the farmers the farmer could still sell their products in local market.

As dragon fruit cultivation in Mizoram is in the initial stage, the government support is still very high and certain challenges faced by the cultivators is also linked to and engaged through government programme. Dragon fruit have complex survival chance that influenced the cultivators to use organic manures and organic fertilizers and even in a problem of pest and insect cultivators resorted to the use of organic pesticides. As dragon fruit cultivation is initiated by government the cultivators lack of technical know-how is addressed by awareness and training programmes. Apart from this, dragon fruit cultivators helped each other, share their experiences which is even regarded as more helpful for the cultivators. The cultivators also develop their own tools for use as there is no particular tools for dragon fruit cultivation. But certain technique and methods were applied without hesitation. As Mizoram

is a rain fed region irrigation is neglected and depend mainly on rainwater. But only a few cultivators irrigate their land using river and stream, rainwater harvesting pond due to topographical problems. Although the government support is instrumental in some areas certain problems like lack of capital is one of the main issue for farmer who started cultivating and lack of proper storage facilities are faced by farmers who started producing dragon fruit. Although the market opportunities are still manageable at local level market the expenditure on process of cultivation is high which is in the meantime supported by government support and farmers managed it by cultivating other crops. As market opportunities and rate is still favourable in local market the cultivator income is also increased and earned significant amount of profit from dragon fruit cultivation.

Dragon fruit cultivation increases financial capital which in turn improves physical capital in the form of assets owned. Dragon fruit cultivation increased income of farmers and the household expenditures related to cultivation also increased in spite of systematic government support. In the meantime the social capital and natural capital owned by the dragon fruit cultivator do not improve living conditions of dragon fruit cultivators. However the educational qualification as human capital has significant relationship with living condition of dragon fruit cultivators.

The pattern of dragon fruit cultivation in Mizoram shows development at a fast rate and many cultivators saw it as a good opportunity which resulted in a rapid increase of number of farmers cultivating dragon fruit in recent years. The challenges faced by the dragon fruit cultivators were also comprehended systematically and could cope with the support of the government and the coping strategies developed by the farmers which in turn create livelihood opportunity and developed living conditions of dragon fruit cultivators in Aizawl, Mizoram. In the meantime we should not fail to mention that the cultivators are now facing a problem on the storage facility although the rate of production is still not in a large scale. With the expected increase of production and the reality of unorganised local market system it can be assumed that market issue will be a problem in the near future. Once the amount of production is not possible to be consumed in the local market farmers will need to export their product outside and currently there is no plan in this regard. Presently dragon fruit cultivation with a significant amount of support from the government is a good prospect for cultivators. However sustainability of dragon fruit cultivation as a livelihood option without the support of the government will only be confirmed by future research.

7.3 Suggestions

There are suggestions from the study that can be utilised for further study and actions.

1. **Storage facility:** There is a lack of storage facility for storing the products before it has been brought to the market. The storage would be helpful in such a way that it is accessible for the farmers to store their crops and other farm products to reduce damage due to lack of proper storage.
2. **Agro-based Industry:** Lack of agro-based industry have impact on the dragon fruit cultivators. A proper packaging and processing industry is much desirable so that damaging of fruits and other products in the course of transportation can be reduced.
3. **Rainwater Harvesting:** Most of the dragon fruit cultivators practice the use of stream and river water by pipelines and waterways. This cannot sustain throughout the year so that a proper rainwater harvesting pond or a tank would be helpful so that irrigation issues can be addressed.
4. **Cooperatives and Associations:** A proper action from the part of cooperative societies and association is lacking. A proper functioning cooperative society would be helpful for the farmers themselves so that they could address their own issues by making a proper link to the market and also with a proper profit from their cultivation.
5. **Organised market system:** A proper organised market system is needed so that the dragon fruit cultivators can have a proper market linkage for the future development both in local market and outside the state of Mizoram.

Appendices

Livelihood and living conditions of Dragon Fruit growers in Aizawl Distirct, Mizoram

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HOUSEHOLD INTERVIEW SCHEDULE

(*Confidential and for research purpose only*)

I. Respondent Profile

1	**Identification Information**	
	Schedule No.:	Date of Interview
	Village:	District:
2	**Profile of Respondent**	
	Name:	
	Tribe	Non-Mizo; 1. Mizo
	Sub-Tribe	Non-Mizo; 1 Lusei; 2 Paite; 3 Ralte; 4Hmar
	Religion	1 Christian; 2 Hindu; 3 Bhuddist; 4 Muslim; 5 Others
	Denomination	1. Presbyterian; 2 Baptist 3 UPC(M); 4 UPC(NE); 5 Salvation Army; 6 Seventh Day; 7 Roman Catholic; 8 Local Denomination
	Educational Qualification	1. Illiterate; 2 Primary 3 Middle; 4 High School; 5 Higher Secondary; 6 UG and above
	Type of Family	0 Nuclear; 1 Joint
	Form of Family	1. Stable; 2. Broken; 3. Reconstituted
	Size of family	
	Socio-economic Category	0 AAY; 1 BPL; 2 APL

Kindly furnish the details of household particulars.

ID	Name	Age	Sex #	Education	1Earner/ 2Dependent**	Relation with head*
1						
2						
3						
4						
5						
6						
7						
8						
9						

Family occupation

	1Govt Servant; 2Cultivation; 3Animal husbandry; 4 Business; 5Petty shop; 6Labourer; 7Private sector; 8 Others		Amount in Rupees
Primary Occupation		**Annual income**	
Secondary Occupation		**Annual income**	
Tertiary Occupation		**Annual income**	

Facilities and Amenities

Sl. No	Items	'1' Yes/'0' NO	No of Items
1.	Water connection		
2.	Electricity		
3.	Septic tank/ Pit Latrine		
4.	LP Gas		
5.	Land		
6.	Ration card		
7.	Phone/ Mobile		
8.	Two Wheelers		
9.	Four Wheelers		
10.	Housing	Owned/ Rented	

Kindly furnish the details of average Monthly Expenditure of your household.

Sl. No	Items	Amount in Rupees
1.	Food	
2.	Electricity	
3.	Water	
4.	Phone	
5.	Clothing	
6.	Transport	
7.	Medication	
8.	Religious and Cultural contributions	
9.	Others (Specify)	

How frequently family members are participating in the meeting of the followingAssociations?

Sl. No	Associations	Always	Mostly	Sometimes	Never
1.	YMA	3	2	1	0
2.	MUP	3	2	1	0
3.	MHIP	3	2	1	0
4.	Games and Sports	3	2	1	0
5.	Church	3	2	1	0
6.	Church based Youth Association	3	2	1	0
7.	SHGs	3	2	1	0
8.	Others(Specify)	3	2	1	0

How Many Adult members of your family voted in the recent elections?

Sl. No	Election	All	Most	Some	None
1.	General	3	2	1	0
2.	Assembly	3	2	1	0
3.	Local Council	3	2	1	0

Please give the details of livestock owned by your family.

Sl. No	Livestock	Number	Current Value	Annual Income
1	Pig			
2	Goat/Sheep			
3	Poultry Birds			
4	Cow			
5	Fish			
6	Horse			
7	Other (Specify)			

Dragon fruit Cultivation

1	Is Dragon fruit the main crops	0 No; 1 Yes;
2	Year of starting cultivation	
3	Area of land used for cultivating Dragon Fruit	Area in Tins
4	Land used for cultivation	1Owned; 2Borrowed
5	Type of land	1Garden LSC; 2PLP; 3VC Pass
6	No of Dragon Fruit cultivated	No of plants:
7	No of times harvested so far from beginning	
8	No of harvest in a year (amount in Kgs)	
9	Annual Income from Dragon Fruit	Amount in Rupees:
10	Source of seed/ cuttings	1 Imported; 2 Subsidy from government; 3Purchased locally; 4 Cooperative society
11	Training received	0 No;1Yes
12	Do you have a nursery bed	If yes how many sampling?:
13	Source of orientation about Dragon Fruit cultivation	1Government Advertisement; 2 Friends; 3 Newspaper; 4 Society
14	Have you attended training	0No; 1 Yes
15	Do you own any manual or book on how to grow Dragon fruit	0No; 1 Yes

Annual Expenditure on Dragon Fruit cultivation

Sl. No	Particulars	Amount in rupees
1	Land preparation	
2	Seeds	
3	Labour cost	
4	Transportation	
5	Weeding	
6	Equipment	
7	Preparation of supporting pole	
8	Manure	
9	Pesticides	
10	Irrigation	
11	Transportation	
12	Harvesting and packing	

What are the reasons of your Dragon Fruit Cultivation?

Sl. No	Reason of cultivation	Strongly Disagree	Disagree	Agree	Strongly Agree
1.	High value for money	1	2	3	4
2.	Dragon fruit being an exotic fruit	1	2	3	4
3.	Good prospect because of Govt. support and market	1	2	3	4
4.	Persuaded by friends	1	2	3	4
5.	Intimidation from government	1	2	3	4
6.	Easy process of cultivation	1	2	3	4
7.	Low cost of cultivation	1	2	3	4
8.	Health benefit of the fruit	1	2	3	4
9.	Easy availability of market opportunities	1	2	3	4

What are the other crops cultivated other than Dragon Fruit?

Sl. No	Name of crops	Annual income	Purpose
1.			Consumption/Market/Both
2.			Consumption/Market/Both
3.			Consumption/Market/Both
4.			Consumption/Market/Both
5.			Consumption/Market/Both
6.			Consumption/Market/Both
7.			Consumption/Market/Both

Tools used for Dragon fruit cultivation

Sl. No	Name of tools	No. of tools	Source 1Subsidy; 2Purchased; 3Prepared by self
1	Chempui		
2	Tuthlawh		
3	Plough		
4	Spade		
5	Water pipe		
6	Tractor tiller		
7	Secateurs/knife		
8	Basket		
9	Thirtiang (Crowbar)		
10	Water pump		
11	Basket knife		
12	Pruning shear		
13	Digging hoe		
14	Digging fork		
15	Crowbar		
16	Weeding hoe		
17	Hand hoe		
18	Pruning shear		
19	Khurpi		
20	Spade		
21	Em		
22	Dawrawn		
23	Iptepui		
24	Mechanical Motor Pump Set		
25	Mechanical Weeder		
26	Drip irrigation		
27	Sprinkler irrigation		
28	Rain water harvesting pond		

Support from government

Sl. No	Nature of support	Never	Sometimes	Always
1.	Financial support	1	2	3
2.	Supply of Dragon fruit plants cuttings (Seeds)	1	2	3
3.	Training for cultivation process	1	2	3
4.	Exposure tour	1	2	3
5.	Supply of Fertilizers	1	2	3
6.	Supply of Pesticides	1	2	3
7.	Irrigating facility	1	2	3
8.	Supply of equipment	1	2	3
9	Loan through banks	1	2	3
10	Systematic market	1	2	3

Support from NGOs

Sl. No	Nature of support	Never	sometimes	Mostly	Always
1.	Selection of Beneficiary for dragon fruit cultivator	0	1	2	3
2.	Supply of Dragon fruit plants cuttings /seeds	0	1	2	3
3.	Organized Training for cultivation process	0	1	2	3
4.	Organized Exposure tour	0	1	2	3
5.	Manage supply of Fertilizers	0	1	2	3
6.	Manage supply of Pesticides	0	1	2	3
7.	Protect farmers from exploitation	0	1	2	3
8.	Help maintain market opportunities	0	1	2	3
9	Help to maintain standard price	0	1	2	3
10	Helps in innovations	0	1	2	3

Input use

Sl.No	Input	Always	Sometimes	Never
1	Seed			
	Local seeds or nursery	2	1	0
	Imported HYV seed from government	2	1	0
	Imported HYV purchased from market	2	1	0
2	Human Labour			
	Hired Labour(Male)	2	1	0
	Hired Labour (Female)	2	1	0
	Family Labour (Male)	2	1	0
	Family Labour (Female)	2	1	0
3	Animal Labour			
	Owned(Specify)	2	1	0
	Hired(Specify)	2	1	0
4	Machinery			
	Own(Specify)	2	1	0
	Hired(Specify)	2	1	0
5	Fertilizer			
	Organic Manure(Specify)	2	1	0
	Chemical Fertilizers(NPK)	2	1	0
	Chemical Fertilizers(Minor)	2	1	0
6	Pesticide			
	Organic Pesticides (Specify)	2	1	0

	Chemical Pesticides (Specify)	2	1	0
7	Irrigation			
	Seasonal Rain Fall	2	1	0
	Rain Water Harvesting(Specify)	2	1	0
	River/Stream Water	2	1	0

Opportunities and prospects

Sl. No	Opportunities	1 Strongly Disagree	2 Disagree	3 Agree	4 Strongly Agree
1.	Proper Market linkage				
2.	Subsidized seed				
3.	Support from government is good				
4.	Benefits from NGOs are reliable				
5.	High Market value and profit				
6.	Simple process of cultivation				
7.	No need to be busy the whole year				
8.	Exposure visit for motivation				
9.	Proper training given by government				
10	Can grow very well in Mizoram Climate and soil				
11	No need for irrigation except rain water				

Are you a member of any kind of association or cooperative society?

'0'Member; '1' Leader		If '1' can you specify what position do you hold	

Problems faced by farmers

Sl. No	Problems	1 Strongly Disagree	2 Disagree	3 Agree	4 Strongly Agree
1.	Complex survival chance of Dragon fruit				
2.	Lack of government support				
3.	Improper Market linkage				
4.	Harvest is low				
5.	Pest and insect problem				
6.	Lack of technical know how				
7.	Lack of proper training				
8.	Insufficient subsidy from the government				
9.	Lack of irrigation and water supply				
10	Non remunerative price				
11	Lack of Transport facilities				
12	Poor link roads				
13	Lack of Information on Market				
14	Lack of storage facilities				
15	Lack of agro based industries				
16	Lack of capital				
17	Tools are not available in market				
18	Damaged products in process of transport				
19	High Expenditure for maintenance				
20	Topographical problems				

Strategies adopted and practiced

Sl. No	Strategies	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
1.	Preparing own tools eg. Pole	1	2	3	4
2.	Preparing rain water harvest tank	1	2	3	4
3.	Adopting traditional style of protection from pest	1	2	3	4
4.	Selling to the market by self when market linkage is not properly organized	1	2	3	4
5.	Preparing water line from stream or River	1	2	3	4
6.	New Techniques were learned from other farmers and friends	1	2	3	4
7.	Use of internet to acquire new knowledge and methods	1	2	3	4
8.	Selling through internet	1	2	3	4
9.	Developing nursery is needed for self sufficiency of seeds	1	2	3	4
10.	Organic Manure prepared by self is required when there is shortage of supply	1	2	3	4
11	There is a need to develop supply chain of seed by individual or society	1	2	3	4
12	Depending on rain water	1	2	3	4
`13	Supports from the NGOs are reliable	1	2	3	4
14	Use fertilizers for higher products	Never	Sometimes	Mostly	Always
15	Use pesticides when plants are infected	Never	Sometimes	Mostly	Always
16	Mixed with other crops for sustenance	Never	Sometimes	Mostly	Always

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LIVELIHOOD AND LIVING CONDITIONS OF DRAGON FRUIT CULTIVATORS IN AIZAWL DISTRICT, MIZORAM

A dissertation submitted in partial fulfilment of the requirements for the
Degree of Master of Master of Philosophy in Social Work

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Abstract

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INTRODUCTION

The present study explicates the livelihood and living condition of dragon fruit cultivators in Aizawl District, Mizoram.

Horticulture is the cultivation and administration of gardens. It is the science and art of developing, producing, selling, and using high-value, intensively farmed food and ornamental plants in a sustainable manner. In the last two decades, horticultural land has nearly doubled, and total horticulture production has overtaken food grain production in India. Horticulture production is labour-intensive and necessitates reliable access to water, accurate information, and well-developed supply systems. It is highly on market inputs and outputs, posing major risks to horticultural farmers*(Pooja Prasad, 2018).*Horticultural farming, namely fruit production, is the people's primary occupation, and they are completely reliant on it for their survival. Regions with favourable agro-climatic conditions are known for increasing the output and productivity of fruit crops*(Sati, Wei, Xue-Qian, 2015).*

The dragon fruit is a prominent tropical fruit that has grown in popularity in recent years. Pitaya or pitahaya is another name for it. It is one of the many cactus species native to the United States. Hylocereusundatus is the scientific name for the Dragon Fruit. It's also known as the Honolulu queen because its flower only blooms at night. Pitaya or dragon fruit refers to fruit from the genus Stenocereus, whereas pitahaya or dragon fruit refers to fruit from the genus Hylocereus, both of which belong to the Cactaceae family. The two most prevalent varieties feature brilliant red skin with green scales, giving them the name dragon. Although a less common kind with red pulp and black seeds exists, the most generally accessible variation has white pulp with black seeds. Yellow dragon fruit is another variation with yellow peel and white pulp with black seeds.*(Sanoamuang, 2019).*

Currently, the market contributes worldwide four types of dragon fruit (Hylocereusundatus): red skin, white flesh, Hylocereuspolyrhizus (red skin, crimson flesh) is primarily found in Israel and Malaysia. Guatemala, Nicaragua, Ecuador, and Israel (Hylocereuscostaricensis) have red skin and purple flesh, while Colombia and Ecuador have yellow skin and white flesh(*Hylocereus (Selenicerus)* megalanthus). The worldwide market shares of red–skin with white flesh, red–skin with red flesh, red–skin with purple flesh, and yellow–skin with white flesh are around 94, 4.0, 1.5, and 0.5 percent, respectively.Estimates

put current global dragon fruit output at more than 2.1 million tonnes over 1.12 lakh acres (2017–18). The leading manufacturers are Vietnam, China, Indonesia, Thailand, Taiwan, Malaysia, Philippines, Comodia, India, and the United States*(Chen and Paull, 2018).*

The flavours of dragon fruit are similar to those of other fruits, despite their unusual appearance. In terms of flavour, it's been compared to a slightly sweet cross between a kiwi and a pear. This plant's native habitats are southern Mexico and Central America. Dragon fruit is produced in Southeast Asia, Florida, the Caribbean, Australia, and other tropical and subtropical regions around the world. Three big countries, Vietnam, China, and Indonesia, produce more than 93 percent of the world's dragon fruit. With an average productivity of 22–35 metric tonnes (MT)/hector (ha)/year and a land area of 55, 419 hectares, Vietnam accounts for more than half (51.1%) of global output. In Vietnam, the volume of dragon fruit produced reaches 1 million metric tonnes, with a value of US$ 895.70 million.*(Chen and Paull, 2018).*Dragon fruit is grown in almost all of Vietnam's provinces, but the BinhThaun, TeinGiang, and Long An regions are the most densely populated. China is the second largest producer, producing about 7,00,000 MT worth US$ 397 million over 40,000 ha of growing regions with an average yield of 17.5 MT/ha/year, accounting for 33.3 percent of global dragon fruit output. *(Hein, 2018).*

Dragon fruit can be grown in a range of conditions, but sandy soils with plenty of water are optimal. The soil ph should be between 5.5 and 6.5 for a productive production. The height of the bed should be at least 40-50 cm.The first option is to begin with seeds, while the second option is to begin with a cutting from a plant sample. Farmers prefer to employ the cutting approach since it takes three years for seeds to develop into a large enough plant to be used. The seedling should be 20 cm long and plucked from the mother plant before being planted in the shade for 5-7 days. Whether the support is vertical or horizontal determines the space between dragon fruit plants when planted. In vertical support, the space between the plants should be 2-3 metres, while in horizontal support, the distance is decreased to about 50 centimetres, allowing for more intensive farming. Vertical support should be between 1 and 1.20 metres tall, and horizontal support should be between 1.40 and 1.60 metres long for healthy growth. Fertilizer from mounds should be spread over the ground. The usage of organic fertilisers weighing 20 kg is recommended. A total of 0.5 kilogrammes of superphosphate and 1 kilogramme of NPK16-16-8 should be used per 50 postings before to the actual planting of dragon fruit plants.Three times a year, 50 grammes of Urea and 50 grammes of phosphate should be administered during the first year of

cultivation. Because the plant needs less water, watering should be done once a week, and drip irrigation should be used for maximum efficiency. The fruit takes 27-30 days to completely mature. Even a 4-5-day wait could cause the fruit to deteriorate. The estimated yield per hectare might range from 10 to 30 hectares, depending on the conditions and processes used. Twisting and plucking it in a clockwise direction are examples of picking techniques. *(Tripathi, 2020)*.

Dragon fruit can be grown from seed or by cutting the plant in the same way that flowers are cut. When the seed is used to cultivate it, the seed is scooped out of the fruit, washed, and dried overnight. The seed is then easily sown in compost or potting mix, where it germinates in about two weeks. Dragon fruit cultivation from seed can take five to seven years for the plant to bear fruit, which is why it is the least preferred alternative. Propagating a dragon fruit tree, on the other hand, is rather simple. Simply clip off a 30cm part of the tree and leave it to dry for 5-6 days, or until the cut end turns white. Simply insert cut side down in sandy cacti soil and water monthly once it has dried. Within a month, the plant will send out roots and establish itself, after which it will continue to develop and bear fruit for one to three years. *(Dalziel, 2019).*

Dragonfruit cultivation in India was first introduced in the late 1990s. Following that, between 2005 and 2017, the area under cultivation was gradually grown from 4 to 400 ha in several states. Farmers from Karnataka, Maharashtra, Gujarat, Kerala, Tamil Nadu, Orissa, West Bengal, Andhra Pradesh, Telagana, and the Andaman and Nicobar Islands were the first to cultivate dragon fruit.Rajasthan, Punjab, Haryana, Madhya Pradesh, Uttar Pradesh, and the North Eastern States are among the states where it is grown. According to recent predictions, India's dragon fruit output will more than double to more than 12,000 MT in 2020, covering an area of 3,000–4,000 ha.These projections are based on firsthand information gathered by the ICAR–NIASM from progressive growers, entrepreneurs, consultants, and officials from state agricultural departments across the country.States like Karnataka, Maharashtra, Gujarat, Telegana, Andhra Pradesh, and West Bengal, which have taken measures to boost commercial production after 2018, are primarily responsible for the significant increase in production and cultivated area. More than 80% of the total 3,085 ha (2,468 hectares) is under fresh cultivation with a plantation age of less than 18 months.Furthermore, these areas' average productivity ranges from 1.5 to 3.1 MT/ha. While the remaining 20% of the crop area (617 ha) is well-established and has reached full maturity, with an average production of 8–13.5 MT/ha.Farmers in India who use appropriate cultivation procedures and drip irrigation

can get up to 4.5 tonnes of fruit per hectare in the first year after planting, 7.5–10 tonnes in the second year, and 16–24 tonnes per hectare in the third year*(Wakchure et, al., 2020)*.

Overview of Dragon Fruit Cultivation in Mizoram

Dragon fruit cultivation in the state of Mizoram had started with the initiative of Mr. Samuel Rosangliana who was the Director of the Department of Horticulture in Mizoram. They had sent delegates to Israel for training on the cultivation of dragon fruit and the planting material was imported from Thailand. The commercial cultivation started in 2014-2015 in Aizawl, Kolasib, Tuidam, Lunglei, Lawngtlai and Serchhip Divisions.The cultivation of Dragon fruit had grown so much in the state of Mizoram that the concerned government and non-government organisations also had worked to improve the quality and quantity of the production of the dragon fruit. In Mizoram approximately the total land area of 430ha is under dragon fruit cultivation. In Aizawl District alone out of the total 430ha of land 210ha is under dragon fruit cultivation *(CAU, Imphal, 2017).*

In the state of Mizoram, the Department of Horticulture, Government of Mizoram had made a tremendous contribution in this field for the development of horticulture within the state. With the help of certain Schemes and Programmes, the Department of Horticulture had made contributions by emphasizing the cultivation of anthurium, dragon fruits, passionfruit, areca nuts, etc.Dragon fruit cultivation had been initialised so that there can be available high-value fruits and crops within the local market and also to promote the practice of cultivation of exotic fruits within the state that can be beneficial for the farmers. Since the market price of the dragon fruit is relevantly high, this ranges from Rs 200/- to Rs. 400/- according to the quality of the fruit and also the availability in terms of harvest season.This makes it a good prospect for the farmers too. The climatic condition of Mizoram is suitable for the cultivation and also that Mizoram is the pioneer of the cultivation of dragon fruit on a large scale. The Department of Horticulture had chosen the beneficiaries in terms of the area of land which the farmer had and the kind of techniques which had been practiced in the past *(CAU, Imphal, 2017).*

From the report prepared by the Central Agriculture University, Reiek Cluster was studied where they had mentioned that the supporting framework structure of dragon fruit plantation needs to be strong and durable to sustain the plantation. The Department of Horticulture had also established a large-scale production through programmes and schemes by distribution to farmers for massive production. A recommendation for standardization of

spacing for optimum and sustainable production is also given and also mentioned the requirement for promotion and strengthening of water management as well*(CAU, Imphal, 2017).*

The construction of a Zero Energy Cool Chamber at the growing site for temporary storage until the fruits are transferred to the cool warehouses will also be started, as well as a Mobile Processing Van. Initiatives for credit linkage with financial institutions will be launched, and growers may be eligible for financial help for the development of supporting facilities. The state government must create market links with other state agencies, and the government agency (Dept. of Horticulture, Govt. of Mizoram) must encourage the buyback system of dragon fruits from growers. *(CAU, Imphal, 2017).*

The present study is focused on the livelihood of the dragon fruit farmers within Aizawl District. It will give emphasis on the study of the demographic profile of the respondents, living conditions and also keeping in mind the social capital and financial capital. In this study four villages within Aizawl District were randomly selected where several government interventions took place. The study also encompasses the support which the dragon fruit cultivators received from the services provided by the government. It also studies the opportunities and prospects as well as the challenges faced by the farmers and the certain strategies that have been adopted in order to overcome their challenges.

Overview of literature

There are scholars who had made their studies and definitions on livelihood such as (see Chambers & Conway, 1992; Niehof& Price, 2001; Engberg, 1996; Hussein & Nelson, 1999; Ellis, 2000; Thompson, 1995; Janvry, 1981; Sarma, 2004; Drinkwater &Rusinow, 1999; De Haan&Zoomers, 2003) livelihood is the constructed basis of income resource which are derived from the basis of their livelihood resources. The scholars have made their contributions to define livelihood, their way of interpretation has differed. They have advocated that livelihood is the main formal or non-formal occupation in which individuals and families derived their income for their basic amenities. The livelihood may differ accordingly with the presence of skills, knowledge, education and health. (seeScoons, 1998; Dercon&Krishan, 1996; Dolan, 2002; Lucas, 1997)

There are also many studies on sustainable livelihood as well. Sustainable livelihood encompasses the livelihood practice which entails goal achievements through physical,

human, financial, natural and social assets and capitals to have income, production and distribution (see Saha, Singha and Xaxa, 2017; Carney, 1998). Sustainable livelihood also means having a strategy that must be inclusive, connected, equitable, prudent and secure to attempt to go beyond conventional definitions and approaches to poverty eradication (see Krantz, 2001; Gladwin et al., 1995)

There have been studies on horticulture and how to make it active among farmers. It needed sustained technical help and guidance because it is an art, a science, and a business (seeKrumbiegal, 1920; Edwinna von Baeyer, 1930). It is also the science and technique of production, processing and merchandising of fruits, vegetables, flowers, spices, plantations, medicinal and aromatic plants which further stress on studying the post-harvest losses and its impact on the economy (see Swamy&Auxcilia, 2015; Subarhamanyam et al., 1981; Overgaauw, 1992;Harold Hume, 1951; IIbery, 1986) where rootstock, picking, cost, dimensions, distribution, norms and preferences, shelf life, microclimate, box specification, compression test, recycling and labelling, describing the cost of packaging are discussed along with direct marketing, local market, distant market, grower cooperative, and contracts farming.

In the study of horticulture, the formal finance is confined almost exclusively to well establish large exporters along with the role of horticultural cooperative and role of the government in assisting to overcome the market failure and role of horticultural sector of the country and its prospects (see Ouattara, Graham, Meyer &Nagarajan, 1995; Trupo, 1997; Singh &Mathur, 2008)

There are studies on dragon fruit in the Philippines and Nepal that is related to the current status prospects, constraints and opportunities. All are focused on the production, market and the future possible outcome that mentioned the possibility for the future (see Eusebio&Alaban, 2018; Tepora, 2019; Pascua, Pascua & Gabriel, 2015; Tagay, 2017; Rijal, 2019). The focus of their study is concerned on the rate and growth in production, impact on the economy and the comparison with other horticulture fruits on the market by taking into account the value of the dragon fruit.

Research Gap

The overview of literature shows that there is an ever growing literature on the cultivation of dragon fruit which is based on varied context in certain developing. In the

context of India there is hardly any literature to be found on the topic study. The research gaps can also be noted as the following.

Firstly, there is absence of the study of the livelihood conditions of the farmers the only literatures that can be found within India especially in the state of Mizoram is the progress reports of the departmental works and not of the farmers (for instance see Central Agriculture University, 2017). This may be due to the importance given on the quantity of product rather than giving importance on the condition of living of the farmers who are dragon fruit growers since the cultivation of dragon fruit is still emerging in Mizoram.

Secondly, among the few studies conducted, most focus is on the prospect, opportunities and constraints (for instance see Eusebio&Alaban, 2018; Tepora, 2019; Pascua, Pascua & Gabriel, 2015; Tagay, 2017; Rijal, 2019). None have done any study on the livelihood and living conditions of dragon fruit growers who are mostly laborers working in the farms who are landless and marginal workers in the context of Mizoram. This is also evident from the studies of other countries that there is no study to be found that the farmers are the subject of the study, rather, the farming itself is studied for the economic and promotion of dragon fruit cultivation.

Lastly, most of the studies are quantitative in methodological orientation and the use of qualitative or participatory methods to study the vulnerable contexts, livelihood challenges, and livelihood strategies are rarely seen. The roles of institutions such as cooperatives as well as livelihood outcomes of the farmers are also rare.

The study will try to fill the research gaps which can be seen from these literatures especially in the context of Mizoram. The study will be based on the Sustainable Livelihood Framework in order to understand the patterns of livelihood and the problems of the dragon fruit cultivators

Statement of the Problem

The progress of the cultivation of dragon fruit within the state of Mizoram can be seen through the reports of the work of the government agency. Since Dragon Fruit is a kind of horticulture crop which is also a kind of luxurious fruit. There are many who have also grown it in their own garden on a small scale. However, these are not viable for the study to know the impact on the livelihood of the grower.

The Government of Mizoram had done work to promote the cultivation of dragon fruit within the state. Through the help of certain central sponsored schemes such as Mission for Integrated Development of Horticulture (MIDH/HMNEH), RashtryaKrishiVikasYojana (RKVY), and PradhanMantriKrishiSinchaiYojana (PMKSY), the Department of Horticulture, Government of Mizoram had chosen farmers and introduced the cultivation of dragon fruit in a large scale within the state of Mizoram. With the help of Programme under Article 275 (1) during 2016 – 2017, the department also had done work in Aizawl, Serchhip and Lunglei Districts with the total of 113 beneficiaries and a financial target of Rs. 115.40 lakh. The beneficiaries have been assisted in terms of planting materials and other necessary inputs including cash assistance for inter culture and trellis erection. *(Department of Horticulture, 2018)*

However, although the government had done their work for the farmers, there are farms owned by the officers themselves in several places bypassing the real farmers who are really in need of such privilege. While in other places the farms are solely owned by private farmers who fall under the criteria for beneficiary. It is the aim of the study to probe into the scenario and study whether the services had reached the beneficiaries and whether it is benefitted by them.

The main concern lies within the persons and individual households who are concerned with the large-scale cultivation and production of the dragon fruit. The farmers who have grown it in their farm for their primary source of income would be the main concern for the study. It is most important to know the impact on the livelihood of the farmers of the cultivators. It is also evident that there is rarely a study that would depict the living condition and the impact of dragon fruit production on the livelihood of the farmers within Aizawl District.

The present study employs the sustainable livelihood framework to comprehend the livelihood and living conditions of the Dragon Fruit growers in Mizoram. The study will try to understand the living conditions of dragon fruit growers especially the role of seasonality and the challenges faced. It will explore the role of government agencies and cooperatives in addressing the challenges faced by farmers and promoting their livelihood. It will probe into the livelihood patterns of the farmers in terms of their natural, physical, financial, human and social capitals. It will also assess the bearing of these livelihood assets on the livelihood outcomes such as household income.

The findings and results of the study will also be useful for policy makers and practitioners in the field in their work for promotion of sustainable livelihood and rural as well as urban development in the field of Horticulture. The current study will also be able to provide the evidence needed for better and smoother intervention planning for the dragon fruit growers and to make policies so that it can be more sustainable and enhance livelihood.

Objectives

The following are the objectives of the study:

1. To understand the vulnerability context of dragon fruit cultivators.
2. To probe into the role played by the Government in promoting dragon fruit cultivation in Mizoram.
3. To study the challenges of dragon fruit cultivators and the strategies employed to manage these challenges.
4. To assess the livelihood assets and living conditions of households cultivating dragon fruit.
5. To assess the relationship between the livelihood assets and living conditions of dragon-fruit cultivators.

Hypotheses

The hypothesis for the study has been formulated which are:

1. Living conditions of the farmer household are directly related to its access to natural resources.
2. Living conditions of the farmer household are directly related to its access to physical capital.
3. Living conditions of the farmer household are directly related to its access to human capital.
4. Living conditions of the farmer household are directly related to its access to social capital.

These hypotheses were derived from the earlier studies on sustainable livelihood framework and studies on livelihood conducted in the department of social work (see Sailo, 2014; Zaitinvawra, 2014; Malsawmtluangi, 2013)

METHODOLOGY

The methodology chapter includes the research methodology and design of the present study. The methodology chapter is presentedas research design, sampling, tools of data collection, data processing andanalysis of processed data.

Research Design

The present study is explanatoryin design and it adopted a quantitative method. The primary data is collected throughquantitative method where pre-tested structured household interview schedule. The secondary data will be collected through articles, journals and other forms of publications

Sampling

The universe of the study includes all the dragon fruit cultivators under Aizawl Horticulture division in Aizawl District.The unit of the study will be an individual dragon fruit cultivator household.

A multistage sampling procedure is employed to select Circles, villages and households in Aizawl District of Mizoram. Sample size is 40 household.

1. In the first stage, two circles were purposefully chosen from the Aizawl Horticulture Division namely, Aizawl South Circle and Thingsulthliah Circle as they are the circle with higher number of dragon fruit cultivators.
2. In the second stage, four villageswith large number of dragon fruit cultivators are selected. From Thingsulthliah circle two village namely Thingsulthiahvillage andSesawngvillage were selected.From Aizawl South CircleSamtlangvillage and Hlimenvillage were selected.
3. In the third stage, Tendragon fruit cultivator household are randomly selected from each villages.

Tools of Data Collection

Primary data is collected using survey and secondary data include information from books, research articles, government records and online resources. Field surveywas conducted to collect quantitative data using a pretested structured household interview schedule. The interview schedule includes socio-demographic and economic characteristics of respondent households, assets and living conditions. It also probed into the challenges and coping strategies used by the households in the process of dragon fruit cultivation.

Data Processing and Analysis

The quantitative data collected were processed using Microsoft Excel and SPSS (Statistical Packages for the Social Sciences)and analysed using simple percentages, ratios, average. Apart from this 't' test andKarl Pearson's product moment correlation were also used to test hypotheses. Analysed data has been presented in the form of a table.

Ethical Consideration

Consent has been taken from the farmers who are selected for respondents and in case if the farmers are a member of any kind of association or society related to Dragon Fruit cultivation, the consent of the respective association or society was also taken to conduct survey among them.The identity of the respondent are confidential and information collected will only be used for academic purpose.

Limitation of the study

The present study represents only a fraction of the whole dragon fruit cultivation of Mizoram since the study area is confined to Aizawl District. Whatever the limitations may be, all efforts are given so that the selected samples depict the right information of Aizawl District. Moreover, the process of dragon fruit cultivation is in its initial stage so it may be immature to draw conclusion on its impact on livelihood and living condition.

CONCLUSION

The present study attempts to assess the livelihood and living conditions of the dragon fruit cultivators in Aizawl District Mizoram. The study also highlights how the patterns of cultivation, vulnerability context, livelihood assets, policies, institutions and processes, livelihood strategies interacted to develop the livelihood of the dragon fruit cultivators.

Dragon fruit cultivation in Aizawl District started some few years back approximately in the year 2014 where initiative was taken by the government and beneficiaries were also selected by the government. However, it is systematically implemented the next year where cultivation has grown and expanded. As it is in the initial stage only handful of farmers were selected as a beneficiary to start dragon fruit cultivation. Almost all the beneficiary cultivates other crops to sustain themselves apart from the government support. Dragon fruit is not primary crop cultivated hence other crops such as Fruits, Vegetables, Tree Crops and Cereals are also cultivated for the purpose of consumption and for market. In the process of cultivation, the tool used for cultivation could not be classified from other tools used for other crops as the cultivator cultivated others crops before cultivating dragon fruit. Since dragon fruit cultivation has only started approximately 5 years back, the average seedlings cultivated were also less which comprises only 286 seedlings per farmers. Cultivation of dragon fruit is not done in a large scale as it only in a beginning phase, even the amount of fruit produced is also not at a large quantity. As the rate of production is still low, marketing is also still manageable at local market. Although there is no systematic market established for the farmers the farmer could still sell their products in local market.

As dragon fruit cultivation in Mizoram is in the initial stage, the government support is still very high and certain challenges faced by the cultivators is also linked to and engaged through government programme. Dragon fruit have complex survival chance that influenced the cultivators to use organic manures and organic fertilizers and even in a problem of pest and insect cultivators resorted to the use of organic pesticides. As dragon fruit cultivation is initiated by government the cultivators lack of technical know-how is addressed by awareness and training programmes. Apart from this, dragon fruit cultivators helped each other, share

their experiences which is even regarded as more helpful for the cultivators. The cultivators also develop their own tools for use as there is no particular tools for dragon fruit cultivation. But certain technique and methods were applied without hesitation. As Mizoram is a rain fed region irrigation is neglected and depend mainly on rainwater. But only a few cultivators irrigate their land using river and stream, rainwater harvesting pond due to topographical problems. Although the government support is instrumental in some areas certain problems like lack of capital is one of the main issue for farmer who started cultivating and lack of proper storage facilities are faced by farmers who started producing dragon fruit. Although the market opportunities are still manageable at local level market the expenditure on process of cultivation is high which is in the meantime supported by government support and farmers managed it by cultivating other crops. As market opportunities and rate is still favourable in local market the cultivator income is also increased and earned significant amount of profit from dragon fruit cultivation.

Dragon fruit cultivation increases financial capital which in turn improves physical capital in the form of assets owned. Dragon fruit cultivation increased income of farmers and the household expenditures related to cultivation also increased in spite of systematic government support. In the meantime the social capital and natural capital owned by the dragon fruit cultivator do not improve living conditions of dragon fruit cultivators. However the educational qualification as human capital has significant relationship with living condition of dragon fruit cultivators.

The pattern of dragon fruit cultivation in Mizoram shows development at a fast rate and many cultivators saw it as a good opportunity which resulted in a rapid increase of number of farmers cultivating dragon fruit in recent years. The challenges faced by the dragon fruit cultivators were also comprehended systematically and could cope with the support of the government and the coping strategies developed by the farmers which in turn create livelihood opportunity and developed living conditions of dragon fruit cultivators in Aizawl, Mizoram. In the meantime we should not fail to mention that the cultivators are now facing a problem on the storage facility although the rate of production is still not in a large scale. With the expected increase of production and the reality of unorganised local market system it can be assumed that market issue will be a problem in the near future. Once the amount of production is not possible to be consumed in the local market farmers will need to export their product outside and currently there is no plan in this regard. Presently dragon fruit cultivation with a significant amount of support from the government is a good prospect

for cultivators. However, sustainability of dragon fruit cultivation as a livelihood option without the support of the government will only be confirmed by future research.

7.1 Suggestions

There are suggestions from the study that can be utilised for further study and actions.

1. **Storage facility:** There is a lack of storage facility for storing the products before it has been brought to the market. The storage would be helpful in such a way that it is accessible for the farmers to store their crops and other farm products to reduce damage due to lack of proper storage.
2. **Agro-based Industry:** Lack of agro-based industry have impact on the dragon fruit cultivators. A proper packaging and processing industry is much desirable so that damaging of fruits and other products in the course of transportation can be reduced.
3. **Rainwater Harvesting:** Most of the dragon fruit cultivators practice the use of stream and river water by pipelines and waterways. This cannot sustain throughout the year so that a proper rainwater harvesting pond or a tank would be helpful so that irrigation issues can be addressed.
4. **Cooperatives and Associations:** A proper action from the part of cooperative societies and association is lacking. A proper functioning cooperative society would be helpful for the farmers themselves so that they could address their own issues by making a proper link to the market and also with a proper profit from their cultivation.
5. **Organised market system:** A proper organised market system is needed so that the dragon fruit cultivators can have a proper market linkage for the future development both in local market and outside the state of Mizoram.

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