

**ENTREPRENEURIAL BEHAVIOUR OF HI-TECH  
FARMERS IN KERALA**

By  
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(2017-11-114)

**THESIS**

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**COLLEGE OF HORTICULTURE  
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**2019**

## DECLARATION

I, hereby declare that the thesis entitled “**Entrepreneurial behaviour of hi-tech farmers in Kerala**” is a bonafide record of research done by me during the course of research and that it has not previously formed the basis for the award to me of any degree, diploma, fellowship or other similar title, of any other University or Society.

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## **CERTIFICATE**

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## CHAPTER 1

### INTRODUCTION

Agriculture is still the backbone of Indian economy, as majority (65 percent) of the population directly or indirectly depends on it. Thus, the fact that the development of agriculture is the core of Indian economy, is still logical. But besides that, the human resources are one of the most strategic and critical determinants of growth. In spite of abundant physical resources, the country could not make rapid economic and social advancement due to low level of entrepreneurial motivation among people. Development of entrepreneurship is crucial in harnessing vast untapped human resources of a country like India. Given the natural endowment of resources the fact that development or under development of any nation is largely the reflection of the abundance or scarcity of entrepreneurship. Several research findings do suggest that entrepreneurship is the dominant variable in the growth process of any society, community or a nation as a whole (Bheemappa *et al.*, 2014).

#### **The concept of entrepreneurship**

According to J.B. Say, “An entrepreneur is the economic agent who unites all means of production; land of one, the labour of another and the capital of yet another and thus produces a product”. An agricultural entrepreneur is one who operates on his best technique of production function to obtain the maximum possible output from his agri-enterprise, which is feasible with current technology, socio-economic and physical environment. It is only the innovative agri-entrepreneur who has the power to dream and transform new situation into thoughts and to resolve them into action. Farmers those who are progressive cannot be identified as agricultural entrepreneurs but those who are entrepreneurs are essentially progressive farmers.

Entrepreneurship is a dynamic activity which helps the entrepreneur to bring changes in the process of production, innovation in production, new usage of materials, creator of market etc. It is a mental attitude to fore see risk and uncertainty with a view to achieve certain strong motive. It also means doing something in a new and effective

manner. Entrepreneurship as a composite variable means that the person possessing entrepreneurial behaviour has some specialized characteristics. Entrepreneurship has been therefore, accepted as a function of several factors such as the entrepreneurial and marketing attributes of the entrepreneur.

Entrepreneurial behaviour refers to changes in knowledge, skill and attitude of an Entrepreneur. Knowing the behaviour of an individual towards any change is foremost to bring that change in the same. The purpose of studying entrepreneurial behaviour is to know various attributes of an individual in order to take steps to inculcate entrepreneurial abilities and promote entrepreneurship.

### **Importance of entrepreneurship**

Entrepreneurship has now been recognized as a concept, not only for starting industries but also in the development of agricultural and horticultural production. Government of India established a separate ministry for Micro Small Medium Enterprises to promote entrepreneurship in rural and semi-urban areas. The importance of entrepreneurship include-

- Promotes capital formation by mobilising the savings of the people.
- Creates immediate and large-scale employment by establishing small- scale enterprises. Thus, they reduce the unemployment problem in the country which is the root cause of all socio-economic problems.
- Promotes balanced regional development by establishing small-scale enterprises in rural, remote and less developed regions.
- Promotes the equitable redistribution of wealth, income and even political power in the interest of the country.
- Encourages effective resource mobilization of capital and skill which might otherwise remain unutilized and idle.

- Induces backward and forward linkages which stimulate the process of economic development in the country.
- Promotes country's export business, which is an important ingredient to economic development.

### **Scope and importance of hi-tech farming**

The conventional farming system in India has witnessed a path breaking change into hi-tech farming aimed at boosting up production and marketing. Considering the high population density, farm labour shortage and low per capita holding size in Kerala, the only solution to ensure food security is with high-tech, mechanised agriculture (Franco, 2013). With an aim to attain self-reliance in the case of vegetable production, the State Government is promoting hi-tech farming techniques in Kerala through several schemes. Keeping in view of the increasing acceptance of hi-tech farming, Kerala State Agriculture Development and Farmers Welfare Department has also initiated many programs to promote hi-tech farming like protected cultivation as well as precision farming in the state.

In Kerala, small and marginal land holdings constitute 98 per cent of cultivated area. Some of these farmers are getting converted to hi-tech farmers with an expectation of sustainable income. Steep rise in cost of inputs, water scarcity, marginal to small land holdings and acute labour shortage forced them to find new ways of farming (Prabhakaran, 2011). Hi-tech farming is now practised in many districts of Kerala. Palakkad and Thrissur where hi-tech farming was initiated has now become the pioneer of this farming practise in the state. The Self Help Groups practising group farming have also been reported to have undertaken hi-tech farming. Various agencies such as National Bank for Agricultural and Rural Development (NABARD) and Vegetable and Fruit Promotion Council Keralam (VFPCCK) are supporting to take up this promising venture.

Evidences showed that hi-tech farming has the potential for enhancing farm income and exert positive influence on livelihood security (Maheswari *et al.*, 2008). However

the extent of spread of this farming practise is limited. The entrepreneurial behaviour specific to hi-tech farmers have not been subjected to scrutiny in a detailed manner.

### **Objectives of the study**

- To analyse the entrepreneurial behaviour of hi-tech farmers in Kerala.
- To unravel the marketing behaviour of hi-tech farmers.
- To assess the backward and forward linkages operated in the hi-tech farming sector.
- To conduct SWOC analysis of hi-tech farming in the area under study.

### **Scope of the study**

Earlier many researchers made concerted efforts to explore socioeconomic, psychological and personal characteristics of farmers engaged in entrepreneurship, especially knowledge, adoption constraints etc. were extensively explored in relation to their influence and contribution to conventional farming, but none have tried to study the entrepreneurial behaviour, specific to hi-tech farming, which is an emerging and progressive method of farming. Therefore, this study may be considered as an innovative effort to explore the various dimensions of entrepreneurship among hi-tech farmers.

The study outcome implies great significance in identifying and understanding social and psychological factors affecting entrepreneurial behaviour of hi-tech farmers. To the great extent, the findings spell out the level of marketing behaviour of hi-tech farmers along with their linkages with other sectors. The study has also practical utility for the planners, policy makers, administrators, extension functionaries and other agencies by making them aware about various dimensions and status of entrepreneurship among hi-tech farmers. Thereby they can plan and implement the appropriate program among hi-tech farmers effectively.

### **Limitations of the study**

A concentrate and deliberate effort was made to make this study comprehensive and to derive facts of academic and practical relevance. However, this study is subjected to the inherent limitations of being a single research project. Some of other usual limitations are given below.

1. The data were collected from very small percentage of hi-tech farmers representing vast number of hi-tech farmers; therefore, the findings may not be generalized.
2. The results are based on the expressed responses of the respondents; therefore, the objectivity of the study depends upon the free and frank opinion of the respondents. Hence their prejudices and bias while giving responses cannot be ruled out.
3. The study suffers from usual limitation of time, money and other resources generally encountered by the student investigator.
4. Although, utmost care was taken while selecting relevant variables for the study, a few more variables may be still missing in research design.

### **Presentation of the study**

The report of the study is presented in five chapters. The first chapter outlines a brief introduction, objectives, scope and limitation of the study. The review of literature relevant to the problem is cited in the second chapter. The third chapter describes material and methods which have a bearing on measurement of variables, with statistical procedures used, while the fourth chapter deals with the results and discussion based on the obtained results. Finally, the fifth chapter put forth summary and conclusions of the thesis followed by bibliography. The appendices and the abstract of the study are given at the end.

## CHAPTER 2

### REVIEW OF LITERATURE

A comprehensive review of literature structures an integral part of scientific investigation. It is important for the researchers to familiarize themselves with the work done in the past to outline the critical issues related to the study. For supporting the findings of the present investigation all accessible journals, books, periodicals and reports were referred by the researcher. Endeavors have been made to gather most important review on entrepreneurial behaviour of hi-tech farmers but as limited research has been done in past, it had not been conceivable by the researcher to find out review directly related to the entrepreneurial behaviour of hi-tech farmers.

On account of these understanding, the available literature appropriate to the issue has been explored in light of the objectives of the study. It has been displayed under the following sub heads:

2.1 Concept related to entrepreneur, entrepreneurship and entrepreneurial behaviour

2. 2 Dimensions of entrepreneurial behaviour

2. 3 Socio-economic characteristics of hi-tech farmers

2.4 Marketing behaviour of hi-tech farmers

2.5 Linkages in the hi-tech farming sector

2.6 Constraints in the hi-tech farming sector

2.7 SWOC analysis

#### **2.1 Concept related to entrepreneur, entrepreneurship and entrepreneurial behaviour**

##### **2.1.1 Entrepreneur- definition**

Drucker (1985) defined an entrepreneur as ‘one who always search for change, responds to it and exploit it as an opportunity. Entrepreneurs innovate. Innovation is an explicit instrument of entrepreneurship’.

Harold (1994) asserted that an entrepreneur took risk in initiating change, hoped to be remunerated and required some level of flexibility to seek after their thoughts; this thus required adequate expert be designated.

Rao (2008) characterized an entrepreneur as a person who has the ability to identify a real market for a product or service idea, can price it economically and make the whole venture sustainable.

Haugen and Vik (2008) suggested that, among farmers, entrepreneurs are distinct type of farmers characterized by a strategic interest in the creation of additional activities on the farm that cannot be described as traditional farming.

### **2.1.2 Concept of Entrepreneurship**

Samwel (2003) viewed entrepreneurship as a function which seeks investment and production process by raising capital, arranging labour and raw materials, finding site, introducing new techniques and commodities and discovering new sources for the enterprises.

Herron and Robinson (1993) viewed entrepreneurship as a set of behaviour that initiates and manages the reallocation of economic resources with the purpose of value creation.

Uddin and Bose (2012) argued that entrepreneurship is the process of identifying opportunities in the market place before committing actions and necessary resources to exploit the opportunities for long term personal gain.

Pihie (2009) asserted that entrepreneurship involves discovering and assessing opportunities.

Reddy (1986) stated that entrepreneurship is a composite ability, the resultant of a blend of numerous qualities and attributes – these incorporate substantial variables as creative ability, readiness to take risks, capacity to unite and put to utilize factors of production, capital, labour, land and further more impalpable variables.

Suresh (2004) stated entrepreneurship as a combination of skills, the consequential of a mix of many qualities and traits, which include tangible factors as

imagination, readiness to take risks, ability to bring together and put to use other factors of production, capital, labour, land, and also intangible factors such as the ability to mobilize scientific and technological advances.

### **2.1.3 Entrepreneurial behaviour:**

Patel *et al.* (2014) defined the term entrepreneurial behaviour as a composite skill, the resultant of a mix of many qualities and traits.

Rao (2003) held a study on entrepreneurial behaviour of vegetable growers in Varanasi publicized that majority (60.00 per cent) of the respondents had medium entrepreneurial behaviour, while 16.00 and 23.30 percent respondents had low and high entrepreneurial behaviour respectively.

Subramanyeswari (1997) in their study on entrepreneurial behaviour of rural dairy women stated entrepreneurial behaviour as the changes in the knowledge, skill and attitude of women livestock farmers towards dairy enterprises.

## **2. 2 Dimensions of entrepreneurial behaviour**

Entrepreneurial behaviour was regarded as a function of seven components- innovativeness, achievement motivation, decision making ability, economic motivation, risk orientation, leadership ability, and cosmopolitaness (Gurubalan,2007).

Murali and Anitha (2003) reported components of entrepreneurial behaviour, viz., innovativeness, achievement motivation, risk orientation (risk taking), self-confidence (confidence), and information seeking behaviour (knowledge). The other five components were: manageability, persuability, hope of success, persistence and feedback usage.

Solanki and Soni (2004) identified 15 indicators of entrepreneurial behaviour viz., decision making ability, economic motivation, knowledge of improved technology, ability to coordinate available resources, risk taking ability, ability to solve problems, credit orientation, self-confidence, scientific orientation, communication skills, experiences, market orientation, achievement motivation, perceiving opportunities, and perceiving management.



Vijay (2001) in their work on entrepreneurial behaviour of floriculture farmers in Hyderabad stated entrepreneurial behaviour as the accumulative outcome of information seeking behaviour, farm decision making, leadership ability, risk taking ability, innovativeness, achievement motivation and market orientation of respondent farmers.

Nomesh and Narayanaswamy (2000) in their study on entrepreneurial behaviour and socio-economic characteristics of farmers who implemented sustainable agriculture in India described entrepreneurial behaviour as a combination of seven components viz., innovativeness, decision making ability, achievement motivation, information seeking ability, risk taking ability, co-coordinating ability and leadership ability.

Narmatha *et al.* (2002) in their study on entrepreneurial behaviour of livestock farm women identified that innovativeness, achievement motivation and risk orientation were the most important components and further, the component decision-making, innovativeness, management orientation, economic motivation, level of aspiration and risk orientation were crucial in influencing the entrepreneurial behaviour.

### **2.2.1 Innovativeness**

Caird (2013) asserted that innovativeness or creative tendency entails coming up with new ideas. She added that an innovative person is imaginative, inventive, versatile and able to draw on personal resources for projects or problem solving.

A study on the effect of entrepreneurship education on the entrepreneurial behaviour of graduates in Tanzania concluded that 67 per cent had a high level of creative tendency while 33 per cent had a low level of creative tendency (Nyello *et al.*, 2015).

Mehta and Sonawane (2012) steered study on entrepreneurial behaviour of mango growers in Valsab specified that 47.50 per cent of respondents fell in low category followed by 31.66 per cent in medium category and 20.84 per cent in high category.

Bhagyalaxmi *et al.* (2003) in their study on profile of rural women micro entrepreneurs detected that majority (69.44 per cent) of the respondents had medium innovativeness followed by 15.56 and 15.00 per cent of respondents having high and low innovativeness, respectively.

Suresh (2004) directed study on entrepreneurial behaviour of milk producers in Andhra Pradesh showed that the milk producers in the district had medium, high and low innovativeness in the order of 55.00, 24.58 and 20.42 per cent, respectively.

In a study conducted by Nagesh *et al.* (2011) informed that majority (63.30 per cent) of the pomegranate growers had medium innovativeness and equal per cent (18.30 per cent) of the respondents were categorized as having low and high innovativeness.

### **2.2.2 Achievement motivation**

Achievement motivation was defined by Heckhausen (1967) as striving to increase or to keep as high as possible, one's own capabilities in all activities in which a standard of excellence is thought to apply and where the execution of such activities can, therefore either succeed or fail.

Chaurasiya *et al.*(2016) reported that the majority of the farmers in Gwalior (70 per cent) had a medium level of achievement motivation, followed by 16.7 per cent of the respondents who had a low level of achievement motivation and 13.3 per cent had a high level of achievement motivation.

The scholars discovered that the majority of farmers (50 per cent) in Maharashtra State in India had a medium level of achievement motivation, followed by 37 per cent who had a high level of achievement motivation, and 13 per cent had a low level of achievement motivation (Bheemappa *et al.*,2014).

Porchezhiyan *et al.* (2016) observed that the majority (60.80 per cent) of dairy farmers had a high level of achievement motivation followed by 21.70 per cent who had a medium level of achievement motivation and 17.50 per cent had a low level of achievement motivation.

Suresh (2004) conducted study on entrepreneurial behaviour of milk producers in Andhra Pradesh specified that 61.25 per cent of the respondents had medium

achievement motivation followed by 20.42 per cent low level and 18.33 per cent high level.

In a study led by Nagesh *et al.* (2011) majority 71.70 per cent of the pomegranate growers had medium achievement motivation followed by 15.00 and 13.30 per cent of respondents having low and high achievement motivation, respectively.

### **2.2.3 Risk taking ability**

Risk- taking was defined as engagement in behaviour with the probability of undesirable results and ability to bear risk is a prime factor in entrepreneurial behaviour (Furby and Marom, 1992).

Raghunath (2014) found out that half of the nursery owners (50.00 per cent) had medium level of risk orientation, followed by 33.33 per cent of the respondents had low risk orientation while, 16.67 per cent of the respondents had low level of risk orientation.

Raut and Sankhala (2014) located that majority of the dairy farmers in Maharashtra (54.58 per cent) were discovered to be mild risk takers. However, maximum of the large farmers (42.30 per cent) had high risk taking ability.

Avhad *et al.* (2015) found that greater part (89.17 per cent) of the dairy farmers in Ahmednagar had medium risk orientation, however 5.83 per cent of the respondents had high risk orientation, though meager per cent of the respondents (5.00 per cent) had low risk orientation.

Gamit *et al.* (2015) reported that 68.00 per cent of the dairy farmers in Suray had medium degree of risk orientation, while 19.00 per cent respondents had low degree and 13.00 per cent respondents had high degree of risk orientation.

Rubeena (2015) indicated that the greater part of the respondents of ATMA (63.30 per cent) had medium risk taking ability, 20.00 per cent of the respondents had high risk taking ability and rest of them (16.67 per cent) had low risk taking ability.

#### **2.2.4 Decision making ability**

Reason (1990) defined decision-making as the process of selecting a logical choice from among the available options.

Boruah *et al.* (2015) revealed that the majority (68.3 per cent) of the tribal farmers in Assam were found to be of moderate decision making ability, followed by 17.5 per cent of farmers with poor decision making and 14.2 per cent of farmers had good decision making ability.

Ghadge *et al.* (2010) found out that the majority of cut flower farmers had medium decision ability, followed by high decision making ability and by low decision making ability.

Chandrapaul (1998) conducted study on the entrepreneurial behaviour of vegetable growers in Hyderabad determined that majority of respondents (50.90 per cent) had medium decision making ability followed by low (25.80 per cent) and high (23.30 per cent) decision making categories.

#### **2.2.5 Planning ability**

Planning abilities were any skills that allow an individual to look ahead and accomplish goals or avoid emotional, financial, physical or social hardship (Reddy and Reddy, 2005).

Chauhan and Patel (2003) revealed that the majority of the poultry farmers had medium level planning ability, followed by high and low levels of planning ability.

Lawrence and Ganguli (2012) established that more than half (55.00 per cent) of dairy farmers in Tamil Nadu had medium level of planning orientation followed by 27.00 and 18.00 per cent of them had low and high level of planning orientation, respectively.

Boruah *et al.* (2015) revealed that 73.30 per cent of vegetable growers had a moderate level of planning ability, while 18.30 per cent and 8.30 per cent of respondents had a poor level and a good level of planning ability respectively.

Porchezhiyan *et al.* (2016) found that 44.20 per cent of the dairy farmers had a low level of planning ability; whereas 39.10 per cent had a medium level of planning ability and 16.70 per cent had a high level of planning ability.

### **2.2.6 Leadership Ability**

Leadership ability was defined as the ability of the entrepreneur to lead his subordinates to achieving goals in targeted time (Mangham ,1986).

Thirty seven percent of dairy farmers in Karnataka had a high leadership ability, followed by 31.10 per cent who had the low coordinating ability and 31.40 per cent had the moderate leadership ability (Rathod *et al.*,2011).

Patil *et al.* (2014) revealed that the majority (680 per cent) of the khol crop growers had a medium level of leadership ability, followed by 16.20 per cent who had high leadership ability and 15 per cent that had a low level of leadership ability.

Boruah *et al.* (2015) revealed that 64.20 per cent of respondents had a moderate level of leadership ability, followed by 20 per cent of respondents who had low leadership ability and 15.80 per cent of respondents that had good leadership ability.

### **2.2.7 Self-confidence**

Self-confidence was defined as an individual's self-assessed probability of being a high type (Ahuja *et al.*, 2016).

Ahmed *et al.* (2011) found that the majority of the respondents (69.20 per cent) had a medium level of self-confidence, followed by 23.30 per cent under a high level of self-confidence, the rest (7.50 per cent) had a low level of self-confidence.

Porchezhiyan *et al.* (2016) reported that nearly two third of the dairy farmers (77.50 per cent) had a high level of self-confidence followed by low (15.80 per cent) and medium (6.70 per cent) level of self-confidence respectively.

Thorat (2005) reported that more than two- third (69.33 per cent) of the poultry farmers had medium level of self-confidence, whereas 17.34 per cent had high level of self-confidence and 13.33 per cent had low level of self-confidence.

Mehta and Sonwane (2012) revealed that (72.00 per cent) of mango growers had medium level of self-confidence followed by 15.00 and 13.00 per cent of them with high level of self-confidence, respectively.

### **2.2.8 Information seeking**

Information plays a significant role in daily professional and personal lives and people constantly are challenged to take charge of the information needed for work, fun and everyday decisions and tasks (Reddy and Reddy, 2005).

Jaganathan *et al.* (2009) discovered that majority (70.00 per cent) of the vegetable growers had medium level of knowledge about organic farming practices, followed by 18.00 per cent and 12.00 per cent had high and low level of awareness about organic farming practices, respectively.

Yadav *et al.* (2014) stated that majority (68.83 per cent) of the tomato farmers were having medium level of knowledge about improved tomato production technology, followed by 19.17 and 12.00 per cent of respondents were having low and high level of knowledge about improved tomato production technology, respectively.

Tripathi and Agarwal (2015) revealed that the majority of farmers in Uttar Pradesh, India, had a medium level of information seeking behaviour followed by those with high and low levels of information seeking behaviour.

Mertiya (2017) revealed that 63.00 per cent of the rural women in Udaipur district of Rajasthan had medium level of information seeking behaviour and rest of them (37 per cent) had low level of information seeking behaviour.

### **2.2.9 Cosmopolitaness**

According to Kulkarni and Jahagirdar (2015) cosmopolitaness was the degree to which a farmer is oriented outside his community to seek information. They further observed that, 43.30 per cent of rose growers of Dharwad district in India belonged to medium level cosmopolitaness category, followed by high (31.70 per cent) and low (25 per cent) cosmopolitaness respectively.

Chaurasiya *et al.* (2016) observed that 57.50 per cent of dairy farmers had a medium level of cosmopolitanism followed by 27.50 per cent who had low cosmopolitanism while 15 per cent of respondents possessed a high level of cosmopolitanism.

Ijaz *et al.* (2012) revealed that most of the entrepreneurs in Pakistan (80 per cent) had a high level of cosmopolitanism, 10.80 per cent had a medium level and 9.20 per cent had a low level of cosmopolitanism.

## **2.3 Socio-economic characteristics of hi-tech farmers**

### **2.3.1 Age**

Nargave (2016) revealed that majority (55.84 per cent) of the sugarcane growers had a place with young age group whereas 27.50 and 16.66 per cent of respondents belonged to middle age group and old age group, respectively.

Krishnan (2017) found that majority (71.66 per cent) of the farmers involved in training belonged to middle age group followed by 15.00 per cent found to be in old age group and 13.34 per cent belonged to young age group.

Padmavathi (2002) in a study conducted at Kurnool district of Andhra Pradesh revealed that a majority (55.00 per cent) of farm women laborers were in middle age group of 30 and 50 years followed by 37 per cent in young age group of less than 30 years and 8 per cent in old age group on more than 50 years.

Rathod *et al.* (2012) conducted a study on socio-personal profile of dairy farmers and reported that majority (55.00 per cent) of dairy farmers were middle aged followed by young (35.00 per cent) dairy farmers and (10.00 per cent) of the dairy farmers were old aged.

Tekale *et al.* (2013) stated that majority of the dairy farmers belonged to middle age 36-50 years (67.00 per cent), followed by young age 1-35 years (24.00 per cent) and old age above 50 years (09.00 per cent).

Bhati *et al.* (2014) concluded that about one fourth of the rural women entrepreneurs (30.00 per cent) belonged to the age group of 18-30 years, whereas, 41

per cent belonged to the age group of 31-45 and one fourth respondents (39.00 per cent) belonged to the 46-60 years of age group.

Sharma *et al.* (2014) specified that most of the potato growers (41.11 per cent) were in the young age group, while (36.67 per cent) were old age group and (22.22 per cent) potato growers were middle aged group.

### **2.3.2 Education**

Yadav *et al.* (2012) indicated that 31.66 per cent of the tomato growers were educated upto primary level, followed by 29 per cent educated upto middle school, 21.67 per cent educated upto higher school and 17.50 per cent of them were illiterates.

Chouhan and Patel (2003) revealed that 28.33 per cent of the poultry farmers were educated upto middle school group, followed by 22.5 per cent were upto higher secondary, 18.33 per cent up to middle school, 15.84 per cent up to high school, 9.16 per cent up to college level and remaining 5.84 per cent were illiterate.

Shivacharan (2014) reported that 65.84 per cent of the rural youth were educated up to college level and above and rest of them, 34.16 per cent had education up to high school level.

Nargave (2016) observed that 45.84 per cent of the sugarcane growers were educated up to middle school level, followed by 22.50 per cent of the respondents up to primary level, 16.67 per cent of them had higher secondary school education, 8.33 per cent were educated up to college level and remaining 6.66 per cent were illiterate.

Krishnan (2017) reported that more than 50 per cent of the farmers involved in training had educated up to PUC, accompanied by 23.00 per cent up to high school, 18.00 per cent had attained degree and remaining 3.00 per cent had primary level of education.

Kumar (2017) revealed that 32.50 per cent of the dairy farmers in Jaipur were illiterate, 22.50 per cent had primary school level, 18.75 per cent finished up to middle school level, 11.25 per cent up to matriculation, 7.50 per cent up to higher secondary level, 5.00 per cent were graduate and only 2.50 per cent respondents had finished post graduate degree.



### **2.3.3 Farming experience**

Padmavathi (2002) observed that about 39 per cent of farm women were in low experience category of less than 11 years. About 35 per cent of respondents were in medium experience category of 23 years. About 26 per cent of respondents were in high experience category with more than 23 years of experience.

Rathod *et al.* (2011) studied the entrepreneurial behaviour of dairy farmers in western Maharashtra, India and found that 68.00 per cent of the dairy farmers were medium experienced. Followed by high (21.34 per cent) and low (10.66 per cent) respectively.

Sabale *et al.* (2014) mentioned that more than half (64.80 per cent) of the farmers in Marathwada had medium farming experience, followed by low (20.00 per cent) and high (15.20 per cent) farming experience.

Sharma *et al.* (2014) found that majority of the potato growers belonged to medium farming experience (66.67 per cent), followed by high (21.11 per cent) and low (12.22 per cent).

### **2.3.4 Size of land holding**

Rathod *et al.* (2012) unveiled that 76.67 per cent dairy farmers were medium farmers followed by small (12.67 per cent) and larger land holding (10.66 per cent) farmers.

Tekale *et al.* (2013) observed that half (51.00 per cent) dairy farmers belonged to semi medium land holding, followed by medium (17.00 per cent), 12.00 per cent had small, 13.00 per cent had marginal and 7.00 per cent respondents had large land holding.

Sabale *et al.* (2014) discovered that nearly half (42.40 per cent) farmers in Marathwada belonged to medium farmers followed by big farmers (40.80 per cent) and a small percentage belonged to small farmer category (16.80 per cent).

Boruah *et al.* (2015) in his study on vegetable growers concluded that majority (37.05 per cent) of the vegetable growers belonged to small farmer, followed by semi medium farmer (36.67 per cent).

### **2.3.5 Annual income**

Giridhara (2013) found that more than half of the women entrepreneurs (57.50 per cent) had medium annual income, followed by low (32.50 per cent) and high (10 per cent) level of annual income.

Raghunath (2014) reported that 66.66 per cent of the nursery owners belonged to medium level of annual income, followed by high and low level of annual income with 16.67 per cent each.

Sundaran (2016) reported that 46.67 per cent of the men respondents received an annual income in the range of Rs. 75,000 – 1,00,000 and in case of women SHG members, 51.12 per cent of them received an annual income between Rs. 50,000 – 75,000.

Sujantha (2013) discovered that majority of the women entrepreneurs had medium level of income (65.60 per cent), followed by (19.20 per cent) had low and (15.20 per cent) had high level of annual income.

### **2.3.6 Social participation**

Singh *et al.* (2013) asserted that 36.67 per cent of the dairy farmers in Rajasthan had both medium and high level of social participation and 26.64 per cent respondents had low level of social participation.

Ramlakshmidēvi *et al.* (2013) reported that higher percentage (67.50 per cent) of the sugarcane farmers in Chittoor had medium social participation accompanied by high (20.83 per cent) and low (11.67 per cent) levels of social participation.

Raghunath (2014) mentioned that majority (43.33 per cent) of the nursery owners had medium level of social participation, followed by 41.67 per cent of them belonged to low social participation and rest of them (15.00 per cent) belonged to high level of social participation.

Shivacharan (2014) observed that 40.84 per cent of the rural youth in Hyderabad belonged to non-official position in socio political organization, 40.00 per cent of the respondents belonged to official position in one or more organization, 10 per cent of the respondents belonged to official position in social/ political/ formal committees and 9.16 per cent belonged to involvement in community work as a member.

Nargave (2016) detailed that 51.67 per cent of the sugarcane growers in Jabalpur belonged to medium social participation, followed by low (41.67 per cent) and high (8.66 per cent) level of social participation.

### **2.3.7 Mass media contact**

Chandramouli (2005) observed that majority (44.17 per cent) of the farmers in Raichur belonged to medium mass media contact category. Whereas, 29.16 and 26.67 per cent of farmers belonged to high and low mass media contact categories, respectively.

Sowmya (2009) reported that majority (75.00 per cent) of the rural women in Mandya district of Karnataka belonged to medium mass media contact category, followed by high (15.83 per cent) and low (9.17 per cent) mass media contact.

Tamilselvi and Sudhakar (2010) found that majority (93.33 per cent) of the vegetable growers in Tamil Nadu belonged to medium information sources utilization category, followed by high (6.67 per cent) and none of them had low mass media participation categories.

### **2.3.8 Extension contact**

Neelaveni *et al.* (2002) found that majority, 65.83 per cent of the farm women had medium extension contact followed by high 20.01 per cent and low 14.16 per cent extension contact.

Prameelamma (1990) stated that majority of the rural women in Karnool district of Andra Pradesh had low extension contact 80.00 per cent and 20.00 per cent of women had high level of extension contact.

Vanithachethan (2002) reported that majority of women 88.33 per cent had low level of extension contact followed by 9.17 per cent of women who belonged to medium extension contact category whereas only 2.50 per cent of them belonged to the high extension contact.

Anitha (2004) revealed that 17.50 per cent of the farm women in Bangalore had high extension contact whereas 44.20 per cent of them had medium, followed by low extension contact (38.30 per cent).

## **2.4 Marketing behaviour**

Janani *et al.* (2016) described marketing behaviour as the mode of selling the products in the market and found that majority of the entrepreneurs had medium level of marketing behaviour among Rural Youth Entrepreneurs.

Jaisridhar *et al.* (2012) reported that the decisive characteristics of the maize growers towards marketing behaviour were educational status, socioeconomic status, extension agency contact, storage facilities, market perception and market potential indicators.

### **2.4.1 Access to market**

Joshi (2012) concluded that nearly one third of the mango growers had transported their produce by lorry (32.23 per cent) followed by bus (28.88 per cent), head load (12.22 per cent), tempo Van (10.00 per cent), auto (07.78 per cent), bicycle (6.67 per cent) and tractor (2.22 per cent).

Naik (2013) unveiled that a large number of sapota growers (88.84 per cent) sold their produce within the village and only 11.16 per cent of farmers sold their produce outside the village (or) in the market.

Sawant (2010) observed that a little more than two thirds of vegetable growers sold their produce in distant towns (68.34 per cent), followed by nearby town (30.83 per cent) and a meager percentage of growers sold their produce in the village itself (0.83 per cent).

Yashodhara and Narasimha (2012) stated that majority of the onion growers sold their produce at nearby town (71.67 per cent) and 28.33 per cent of the respondents sold at distant towns.

#### **2.4.2 Marketing channels**

Maratha and Badodiya (2017) stated that, majority of the vegetable growers in Kota of Rajasthan (80.00 per cent) sold their produce to wholesalers through commission agents .

Devde (2017) stated that 86.67 per cent vegetable growers expressed that they sold their produce to wholesalers through commission agents followed by 21.67 per cent sold their produce directly to the consumers.

Karpagam (2000) revealed that (62.50 per cent) of the produce was sold in regulated market by turmeric growers followed by (32.50 per cent) of the produce was sold to commission agents and only (5.00 per cent) of the produce was sold to co-operative society.

Moulasab (2004) in his study on “A study on knowledge and adoption of improved cultivation practices by mango growers of North Karnataka” found that 58.50 per cent of the fruits were sold to wholesalers, followed by 28.33 per cent of the farmers to pre-harvest contractors and only 7.67 per cent of the farmers sold their fruits with the help of retailers.

Sunil (2004) stated that majority of the tomato growers (65.30 per cent) sold their produce through middle man.

Santoshkumar (2008) in his study reported that majority of the farmers (92.89 per cent) expressed that they sold their produce to wholesaler through commission agents.

#### **2.4.3 Access to storage**

Maratha and Badodia (2017) concluded that weak marketing of vegetable farmers could be attributed to low storage facilities (43.33 per cent).

Thakur *et al.* (1992) identified that (88.00 per cent) vegetable framers suffered from lack of mechanical grading, packing and proper storage facilities.

Mohan (2002) found that 41.40 per cent of chilli farmers in Warangal expressed lack of proper cold storage facilities, which led to high perishability of the produce.

Joshi (2012) observed that one of the major problems expressed by mango growers in marketing produce was lack of storage facilities (88.88 per cent).

Diware (2002) reported that 71.11 per cent of the orange growers in Nagpur had opined that provision of cold storage facilities at reasonable rates can increase marketing.

Rao (2002) asserted that 60.83 per cent of the onion growers in Pune had suggested that provision of subsidies on construction of onion storage structures can increase marketing.

#### **2.4.4 Price satisfaction**

Hossain and Mishra (2002) observed that cheap price of produce resulting into low profit margin was a major constraint faced by 65.30 per cent of women entrepreneurs in marketing their produce.

Wankhade *et al.* (2013) specified that one of the constraints which decreased their price satisfaction identified in entrepreneurial behaviour of vegetable growers was price fluctuation in the market.

Barik (2013) asserted that 71.37 per cent farmers found lack of reasonable support price as a main problem in marketing the produce.

#### **2.5 Linkages**

Guimaraes and Hefner (1991) stated that backward linkages are demand-side connections a firm has with other existing firms in the region while Forward linkages are supply-side connections a firm has with other existing firms in the region

Gotyal (2007) reported that all the grape growers maintained a backward linkage with input agencies for nutrients, bio-fertilizer, growth regulators and processing

materials. Whereas, in case forward linkages, marketing agents were linked with majority of the small grape growers, than the medium and big grape growers for place of marketing, price and grading.

Allen (1977) emphasized the need for some kind of linking system to conduit the gap between the research and client systems.

Jaiswal and Arya (1981) stated that there was normally no effective connection between the research and extension systems, a situation unfavorable to the effectiveness of both the extension service would swiftly run out of anything to transfer without continuous flow of innovation

Reddy (1986) concluded that the seven systems in the chain of technology transfer viz., research, extension, client, input, economic, psycho-socio-cultural, administrative and organizational systems are inter-related very much as to be considered as the crucial links in the chain of technology transfer. None of these interlinked systems should be underestimated much less disregarded because the chain is as strong as its weakest link.

Pandey and Mishra (1984) reported that the basic requirement for proper processing and transmission of relevant technology to the extension workers and farmers is the systematic linkage of SMS with various sources of farm information.

## **2.6 Constraints**

Singh (2011) conducted a study of profile and problems of entrepreneurs in Punjab found that 38.46 per cent of the respondents faced lack of skilled labours as the major constraints, followed by lack of knowledge about particular enterprise (30.76 per cent), non-availability of inputs (23.07per cent), high cost of production (15.38 per cent) and non-availability of credit (11.53 per cent).

Giridhara (2013) revealed that 32.50 per cent of the women entrepreneurs in Maharashtra perceived securing working capital as the most serious constraint while, 72.50 per cent of them perceived entire loan amount was given as the serious constraint in finance, whereas in marketing 48.75 per cent of the respondents perceived long distance of the market as most serious constraint and in production, high labour cost

was the most serious constraint faced by the women entrepreneurs in Mandya district of Karnataka.

Mohapatra *et al.* (2012) conducted a study on constraints faced by tribal entrepreneurs in dairy farming enterprise and revealed that major constraints expressed by tribal dairy entrepreneurs were lack of availability of veterinary services in the village (79.67 per cent), highly expensive consultancy service of private practitioners (68.33 per cent), lack of veterinary facilities in the village (47.50 per cent), followed by lack of technical knowledge to manage the dairy enterprise (31.67 per cent).

Narmatha *et al.* (2002) stated that constraints faced by entrepreneurial behaviour of farm women were dual responsibility (96.66 per cent), lack of resources (91.66 per cent), poor family support (83.00 per cent), lack of awareness (78.33 per cent), marketing constraints (65.00 per cent) and non-availability of funds from institutional sources (53.33 per cent).

Wankhade *et al.* (2013) indicated that the constraints identified in entrepreneurial behaviour of vegetable growers, were price fluctuation in the market and no provision of vegetable crop insurance (100.00 per cent), whereas the major constraints faced by the vegetable entrepreneurs were non availability of labour at harvesting of crop (77.00 per cent), exploitation by middleman (85.00 per cent), high input costs (71.00 per cent), inadequate extension services (67.00 per cent), insufficient electricity (63.00 per cent), non-availability of planting material (50.00 per cent), lack of transport facility (33.00 per cent), lack of technical knowledge (43.00 per cent), lack of cold storage and processing facility (30.00 per cent) and lack of cooperatives (37.00 per cent).

Kumar (2017) reported that the major constraints identified in case of dairy farmers were difficulty in borrowing loans (60.00 per cent), lack of conviction (36.66 per cent), and lack of technical guidance (60.00 per cent).

Sreeram (2013) conducted a study on entrepreneurial behaviour of members of kudumbashree non-government organizations in Palakkad district of Kerala reported that problems related to marketing like, problems due to delay payment and prejudices among the consumers about quality of the produce were the major constraints, followed



by competition from other enterprises and non-availability of input at nearby market for wholesale purchase .

Raghunath (2014) led a study on entrepreneurial behaviour of nursery owner in Kolhapur city of Maharashtra uncovered that marketing (35.00 per cent) and access to needed information (33.33 per cent) were the severe constraints faced by the respondents.

## **2.7 SWOC analysis**

A SWOC (Strength, Weakness, Opportunities, Challenges) is a model that can assess what an enterprise can do and cannot do as well as its opportunities and threats. It could determine ways of accomplishing objectives and overcoming threats. (Ommani, 2011).

## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

Research methodology has been defined as the systematic and theoretical analysis of the procedures applied in the field of study. Methods and procedures followed in the study are described in this chapter. In order to accomplish the objectives of the study, appropriate data collection tools and analytical methods were employed and the details are presented under the following subheads.

3. 1 Research design

3.2 Locale of the study

3.3 Selection of the respondents

3.4 Measurement of independent variables

3.5 Operationalization and measurement of dependent variables

3.6 Components of marketing behaviour

3.7 Components of marketing linkages

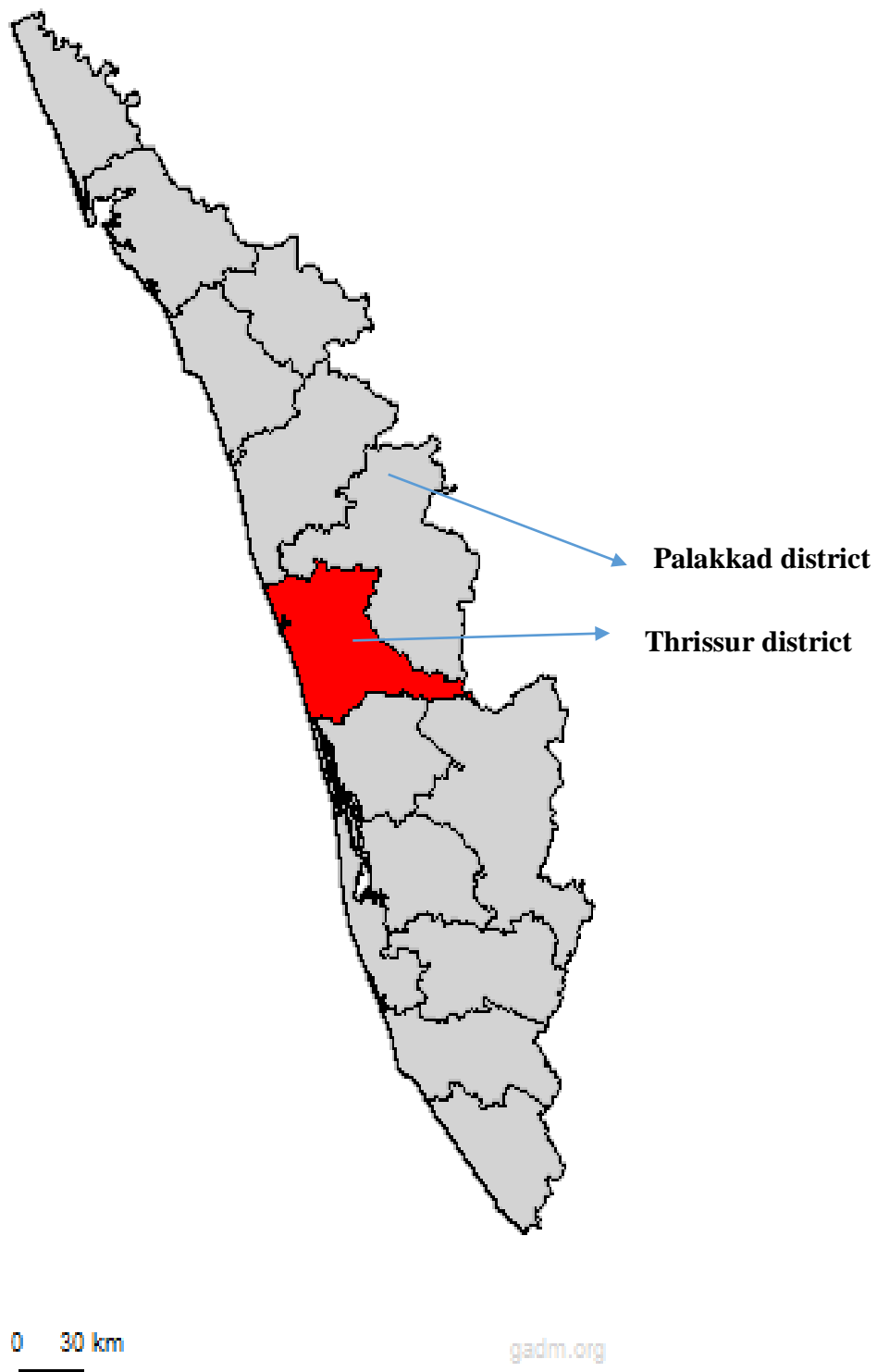
3.8 Statistical tools used in the study

#### **3. 1 Research design**

In the present research, Ex-post facto research design was used. Ex-post facto design is any systematic empirical investigation in which the independent variables have not been directly managed because they have already happened or because they are inherently not manageable.

#### **3. 2 Locale of the study**

Thrissur and Palakkad districts were purposively selected for the study.

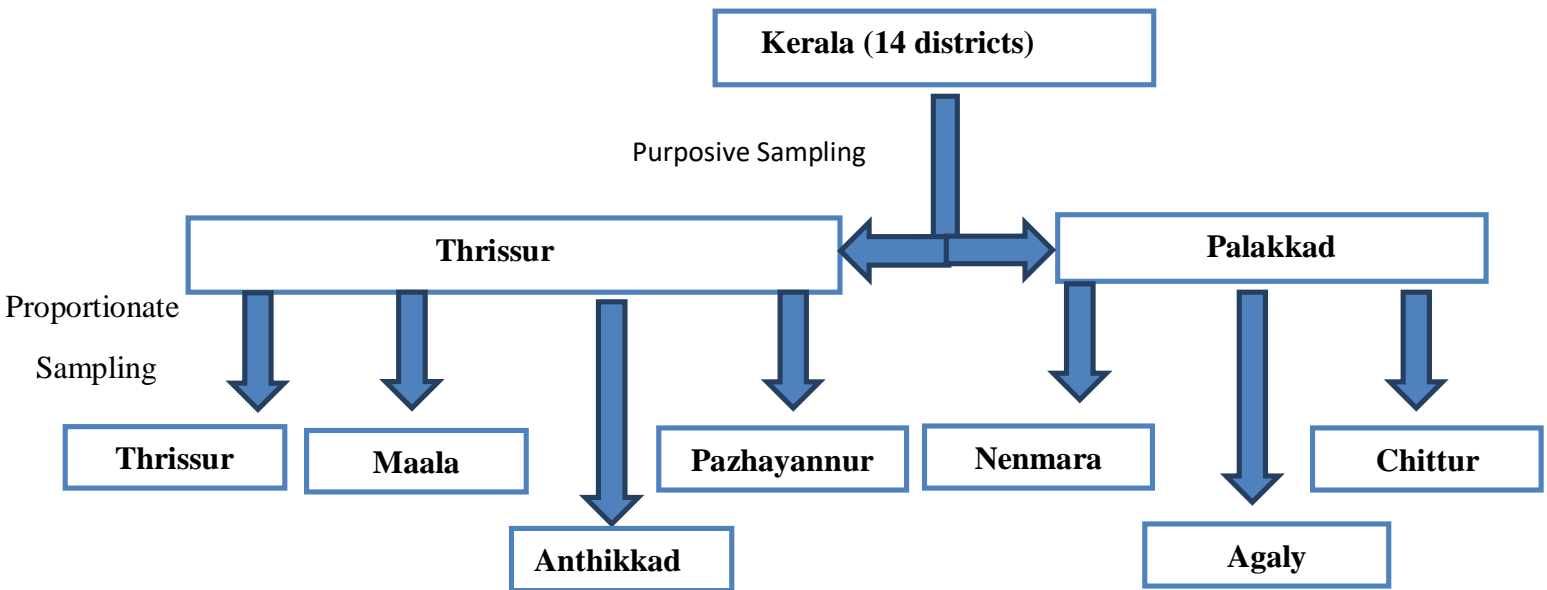


**Figure 1 Map of the study area**

### 3.3 Selection of the respondents

Multistage sampling was adopted as the sampling procedure. Hi-tech farmers who were functional for at least two years were selected. Thrissur, Maala, Anthikkad and Pazhayannur blocks were selected from Thrissur district and Chittur, Agaly and Nenmara blocks were selected from Palakkad districts due to higher proportion of hi-tech farmers in these blocks.

Thirty farmers were randomly selected from each district to constitute a total of 60 hi-tech farmers. Out of the 30 hi-tech farmers in each district, 15 were open precision farmers and 15 were polyhouse farmers.



**Figure 2 Flowchart for selection of blocks**

### 3.4 Measurement of independent variables

Through the review of past studies and consultation with experts in the field eight independent variables were identified.

**The selected independent variables were:**

**3. 4. 1 Age**

**3. 4. 2 Education**

**3. 4. 3 Farming experience**

**3. 4. 4 Size of land holding**

**3. 4. 5 Annual income**

**3. 4. 6 Social participation**

**3. 4. 7 Mass media contact**

**3. 4. 8 Extension contact**

**3. 4. 1 Age**

Age of the respondents was the number of completed years at the time of interview. The respondents were categorized in to three groups viz., young age (up to 35 years), middle age (36 to 50 years) and old age (above 50 years) according to the method followed by census of India, ( Government of India, 2011). For calculation of relationship with dependent variables each group was assigned the score 1, 2 and 3.

<b>Sl.No</b>	<b>Categories</b>	<b>Score</b>
1	Young (Up-to 35 years)	1
2	Middle (36 to 50 years)	2
3	Old (Above 50 years)	3

**3. 4. 2 Education**

Education is critical input in bringing desirable changes in the behaviour of an individual. In this study, this variable was operationalized as the number of years of formal education obtained by the respondents. The respondents were categorized into

four categories based on the scale followed by Nargave (2016) with due modifications and their frequencies and percentages were found out. Each group was given scores as below

<b>Sl.No</b>	<b>Categories</b>	<b>Score</b>
1	Primary	0
2	Secondary & higher secondary	1
3	Graduate	2
4	Post graduate	3

### **3. 4. 3 Farming experience**

It is referred to the years spent by the farmers in hi-tech farming. The data in this regard was collected and score assigned as suggested by Silvakumar (1988) in the scale developed by him with due modifications. According to the scale, the respondents were grouped in to three categories.

<b>Sl.No</b>	<b>Categories</b>	<b>Score</b>
1	Low (Up to 5 years)	1
2	Medium (6 to 15 years)	2
3	High (Above 15 years)	3

### **3. 4. 4 Size of Land holding**

It is one of the crucial variables which decides the economic as well as the social status of an individual. The variable was operationally defined as the number of acres possessed by the farmer. The land holding was measured with the SES scale developed by Pandya (2010) with due modifications.

Information about total acres of land owned by the vegetable growers was classified into three.

Sl.No	Categories	Class range	Score
1	Marginal	Up to 2.5 acre	1
2	Small	2.5 to 5.00 acre	2
3	Large	Above 5.00 acre	3

### 3. 4. 5 Annual income

Annual income was operationally defined as the income secured by the respondents in rupees from various sources in a year. The respondents were categorized in to three categories based on their income level. The data in this regard were collected and score assigned as suggested by the SES scale developed by Pandya (2010) with due modification

Sl.No	Categories	Class range	Score
1	Low	Up to Rs 350000	1
2	Medium	Rs 350000 to 700000	2
3	High	Above Rs 700000	3

### 3. 4. 6 Social participation

Social participation was operationalized as the degree of involvement of hi-tech farmers in different social organizations. It was measured with the help of method followed by Krishnan (2017) with due modification.

The respondents were classified into three categories based on the number of social organizations they have membership in.

Sl.No	Categories	Class range	Score
1	Low	Membership in one organization	1
2	Moderate	Membership in two organizations	2
3	Good	Membership in more than two organizations	3

### 3. 4. 7 Mass media contact

Mass media contact denoted the contact of hi-tech farmers to mass media namely; newspaper, extension publication, farm magazines, agricultural films, radio, television, Kisan Call Center and internet. The scale developed by Nirban (2004) was used to measure this variable, with due modification. Score was assigned to the respondents for receiving knowledge about agricultural and allied enterprise from each of the selected mass media. Score 2 for always, 1 for sometimes and 0 for never was awarded. Based on the total score obtained by the respondents, they were grouped into three categories namely low, medium, and high by using mean and standard deviation.

Sl.No	Categories	Class range	Score
1	Low	Less than (Mean – SD)	0
2	Medium	In between (Mean $\pm$ SD)	1
3	High	More than (Mean + SD)	2

### 3. 4. 8 Extension contact

It refers to the extent of contact by the respondents with various extension officers. The responses obtained were expressed in frequency and percentage. They were asked to indicate their contact as regularly, occasionally and never with scores of



2, 1 and 0, respectively. The scoring process given by Gulabsinh (2016) was used with slight modification. On the basis of mean and standard deviation respondents were grouped as below.

<b>Sl.No</b>	<b>Categories</b>	<b>Class range</b>	<b>Score</b>
1	Low	Less than (Mean – SD)	0
2	Medium	In between (Mean ± SD)	1
3	High	More than (Mean + SD)	2

### **3. 5 Measurement of dependent variable**

The level of entrepreneurial behaviour of hi-tech farmers was measured as Entrepreneurial Behaviour Index with the method followed by Aiswarya (2016) with due modifications appropriate for the study.

The dimensions of entrepreneurial behaviour was selected from Ahuja (2016) as:

#### **3. 5. 1 Innovativeness**

#### **3. 5. 2 Decision making ability**

#### **3. 5. 3 Achievement motivation**

#### **3. 5. 4 Risk taking ability**

#### **3. 5. 5 Planning ability**

#### **3. 5. 6 Leadership ability**

#### **3. 5. 7 Cosmopolitaness**

#### **3. 5. 8 Self-confidence**

#### **3. 5. 9 Information seeking behaviour**

The respondents were asked to rate the statements representing selected dimensions with scores of 1,2 and 3 , which was reversed for negative statements. The

total score of each statement was used to calculate the index of each statement .The following formula was used for calculating the index:

$$\text{Index of each statement} = \frac{\text{total score of each statement}}{\text{maximum score of each statement}} \times 100$$

$$\text{Composite index} = \frac{\sum X}{M \times N \times S}$$

$\sum X$  = sum of total scores of all statements

M = Maximum score

N = Number of respondents

S = Number of statements

### **3. 5. 1 Innovativeness**

Innovativeness was characterized as the degree to which a hi-tech farmer is prior in adopting new ideas. It was measured with the help of a method followed by Gulabsinh (2016) with due modifications.

This consisted of two positive statements and responses were obtained as ‘always’, ‘sometimes’ and ‘never’ with scores of 3, 2, 1 respectively. The total score was computed by summing up each response and they were grouped in to three categories. The total score for innovativeness ranged from 2 to 6.

### **3. 5. 2 Decision making ability**

Decision making ability was operationally defined as the means used by hi-tech farmers to arrive at a decision regarding their farm activities. The scale developed by Rao (2003) with modifications was adopted to measure decision making ability of farmers in the present study.

The scores of 3, 2 and 1 were assigned to the three rationality levels namely ‘rational’, ‘inter mediate’ and ‘less rational’, respectively. Hence the total score of each farmers for his decision making ability ranged from 4 to 12. Based on the total score obtained by respondents on decision making, they were grouped into following three categories, keeping the mean and standard deviation as check.

### **3. 5. 3 Achievement motivation**

Achievement motivation was operationally defined as the desire to achieve a feeling of individual accomplishment. The method followed by Barik (2013) was adopted with due modifications.

The instrument consisted of four statements and responses obtained on three point continuum namely 'agree', 'undecided' and 'disagree'. A score of 3, 2 and 1, respectively were assigned to the response categories in the case of positive statements and the scoring was reversed for negative statements. The total score of the respondents on their achievement motivation was reached summing up the scores of responses for each statement. Thus, the total score for each farmer on his achievement motivation ranged from 4 to 12. The farmers were grouped into three categories based their total score, keeping the mean and standard deviation as check. .

### **3. 5. 4 Risk taking ability**

Risk taking ability was operationally defined as the extent to which hi-tech farmer is oriented towards risk and uncertainties in the instances of crisis and crucial times. In the present study, risk taking ability of respondents was measured with the help of a scale developed by Supe (1969).

The scale contained four statements of which third statement was negatively keyed. Modification in the scoring procedure was made by giving a score of 3 for 'agree', of 2 for the 'undecided' 1 for 'disagree' for positive statement. This was reversed in case of negative statements. The aggregate of scores over four statements was the total score of a respondent on this variable. The possible score range was from 4 to 12. Based on the total score obtained by the respondents on risk taking ability, they were grouped into three categories, keeping the mean and standard deviation as check.

### **3. 5. 5 Planning ability**

It was operationally defined as the ability to schedule farm activities in advance. The method followed by Patel *et al* . (2014) with suitable modifications was used to measure the farmers' planning ability.

The scale consisted of four questions. A score of 3, 2 and 1 were assigned for the responses “well in advance”, “at the nick of time” and “don’t consider” respectively. Total score was obtained by summing up the scores recorded. Thus the maximum and minimum possible score was 12 and 4 respectively. Based on the score obtained by respondents on their ability to plan farm activities, they were grouped into three categories, keeping the mean and standard deviation as check.

### **3. 5. 6 Leadership ability**

It was characterized as how much an individual leads and directs the subordinates or labourers in various activities in the farm. Scale developed by Nandapurkar (1981) with suitable modifications was used to measure leadership ability.

In the present study, leadership ability was measured along a three point rating scale “Always”, “Sometimes” and “never” with decreasing score from 3, 2 and 1 respectively. The total score was computed for each respondent by summing up the scores recorded. Based on the total scores obtained, the respondents were classified into three categories, keeping the mean and standard deviation as check.

### **3. 5. 7 Cosmopolitaness**

It was operationally defined as the contact of the individual with the outer world. In the study cosmopolitaness was measured by using the procedure adopted by Patel *et al.* (2014).

The scale consisted of three statements. The responses were obtained and scores were given in terms of 3 for ‘always’, 2 for ‘sometimes’ and 1 for ‘never’. The total score was computed by summing up all the scores recorded based on the total scores obtained which ranged from 3 to 9. The respondents were classified into three categories, keeping the mean and standard deviation as check. The total score ranged from 3 to 9.

### **3. 5. 8 Self Confidence**

It was characterized as the extent of trust in one’s own abilities and hard work in achieving targets. The self-confidence scale developed by Heartheton & Polivey (1991) was used in present study with slight modifications.

Three statements were to be answered by the respondents as either ‘agree’, ‘undecided’ or ‘disagree’ with scores as 3,2 and 1 respectively. The final score was worked out by summing scores obtained by respondents for all statements. Total score for self confidence for each individual ranges from 3 to 9. The respondents were categorized in three groups.

### 3. 5. 9 Information seeking behaviour

The information seeking behaviour of a farmer was operationally defined as the frequency of contact of hi-tech farmer with various information sources. It was measured with the help of the method followed by Barik (2013) with reasonable alterations.

The scale contained three information sources namely informal sources, formal sources and mass media. Three response categories namely ‘frequently’, ‘occasionally’, and ‘never’ were provided with scores 3, 2 and 1 respectively for determining the information seeking behaviour of the respondents. Based on the score obtained by respondents on information seeking, they were grouped into three categories, keeping the mean and standard deviation as check. The total score for information seeking behaviour ranges from 3 to 9.

### 3.5.10 Distribution of hi-tech farmers with respect to dimensions

The distribution of hi-tech farmers was done by using mean and standard deviation as check and categorized into following three categories.

Sl.No	Categories	Class range
1	Low	Less than (Mean – SD)
2	Moderate	In between (Mean ± SD)
3	High	More than (Mean + SD)

### 3. 6 Marketing behaviour

Marketing behaviour was operationally defined as the mode of selling produce in the market. The components of marketing behaviour were identified and measured by the procedure followed by Kumar (2013) with reasonable alterations.

#### 3. 6. 1 Marketed surplus

Marketed surplus refers to the quantity of produce, which is marketed. The marketed surplus was measured in tonnes in three categories as in table:

Sl. No	Categories of marketed surplus	Score
1	Up to 5 tonnes	1
2	5-10 tonnes	2
3	>10 tonnes	3

#### 3. 6. 2 Access to market

The respondents were asked as to whether they have adequate access to market. The two constituents of access to market were identified as:

##### 3. 6. 2. 1 Distance to market

The distance to market was operationalized as the Kilo metres from the farm to market. The respondents were categorized in to three groups based on the distance to market from the farm.

Sl. No	Distance from market	Score
1	1-3 Km	1
2	4-6 Km	2
3	7-10 Km	3

### **3. 6. 2 Mode of transportation**

Mode of transportation was characterized as the vehicle utilized for transporting the produce from farm to market. In the light of survey of farmers, mainly four modes of transportation were considered namely, car, auto, tempo and tractor. The respondents were asked to specify their mode of transport for marketing the produce. The scores were given as 1,2,3, and 4 respectively.

### **3. 6. 3 Marketing channels**

The respondents were asked to specify the marketing channel they used to market the produce. Four channels were identified based on feedback from extension officers and farmers, namely direct access to market, VFPCs, middlemen and Eco shops with scores of 1, 2, 3 and 4 respectively.

### **3. 6. 4 Access to storage facilities**

Availing storage facilities was characterized as to whether the farmers were getting adequate access to any kind of storage units in or around the farm. The respondents were asked to denote the availability of storage facilities. A score of 1 was given for adequate access to storage and 0 for inadequate access.

### **3. 6. 5 Post-harvest handling**

Post-harvest handling was operationalized as all the activities from storage to processing of the produce. The respondents were asked as to whether they follow any post-harvest handling practices. A score of one was given for positive response and zero for not following post-harvest practices.

### **3. 6. 6 Price satisfaction**

The respondents were asked to specify if they got satisfactory price for the produce. A score of one was given for yes and zero for no.

### **3. 6. 7 Access to market information**

It is defined as the accessibility to the up to date information regarding market prices, sales etc through different media. The respondents were asked if they had

adequate access to market information. A score of 1 was given for positive response and 0 for negative response.

### **3.7 Linkages in hi-tech farming sector**

The linkages were studied by following the method by Gotyal (2007) with due modifications.

#### **3.7.1 Backward linkages**

It was operationally defined as the demand side connections of a firm.

The respondents were asked to specify the backward linkages they operated for procuring the inputs such as technological knowledge, infrastructure, planting materials, manures and fertilizers, finance for establishment and finance for cultivation. The main sources identified in the study were private agencies, government organizations, co-operatives and own resources. These were given scores as 1,2 3 and 4 respectively.

#### **3.7.2 Forward linkages**

It was characterized as the supply side connections of a firm.

The respondents were asked to denote the forward linkages they had operated for financial assistance for marketing, processing or value addition and market information. The main sources identified in the study were private agencies, government organizations, co-operatives and own resources. These were given scores as 1,2 3 and 4 respectively.

### **3.8 Statistical frame work for analysis of data**

#### **3.8.1 Arithmetic mean**

It is defined as the sum of all values of observations divided by the total number of observations. Symbolically represented as  $\bar{X}$ .

#### **3.8.2 Standard deviation**

It is the positive square root of the mean of the squared deviations taken from arithmetic mean. It is represented by  $\sigma$ .



### 3.8.3 Frequency and percentages

Frequency distribution and percentages were used to know the distribution pattern of respondents according to variables.

Percentages were used for standardization of sample by calculating the number of individuals that would be under the given category.

### 3.8.4 Kendall's rank correlation coefficient

It is a measure of at least ordinal level of association between two series of variables. Every subject is assigned a rank and 'τ' will be a measure of the degree of association or correlation between the two sets of ranks .

$$\tau = \frac{\text{actual total}}{\text{maximum possible total}}$$

$$\tau = \frac{S - \text{actual score}}{\frac{1}{2}N(N-1)}$$

### 3.8.5 Kendall's coefficient of concordance (w)

It was used to determine the association among K sets of rankings. To compute 'W' the sum of ranks (R<sub>j</sub>) in each column of a K/N table is found out.

W is computed using the formula

$$W = \frac{12S}{K^2(N^3 - N)}$$

S = sum of squares of the observed deviations from the mean of R<sub>j</sub>.

$$\text{Where, } S = \sum \left( R_j - \frac{\sum R_j}{N} \right)^2$$

K= Number of rankings

N= no of entities or objects ranked

### 3.8.6 Mann Whitney U test

This test is used to determine whether two independent samples have been drawn from the same population (or from two different populations having the same distribution).

The statistic U is defined as

$$U = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1$$

$$\text{Mean} = \frac{n_1 n_2}{2}$$

$$\text{Standard deviation} = \sqrt{\frac{n_1 n_2 (n_1 + n_2 + 1)}{12}}$$

$$U = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

### 3.8.8 Kruskal – Wallis one way analysis of variance by ranks

The Kruskal-Wallis one way analysis of variance by ranks is used to determine whether k independent samples are from different populations for at least ordinal level of measurements. It tests the null hypothesis that the k samples come from the same population or from identical population with respect to averages.

$$H = \frac{12}{N(N+1)} \sum_{j=1}^k \frac{R_j^2}{n_j} - 3(N + 1)$$

*k = number of samples*

*n<sub>j</sub> = number of cases in the j<sup>th</sup> sample*

*N =  $\sum n_j$ , the number of cases in all samples combined*

*R = sum of ranks in the j<sup>th</sup> sample (column)*

*$\sum_{j=1}^k$  directs to sum over k samples (columns)*

### 3.8.9 Discriminant Function Analysis

This was used to test whether there is a significant discriminating power in the variables of marketing behaviour.

Discriminant function is used for classifying the observations .It produces functions that help to define the groups. The maximum number of functions that can be defined is 1 less than number of groups. The Eigen value shows what percentage of variance that is accounted for by the function. Wilks lambda tests the significance of the function.

### 3.8.10 Garrett ranking

To conduct a SWOC analysis of the hi-tech farming sector, Garrett ranking technique was used. As the first step in analysis, major strengths, weaknesses, opportunities and challenges faced by farmers were identified. The respondents were then asked to rank them. Then, Garrett ranking technique was used to identify the major statements.

In this method, the rank assigned to different statements were transformed into percentage using the following formula described below.

$$\text{Per cent position} = 100(R_{ij} - 0.5)/N_j$$

Where,  $R_{ij}$  = Rank given for  $i^{\text{th}}$  factor by  $j^{\text{th}}$  individual

$N_j$  = Number of factors ranked by  $j^{\text{th}}$  individual

Here 0.5 is subtracted from each rank because the rank is an interval on a scale and its midpoint best represents the interval. Then the percentage positions were transformed into scores on a scale of 100 points referring to the table given by Garrett and Woodworth (1969). From the scores so obtained, the mean score level was derived and constraints were ranked based on the mean score level.

### 3.8.11 Binary logistic regression

Many social phenomena are qualitative rather than quantitative in nature. In a binary discrete phenomena the nature of an event occurs usually takes the form of a dichotomous variable. Logistic regression analyses the relationship between multiple independent variable with response variable. The responsible variable 'Y' is a dichotomous variable with possible values '0' and '1'. Let there be 'K' independent variables. Then the prediction equation takes the form:

$$E(Y/x_1, x_2, \dots, x_n) = \frac{\text{Exp}(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k)}{1 + \text{Exp}(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k)}$$

where  $\beta_0, \beta_1, \beta_2, \dots, \beta_k$  are the estimated logistic regression coefficients. They are interpreted in terms of probability. i.e., for every unit change in a given independent

variable, there will be a change in probability of being in a category. The predictor probability for each case can be derived from the odds ratio, which will help in prediction of the group into which a new entity will fall.

The Hosmer Lemeshow goodness of fit is used in assessing the fit of logistic regression model. Wald statistic which is the ratio of the estimated coefficient to its standard error is used to test the significance of individual logistic regression coefficients for each independent variable.

Exp (B) represents the ratio change in the odds of the event of interest for a one unit change in the predictor. The corresponding probability is given by-

$$\frac{\text{Exp}(B)}{1+\text{Exp}(B)}$$

To predict the chances of becoming an above average entrepreneur, this analysis was used.

## CHAPTER 4

### RESULTS AND DISCUSSION

#### 4.1 Socio-economic characteristics of hi-tech farmers

##### 4.1.2 Age of the hi-tech farmers

**Table 4.1 Distribution of polyhouse farmers according to their age**

Sl.No	Categories	Frequency(n=30)	Percentage
1	Young ( up to 35 years)	1	3.30
2	Middle (36-50 years)	19	63.40
3	Old (above 50 years)	10	33.30
<b>Total</b>		<b>30</b>	<b>100</b>

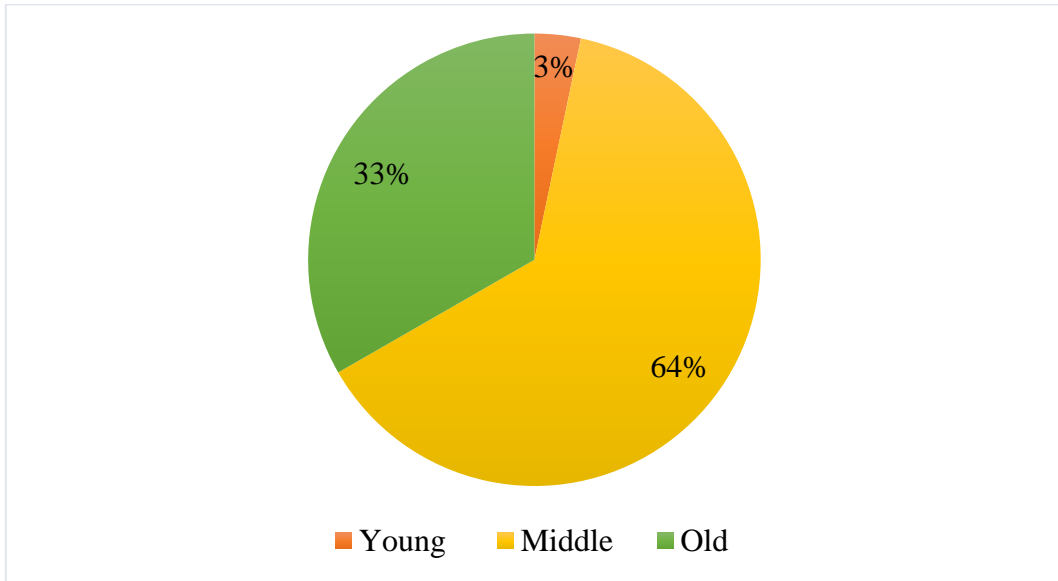
Table 4.1 showed that 3.30 per cent of the polyhouse farmers belonged to the young age category, while 63.40 per cent of the farmers belonged to middle age category and 33.30 per cent belonged to the old age category. It was evident that majority of the polyhouse farmers were middle aged and least number of farmers fell into young age category.

**Table 4.2 Distribution of open precision farmers according to their age**

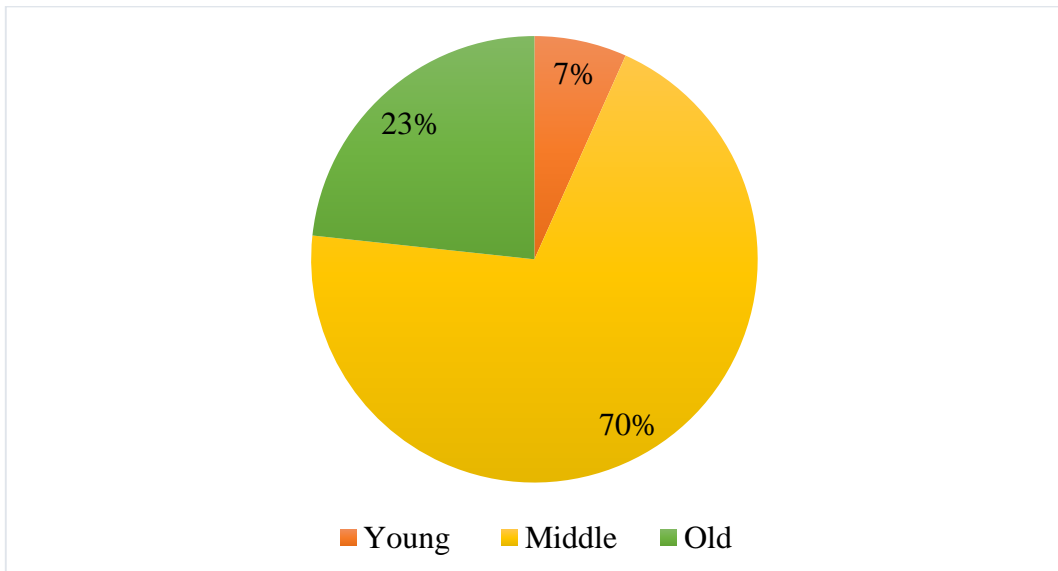
Sl.No	Categories	Frequency(n=30)	Percentage
1	Young ( up to 35 years)	2	6.70
2	Middle (36-50 years)	21	70. 00
3	Old (above 50 years)	7	23.30
<b>Total</b>		<b>30</b>	<b>100</b>

The results in Table 4.2 showed that a clear majority of 70 per cent farmers belonged to the middle age category, while 23.30 per cent belonged to the old age category and a mere 6.70 per cent in the young age category.

The likely reason for majority of respondents to be in 36-50 years age category might be that usually farmers of this age would have moderate experience in farming and had more work competence than older and younger ones. Further, middle aged farmers could bear more family responsibility. The results are in line with the findings of Gulabsinh (2016) and Naik (2017).



**Figure 3 Distribution of polyhouse farmers according to their age**



**Figure 4 Distribution of open precision farmers according to their age**

#### 4.1.2 Education level of the hi-tech farmers

**Table 4.3 Distribution of polyhouse farmers according to their education level**

Sl.No	Categories	Frequency(n=30)	Percentage
1	Primary	1	3.3
2	Secondary and higher secondary	15	50
3	Graduate	12	40
4	Post graduate	2	6.7
<b>Total</b>		<b>30</b>	<b>100</b>

The data in Table 4.3 revealed that half of the respondents, that is 50 per cent of the polyhouse farmers had secondary and higher secondary level of education, followed by 40 per cent had graduation level, while only 6.70 per cent belonged to the post graduate level and a mere 3.30 percent in the primary level of education.

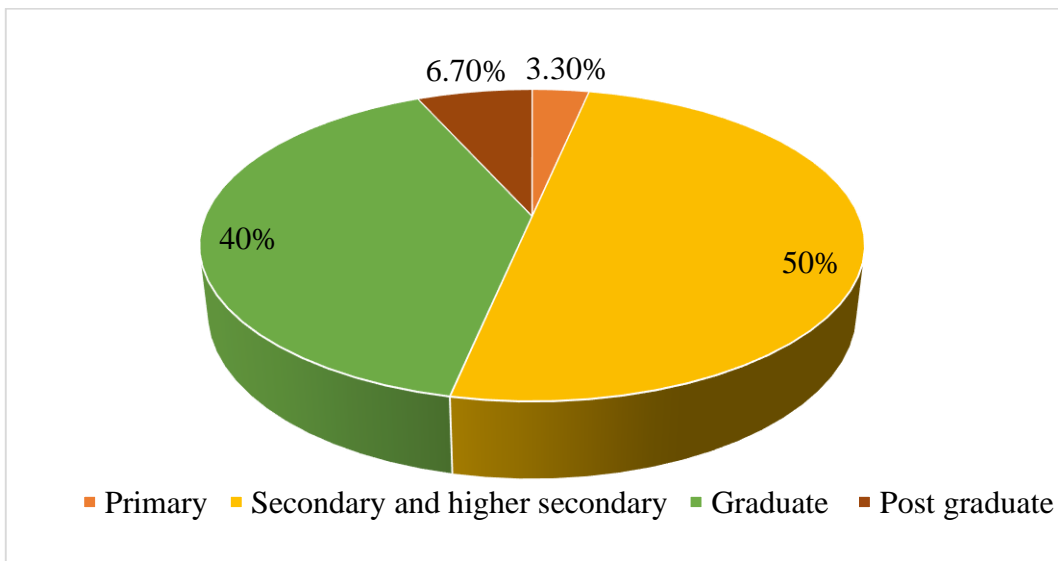
**Table 4.4 Distribution of open precision farmers according to their education level**

Sl.No	Categories	Frequency(n=30)	Percentage
1	Primary	4	13.30
2	Secondary and higher secondary	16	53.30
3	Graduate	7	23.30
4	Post graduate	3	10.00
<b>Total</b>		<b>30</b>	<b>100</b>

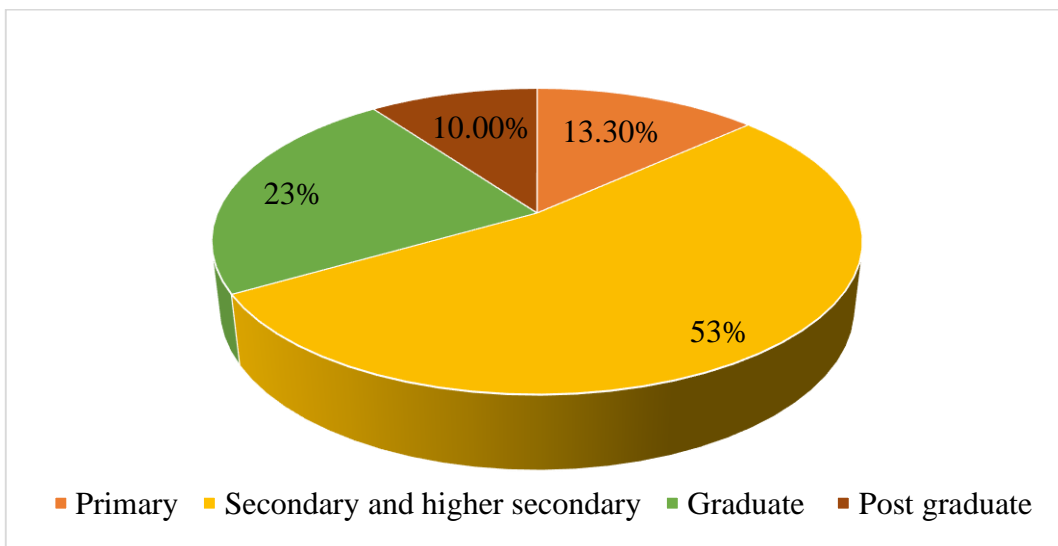
It is evident from the results in Table 4.4 that slightly more than half of the open precision farmers had secondary and higher secondary level of education, a

23.30 per cent had graduation level of education , 13.30 per cent had primary level of education while a mere 10 per cent had post graduate level of education.

The probable reason for a fair level of education must be their realization that education opens up new doors for making economic profits and also for finding subsidiary occupations. The results are on par with the findings of Barik (2013) and Nargave (2016).



**Figure 5 Distribution of polyhouse farmers according to their education level**



**Figure 6 Distribution open precision farmers according to their education level**



#### 4.1.3 Farm experience of hi-tech farmers

**Table 4.5 Distribution of polyhouse farmers according to their farm experience**

Sl.No	Categories	Frequency(n=30)	Percentage
1	Low (up to 5 years)	15	50.00
2	Medium (6-15 years)	15	50.00
3	High ( above 15 years)	0	0
<b>Total</b>		<b>30</b>	<b>100</b>

It is apparent from the Table 4.5 that half of the respondents that is 50 per cent had lower level of farm experience and 50 per cent had medium level of farm experience.

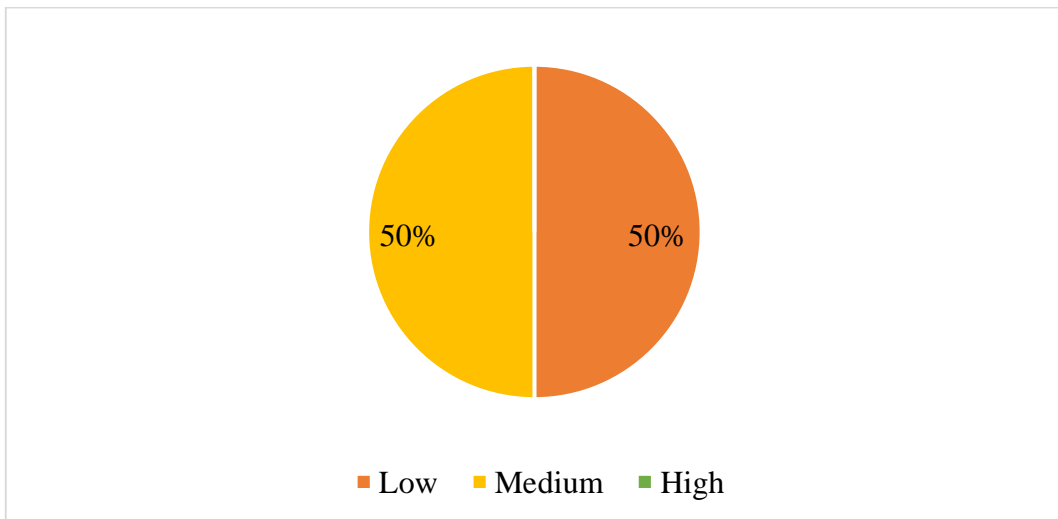
The probable reason for medium to low level of experience might be that polyhouse farming had gained focus only in the recent years and people might have had an inhibition to take it up as a method of farming. Most of the polyhouse farmers started polyhouse farming as a part of the SHM scheme in 2011-2012. The results are in agreement with that of Barik (2013)

**Table 4.6 Distribution of open precision farmers according to their farm experience**

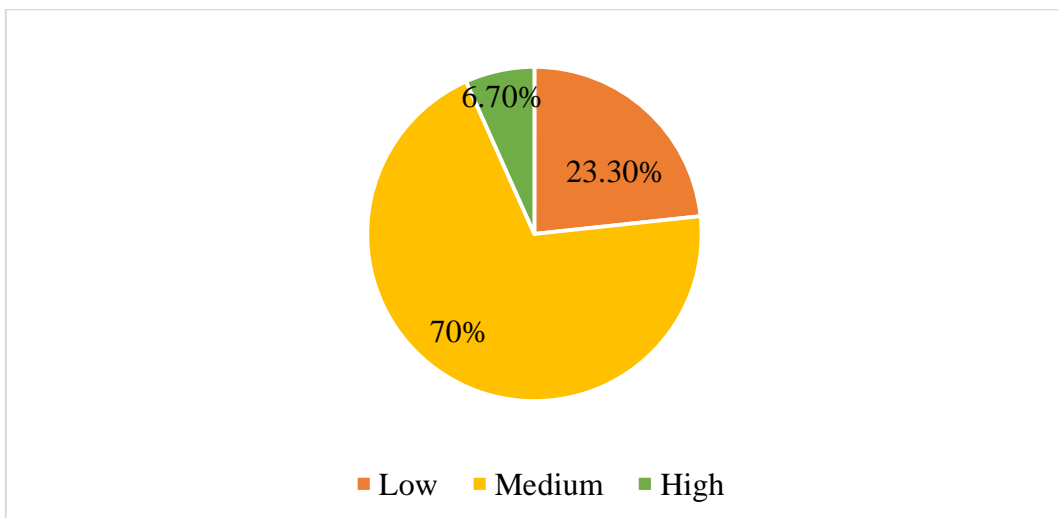
Sl.No	Categories	Frequency(n=30)	Percentage
1	Low (up to 5 years)	7	23.30
2	Medium (6-15 years)	21	70.00
3	High( above 15 years)	2	6.70
<b>Total</b>		<b>30</b>	<b>100</b>

The results in Table 4.6 showed that a clear majority of 70 per cent of open precision farmers had medium level of farm experience, 23.30 per cent had lower level of farm experience while only 6.70 per cent had higher level of farm experience.

The likely reason for medium level of farm experience could be that the respondents took a fair amount of time for them to take up open precision farming as an occupation, doubtful of its profit margins, besides they had to invest huge amount initially to convert conventional farms to open precision farms. The results are in line with the findings of Sharma (2014) and Gulabsinh (2016).



**Figure 7 Distribution of polyhouse farmers according to their experience**



## Figure 8 Distribution of open precision farmers according to their experience

### 4.1.4 Size of the land holding of hi-tech farmers

**Table 4.7 Distribution of polyhouse farmers according to the size of land holding**

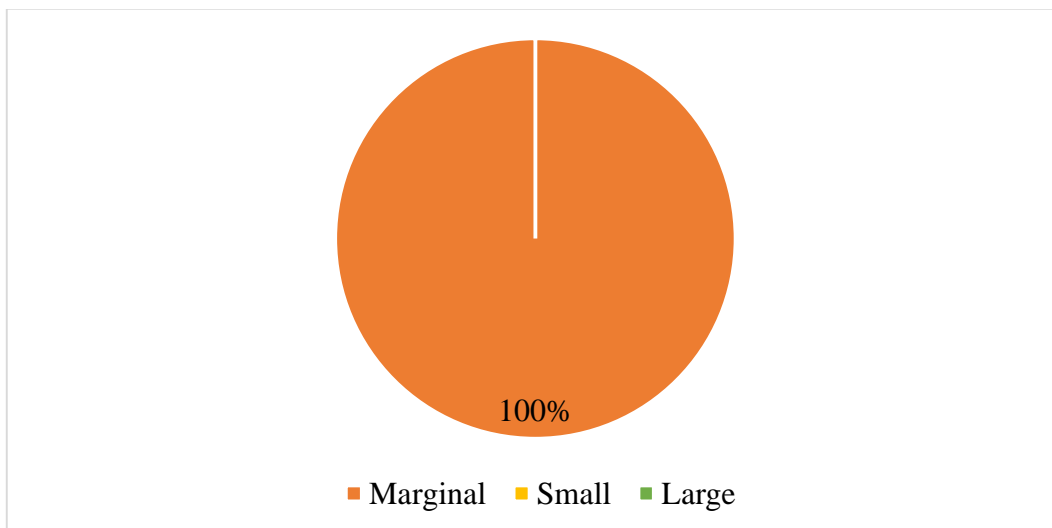
Sl.No	Categories	Frequency(n=30)	Percentage
1	Marginal land holding (up to 2.5 acres)	30	100.00
2	Small land holding ( 2.5-5 acres)	-	-
3	Large land holding (above 5 acres)	-	-
<b>Total</b>		<b>30</b>	<b>100</b>

The results in Table 4.7 showed that 100 per cent of the polyhouse farmers had marginal land holding. Most of the farmers constructed polyhouse in the backyard of their house which did not require much space as they were not fully into farming. Highly fragmented nature of land holding in Kerala could be another reason. The results are on par with the findings of Patil *et al.* (2014).

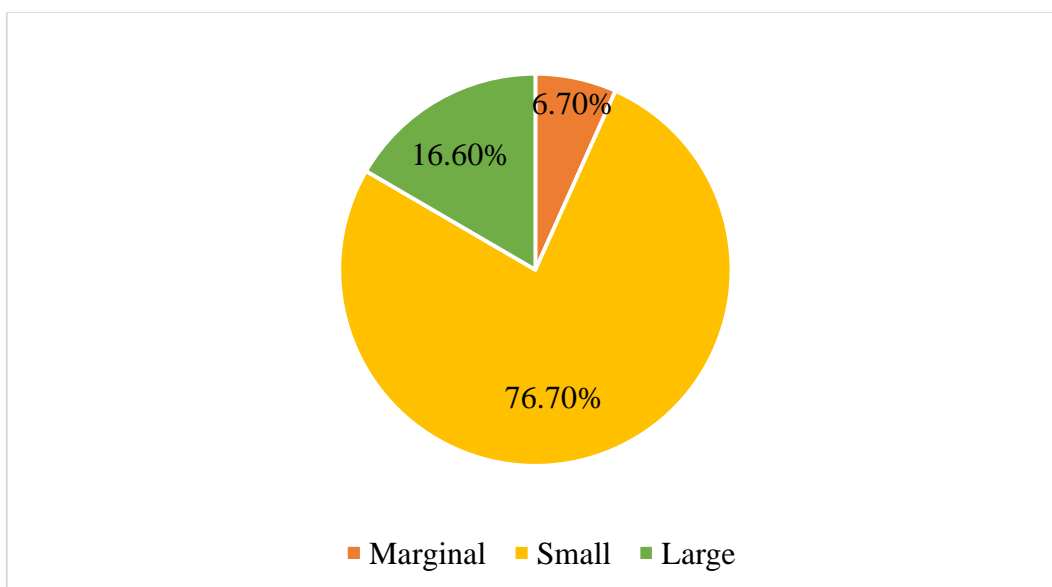
**Table 4.8 Distribution of open precision farmers according to the size of land holding**

Sl.No	Categories	Frequency(n=30)	Percentage
1	Marginal land holding (up to 2.5 acres)	2	6.70
2	Small land holding ( 2.5-5 acres)	23	76.70
3	Large land holding (above 5 acres)	5	16.60
<b>Total</b>		<b>30</b>	<b>100</b>

The results in Table 4.8 showed that 76.70 per cent had small land holding, followed by 16.60 per cent with large land holding and 6.70 per cent had marginal land holding. It might be because open precision farmers practiced farming in leased land. The results are in line with that of Tekale *et al.* (2013).



**Figure 9 Distribution of polyhouse farmers according to the size of land holding**



**Figure 10 Distribution of open precision farmers according to the size of land holding**

#### 4.1.5 Annual income of hi-tech farmers

**Table 4.9: Distribution of polyhouse farmers according to their annual income**

Sl.No	Categories	Frequency(n=30)	Percentage
1	Low annual income ( up to 350000)	8	26.70
2	Medium annual income ( 350000 – 700000)	15	50.00
3	High annual income ( above 700000)	7	23.30
<b>Total</b>		<b>30</b>	<b>100</b>

From the results in Table 4.9 it was found that half of the respondents that is 50 per cent had medium level of annual income followed by 26.70 per cent with low annual income and 23.30 per cent had high annual income.

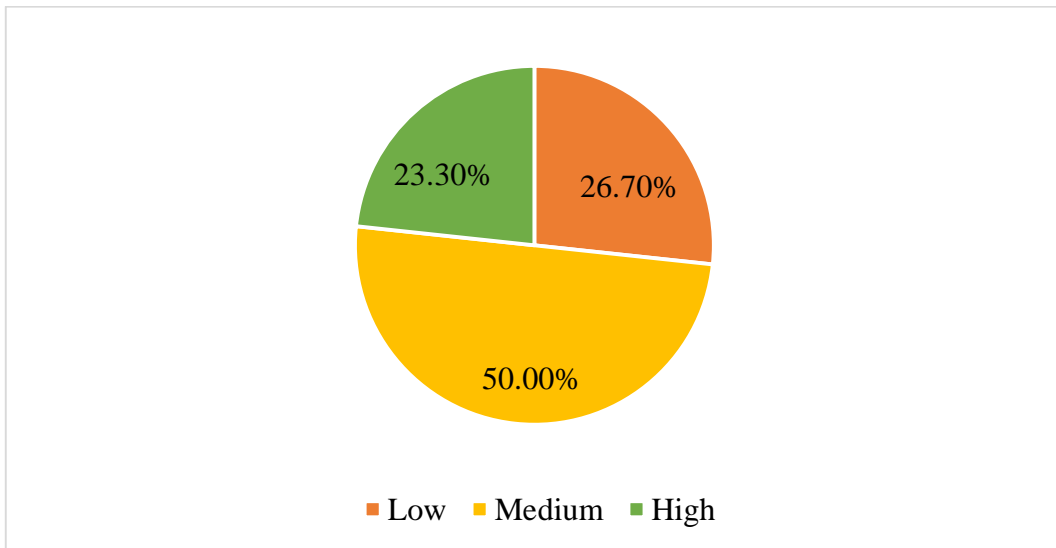
The probable reason for majority of respondents having medium level of annual income might be due to their moderate educational status enabling them to find subsidiary occupation to support farming. The results are in agreement with the findings of Naik (2017).

**Table 4.10 Distribution of open precision farmers according to their annual income**

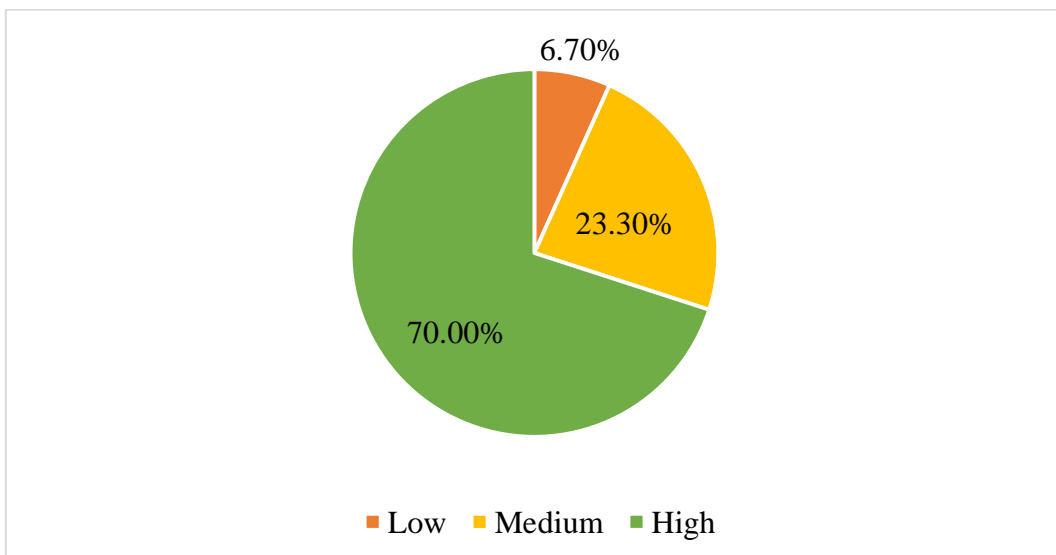
Sl.No	Categories	Frequency(n=30)	Percentage
1	Low annual income ( up to Rs.350000)	2	6.70
2	Medium annual income ( Rs.350000 – 700000)	7	23.30
3	High annual income ( above Rs.700000)	21	70.00
<b>Total</b>		<b>30</b>	<b>100</b>

It was evident from the results in Table 4.10 that 70 per cent had high annual income, followed by 23.30 per cent of farmers with medium level of annual income while 6.70 per cent had low level of annual income.

The likely reason for high annual income among open precision farmers could be that they had medium size of land holding which led to higher level of farm production.



**Figure 11 Distribution of polyhouse farmers according to their annual income**



**Figure 12 Distribution of open precision farmers according to their annual income**

#### 4.1.6 Social participation of the hi-tech farmers

**Table 4.11 Distribution of polyhouse farmers according to their social participation**

Sl.No	Categories	Frequency (n=30)	Percentage
1	Low	12	40.00
2	Moderate	16	53.30
3	Good	2	6.70
<b>Total</b>		<b>30</b>	<b>100</b>

The results in Table 4.11 showed that 53.30 per cent had moderate level of social participation, while a 40 per cent had low social participation and 6.70 per cent had good social participation.

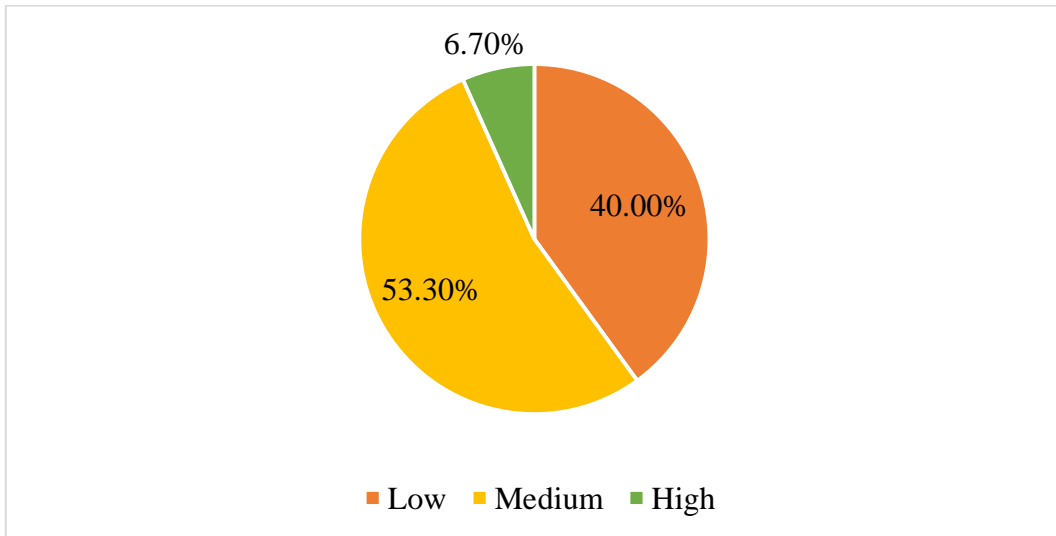
The probable reason for moderate to low social participation may be due to moderate educational status and most of the farmers were near to towns that facilitated connections with various social organizations by which they interact with each other. The results are on par with the findings of Krishnan (2017) and Ramlakshmidivi *et al.* (2013).

**Table 4.12 Distribution of open precision farmers according to their social participation**

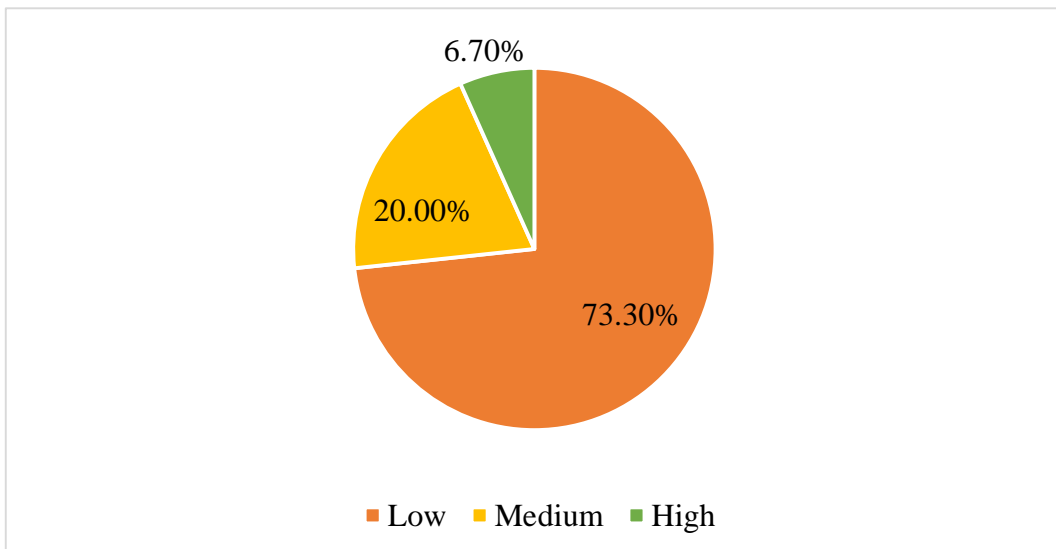
Sl.No	Categories	Frequency (n=30)	Percentage
1	Low	22	73.30
2	Moderate	6	20.00
3	Good	2	6.70
<b>Total</b>		<b>30</b>	<b>100</b>

It could be observed from the results in Table 4.12 that a majority of 73.30 per cent of open precision farmers had low social participation, while 20 percent had moderate and a 6.70 per cent had good social participation.

The possible reason for the result could be that the time of work of farmers made it inconvenient for them to take part in various social activities.



**Figure 13 Distribution of polyhouse farmers according to their social participation**



**Figure 14 Distribution of open precision farmers according to their social participation**



#### 4.1.7 Mass media contact of the hi-tech farmers

**Table 4.13 Distribution of polyhouse farmers according to their mass media contact**

Sl.No	Categories of mass media contact	Frequency(n=30)	Percentage
1	Low	3	10
2	Medium	14	46.70
3	High	13	43.30
<b>Total</b>		<b>30</b>	<b>100</b>
<b>Mean- 1.33</b>			<b>SD- 0.66</b>

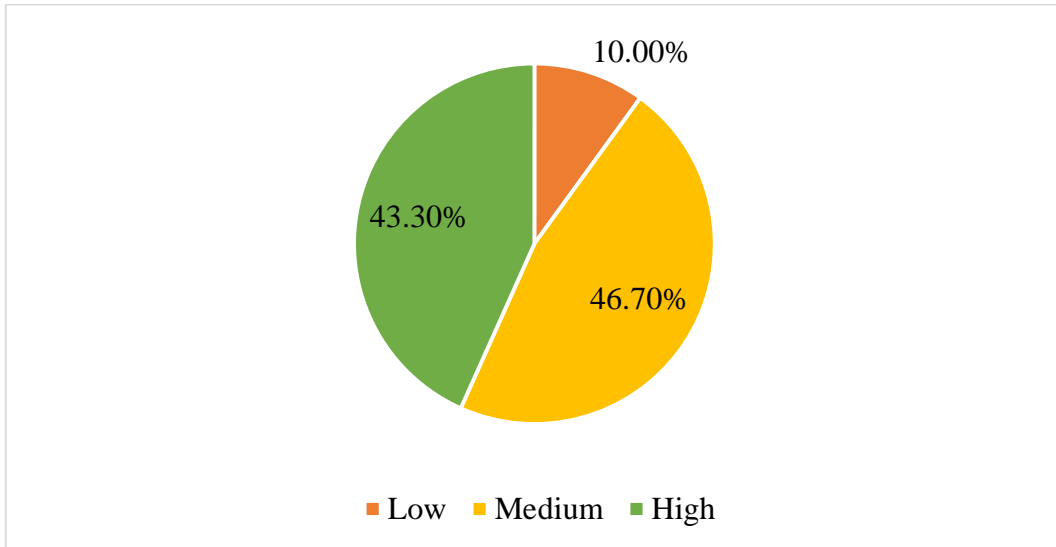
It could be observed from the results in Table 4.13 that almost half of the polyhouse farmers had medium level of mass media contact, while 43.30 per cent had high level of mass media contact and 10 per cent had low level of mass media contact.

The probable reason might be that good number of farmers had secondary and above level of education and most households had their televisions, radio or newspapers which enabled them to utilize various mass media. The results are in conformity with the findings of Sreeram (2013).

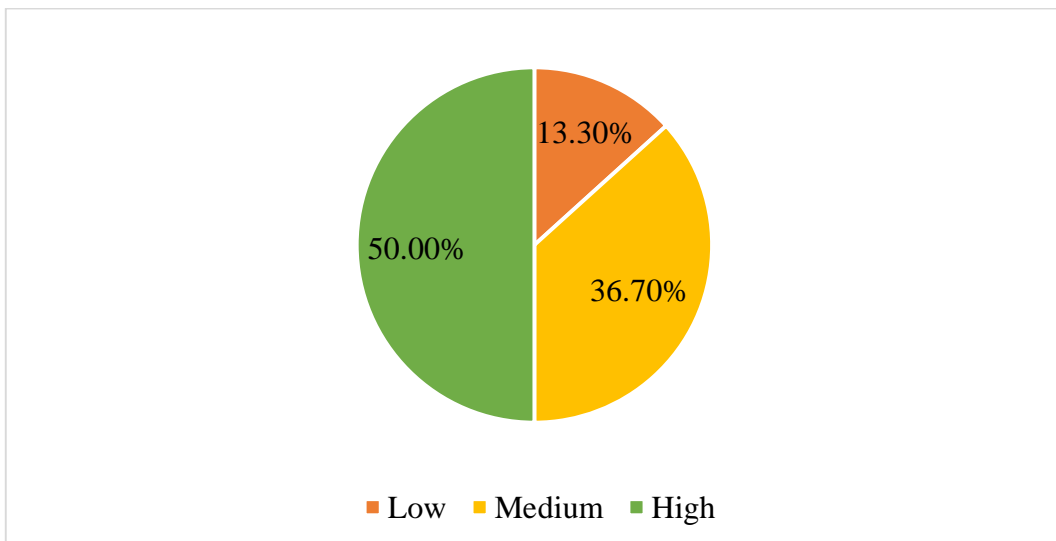
**Table 4.14 Distribution of open precision farmers according to their mass media contact**

Sl.No	Categories of mass media contact	Frequency(n=30)	Percentage
1	Low	4	13.30
2	Medium	11	36.70
3	High	15	50.00
<b>Total</b>		<b>30</b>	<b>100</b>
<b>Mean- 1.37</b>			<b>SD - 0.72</b>

The results in Table 4.14 showed that half of the respondents had high mass media contact, while 36.70 per cent had medium and a mere 13.03 per cent had low mass media contact. The probable reason could be that Kerala has high literacy rate and majority of the households possessed radio, television or newspaper. The results are in line with Neelveni *et al.* (2002).



**Figure 15 Distribution of polyhouse farmers according to their mass media contact**



**Figure 16 Distribution of open precision farmers according to their mass media contact**

#### 4.1.8 Extension contact of hi-tech farmers

**Table 4.15 Distribution of polyhouse farmers according to their extension contact**

Sl.No	Categories of extension contact	Frequency(n=30)	Percentage
1	Low	8	26.70
2	Medium	17	56.70
3	High	5	16.60
<b>Total</b>		<b>30</b>	<b>100</b>
<b>Mean- 0.90</b>			<b>SD - 0.66</b>

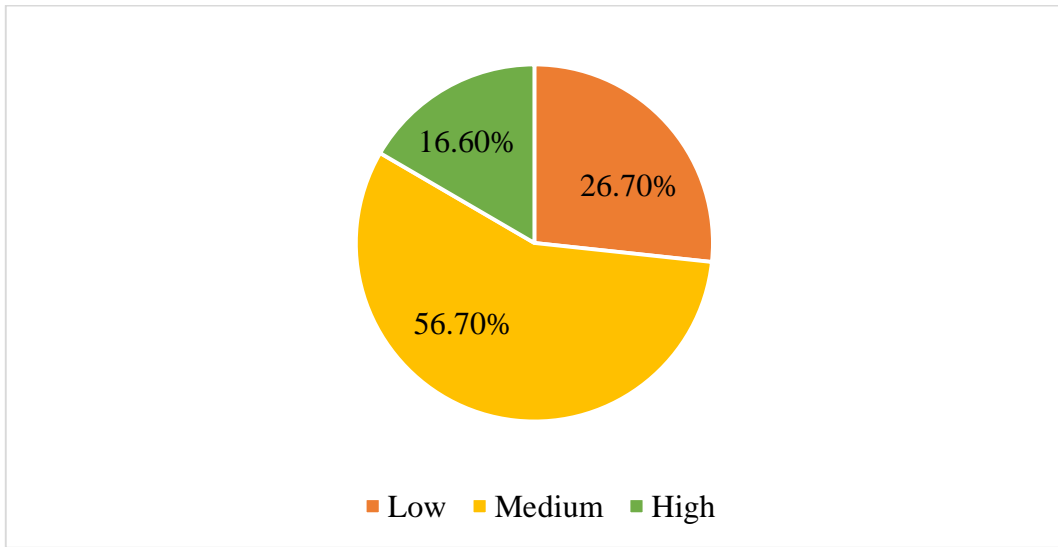
It was evident from the result in Table 4.15 that 56.70 per cent of the polyhouse farmers had medium level of extension contact, while 26.70 per cent had low level and 16.60 per cent had high level of extension contact.

The likely reason for such a result could be that the respondents had a fair level of education and were aware of the benefits of having close contact with extension agency. The results are on par with the findings of Patel *et al.* (2014).

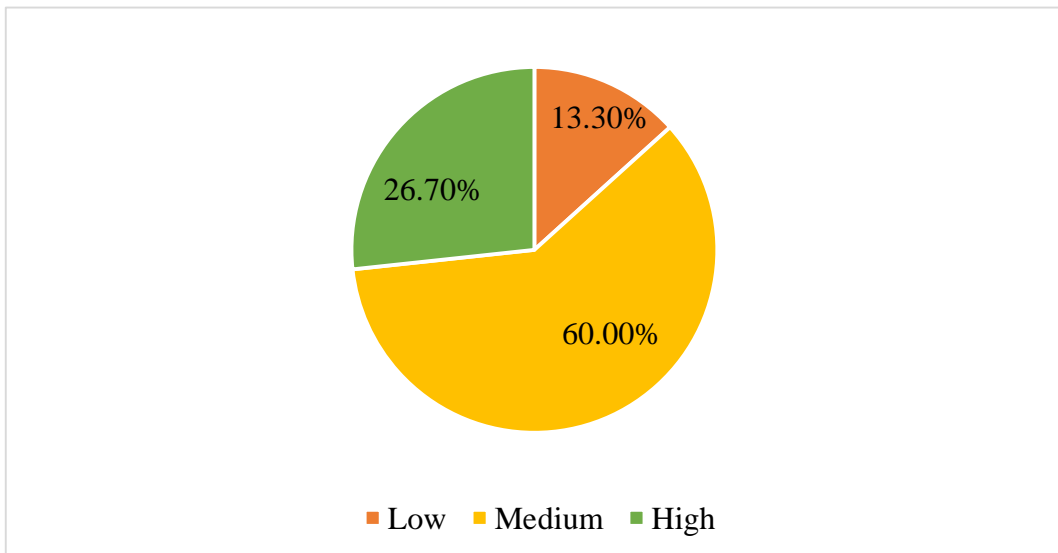
**Table 4.16 Distribution of open precision farmers according to their extension contact**

Sl.No	Categories of extension contact	Frequency(n=30)	Percentage
1	Low	4	13.30
2	Medium	18	60.00
3	High	8	26.70
<b>Total</b>		<b>30</b>	<b>100</b>
<b>Mean- 1.13</b>			<b>SD - 0.63</b>

The results in Table 4.16 showed that 60 per cent of the open precision farmers had moderate level of extension contact, while 26.70 per cent had high and 13.30 per cent had low extension contact. The probable reason for such a result could be due to the diversity of respondents in age and education, at least the middle aged and young respondents seek the assistance of extension personnel. The results are in conformity with the findings of Anitha (2004).



**Figure 17 Distribution of polyhouse farmers according to their extension contact**



**Figure 18 Distribution of open precision farmers according to their extension contact**

## 4.2 Dimensions of entrepreneurial behaviour of hi-tech farmers

### 4.2.1 Decision making ability

**Table 4.17 Distribution of polyhouse farmers according to their decision making ability** **n=30**

Sl.No	Categories of decision making ability	Range of indices	Percentage
1	Low	<59.06	26.70
2	Medium	59.06-81.02	53.30
3	High	>81.02	20.00
<b>Mean</b> –63.06			<b>S.D-</b> 15.27

The results in Table 4.18 revealed that more than half, 53.30 per cent of the polyhouse farmers belonged to the medium category, while 26.70 per cent had low and 20 per cent had high decision making ability.

The probable reason for such result could be the inability of the polyhouse farmers to take decisions at a rational level due to their low social participation and medium level of extension contact. More or less similar results were reported by Porchezhiyan *et al.* (2016).

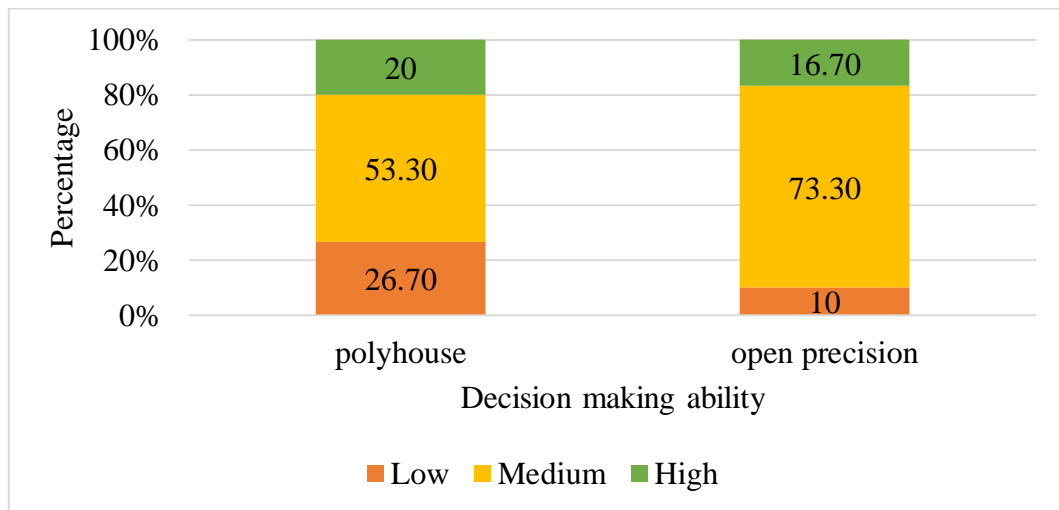
**Table 4.18 Distribution of open precision farmers according to their decision making ability** **n=30**

Sl.No	Categories of decision making ability	Range of indices	Percentage
1	Low	<47.79	10.00
2	Medium	47.79-78.33	73.30
3	High	>78.33	16.70
<b>Mean</b> – 70.04			<b>SD</b> -10.98

The results in Table 4.17 indicated that a clear majority of 73.30 per cent open precision farmers belonged to the medium level in decision making ability, while 16.70 per cent fell into high level of decision making ability and a mere 10 per cent had only lower level of decision making ability.

The probable reason could be that the open precision farmers had fair social participation and extension contact and always preferred to consult others in taking decisions. The results are on par with the findings of Ahmed *et al.* (2011).

**Figure 19 Distribution of hi-tech farmers according to their decision making ability**



#### 4.2.2 Achievement motivation

**Table 4.19 Distribution of polyhouse farmers according to their achievement motivation** n=30

Sl.No	Categories of achievement motivation	Range of indices	Percentage
1	Low	<50.56	26.70
2	Medium	50.56-74.4	53.30
3	High	>74.44	20.00
<b>Mean – 62.50</b>			<b>SD – 11.94</b>

Table 4.19 revealed that slightly more than half (53.30%) of the respondents had medium level of achievement motivation, while 26.70 per cent had low level of achievement motivation and only 20 per cent belonged to the category of high level of achievement motivation.

The likely reason for the result might be that the polyhouse farmers were gratified with whatever profits they had and they were not aiming at profit maximization.

**Table 4.20 Distribution of open precision farmers according to their achievement motivation n=30**

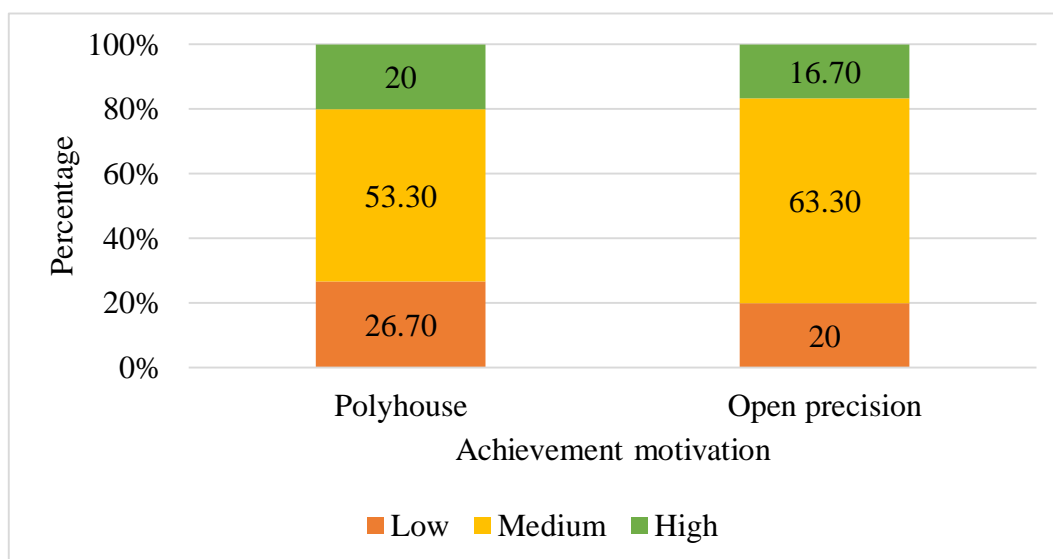
Sl.No	Categories of achievement motivation	Range of indices	Percentage
1	Low	<55.49	20.00
2	Medium	55.49-84.03	63.30
3	High	>84.03	16.70
<b>Mean – 69.76</b>			<b>SD-14.27</b>

It could be observed from the results in Table 4.20 that a majority of 63.30 per cent of the farmers had medium level of achievement motivation followed by 20 per cent with low and only 16.70 per cent with high level of achievement motivation.

The probable reason could be that open precision farmers were not ready to give their full time and efforts in farming activities, in order to achieve big. They found it important to engage in non-farm activities.

The results are on par with the findings of Takale *et al.* (2015) and Vivek (2019).

**Figure 20 Distribution of hi-tech farmers according to their achievement motivation**



#### 4.2.3 Risk taking ability

**Table 4.21 Distribution of polyhouse farmers according to their risk taking ability** **n=30**

Sl.No	Categories of risk taking ability	Range of indices	Percentage
1	Low	<54.75	26.50
2	Medium	54.75-77.46	63.40
3	High	>77.46	10.10
<b>Mean – 66.11</b>			<b>SD – 11.36</b>

It was evident from the Table 4.21 that a majority of 63.40 per cent of polyhouse farmers showed medium level of risk taking ability, while 26.50 per cent had low and 10.10 per cent had high level of risk taking ability.

The probable reason for such a result could be that the polyhouse farming had gained popularity in the recent years and thus farmers were unlikely to take



risks without proper guidance and knowledge, which could probably result in loss of money and time. Further, the polyhouse farmers did not have ample income from farming so as to take more risks by investing more time and money.

The results are in agreement with the findings of Bheemappa *et al.* (2014) and Vivek (2019).

**Table 4.22 Distribution of open precision farmers according to their risk taking ability** **n=30**

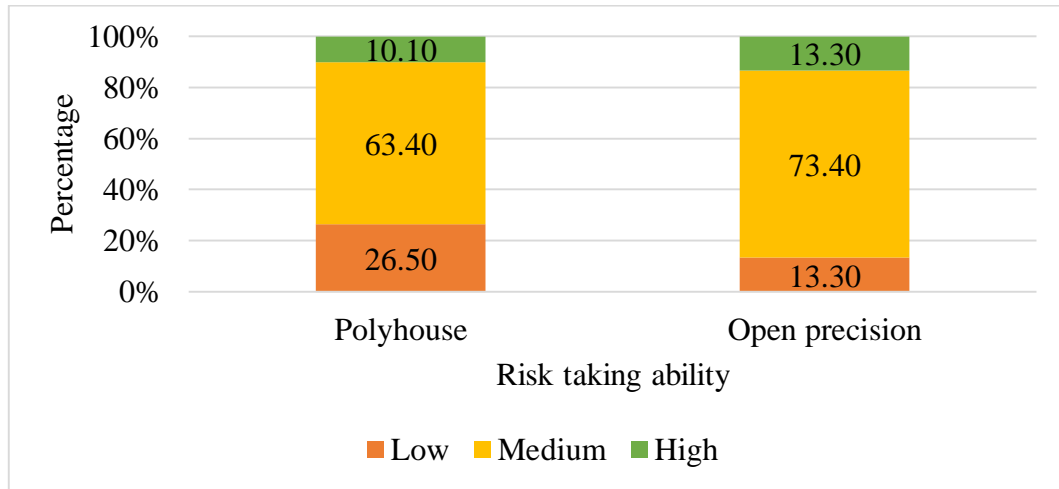
Sl.No	Categories of risk taking ability	Range of indices	Percentage
1	Low	<54.63	13.30
2	Medium	54.63-79.89	73.40
3	High	>79.89g	13.30
<b>Mean – 67.46</b>			<b>SD -12.43</b>

The results in table 4.22 revealed that a clear majority of 73.40 per cent open precision farmers had medium level of risk taking ability, while an equal per cent (13.30%) of open precision farmers had low and high risk taking ability.

The result may be because the technology of open precision have already been proved successful among the farmers and they need not take much risk, added to the fact that they already high income from open precision farming which has high input efficiency by precise application of nutrients and manures and did not wish to venture into innovative practises that had a share of risk which could probably lower their income.

The results are on par with the findings of Rubeena (2015) and Bhagyalaxmi *et al.* (2003).

**Figure 21 Distribution of hi-tech farmers according to their risk taking ability**



#### 4.2.4 Planning ability

**Table 4. 23 Distribution of polyhouse farmers according to their planning ability** **n=30**

Sl.No	Categories of planning ability	Range of indices	Percentage
1	Low	<58.16	3.30
2	Medium	58.16-82.4	70.00
3	High	>82.4	26.70
<b>Mean – 70.28</b>			<b>SD – 12.12</b>

The result in Table 4.23 showed that 70 per cent of polyhouse farmers had medium level of planning ability while 26.70 per cent had high and a mere 3.30 per cent had low level of planning ability.

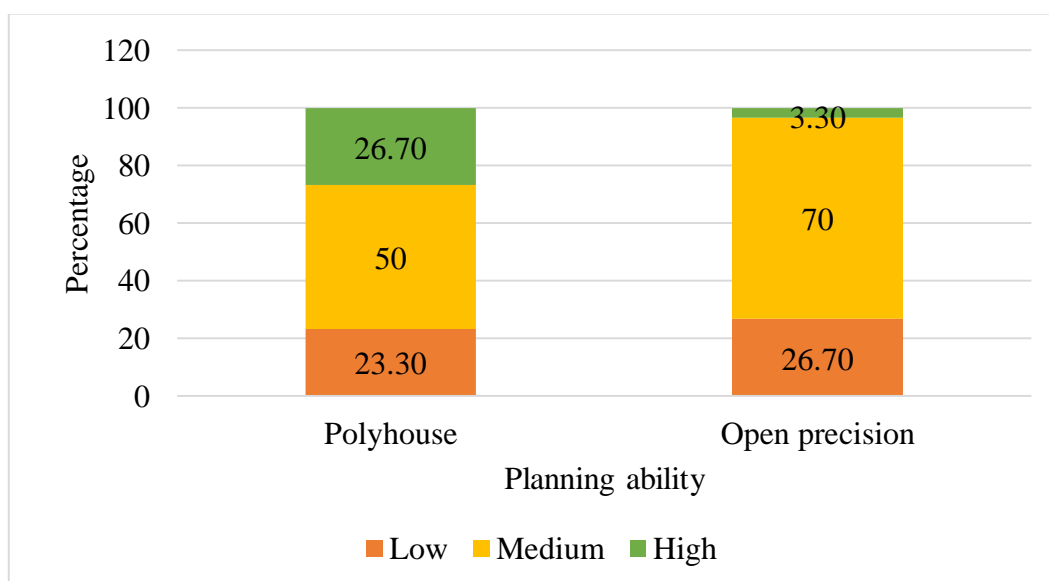
The likely reason for the result could be that the polyhouse farmers had a fair education level to plan the farming activities in advance, to avoid any kind of unforeseen risks. The moderate level of social participation and extension contact might have helped them to plan in consultation with other farmers and officers. The results are on par with the findings of Turker and Seleck (2009).

**Table 4.24 Distribution of open precision farmers according to their planning ability** **n=30**

Sl.No	Categories of ability to plan	Range of indices	Percentage
1	Low	<61.02	26.70
2	Medium	61.02-80.62	50.00
3	High	>80.62	23.30
<b>Mean – 70.82</b>			<b>SD - 9.80</b>

The results in Table 4.24 showed that half of the open precision farmers had medium level of planning ability, followed by 26.70 per cent with low and 23.30 per cent with high planning ability. The likely reason for such a result could be that they had fair experience in farming, which made them confident enough to perform operations without planning. As the open precision farmers already had high earning, they might have not found planning as a way to to earn more profits. The results are in conformity with the findings of Chaurasya *et al.* (2016) and Naik (2017).

**Figure 22 Distribution of hi-tech farmers according to their planning ability**



#### 4.2.5 Leadership ability

**Table 4.25 Distribution of polyhouse farmers according to their Leadership ability** **n=30**

Sl.No	Categories of Leadership ability	Range of indices	Percentage
1	Low	<50.24	16.70
2	Medium	150.24-76.42	60.00
3	High	>76.42	23.30
<b>Mean – 63.33</b>			<b>SD- 13.09</b>

It was evident from the results in Table 4.25 that 60 per cent of the polyhouse farmers had medium level of leadership ability, while 23.30 per cent had high and 16.70 per cent had low level of leadership ability.

The likely reason for the result might be that the polyhouse farmers had fair education level to manage different activities by leading and directing the labourers. This could help them in securing efficient output and to finish work in time. Similar results have been reported by Lawrence and Ganguly (2012).

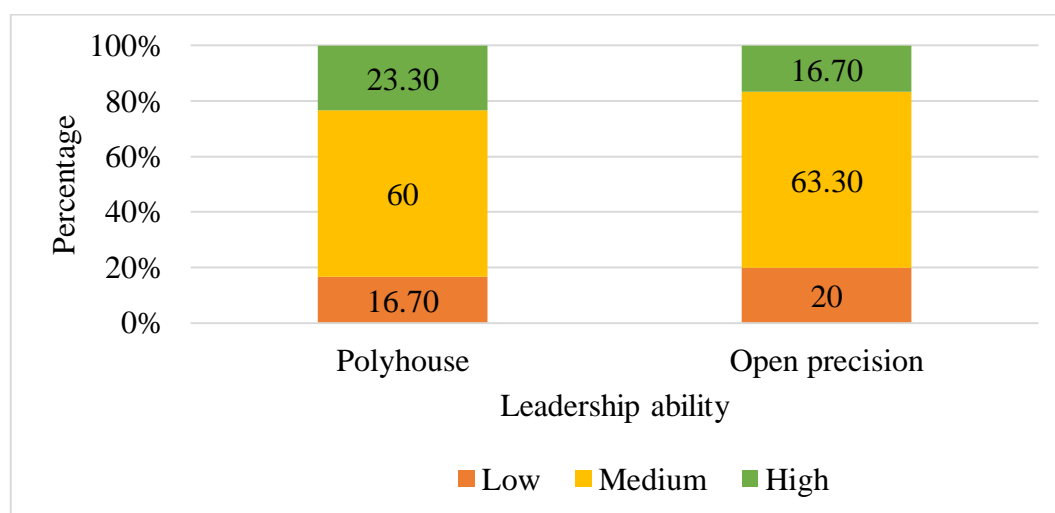
**Table 4.26 Distribution of open precision farmers according to their leadership ability** **n=30**

Sl.No	Categories of leadership ability	Range of indices	Percentage
1	Low	<49.16	16.70
2	Medium	49.16-81.8	63.30
3	High	>81.8	20.00
<b>Mean – 65.48</b>			<b>SD - 16.32</b>

The results in Table 4.26 revealed that 63.30 per cent of open precision farmers had medium level of leadership, while 20 per cent and 16.70 per cent had

high and low level of leadership ability respectively. The probable reason could be the moderate educational status of the open precision farmers that prompted them to manage activities for benefits. The results are on par with the findings of Abeyrathne and Jayawardene (2014).

**Figure 23 Distribution of hi-tech farmers according to their leadership ability**



#### 4.2.6 Cosmopolitaness

**Table 4.27 Distribution of polyhouse farmers according to their cosmopoliteness n=30**

Sl.No	Categories of cosmopoliteness	Range of indices	Percentage
1	Low	<41.67	10.00
2	Medium	41.67-76.85	66.70
3	High	>76.85	23.30
<b>Mean – 59.26</b>			<b>SD - 17.59</b>

The results in Table 4.27 showed that 66.70 per cent of the polyhouse farmers had medium level of cosmopoliteness, while 23.30 per cent had high and 10 per cent had low level of cosmopoliteness. The result might be because of the fair extension contact, mass media contact and social participation of the polyhouse

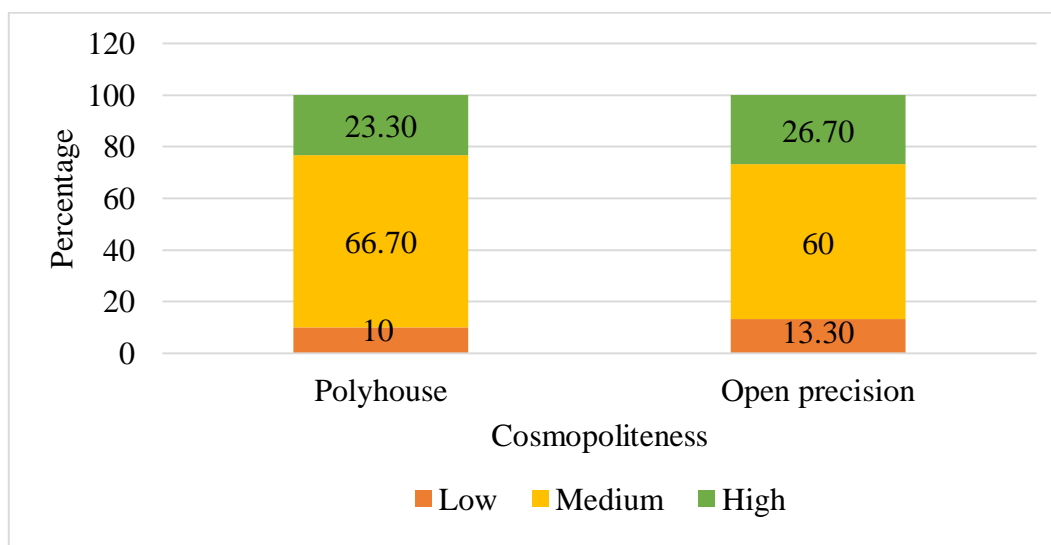
farmers that helped them to have a consistent interaction with people of different social strata. More or less similar results were reported by Ahuja *et al.* (2016).

**Table 4.28 Distribution of open precision farmers according to their cosmopoliteness** **n=30**

Sl.No	Categories of cosmopoliteness	Range of indices	Percentage
1	Low	<48.97	13.30
2	Medium	48.97-76.71	60.00
3	High	>76.71	26.70
<b>Mean – 62.84</b>			<b>SD - 13.87</b>

The results in Table 4.28 revealed that 60 per cent of open precision farmers had medium level of cosmopoliteness followed by 26.70 per cent and 13.30 per cent with high and low level of cosmopoliteness respectively. The probable reason for the result could be due to the good educational status, mass media and extension contact of the open precision farmers that opened up the doors to share ideas and collaborate with people. The results are in line with the findings of Chauhan and Patel (2003).

**Figure 24 Distribution of hi-tech farmers according to their cosmopoliteness**



#### 4.2.7 Self confidence

**Table 4.29 Distribution of polyhouse farmers according to their self confidence**

**n=30**

Sl.No	Categories of self confidence	Range of indices	Percentage
1	Low	<47.78	23.30
2	Medium	47.78-73.7	60.00
3	High	>73.7	16.70
<b>Mean – 60.74</b>			<b>SD - 12.96</b>

The results in Table 4.29 showed that 60 per cent of the polyhouse farmers had medium level of self-confidence while, 23.30 per cent had low and 16.70 per cent had high self-confidence.

The reason for medium to low confidence could be due to their low income and marginal land holding that might not have given them much profits in farming. The results are in conformity with the findings of Gulabsinh (2016).

**Table 4.30 Distribution of open precision farmers according to their self confidence**

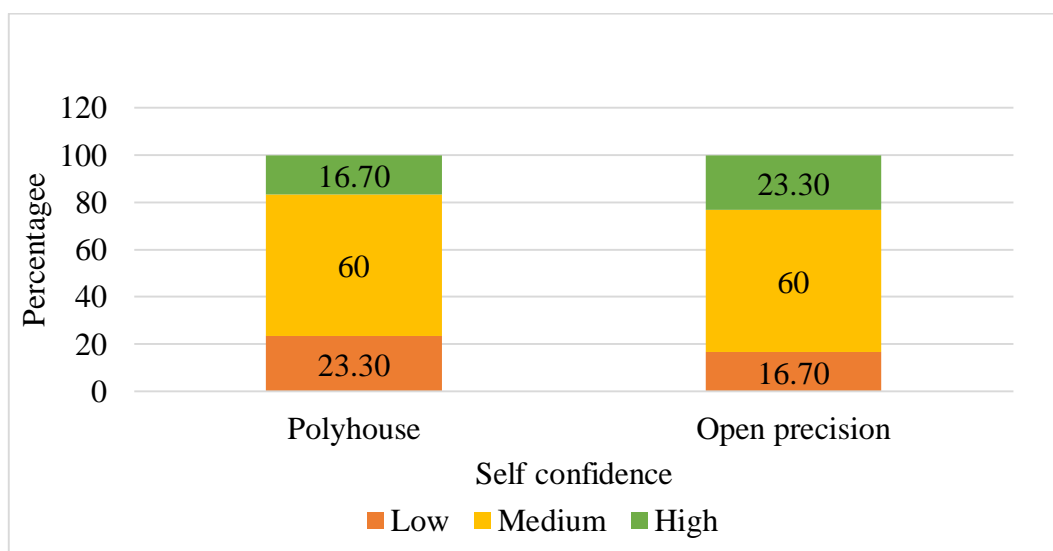
**n=30**

Sl.No	Categories of self confidence	Range of indices	Percentage
1	Low	<51.76	16.70
2	Medium	51.7-88.36	60.00
3	High	>88.46	23.30
<b>Mean – 70.06</b>			<b>SD - 18.30</b>

The results in Table 4.30 revealed that 60 per cent of the open precision farmers had medium level of self-confidence while 23.30 per cent had high and 16.07 per cent had low level of self-confidence.

The result of medium to high self-confidence could be due to the high income level, moderate farming experience and fair educational status of the open precision farmers. This would have built in them an optimism that they can earn more in future by trusting their own hard work. Similar results have been reported by Barik (2013).

**Figure 25 Distribution of hi-tech farmers according to their self confidence**



#### 4.2.8 Information seeking behaviour

**Table 4.31 Distribution of polyhouse farmers according to their information seeking behaviour** n=30

Sl.No	Categories of information seeking behaviour	Range of indices	Percentage
1	Low	<54.9	6.70
2	Medium	54.9-86.58	73.30
3	High	>86.58	20.00
<b>Mean – 70.74</b>			<b>SD - 15.84</b>



The results in Table 4.31 showed that 73.30 per cent of polyhouse farmers had medium level of information seeking behaviour while, 20 per cent had high and only 6.70 per cent had low level of information seeking behaviour.

The medium to high level of information seeking behaviour could be due to the fact that majority of polyhouse farmers had moderate contact with formal sources such as extension officers and they found it easier to access different kinds of services from government and SAUs. The farmers found it necessary to seek information on production and marketing aspects from different sources .

The results are on par with the findings of Jaisridhar *et al.* (2012).

**Table 4.32 Distribution of open precision farmers according to their information seeking behaviour** **n=30**

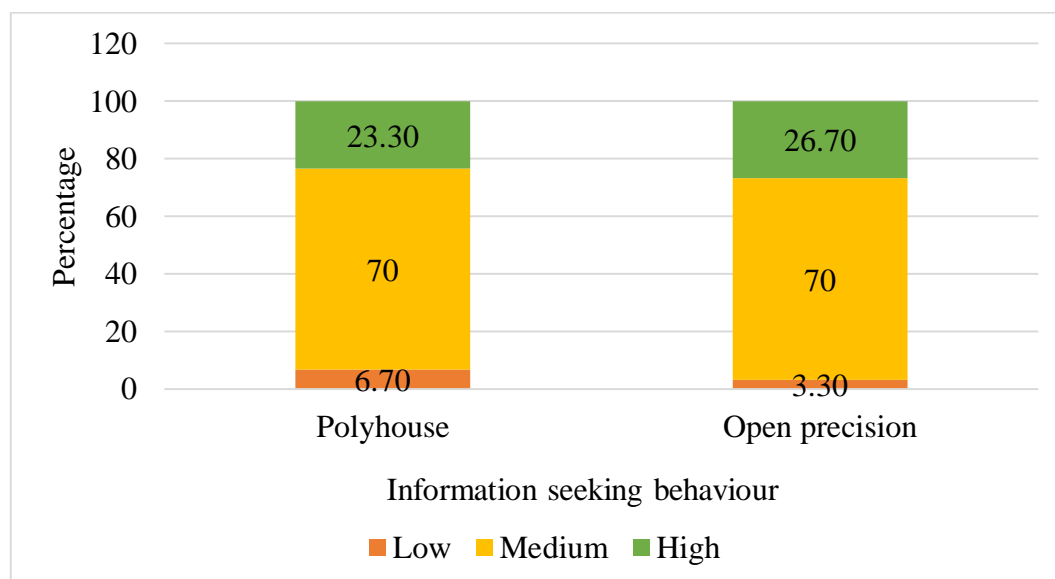
Sl.No	Categories of information seeking behaviour	Range of indices	Percentage
1	Low	<59.68	6.70
2	Medium	59.68-89.04	73.30
3	High	>89.04	20.00
<b>Mean – 74.36</b>			<b>SD - 14.68</b>

It was apparent from the results in Table 4.32 that 73.30 per cent of open precision farmers had medium 20 per cent had high and only 6.70 per cent had low level of information seeking behaviour.

The reason for such a result could be their fair extension contact and moderate mass media contact that could have probably made it easier to access up to date information.

The results are in agreement with the findings of Boruah *et al.* (2015).

**Figure 26 Distribution of hi-tech farmers according to their information seeking behaviour**



#### 4.2.9 Innovativeness

**Table 4.33 Distribution of polyhouse farmers according to their innovativeness**

n=30

Sl.No	Categories of innovativeness	Range of indices	Percentage
1	Lower level of innovativeness	<54.7	23.30
2	Medium level of innovativeness	54.7-80.86	50.00
3	Higher level of innovativeness	>80.86	26.70
<b>Mean – 67.78</b>			<b>SD - 13.08</b>

Table 4.33 revealed that level of innovativeness among polyhouse farmers was found to be at medium level. Results showed that half of the respondents showed medium level of innovativeness, 26.70 per cent showed high level of innovativeness and 23.3 per cent showed lower level of innovativeness.

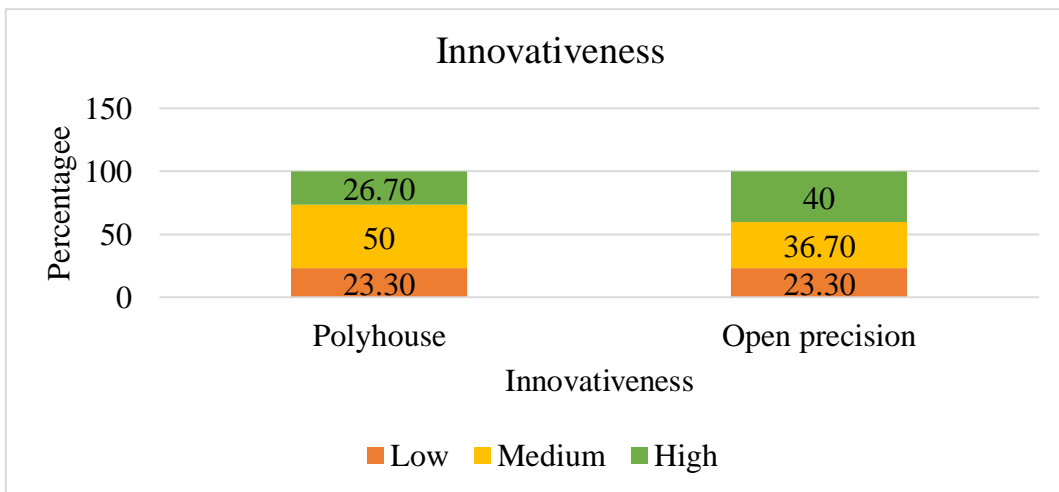
The probable reason could be that the polyhouse farmers were careful about trying new practises and they chose to avoid venturing to risks. Similar results have been reported by Patel *et al.* (2014) and Naik (2017).

**Table 4.34 Distribution of open precision farmers according to their innovativeness** **n=30**

Sl.No	Categories of innovativeness	Range of indices	Percentage
1	Lower level of innovativeness	<54.76	23.30
2	Medium level of innovativeness	54.76-82.94	36.70
3	Higher level of innovativeness	>82.94	40.00
<b>Mean – 68.85</b>			<b>SD - 14.09</b>

The results in Table 4.34 revealed that 40 per cent of the open precision farmers showed higher level of innovativeness, while 36.70 per cent showed medium level and 23.30 per cent showed lower level of innovativeness. The result could be due their desire to take advantage of the novel opportunities in farming, which could potentially increase income. The results are in accordance with that of Neyello *et al.* (2015).

**Figure 27 Distribution of hi-tech farmers according to their level of innovativeness**



### 4.3 Overall entrepreneurial behaviour of hi-tech farmers

**Table 4.35 Overall entrepreneurial behaviour of hi-tech farmers**

Sl. No	Dimensions	Polyhouse farmers		Open precision farmers	
		Index	Rank	Index	Rank
1	Decision making ability	63.06	6	72.38	3
2	Achievement motivation	62.50	7	72.08	5
3	Risk taking ability	66.11	4	69.70	7
4	Planning ability	70.28	2	73.18	4
5	Leadership ability	63.33	5	67.67	8
6	Cosmopolitaness	59.26	9	64.94	9
7	Self-confidence	60.74	8	73.39	2
8	Information seeking behaviour	70.74	1	76.80	1
9	Innovativeness	67.78	3	71.15	6
<b>Composite Index</b>		<b>64.87</b>		<b>68.98</b>	

The Table 4.35 indicated that the entrepreneurial behaviour of hi-tech farmers was measured with a composite index of 64.87 for polyhouse farmers and 68.98 for open precision farmers. Among the listed nine dimensions, information seeking behaviour gained the highest index for both polyhouse and open precision farmers (70.74 and 76.80 respectively). Information seeking was vital as it connected the farmers to the updates in the marketing and technological aspects. The probable reason for the result could be because the farmers had fair social participation, mass media contact and extension contact, along with educational status.

It was found that planning ability ranked second for polyhouse farmers. Planning was very crucial for scheduling the farm activities and allocation of finance. The result could be attributed to relatively better educational status of the farmers, which might have helped them in planning. Among open precision farmers, self-confidence ranked second because of the high income and large land holding of the farmers, along with better farming experience. They had complete trust on their efforts as they received profits.

The results showed that cosmopolitaness and self-confidence ranked least among polyhouse farmers. The probable reason for weak cosmopolitaness might be that the farmers did not take part in trainings and discussions on a regular basis. They were often reluctant to participate in field trips and visits. Low self-confidence could be due to low income and less expertise in technology. Cosmopolitnness and leadership ability ranked least among open precision farmers as they had poor social participation and were not ready to take up the initiative in groups.

**Table 4.36 Distribution of polyhouse farmers according to their entrepreneurial behaviour**

Sl. No	Category	Range of indices	Percentage
1	Low	<58.2	16.70%
2	Medium	58.2- 71.54	63.30%
3	High	>71.54	20.00%
<b>Mean: 64.87</b>			<b>S. D: 6.67</b>

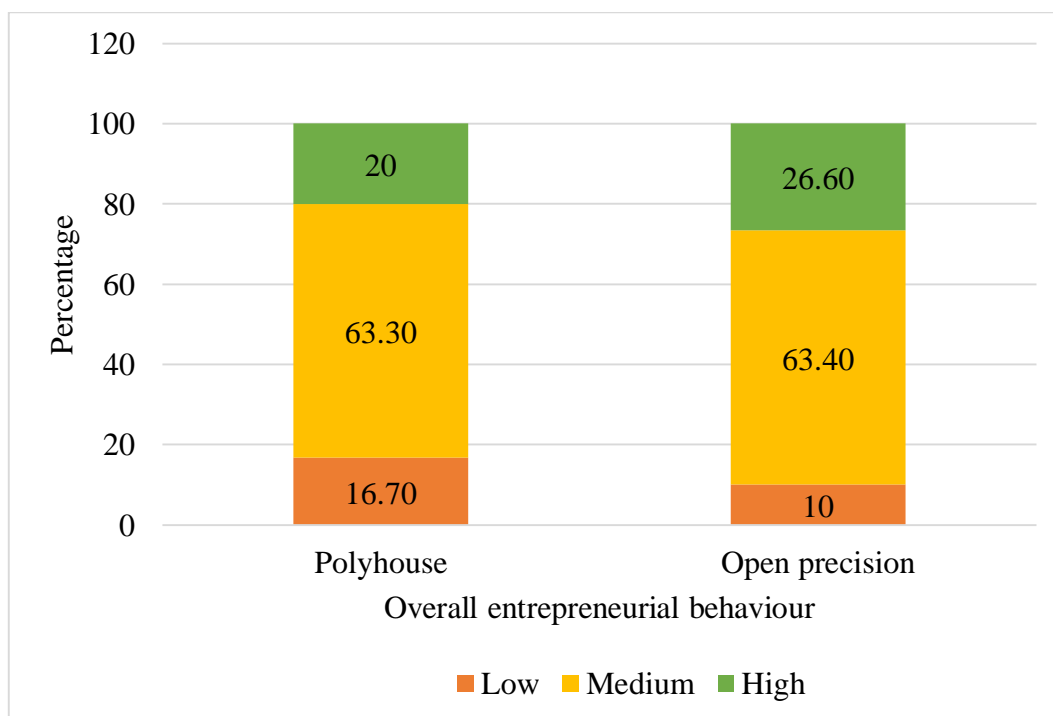
The Table 4.36 indicated that majority (63.30%) of the polyhouse farmers had medium level of entrepreneurial behaviour, followed by 20 per cent of them had high and 16.70 per cent had low level of entrepreneurial behaviour. It was observed that all the nine dimensions selected were medium among polyhouse farmers. This could be the reason for such a result. The results are on par with the findings of Mertiya (2017) .

**Table 4.37 Distribution of open precision farmers according to their entrepreneurial behaviour**

Sl. No	Category	Range of indices	Percentage
1	Low	<60.66	10.00%
2	Medium	60.66- 77.30	63.40%
3	High	>77.30	26.60%
<b>Mean: 68.98</b>			<b>S. D: 8.32</b>

The Table 4.37 indicated that majority (63.4%) of the open precision farmers had medium level of entrepreneurial behaviour, followed by 26.6 per cent of them had high and 10 per cent had low level of entrepreneurial behaviour. It was observed that all the nine dimensions except innovativeness were medium among open precision farmers. This could be the reason for such a result. The results are on par with the findings of Naik (2017) and Tekale *et al.* (2013).

**Figure 28 Overall entrepreneurial behaviour of hi-tech farmers**



#### 4.4 Factors affecting the entrepreneurial behaviour of farmers

The relationship between the entrepreneurial behaviour and profile characteristics of the hi-tech farmers viz, age, farm experience income, education, size of the land holding, social participation, mass media contact and extension contact were studied independently for polyhouse and open precision farmers. The results are shown in the Table 4.38.

**Table 4.38 Factors affecting the entrepreneurial behaviour of farmers**

Sl. No	Profile characteristic	Open precision	Polyhouse
1	Age	-0.424*	--0.049
2	Experience	0.361*	0.360*
3	Income	0.036	-0.046
4	Size of the land holding	0.291	0
5	Education	0.433**	0.170
6	Social participation	0.408	0.389*
7	Mass media contact	0.035	0.087
8	Extension contact	0.268	0.429*

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

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

The Table 4.38 showed that among open precision farming farmers, experience and education showed a positive and significant relationship with the entrepreneurial behaviour of the farmers, while age had a negatively significant relationship.

The result indicated that young farmers were more motivated to take up innovative technologies and upgrade their farms. On the other hand, long years of experience and education made farmers efficient, skilled, market oriented and wise to take appropriate decisions in time.

The result in Table 4.38 showed that, among polyhouse farmers, experience, social participation and extension contact had a positive and significant relationship with the overall entrepreneurial behaviour of the farmers. While all other independent variables did not show any correlation.

The result could be because the farmers with longer years of experience would have ease in farming and marketing, which helped to reap profits. Social participation and extension contact was crucial in the information seeking and cosmopolitanism of the farmers. With greater social participation and extension contact, they could get up to date information and ideas on novel practices.

#### **4.5 Comparison of entrepreneurial behaviour of polyhouse and open precision farmers**

Mann Whitney U test was performed to compare the overall entrepreneurial behaviour of the farmers in polyhouse and open precision. The result showed that there was significant difference between the groups with a Mann Whitney U of 320. Detailed analysis was done to study the contribution of different variables.

**Table 4.39 Comparison of dimensions of polyhouse and open precision farmers**

<b>Sl. No.</b>	<b>Dimensions of entrepreneurial behaviour</b>	<b>Mann Whitney U</b>
1	Decision making ability	307.500*
2	Achievement motivation	306.500*
3	Risk taking ability	429.500
4	Ability to plan	428.500
5	Ability to co ordinate	424.000
6	Cosmopolitanism	377.000
7	Self confidence	296.500*
8	Information seeking	372.500
9	Innovativeness	413.500

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



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

The results in Table 4.39 indicated that two groups were significantly different with respect to three dimensions of entrepreneurial behaviour viz, decision making ability, achievement motivation and self-confidence .This means that the open precision farmers had higher index in decision making ability, achievement motivation and self-confidence.

This could be attributed to their moderate experience in farming, social participation and extension contact, the three independent variables that were found significantly correlated with their entrepreneurial behaviour.

#### **4.6 Testing within Group variability among polyhouse and open precision farmers**

The within group variability among socio-economic and personal variables were found out by Kruskal-Wallis test by taking the nine dimensions of entrepreneurial behaviour as the dependent variable.

The Table 4.40 showed that age had a significant variability between the three categories of age with respect to the self confidence of the farmers. The significant increase in self-confidence with age might be due to higher experience in farming and marketing.

It was also found that, there was a significant variability among different classes of education with respect to innovativeness of polyhouse farmers, this might be because, with higher education, farmers would be able to connect with different kinds of people and institutions to get ideas on new practises and implement them on field. Education brought greater exposure and willingness to try differently.

The Table 4.41 revealed that among open precision farmers, education had a significant variability among categories with respect to planning ability. Farmers with higher education tended to plan before acting as they were wiser and avoided any kind of lop-sidedness in farming. They engaged in nonfarm activities also and thus scheduled time and money well before.

It was also found that farmers with higher extension contact were more self-confident. This could be because farmers approached extension officials frequently and were well informed and motivated to do work confidently.

**Table 4.40 Group variability among polyhouse farmers**

Sl. No	Socio-economic and personal variables	Dimensions of entrepreneurial behaviour								
		D1	D2	D3	D4	D5	D6	D7	D8	D9
1	Age	2.85	2.44	1.75	1.03	2.02	1.03	<b>8.04*</b>	4.84	1.75
2	Experience	1.66	1.90	1.51	3.74	1.93	3.84	2.36	2.77	3.48
3	Size of land holding	0	0	0	0	0	0	0	0	0
4	Annual income	0.44	1.87	2.67	1.32	1.83	2.70	3.29	3.10	1.61
5	Education	3.32	0.98	1.37	1.88	0.64	2.94	1.98	1.02	<b>10.00*</b>
6	Social participation	2.46	1.03	1.69	2.92	0.09	0.49	1.52	1.26	2.79
7	Mass media contact	4.80	0.12	0.01	0.16	0.00	0.72	0.60	0.35	0.44
8	Extension contact	2.28	1.16	2.48	0.81	0.28	0.002	7.25	0.94	0.02

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

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

#D1- decision making ability, D2-achievement motivation, D3-risk taking ability,D4-planning ability,D5-leadership ability,D6-cosmopolitaness,D7-self-confidence,D8-information seeking behaviour,D9-innovativeness.

**Table 4.41 Group variability among open precision farmers**

Sl. No	Socio-economic and personnel variables	Dimensions of entrepreneurial behaviour								
		D1	D2	D3	D4	D5	D6	D7	D8	D9
1	Age	2.94	1.98	0.043	1.85	1.81	2.09	1.84	1.33	3.64
2	Experience	1.78	0.07	0.80	1.08	1.23	1.58	0.72	3.76	1.95
3	Size of land holding	2.19	0.79	4.99	0.88	2.13	1.74	0.17	5.19	2.98
4	Annual income	0.36	1.89	3.71	1.27	1.74	2.29	3.81	3.23	3.21
5	Education	6.11	0.93	1.14	<b>6.87*</b>	3.75	5.84	4.03	4.80	0.90
6	Social participation	3.34	0.48	0.82	4.76	0.19	0.96	0.54	0.43	0.32
7	Mass media contact	1.72	3.23	3.31	0.17	1.2	0.36	0.64	1.62	0.94
8	Extension contact	2.76	2.48	3.24	0.24	0.04	0.004	<b>5.55*</b>	3.55	0.99

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

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

D1- decision making ability, D2-achievement motivation,D3-risk taking ability,D4-planning ability,D5-leadership ability,D6-cosmopolitaness,D7-self-confidence,D8-information seeking behaviour,D9-innovativeness.

#### 4.7 Odds to be an above average entrepreneur

Binary logistic regression was performed separately for polyhouse and open precision farmers, to find the probability of farmers to be an above average entrepreneur. The results are furnished in Table 4.42 and 4.43.

**Table 4.42 Odds to be above average entrepreneur for open precision farmers**

Sl.No	Variables	B	Standard Error	Exp B (Odds ratio)	Probability
1	Age	2.042	1.07	0.46	0.32
2	Experience	-0.77	1.66	5.31	0.84
3	Income	1.67	1.61	0.39	0.29
4	Size of land holding	-0.92	2.14	0.96	0.49
5	Education	0.038	0.87	0.42	0.29
6	Social participation	0.879	0.96	0.94	0.48
7	Mass media contact	0.062	1.59	1.59	0.61
8	Extension contact	0.466	1.48	10.63*	0.91

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

The results in Table 4.42 revealed that odds ratio for extension contact is significant. The sample of open precision farmers were already having 0.5 probability to become an above average entrepreneur. The calculated value of probability showed that if the level of extension contact is raised to next higher level, there will be a probability of 0.41 for entrepreneur to become an above average open precision farmer.

The probable reason could be that with increase in the level of extension contact, farmers would become more updated about the technologies and innovations in farming, which can be implemented on their farm for higher productivity.

**Table 4. 43 Odds to be above average entrepreneur for polyhouse farmers**

Sl.No	Variables	B	Standard Error	Exp B (Odds ratio)	Probability
1	Age	-0.47	0.96	0.62	0.39
2	Experience	1.06	0.97	2.89	0.74
3	Income	0.17	0.76	0.84	0.45
4	Size of land holding	-0.99	0.81	1.39	0.58
5	Education	0.33	0.98	2.71*	0.73
6	Social participation	1.01	0.86	0.36	0.26
7	Mass media contact	0.42	0.77	1.51	0.60
8	Extension contact	1.38	3.13	0.25	0.20

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

The results in Table 4.43 revealed that odds ratio for education is significant. The sample of polyhouse farmers were already having 0.5 probability to become an above average entrepreneur.

The calculated value of probability showed that if the level of education is raised to next higher level, there will be a probability of 0.23 for entrepreneur to become an above average polyhouse farmer.

The probable reason could be that , if the farmers acquire higher levels of education, farmers would be better informed and self-confident in their occupation.

## 4.7 Marketing behaviour of hi-tech farmers

### 4.7.1 Marketed surplus

It was found out from the survey that 12 out of the 30 polyhouse farmers had stopped commercial production.

**Table 4.44 Distribution of hi-tech farmers according to their marketed surplus**

Sl. No	Marketed Surplus	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Up to 5 tonnes	7	38.90%	1	3.30%
2	5-10 tonnes	11	61.10%	10	33.30%
3	>10 tonnes	-	-	19	63.40%

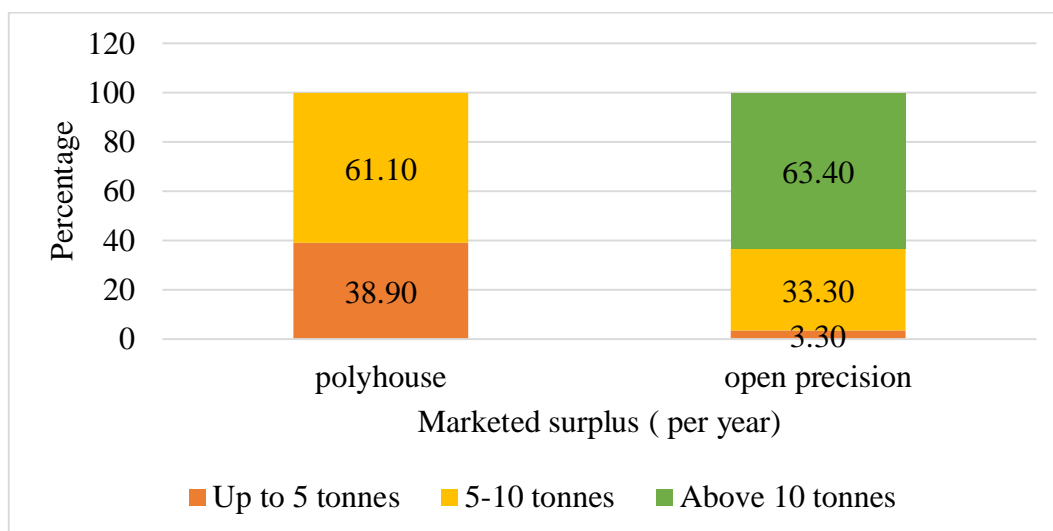
It is evident from the results in Table 4.44 that, among polyhouse farmers, a majority of 61.10 per cent had a marketed surplus ranging from 5-10 tonnes, while 38.90 per cent had marketed surplus up to five tonnes.

The reason for such a result could be that the potential production couldn't be achieved in polyhouse farming and polyhouse farmers found it difficult to repair and maintain the infrastructure, they had marginal land holding and some did not have adequate access to market.

The results showed that, among open precision farmers, a majority of 63.40 percent had high marketed surplus of above 10 tonnes, 33.30 percent had up to 10 tonnes and 3.30 percent had a marketed surplus up to 5 tonnes.

The result might be due to the finding that open precision farmers had more access to market information, they had high income to maintain their farms thereby ensuring production and productivity.

**Figure 29 Distribution of hi-tech farmers according to their marketed surplus**



#### 4.7.2 Marketing channels

**Table 4.45 Distribution of hi-tech farmers according to their marketing channel**

Sl. No	Name of the channel	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Direct access to market				
a	Supermarkets or local markets	9	50.00%	10	33.30%
b	Eco shops	2	11.10%	-	-
2	VFPCK	5	27.80%	20	66.70%
3	Middlemen	2	11.10%	-	

It is apparent from the results in Table 4.45 that more than half (61.10%) of the polyhouse farmers had a direct access to market via supermarkets

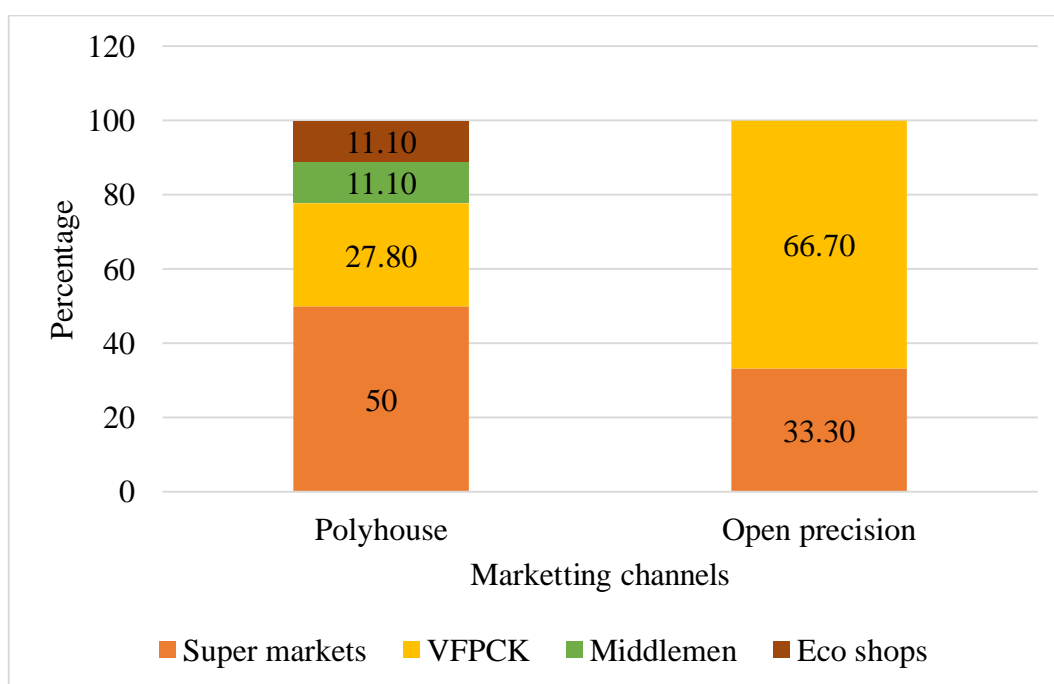
or local markets , 11.10 per cent through eco shops 27.80 per cent marketed through VFPCCK and 11.10 per cent marketed through middlemen.

The probable reason could be that, the farmers got more price for the produce when sold directly to the consumers. VFPCCK facilitated their marketing, making it easier for them to dispose the produce in time at a fair price. Most of the farmers believed that they did not get profit when sold through middlemen. The results are on par with the findings of Maratha and Badodia (2017).

In case of open precision farmers, it is evident from table that 66.70 percent marketed through VFPCCK and 33.30 percent had direct access to market.

The result might be due to the fact that open precision farmers got more profits through VFPCCK marketing, as they can market produce easily. More or less similar results have been reported by Desai and Solanki (2013).

**Figure 30 Distribution of hi-tech farmers according to their marketing channel**



#### 4.7.3 Access to market

##### 4.7.3.1 Distance from market

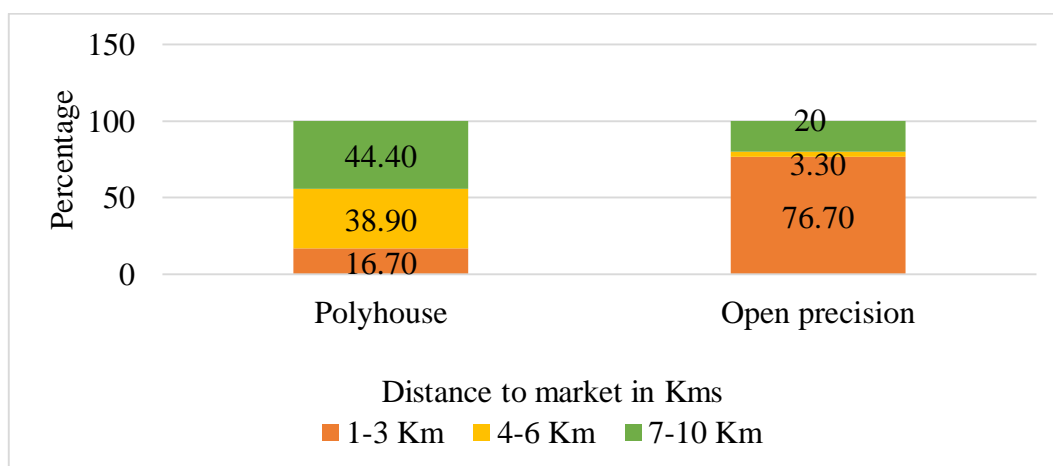


**Table 4.46 Distribution of hi-tech farmers according to distance from market**

Sl. No	Distance from the market (Km)	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	1-3 Km	3	16.70%	23	76.70%
2	4-6 Km	7	38.90%	1	3.30%
3	7-10 Km	8	44.40%	6	20.00%

The results in Table 4.46 showed that 44.4 per cent of the polyhouse were 7-10 Km away from the market while, 38.90 per cent were 4-6 Km away and 16.70 per cent were 1-3 Km away from the market. The result showed that polyhouse farmers had limited access to rural markets, while they travelled to nearby city to sell their produce in supermarkets and eco shops, which ensured fair price. As far as open precision farmers are concerned, a clear majority of 76.70 per cent were only 1-3 Km away from market, while 20 per cent were 7-10 Km away and 3.30 per cent were 4-6 Km away from market. The result could be because, most of the open precision farmers marketed through VFPCCK which are nearby their farms, while some of them sold it in cities for higher prices.

**Figure 31 Distribution of hi-tech farmers according to the distance from market**



#### 4.7.3.2 Mode of transport

**Table 4.47 Distribution of hi-tech farmers according to their mode of transport**

Sl. No	Mode of transport	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Car	3	16.70%	3	10.00%
2	Auto	7	38.90%	5	16.70%
3	Tempo	5	27.80%	18	60.00%
4	Tractor	3	16.70%	4	13.30%

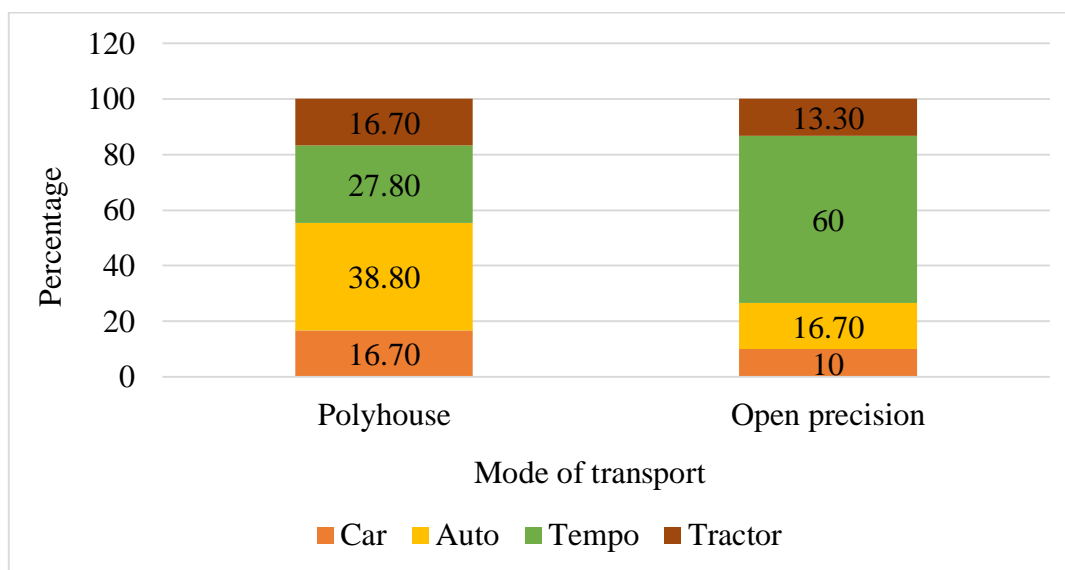
The results in Table 4.47 showed that 38.90 per cent of the polyhouse farmers used auto as a mode of transport to reach markets, while 27.80 per cent used tempo, 16.70 per cent used car and another 16.70 per cent used tractor.

The result showed that the polyhouse farmers found it economical and affordable to transport large quantity of produce in tempo and auto. While some of the farmers had very small quantity of produce, for which they used their own cars. Most of the farmers did not own a tractor.

In case of open precision farmers, 60 per cent used tempo as the mode of transport, 16.70 per cent used auto, 13.30 per cent used tractor and 10 per cent used cars.

The likely reason for such a result could be that, majority of the farmers marketed in nearby VFPCCK which could be reached in a tempo and most of them did not own tractors or any other private vehicles. Similar results have been reported by Kumar (2013).

**Figure 32 Distribution of hi-tech farmers according to their mode of transport**



#### 4.7.4 Price satisfaction

**Table 4.48 Distribution of hi-tech farmers according to their price satisfaction**

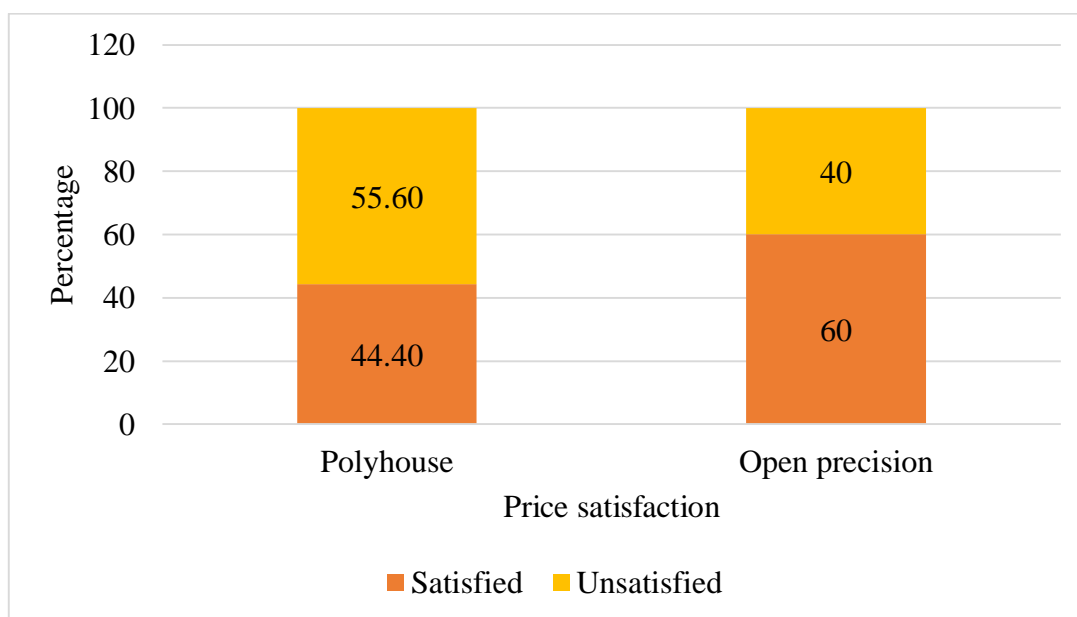
Sl. No	Price satisfaction	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Satisfied	8	44.40%	18	60.00%
2	Unsatisfied	10	55.60%	12	40.00%

The results in Table 4.48 showed that 55.60 per cent of the polyhouse farmers were unsatisfied with the price of the produce, while 44.40 per cent were satisfied with the price. The reason for non-satisfaction could be as the polyhouse farmers are unable to cop up with the changing market demands and they did not get any kind of guidance from the officials to avail market information.

It is apparent from the result that a clear majority of 60 per cent of the open precision farmers found the prices satisfactory, while 40 per cent found it

unsatisfactory. The probable reason for majority being satisfied could be that they sold their produce through VFPCK at a fair price, and also had moderate contact with the officers to collect market intelligence data on time. Open precision farmers also followed a mixed cropping system to meet the market demands and cop up with price fluctuations.

**Figure 33 Distribution of hi-tech farmers according to their price satisfaction**



#### 4.7.5 Access to market information

**Table 4.49 Distribution of hi-tech farmers according to their access to market information**

Sl. No	Access to market information	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Adequate	11	61.10%	25	83.30%
2	Inadequate	7	38.90%	5	16.70%

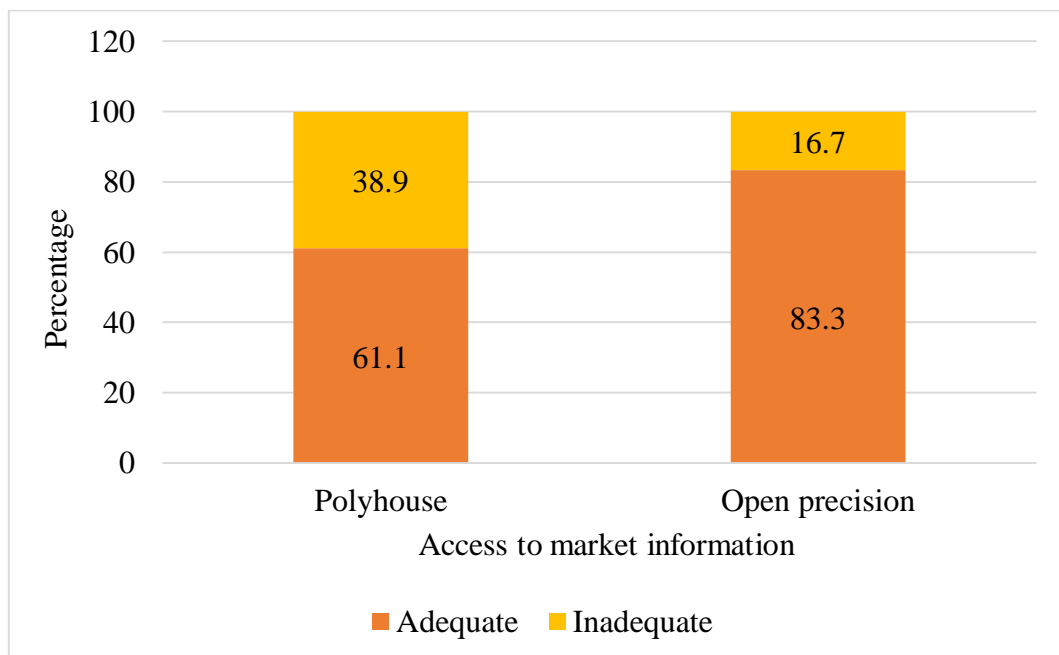
The results in Table 4.49 showed that 61.10 per cent of polyhouse farmers had adequate access to market information, while 38.90 per cent had inadequate access.

The likely reason for such a result could be the medium level of education among polyhouse farmers added to their moderate mass media and extension contact. The results are in conformity with Dhara *et al.* (2015).

In case of open precision farmers, a clear majority of 83.30 per cent had adequate access, while 16.70 per cent had inadequate access to market information.

The reason for such a result could be attributed to the consistent contact of open precision farmers with VFPCCK and extension officials. The results are on par with the findings of Gangadhar (2009).

**Figure 34 Distribution of hi-tech farmers according to their access to market information**



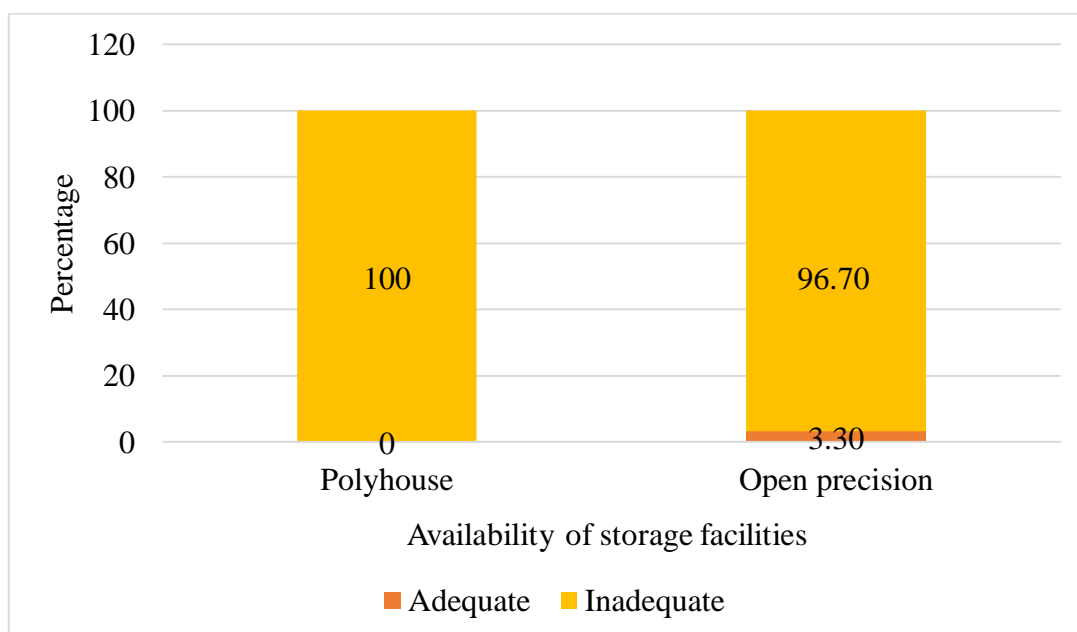
#### 4.7.6 Availability of storage facilities

**Table 4.50 Distribution of hi-tech farmers according to the availability of storage facilities**

Sl. No	Availability of storage facilities	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Adequate	-	-	1	3.30%
2	Inadequate	18	100%	25	96.70%

The results in Table 4.50 showed that 100 per cent of the polyhouse farmers had inadequate storage facilities, while 96.70 per cent of open precision farmers had inadequate and 3.30 per cent had adequate storage facilities. The result might be because the government didn't provide any infrastructure for storage and farmers did not have the knowhow on the importance of storage and post-harvest handling. The results are on par with the findings of Karpagam (2000).

**Figure 35 Distribution of hi-tech farmers according to the availability of storage facilities**



#### 4.7.7 Post-harvest handling or processing or value addition

The results showed that none of the farmers, both in polyhouse and open precision had adopted any processing or value addition activities.

#### 4.8 Discrimination in the marketing behaviour of polyhouse and open precision farmers

To test whether there is a significant discriminating in the marketing behaviour of polyhouse and open precision farmers, discriminant analysis was performed.

**Table 4.51 Summary of discriminant function analysis**

Sl.No	Eigen value	Percentage of variance	Canonical correlation	Wilks lambda
1	2.11	100%	0.824	0.322**

As in the Table 4.48 , the eigen value was found to be 2.11, and the function explained 100 per cent of the variance. The canonical correlation is 0.824 which is comparatively high. The higher the value of correlation better the function that discriminates the two groups. The Wilks lambda is 0.322 and chi square statistic shows that it is significant at 1 per cent level of significance. Then the function is statistically significant in showing a discriminatory power.

The Table 4.49 showed that marketed surplus had the greatest effect for predicting membership to group as there is a huge difference between the marketed surplus of polyhouse and open precision farmers, followed by distance to market , though it has inverse relationship to group membership , showing that as distance increases farmers show weaker marketing behaviour. Marketing channel had the lowest effect for predicting group membership as both groups had some marketing channels in common. Thus it was found that there was a significant discriminatory power for the variable marketed surplus between the groups.

**Table 4.52 Standardized Canonical Discriminant Function Coefficients**

<b>Sl.No</b>	<b>Prediction variable</b>	<b>Standardized Canonical Discriminant Function Coefficients</b>	<b>Rank of variable</b>
1	Marketed surplus	0.906	1
2	Distance to market	-0.850	2
3	Access to market information	0.719	3
4	Price satisfaction	0.308	4
5	Mode of transport	0.264	5
6	Access to storage	0.249	6
7	Marketing channels	0.054	7

#### **4.9 Linkages in hi-tech farming sector**

##### **4.9.1 Backward linkages**

##### **4.9.1.1 Linkage for technological needs**

**Table 4.53 Distribution of hi-tech farmers according to their technology sources**

<b>Sl. No</b>	<b>Technological sources</b>	<b>Polyhouse n=18</b>		<b>Open precision n=30</b>	
		<b>Frequency</b>	<b>Percentage</b>	<b>Frequency</b>	<b>Percentage</b>
1	Training	12	66.70%	26	86.70%
2	Consultancy	5	27.80%	3	10.00%
3	Exposure visits	1	5.60%	1	3.30%



It is apparent from the results in Table 4.50 that 66.70 per cent of the polyhouse farmers utilized training programmes for receiving information on technology. While 27.80 per cent used consultancy services and 5.60 per cent used exposure visits.

In case of open precision farmers, 86.70 per cent utilized training services as source of information on technology, while 10 per cent utilized consultancy services and 3.30 per cent utilized exposure visits.

The probable reason could be that the SAU was providing periodical training for farmers on technology and farm intelligence, while farmers found consultancy services inefficient and inaccessible.

#### 4.9.1.2 Linkages for infrastructure

**Table 4.54 Distribution of hi-tech farmers according to sources for infrastructure**

Sl. No	Sources for infrastructure	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Private agencies	18	100.00%	30	100.00%
2	Government organizations	-	-	-	-

The results in Table 4.54 showed that 100 per cent of the polyhouse farmers established the infrastructure with the support of private agencies. In case of open precision farmers also, 100 per cent purchased inputs from private agencies.

The probable reason could be that government organizations did not have much sales output for selling infrastructural inputs. The SAUs and other government agencies were located far away from the fields. Farmers found it easier and cheaper to purchase from private agencies through instalments.

#### 4.9.1.3 Linkage for planting materials

**Table 4.55 Distribution of hi-tech farmers according to sources for planting materials**

Sl. No	Sources for planting materials	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Private nurseries and shops	13	72.20%	12	40.00%
2	Government organizations	5	27.80%	7	23.30%
3	Own seedlings or seeds	-	-	11	16.70%

The results in Table 4.55 showed that 72.20 per cent procured planting materials such as seeds and seedlings from private nurseries and shops, while 27.80 per cent from government organizations.

In case of open precision farmers, 40 per cent bought planting materials from private nurseries, while 23.30 per cent from government organizations and 16.70 per cent used their own seedlings.

The probable reason for the result could be that the farmers purchased seedlings and seeds at a lower cost from private agencies and hybrids were easily available in private seed shops. Polyhouse farmers were largely dependent on hybrid seeds, suitable for the polyhouse climate, which were rarely available in government agencies. In order to make farming economical, some of the open precision farmers, who had surplus production depended on own seeds and seedlings.

#### 4.9.1.4 Linkage for fertilizers and manures

**Table 4.56 Distribution of hi-tech farmers according to sources for fertilizers and manures**

Sl. No	Sources for fertilizers and manures	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Private shops	9	50.00%	12	40.00%
2	Government organizations	2	11.10%	11	36.70%
3	Own resources	7	38.90%	7	23.30%

The results in Table 4.56 revealed that 50 per cent of the polyhouse farmers and 40 per cent of open precision farmers purchased manures from private shops while 11 per cent of polyhouse and 40 per cent of open precision farmers purchased from government organizations and 38.90 per cent of polyhouse and 23.30 per cent of open precision farmers had been preparing their own manures.

The probable reason could be that, most of the polyhouse farmers were following organic method of farming, which required more of manures. Since majority of the farmers had cattle and poultry farms, they could prepare Farm Yard Manure and other manures at their farms itself. The open precision farmers purchased fertilizers mostly from private agencies as it was cheap and easily accessible.

#### 4.9.1.5 Linkage for financial assistance

#### 4.9.1.5.1 Finance for Establishment

**Table 4.57 Distribution of hi-tech farmers according to sources of finance for establishment**

Sl. No	Sources of finance for establishment	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Nationalized banks	13	72.20%	9	30.00%
2	Own funds	5	27.80%	9	30.00%
3	Co-operative banks	-	-	12	40.00%

It is evident from Table 4.57 that 72.20 per cent of polyhouse and 30 per cent of open precision farmers met financial needs by assistance of nationalized banks, while a majority of 40 per cent of open precision farmers approached co-operative banks for finance and 27.80 per cent of polyhouse and 30 per cent of open precision farmers had their own funds for establishment.

The probable reason for polyhouse farmers to choose nationalized banks for finance might be that the most of them took loans as a group as a part of the SHM scheme at low interest rates.

The open precision farmers had high annual income from farming, which enabled them to use their own funds, apart from that they had strong contact with co-operative banks in nearby towns which disposed farm loans at affordable interests without delay.

#### 4.9.1.5.2 Finance for Cultivation

**Table 4.58 Distribution of hi-tech farmers according to financial assistance for cultivation**

Sl. No	Sources of finance for cultivation	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Nationalized banks		16.70%	6	6.70%
2	Own funds		83.30%	20	70.00%
3	Co-op banks	-	-	4	23.30%

It is evident from Table 4.58 that 16.70 per cent of polyhouse and 6.70 per cent of open precision farmers met financial needs by assistance of nationalized banks, while 83.30 per cent of polyhouse and 70 per cent of open precision farmers had their own funds for establishment which was either saved from last season's profit or from other non-farm activities. A mere 23.30 per cent of open precision farmers relied on co-operative banks.

Most of the polyhouse farmers had subsidiary occupation, so that they could use those funds in farming. The open precision farmers had high annual income from farming, which enabled them to use their own funds, apart from that they had strong contact with co-operative banks in nearby towns which disposed farm loans at affordable interests without delay.

#### 4.9.2 Forward linkages

##### 4.9.2.1 Finance for marketing

**Table 4.59 Distribution of farmers according to their sources of finance for marketing**

Sl. No	Sources of finance for marketing	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	Nationalized banks	3	16.70%	2	6.70%
2	Own funds	15	83.30%	21	70.00%
3	Co-op banks	-	-	7	23.30%

The results in Table 4.59 showed that 83.30 per cent of polyhouse farmers and 70 per cent of open precision farmers used their own funds for marketing .While 16.70 per cent of polyhouse and 6.70 per cent of open precision farmers relied on nationalized banks and 23.30 per cent of open precision farmers relied on co-operative banks .The probable reason for the result could be that, most of the farmers marketed their produce in VFPCs, Eco shops or super markets which was located at easily accessible distance, thus avoiding transportation, costs. They could meet marketing costs with their own funds and only a small fraction of open precision farmers approached co-operative banks in case of emergencies.

#### **4.9.2.2 Linkage for market information**

**Table 4.60 Distribution of farmers according to their sources of market information**

Sl. No	Sources of market information	Polyhouse n=18		Open precision n=30	
		Frequency	Percentage	Frequency	Percentage
1	VFPC	5	27.80%	21	66.70%

2	Krishihavan	13	72.20%	7	33.30%
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The results in Table 4.60 showed that 72.20 per cent of polyhouse farmers approached Krishihavans for market information as they got updates through text messages on a regular basis .While 27.80 per cent of polyhouse farmers got market information through VFPCCK.

In case of open precision farmers, 66.70 per cent approached VFPCCK and only 33.03 per cent approached Krishihavans as most of them were VFPCCK farmers who received market information received from Market Information Centre at Trivandrum.

#### **4.9.3.3 Linkage with processing or value addition industries**

It was found that none of the farmers had any kind of linkage for value addition or processing.

#### **4. 10 Constraints faced by hi-tech farmers**

The constraints in high tech farming was studied and it showed high degree of concordance among the farmers to rank.

The results in Table 4.61 showed that lack of knowledge on repair and maintenance was found to be the major constraint faced by polyhouse farmers, followed by inadequate skilled labour, low income, high cost of repair and maintenance and also inadequate knowledge on production practices in polyhouse. The polyhouse farmers preferred to follow organic way of production due to higher market demand, this might have caused lower productivity. It could be concluded that due to these constraints the production potential couldn't be achieved in polyhouse.

The probable reason for such a result could be that the polyhouse farmers lacked technical knowledge on farming practices, they were found to be reluctant to attend various training programs. The marketed surplus was not adequate for them to maintain a profit in farming, thus making it difficult to invest on repair and

maintenance. Due to high labour wages and non-availability of skilled labourers, they couldn't appoint skilled labourers.

**Table 4.61 Ranking for constraints among polyhouse farmers**

**W= 0.836\***

<b>Sl. No</b>	<b>Type of constraint</b>	<b>Constraint</b>	<b>Mean rank</b>	<b>Rank</b>
1	Technical	Lack of knowledge on repair and maintenance	1.57	1
2	Technical	Inadequate skilled labour	2.35	2
3	Financial	Low income	3.47	3
4	Financial	High cost of repair and maintenance	3.87	4
5	Technical	High susceptibility to pest and diseases	4.92	5
6	Technical	Inadequate knowledge on production practices in polyhouse	5.13	6
7	Marketing	Inadequate post-harvest handling facilities	5.13	7
8	Marketing	Price fluctuations	7.58	8
9	Financial	Non availability of credit in time	8.73	9

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



**Table 4.62 Ranking for constraints among open precision farmers****W= 0.814\***

<b>Sl. No</b>	<b>Type of constraint</b>	<b>Constraint</b>	<b>Mean rank</b>	<b>Rank</b>
1	Financial	High cost of infrastructure	2.07	1
2	Financial	High cost of repair and maintenance	2.10	2
3	Technical	Lack of knowledge on repair and maintenance	2.20	3
4	Financial	Low income	4.02	4
5	Technical	Inadequate skilled labour	5.23	5
6	Technical	Inadequate guidance from government agencies	6.37	6
7	Marketing	Inadequate post-harvest handling facilities	7.05	7
8	Marketing	Price fluctuations	7.58	8
9	Technical	Inadequate availability of inputs	8.38	9

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

The results in Table 4.62 showed that high cost of infrastructure was the major constraint faced by open precision farmers, followed by high cost of repair and maintenance and lack of knowledge on repair and maintenance. Open precision farming demands reasonable infrastructure facilities, which require a huge amount of initial investment. The farmers depended on nationalized banks for loans to spend on infrastructure and often struggles to repay it. Added to this predicament,

there is high cost for repair and maintenance of the equipment and non-availability of skilled labour to perform the farming operations efficiently.

#### 4.11 SWOC analysis of hi-tech farming sector

The main strengths, weakness, opportunities and challenges of hi-tech farmers were identified and ranked by Garrett ranking.

##### 4.11.1 SWOC analysis for polyhouse farming

**Table 4.63 Garrett ranking of strengths of polyhouse farmers**

Sl.No	Strength	Score	Rank
1	Unconventional crops can be cultivated which fetches better price and higher income	76.46	1
2	Polyhouse farming can be done in small area	67.99	2
3	Input use efficiency	64.43	3
4	Quality of the produce	64.12	4

The Table 4.63 indicates that the major strength of polyhouse farming was that unconventional crops can be cultivated which fetched better price and higher income, followed by the advantage that it can be practiced in small area. This could be due to the fact that polyhouse climate can be utilized to produce off season crops which can fetch higher price in market. Since most of the farmers practiced farming near their houses, they had a limitation of space which could be solved by polyhouse farming.

**Table 4.64 Garrett ranking of weaknesses of polyhouse farmers**

Sl.No	Weakness	Score	Rank
1	Lack of knowledge on repair on maintenance	73.93	1
2	Difficulty in organic methods of production	66.02	2
3	Requirement of skilled labour	65.03	3
4	Higher susceptibility to pests and diseases	63.05	4

The Table 4.64 indicates that the major weakness was the lack of knowledge in repair and maintenance, followed by difficulty in following organic methods of production. Most of the polyhouse farmers did not take up farming as a serious occupation, it was only subsidiary and they were not trained in polyhouse farming, except for the initial few trainings. They were not willing to access trainings provided by SAUs due to other engagements and low profit margins. They faced problems of pests and diseases frequently that caused severe crop loss.

**Table 4.65 Garrett ranking of opportunities of polyhouse farmers**

Sl.No	Opportunities	Score	Rank
1	Popularization of unconventional crops and higher market demand	75.37	1
2	Agrepreneurship and attraction of youth to agriculture	65.97	2
3	Opportunities for government subsidy and schemes	63.92	3
4	Export market opportunities	61.98	4

The Table 4.65 shows that popularization of unconventional crops that creates higher market demand and agrepreneurship and attraction of youth to agriculture were the major opportunities in polyhouse farming. Since a variety of off season crops can be cultivated in polyhouse, many unconventional crops are being popularized like salad cucumber and capsicum. The novel method of polyhouse farming that offered economic benefits in minimum space had encouraged youth to opt as their occupation.

**Table 4.66 Garrett ranking of challenges of polyhouse farmers**

Sl.No	Challenges	Score	Rank
1	Limited sources of inputs in local markets	75.23	1
2	Inadequate post-harvest handling practices	72.05	2
3	Inadequate guidance from government agencies	65.63	3
4	Non availability of credit for higher investment	58.22	4

The Table 4.66 indicates that limited sources of inputs in local markets and inadequate post-harvest handling practices were the major challenges faced in polyhouse farming. The farmers purchased most of the inputs from private agencies at a cost , often very high. They did not have access to such services and inputs through any government machinery. They found it difficult to procure High Yielding Varieties from nurseries and other state markets. None of the framers were practicing any kind of post-harvest practices due to mere availability of such facilities near to their farms.

#### 4.11.2 SWOC analysis for open precision farming

**Table 4.67 Garrett ranking for strengths in open precision farming**

Sl.No	Strength	Score	Rank
1	Input use efficiency	73.39	1
2	Higher productivity	72.49	2
3	Lower labour requirements	62.58	3
4	Better resource management	61.76	4

The Table 4.67 indicates that input use efficiency and higher productivity were the major strengths of open precision farming. Open precision farming allows optimum utilization of inputs without wastage by precise application of fertilizers through fertigation and water use efficiency by drip irrigation. This can also lead to higher productivity as the plants get nutrients and water as per the need.

**Table 4.68 Garrett ranking for weaknesses in open precision farming**

Sl.No	Weakness	Score	Rank
1	High cost of infrastructure	66.16	1
2	Lack of availability of land to expand production	51.20	2
3	Inadequate skilled labour	44.30	3
4	Lack of knowledge on repair on maintenance	37.17	4

The Table 4.68 shows that high cost of infrastructure and lack of availability of land to expand production were the major weaknesses in the pen precision farming sector. It incurs a huge amount of investment to convert a conventional farm to open precision farm, by installing irrigation and fertigation systems in large area. Since the cost of inputs are high, this proves difficult.

The land holding in India is mostly marginal and small due to fragmentation of land and partitioning. The transformation of agricultural land to non-agricultural purpose have added to the predicament and farmers found it hard to avail land for expanding production.

**Table 4.69 Garrett ranking for opportunities in open precision farming**

Sl.No	Opportunities	Score	Rank
1	Large scale production can help to achieve self sufficiency	51.55	1
2	Opportunities for skilled employment in agriculture	43.35	2
3	Refinement and wider application of open precision farming can reduce production cost	41.27	3
4	Better utilization of natural resources	28.78	4

The Table 4.69 indicates that large scale production, that helps in achieving self-sufficiency and opportunities for skilled employment in agriculture were found to be the major opportunities. Self-sufficiency has become a matter of concern in the recent times, especially in Kerala where most of the vegetables arrive from other states.

Open precision farming could be a solution for this problem by enhancing production and productivity. Since the practice of open precision farming requires skilled workers for operating the machineries, there is scope for skilled employment in agriculture.

**Table 4.70 Garrett ranking for challenges in open precision farming**

<b>Sl.No</b>	<b>Challenges</b>	<b>Score</b>	<b>Rank</b>
1	Constraints in attaining new market opportunities	61.1	1
2	Competition from other markets	47.75	2
3	Inadequate post-harvest handling facilities	30.17	3
4	Marginal to small land holdings of farmers	21.28	4

Table 4.70 indicates that constraints in attaining new market opportunities and competition from other markets were the major challenges faced by open precision farmers. There is huge competition from other states market, the farmers are unable to find markets for their produce as they cannot match the production in other states and couldn't supply produce regularly.

## CHAPTER 5

### SUMMARY AND CONCLUSION

Hi-tech farming has gained importance in the recent years as an innovative and profitable practise of farming which can potentially increase the productivity in the state. Several schemes and programmes have been introduced in Kerala for the development and promotion of hi-tech farming, especially open precision and polyhouse farming. Hi-tech farming has potential to generate growth, diversifying income, providing widespread employment and entrepreneurial opportunities to all sections of people engaged in farming.

The study was conducted in Thrissur and Palakkad districts of Kerala. Sixty hi-tech farmers were selected, thirty each from Trissur and Palakkad districts. Multistage sampling procedure was adopted in the study. Hi-tech farmers who were functional for at least two years were selected. Thrissur, Maala, Anthikkad and Pazhayannur blocks were selected from Trissur district and Chittur, Agaly and Nenmara blocks were selected from Palakkad districts due to higher proportion of hi-tech farmers in these blocks. Thirty famers were randomly selected from each district to constitute a total of 60 hi-tech farmers. Out of the 30 hi-tech farmers in each district, 15 were open precision farmers and 15 were poly house farmers.

Each selected respondent was individually interviewed with a structured interview schedule. It was ensured that the questions were efficiently comprehended by the respondent by repeating the questions wherever necessary. Perception of respondents, experience, conduct, feelings, emotions, thoughts, goals and surroundings were additionally observed during interview.

The data collected from the respondents were scored, tabulated and analysed using the appropriate statistical tools such as arithmetic mean ( $\bar{X}$ ), standard deviation ( $\sigma$ ), percentage, correlation coefficient, Mann-Whitney U test, Binary logistic regression, Kruskal Wallis test, Discriminant Function Analysis and index method.

**Salient findings of the study are presented below:**

**Socio-economic and personal characteristics of hi-tech farmers**

- ❖ About 3.300 per cent of the poly house farmers belonged to the young age category, while 63.40 per cent of the farmers belong to middle age category and 33.30 per cent belonged to the old age category. It was evident that majority of the polyhouse farmers were middle aged and least number of farmers fell into young age category. A clear majority of 70 per cent open precision farmers belonged to the middle age category, while 23.30 per cent belonged to the old age category and a mere 6.70 per cent in the young age category.
- ❖ Half of the respondents, that is a 50 per cent of the poly house farmers had secondary and higher secondary level of education , followed by 40 per cent had graduation level ,while only 6.70 per cent belonged to the post graduate level and a mere 3.30 percent in the primary level of education. Slightly more than half of the open precision famers had secondary and higher secondary level of education, a 23.30 per cent had graduation level of education , 13.30 per cent had primary level of education while a mere 10 per cent had post graduate level of education.
- ❖ Half of the polyhouse farmers that is 50 per cent had lower level of farm experience and 50 per cent had medium level of farm experience. A clear majority of 70 per cent of open precision farmers had medium level of farm experience, 23.30 per cent had lower level of farm experience while only 6.70 per cent had higher level of farm experience.
- ❖ Hundred per cent of the polyhouse farmers had marginal land holding, but they might have other source of income to invest in polyhouse. A majority of 76.70 per cent of open precision farmers had small land holding, followed by 16.60 per cent with large land holding ad 6.70 per cent had marginal land holding.
- ❖ It was found that half of the polyhouse farmers ,that is 50 per cent had medium level of annual income followed by 26.70 per cent with low annual income and 23.30 per cent had high annual income. Among open precision farmers, about 70 per cent had high annual income, followed by 23.30 per cent of farmers with



medium level of annual income while 6.70 per cent had low level of annual income.

- ❖ About 53.30 per cent of polyhouse farmers had moderate level of social participation, while a 40 per cent had poor social participation and 6.70 per cent had good social participation. A majority of 73.30 per cent of open precision farmers had poor social participation, while 20 percent had moderate and a 6.70 per cent had good social participation.
- ❖ Almost half of the polyhouse farmers had medium level of mass media contact, while 43.30 per cent had high level of mass media contact and 10 per cent had low level of mass media contact. Half of the open precision farmers had high mass media contact, while 36.70 per cent had medium and a mere 13.30 per cent had low mass media contact.
- ❖ A majority of 56.70 per cent of the poly house farmers had medium level of extension contact, while 26.70 per cent had low level and 16.60 per cent had high level of extension contact. Sixty per cent of the open precision farmers had moderate level of extension contact, while 26.70 per cent had high and 13.30 per cent had low extension contact.

#### **Dimensions of entrepreneurial behaviour**

- ❖ More than half, 53.30 per cent of the polyhouse farmers belonged to the medium category, while 26.70 per cent had low and 20 per cent had high decision making ability. a clear majority of 73.30 per cent open precision farmers belonged to the medium level in decision making ability, while 16.70 per cent fell into high level of decision making ability and a mere 10 per cent had only lower level of decision making ability.
- ❖ Slightly more than half (53.30%) of the polyhouse farmers had medium level of achievement motivation, while 26.70 per cent had low level of achievement motivation and only 20 per cent belonged to the category of high level of achievement motivation. A majority of 63.30 per cent of the open precision farmers had medium level of achievement motivation followed by 20 per cent with low and only 16.70 per cent with high level of achievement motivation.

- ❖ A majority of 63.40 per cent of polyhouse farmers showed medium level of risk taking ability, while 26.50 per cent had low and 10.10 per cent had high level of risk taking ability. About 73.40 per cent open precision farmers had medium level of risk taking ability, while an equal per cent (13.30%) of open precision farmers had low and high risk taking ability.
- ❖ Seventy per cent of polyhouse farmers had medium level of planning ability while 26.70 per cent had high and a mere 3.30 per cent had low level of planning ability. Half of the open precision farmers had medium level of planning ability, followed by 26.70 per cent with low and 23.30 per cent with high planning ability.
- ❖ Sixty per cent of the polyhouse farmers had medium level of leadership ability, while 23.30 per cent had high and 16.70 per cent had low level of leadership ability. About 63.30 per cent of open precision farmers had medium level of leadership, while 20 per cent and 16.70 per cent had high and low level of leadership ability respectively.
- ❖ A majority of 66.70 per cent of the polyhouse farmers had medium level of cosmopolitanism, while 23.30 per cent had high and 10 per cent had low level of cosmopolitanism. Sixty per cent of open precision farmers had medium level of cosmopolitanism followed by 26.70 per cent and 13.30 per cent with high and low level of cosmopolitanism respectively.
- ❖ Sixty per cent of the polyhouse farmers had medium level of self-confidence while, 23.30 per cent had low and 16.70 per cent had high self-confidence. About 60 per cent of the open precision farmers had medium to high level of self-confidence while 23.30 per cent had high and 16.70 per cent had low level of self-confidence.
- ❖ A majority of 73.30 per cent of polyhouse farmers had medium level of information seeking behaviour while, 20 per cent had high and only 6.70 per cent had low level of information seeking behaviour. About 73.30 per cent of open precision farmers had medium 20 per cent had high and only 6.70 per cent had low level of information seeking behaviour.
- ❖ The level of innovativeness among polyhouse farmers was found to be at medium level. Results showed that half of the respondents showed medium

level of innovativeness, 26.70 per cent showed high level of innovativeness and 23.30 per cent showed lower level of innovativeness. Forty per cent of the open precision farmers showed higher level of innovativeness, while 36.70 per cent showed medium level and 23.30 per cent showed lower level of innovativeness.

### **Overall entrepreneurial behaviour of hi-tech farmers**

- ❖ The entrepreneurial behaviour of hi-tech farmers was measured with a composite index of 64.87 for polyhouse farmers and 68.98 for open precision farmers. Among the listed nine dimensions, information seeking behaviour gained the highest index for both polyhouse and open precision farmers (76.80 and 70.74 respectively). It was found that planning ability ranked second highest index for polyhouse farmers. While cosmopolitaness and self-confidence ranked least among polyhouse farmers.
- ❖ Majority (63.30%) of the polyhouse farmers had medium level of entrepreneurial behaviour, followed by 20 per cent of them had high and 16.70 per cent had low level of entrepreneurial behaviour. Majority (63.40%) of the open precision farmers had medium level of entrepreneurial behaviour, followed by 26.60 per cent of them had high and 10 per cent had low level of entrepreneurial behaviour.

### **Factors affecting the entrepreneurial behaviour of farmers**

- ❖ The relationship between the entrepreneurial behaviour and profile of the hi-tech farmers viz, age, experience, annual income, education, size of the land holding, social participation, mass media contact and extension contact were studied independently for poly house and open -precision farmers.
- ❖ Among open precision farmers, experience and education showed a positive and significant relationship with the entrepreneurial behaviour. While age had a negatively significant relationship. Among polyhouse farmers, experience, social participation and extension contact had a positive and significant relationship with the overall entrepreneurial behaviour of the farmers. While all other independent variables did not show any correlation.

### **Comparison of entrepreneurial behavior of polyhouse and open precision farmers**

- ❖ Mann Whitney U test was performed to compare the overall entrepreneurial behaviour of the farmers in poly house and open precision. The result showed that there was significant difference between the groups with a Mann Whitney U of 320. Detailed analysis was done to study the contribution of different variables. The two groups were significantly different with respect to three dimensions of entrepreneurial behaviour viz, decision making ability, achievement motivation and self-confidence .

### **Testing within group variability among polyhouse and open precision farmers**

- ❖ The within group variability among socio-economic and personnel variables were found out by Kruskal-Wallis test by taking the nine dimensions of entrepreneurial behaviour as the dependent variable.
- ❖ The variable age had a significant variability between the three categories of age with respect to the self confidence of the farmers. It was also found that, there was a significant variability among different classes of education with respect to innovativeness of polyhouse farmers. Among open precision farmers, education had a significant variability among categories with respect to planning ability. It was also found that farmers with higher extension contact were more self-confident.

### **Odds to be an above average entrepreneur**

- ❖ Binary logistic regression was performed separately for polyhouse and open precision farmers, to find the probability of farmers to be an above average entrepreneur.
- ❖ Odds ratio for extension contact is significant. The sample of open precision farmers were having 0.5 probability to become an above average entrepreneur. The calculated value of probability showed that if the level of extension contact is raised to next higher level, there will be a probability of 0.41 for entrepreneur to become an above average open precision farmer.

- ❖ Odds ratio for education is significant. The sample of polyhouse farmers were having 0.5 probability to become an above average entrepreneur. The calculated value of probability showed that if the level of education is raised to next higher level, there will be a probability of 0.23 for entrepreneur to become an above average polyhouse farmer.

### **Marketing behaviour of hi-tech farmers**

- ❖ It was found out from the survey that 12 out of 30 polyhouse farmers had stopped commercial production.
- ❖ Among polyhouse farmers, a majority of 61.10 per cent had a marketed surplus ranging from 5-10 tonnes, while 38.90 per cent had marketed surplus up to 5 tonnes. The results showed that, among open precision farmers, a majority of 63.40 percent had high marketed surplus of above 10 tonnes, 33.30 percent had 5-10 tonnes and 3.30 percent had a marketed surplus up to 5 tonnes.
- ❖ Half (50%) of the polyhouse farmers had a direct access to market via supermarkets or local markets , 11.10 per cent through eco shops 27.80 per cent marketed through VFPCK and 11.10 per cent marketed through middlemen and Eco shops. In case of open precision farmers, it is evident that 66.70 percent marketed through VFPCK and 33.30 percent had direct access to market.
- ❖ About 44.40 per cent of the polyhouse farmers were 7-10 Km away from the market while, 38.90 per cent were 4-6 Km way and 16.70 per cent were 1-3 Km away from the market. As far as open precision farmers are concerned, a clear majority of 76.70 per cent were only 1-3 Km away from market, while 20 per cent were 7-10 Km away and 3.30 per cent were 4-6 Km away from market.
- ❖ Fourty per cent of the polyhouse farmers used auto as a mode of transport to reach markets, while 27.80 per cent used tempo , 16.70 per cent used car and another 16.70 per cent used tractor. In case of open precision farmers, 60 per cent used tempo as the mode of transport, 16.70 per cent used Auto, 13.3 per cent used tractor and 10 percent used cars.
- ❖ A majority of 55.60 per cent of the polyhouse farmers were unsatisfied with the price of the produce, while 44.40 per cent were satisfied with the price. A clear

majority of 60 per cent of the open precision farmers found the prices satisfactory, while 40 per cent found it unsatisfactory.

- ❖ About 61.10 per cent of polyhouse farmers had adequate access to market information, while 38.90 per cent had inadequate access. In case of open precision farmers, a clear majority of 83.30 per cent had adequate access, while 16.70 per cent had inadequate access to market information.
- ❖ Hundred per cent of the polyhouse farmers had inadequate storage facilities, while 96.70 per cent of open precision farmers had inadequate storage facilities while only 3.30 per cent had adequate storage facilities.
- ❖ The results showed that none of the farmers, both polyhouse and open precision had adopted any processing or value addition activities.

### **Discrimination in the marketing behaviour of polyhouse and open precision farmers**

- ❖ To test whether there is a significant discrimination power in the marketing behaviour of polyhouse and open precision farmers, Discriminant Function Analysis was performed.
- ❖ Marketed surplus had that greatest effect for predicting membership to group as there is a huge difference between the marketed surplus of polyhouse and open precision farmers, followed by distance market , though it has inverse relationship to group membership , showing that as distance increases farmers show weaker marketing behaviour.

### **Linkages in hi-tech farming sector**

#### **Backward linkages**

- ❖ In the case of linkages for technology, about 66.70 per cent of the polyhouse farmers utilized training programmes for receiving information on technology. While 27.80 per cent used consultancy services and 5.60 per cent used exposure visits. In case of open precision farmers, 86.70 per cent utilized training services as source of information on technology, while 10 per cent utilized consultancy services and 3.30 per cent utilized exposure visits.

- ❖ Hundred per cent of the polyhouse farmers established the infrastructure with the support of private agencies. In case of open precision farmers also, 100 per cent depended on private agencies to establish the infrastructure. A majority of 72.20 per cent procured planting materials like seeds and seedlings from private nurseries and shops, while 27.80 per cent from government organizations. In case of open precision farmers, 40 per cent bought planting materials from private nurseries, while 23.30 per cent from government organizations and 16.70 per cent used their own seedlings.
- ❖ Fifty per cent of the polyhouse farmers and 40 per cent of open precision farmers purchased manures from private shops while 11 per cent of polyhouse and 40 per cent of open precision farmers purchased from government organizations and 38.90 per cent of polyhouse and 23.30 per cent of open precision farmers had been preparing their own manures.
- ❖ About 72.20 per cent of polyhouse and 30 per cent of open precision farmers met financial needs for establishment of farm by assistance of nationalized banks, while a majority of 40 per cent of open precision farmers approached co-operative banks for finance and 27.80 per cent of polyhouse and 30 per cent of open precision farmers had their own funds for establishment.
- ❖ About 16.70 per cent of polyhouse and 6.70 per cent of open precision farmers met financial needs by assistance of nationalized banks, while 83.30 per cent of polyhouse and 70 per cent had their own funds for establishment which was either saved from last season's profit or from other non-farm activities. A mere 23.30 per cent of open precision farmers relied on co-operative banks.

#### **Forward linkages**

- ❖ A majority of 83.30 per cent of polyhouse farmers and 83.30 per cent of open precision farmers used their own funds for marketing .While 16.70 per cent of polyhouse and 6.70 per cent of open precision farmers relied on nationalized banks and 23.30 per cent of open precision farmers relied on co-operative banks
- ❖ About 72.20 per cent of polyhouse farmers approached KrishiBhavans for market information as they got updates through text messages on a regular basis and had a regular contact with Agricultural Officers, while 27.80 per cent got

market information through VFPCCK. In case of open precision farmers, 66.70 per cent approached VFPCCK and only 33.30 per cent approached Krishibhavans as most of them were VFPCCK farmers which disseminated market information received from Market Information Centre at Trivandrum.

- ❖ It was found that none of the farmers had any kind of linkage for value addition or processing.

#### **Constraints faced by hi-tech farmers**

- ❖ The constraints in high tech farming was studied and it showed high degree of concordance among the farmers to rank .Lack of knowledge on repair and maintenance was found to be the major constraint faced by poly house farmers, followed by high cost of repair and maintenance, low income and inadequate skilled labor and also inadequate knowledge on production practices in polyhouse. High cost of infrastructure was the major constraint faced by open precision farmers, followed by high cost of repair and maintenance and lack of knowledge on repair and maintenance.

#### **SWOC analysis of hi-tech farming sector**

- ❖ The main strengths, weakness, opportunities and challenges of hi-tech farmers were identified and ranked by Garrett ranking.

#### **SWOC analysis for polyhouse farming**

- ❖ The major strength of polyhouse farming was that unconventional crops can be cultivated which fetched better price and higher income, followed by the advantage that it can be practiced in small area.
- ❖ The major weakness was the lack of knowledge in repair and maintenance, followed by difficulty in following organic methods of production.
- ❖ Popularization of unconventional crops that creates higher market demand and agpreneurship and attraction of youth to agriculture were the major opportunities in polyhouse farming.
- ❖ Limited sources of inputs in local markets and inadequate post-harvest handling practices were the major challenges faced in polyhouse farming.



### **SWOC analysis for open precision farming**

- ❖ Input use efficiency and higher productivity were found to be the major strengths open precision farming.
- ❖ High cost of infrastructure and lack of availability of land to expand production were the major weaknesses in the open precision farming sector.
- ❖ Large scale production, that helps in achieving self-sufficiency and scope for skilled employment in agriculture were found to be the major opportunities.
- ❖ Constraints in attaining new market opportunities and competition from other markets were the major challenges faced by open precision farmers.

### **Future line of work**

- ❖ Similar studies with the same objectives can be replicated in the other areas for drawing valid conclusion.
- ❖ More number of districts can be studied in order to have comprehensive understanding of hi-tech farming in Kerala.
- ❖ A comparative study of entrepreneurial behaviour of hi-tech farmers engaged in different methods of farming apart from open precision and polyhouse can be done.
- ❖ To have an in depth analysis of the study, case studies of successful hi-tech famers may be taken up to understand various factors contributing for their success.

**PLATE 1: PHOTOS TAKEN DURING SURVEY**



**Yard long bean grown in the polyhouse**



**Salad cucumbers grown in the polyhouse**



**Interview with open precision farmers at VFPCCK, Pazhayannur.**



**Interview with open precision farmer at Chelakkara**



**Bhendi fields in open precision farms at  
Nenmara**



**Biiter gourd grown in open precision farms at  
Pazhayannur**



**Polyhouse at Maala, Thrissur**



**Drip and fertigation system installed in polyhouse**

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**APPENDIX 1**  
**KERALA AGRICULTURAL UNIVERSITY**  
**COLLEGE OF HORTICULTURE**  
**Department of Agricultural Extension**  
**Entrepreneurial behavior of hi-tech farmers in Kerala**  
**Interview schedule**

**I. GENERAL INFORMATION**

1. **Name of the farmer** :
2. **Village** :
3. **Gram Panchayat** :
4. **Block** :
5. **District** :

**II. Personal, socio-economic and psychological characteristics**

1. **Age** : \_\_\_\_\_years
2. **Education** : Illiterate/Primary school/Middle school/High school/ Higher secondary school/Graduate/Post-graduate
3. **Occupation** :  
Main :  
Subsidiary :  
Others :
4. **Size of the land holding** (acres) :  
Polyhouse:  
Open precision farming:
5. **Annual family income** (Rs.) : Main source :  
Subsidiary :  
Other sources :  
Total :

### 7. Social participation

- a. Are you a member of any of the organizations? Yes/No.  
b. If yes, indicate the name of the organizations

### 8. Mass media contact

Do you follow up mass media? Regularly Occassionally Never

Indicate the types of mass media

### 9. Extension contact

Please indicate your response regarding the awareness about the extension activities organized in your area during last year and your extent of participation in the activities.

Training programs

Demonstration

Field day

Field visit

Extension group meeting

### Part – B

## ENTREPRENEURIAL BEHAVIOR OF FARMERS

### 1. INNOVATIVENESS

Following are some of the innovations introduced in your area during last 5 to 10 years. Please indicate whether you are adopting them or not.

Sl. No	Statements	Always	Sometimes	Never
1	Do you try innovative techniques in farming as and when you hear about it			
2	Do you invest money for implementing such techniques on farm			

## 2. FARM DECISION MAKING

The following are some of the management decisions which you might have taken while growing the crops. Please indicate the appropriate justification for taking each decision in your case.

Sl. No	Statements	Rational	Less rational	Irrational
1	How did you decide the area for cultivation of different crops?	Market condition	Ease in supervision	Followed last years' pattern
2	How do you decide on different species or varieties?	Market condition	Ease in supervision	Followed last years' pattern
3	How did you decide quantity of fertilizers?	Soil tests	Recommendation of expert	General experience
4	How did you decide plant protection measures?	Recommendation of expert	Careful observation	General experience

## 3. ACHIEVEMENT MOTIVATION

A set of statements are given below representing the achievement motivation of farmers. Please express your feelings about these statements by indicating the degree of your agreement or disagreement on the three point continuum.

Sl. No	Statements	Agree	Undecided	Disagree
1	Work should come first even if one cannot get proper rest			
2	It is better to be content with whatever little money one has than to be struggling for more			
3	I would like to try hard for more profits			
4	The way things are now discourage one to work hard			

## 5. RISK TAKING ABILITY

Please indicate whether you agree or disagree with the following four statements

Sl. no	Statement	Agree	Undecided	Disagree
1	A farmer should rather take more of a change in making a big profit than to be content with a smaller but less risky profits			
2	farmer who is willing to take greater risks than the average farmer usually have better financial condition			
3	It is better for a farmer not to try new farming methods unless most other farmers have used them with success (N)			
4	Trying an entirely new method in farming by a farmer involves risk, but it is worth			

## 6. INFORMATION SEEKING BEHAVIOUR

Please state the sources you have utilized in general for getting farm information and the degree of contact with them.

Sl No.	Information sources	Frequently	Occasionally	Never
1	Informal sources 1. Family members 2. Friends/relatives 3. Neighbors 4. Progressive farmers			
2	Formal sources 5. Village panchayat member 6. VDO/AEO 7. BDO 8. ADA 9. Scientists from agricultural University 10. Salesman 11. Bank officials			
3	Mass media			

	12. Newspapers 13. Radio 14. Television 15. Farm literature 16. Film shows 17. Others (specify)			
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## 7. ABILITY TO PLAN

In farming business, farmer has to harmonize and synchronize the various farm activities in order to complete the work in stipulated period. Please indicate your response to the following statements.

### 1. During last season did you purchase fertilizers well in advance (15-30 days).

- a. Purchased well in advance ( )
- b. Purchased at nick of the time ( )
- c. Did not purchase ( )

### 2. Last season did you procure seeds of HYV well in advance.

- a. Procured well in advance ( )
- b. Procured at nick of time ( )
- c. Did not procure ( )

### 3. Last season did you prepare cropping plan well in advance.

- a. Prepared well in advance ( )
- b. Prepared at the nick of time ( )
- c. Plan not prepared ( )

### 4. Did you consult extension worker/specialists when you heard about the incidence of pest attack on the crop in the village

- a. Discussed as soon as the incidence was heard ( )
- b. Discussed at the lapse of 8 days ( )
- c. Never discussed ( )

## 8. LEADERSHIP ABILITY

Farmer has to take decisions for getting the things done, initiate the action, and motivate the followers. The statements related to this aspect are given below. Please indicate your response on a three point continuum.

Sl No	Statements	Always	Sometimes	Never
1	Did you participate in group discussions on new farm practice			
2	Whenever you see/hear a new farm practice did you initiate discussion about it with your colleagues			
3	Do people regard you as good source of information on new farm practice			
4	Do you assign the farm work to your family members			

### 9. COSMOPOLITENESS

Please give your response regarding the following statements pertaining to cosmopolitanism.

1. Do you actively participate in any organization outside your locality always/sometimes/never

2. Do you go to nearby town to meet officials to seek information related to your enterprise always/sometimes/never

(whom do you meet)

3. Do you live for some time in a larger town/cities for any specific purpose related to your enterprise during 3 months always/sometimes/never

### 10. SELF CONFIDENCE

Sl. No	Statements	Agree	Undecided	Disagree



1	I am confident that I can achieve better profits in future			
2	I have complete trust in my hard work as a farmer			
3	I have confidence in the extension systems that help me in better farming			

## MARKETING BEHAVIOUR

### 1. STORAGE DETAILS:

a) Do you store the produce after harvest? Yes / No If yes,

a) type of storage: Ordinary / Cold storage

#### b) Reasons for storing:

- i. Expectation of better prices in future
- ii. Present prices are not remunerative
- iii. Adequate availability of storage facilities
- iv. Any other, please specify

### 2. MODE OF TRANSPORTATION OF PRODUCE

a) Which is the mode of transportation of your produce to the market?

i. Bus ii. Lorry iii. Tempo iv. Bullock cart v. Tractor vi. Other (specify)

b) Reasons for selecting particular mode?

- i. Available at door step
- ii. Produce reaches market in time
- iii. Less cost
- iv. It is easy to load and unload
- v. No other mode
- vi. Any other (specify)

### 3. DETAILS OF MARKETING

1. Total quantity of production.....

2. Marketable surplus.....
3. Marketed surplus.....
4. Place of the market you selected for the selling .....
5. Reason for selling at that market
  - a.....
  - b.....

**4. What are the post harvest handling practices adopted**

practice	Sorting and grading	cooling	packaging	processing	storage

**5. Access to market**

Do you get easy access to market the produce, if yes how

1. Middle men or intermediaries
2. Direct access to local markets
3. VFPCCK or other agencies
4. International market

**BACKWARD LINKAGES**

**Inputs**

**Input sources**

	Agricultural university	Research stations	Fellow farmers	Private companies or nurseries	NGO	Other govt agencies
Infrastructure requirements						
Irrigation units						
Planting materials						
Nutrients						
Organic fertilizers						

Packing materials						
Labors						
others						

### Financial assistance

	Nationalized banks	Cooperative banks or self-help groups	Private finance or money lenders	Own funds	Fellow farmers or friends
Establishment					
Inputs					
Labor wages					
Water source					
transportation					
Marketing					
Harvesting					
Post-harvest handling					

### Forward linkages

Linkage for finance for marketing-

Linkage for market information

Linkage for value addition

### CONSTRAINTS IN HI-TECH FARMING

Constraints	Rank
<b>Technical constraints</b>	
Lack of infrastructural facilities	
Acute shortage of water	
High susceptibility to diseases and pests in protected conditions	
Power supply to run appliances	
Poor availability of inputs	
Availability of skilled labour	
Lack of facilities for post harvest handling or processing	
<b>Financial constraints</b>	
Access to financial services	
Rate of interest is high	
Non availability of credits in time	

Inadequate credit	
Low income	
Cost of infrastructure	
Charges for repair and maintenance	
<b>Marketing constraints</b>	
Low price of produce	
Middlemen	
Lack of regulated or organized market	
Transportation cost	
Lack of value addition	
Lack of storage units	
Lack of guidance from govt or SAU	
Absence of support price while glut	
Inadequate cooperative marketing agencies	
Less support for export market	
Lack of crop insurance support	

Indicate the strengths weakness opportunities and challenges as perceived by the farmer in order

# **ENTREPRENEURIAL BEHAVIOUR OF HI-TECH FARMERS IN KERALA**

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## **ABSTRACT OF THE THESIS**

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## ABSTRACT

The conventional farming system in Kerala witnessed a path breaking change in the recent years with the adoption of hi-tech farming, which is a promising venture for the educated youth and part time farmers who are progressively attracted to agriculture. Keeping in view of this increasing acceptance of hi-tech farming, Kerala State Agriculture Development and Farmers Welfare Department has initiated many programs to promote protected cultivation and precision farming in the state. However, the success of hi-tech farming is determined by crucial aspects such as the entrepreneurial attributes and marketing behavior of the farmer.

With this background, the present study was undertaken to analyse the entrepreneurial and marketing behavior of the hi-tech farmers, their linkages with other sectors, constraints faced by them along with a SWOC analysis of the hi-tech farming sector. The results of the study would be greatly helpful for the policy makers, government and extension workers in formulating plans for hi-tech farming sector in Kerala.

A total of 60 hi-tech farmers, 30 each of polyhouse and open precision were selected from Trissur and Palakkad districts through multistage sampling method. Entrepreneurial behavior was quantified using Entrepreneurial Behavior Index. The index was found to be higher (68.98) for open precision farmers compared to that of polyhouse farmers (64.87). Indices were formed separately for each of the nine selected dimensions of entrepreneurial behavior viz., innovativeness, decision making ability, achievement motivation, risk taking ability, planning ability, cosmopolitaness, self-confidence and information seeking behavior. Information seeking behavior gained highest index for both polyhouse and open precision farmers. Further, Mann-Whitney U test was performed to ascertain significance of the difference between two groups and it was found that the two groups were significantly different in their entrepreneurial behavior with respect to decision making ability, achievement motivation and self-confidence.

The marketing behavior of hi-tech farmers was studied for polyhouse and open precision farmers. The components selected were marketed surplus, marketing channels, distance to market, mode of transport, price satisfaction, access to market information, access to storage and post-harvest handling or value addition. Since 12 of the 30 polyhouse farmers had quit commercial production, only 18 polyhouse farmers were considered in studying the marketing behavior. The results of Discriminant Function Analysis revealed that there was significant

discrimination in marketing behavior of polyhouse and open precision farmers, particularly with respect to marketed surplus and distance to the market. The study also revealed that the hi-tech farmers had different types of backward linkages but their forward linkages were limited to linkages for market information and finance for marketing and did not have any kind of forward linkage with processing industries.

The major constraints faced by the polyhouse farmers were technical and financial in nature, namely, lack of knowledge on repair and maintenance, inadequate skilled labor, low income and inadequate guidance on production. The open precision farmers also faced technical and financial constraints such as high cost of infrastructure, repair and maintenance and lack of services for repair and maintenance. Inadequate access to post-harvest handling and processing facilities was found to be the major constraint in marketing for both polyhouse and open precision farmers.

SWOC analysis was conducted separately for the polyhouse and open precision farmers. It was found that the primary strength, weakness, opportunity and challenge in polyhouse farming were cultivation of unconventional crops that can fetch higher price in market, lack of knowledge on repair and maintenance, popularization of unconventional crops and limited sources of inputs in local markets respectively while that of open precision farmers were higher input use efficiency, high cost of infrastructure, large scale production to achieve self-sufficiency and difficulties in attaining new markets respectively.

The hi-tech farming sector can be uplifted by providing better training and consultancy services to the farmers as the results showed strong correlation between their entrepreneurial behavior and extension contact. Trainings can enhance their technical know-how to generate skilled labor in the hi-tech farming sector. The linkages of the farmers with processing industries has to be strengthened to substantially increase the income of farmers and prevent losses.