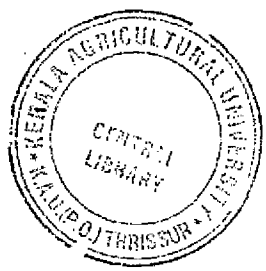
# TECHNOLOGY UTILIZATION OF BANANA IN THIRUVANANTHAPURAM DISTRICT




*by*

**THASNEEM. S**

**(2014-11-193)**

**THESIS**

**Submitted in partial fulfilment of the requirements for the degree of**

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**VELLAYANI, THIRUVANANTHAPURAM-695522**

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**2016**

## DECLARATION

I, hereby declare that this thesis entitled **"TECHNOLOGY UTILIZATION OF BANANA IN THIRUVANANTHAPURAM DISTRICT"** is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

Vellayani,
Date: 7/11/16

**Thasneem. S**
(2014-11-193)

# CERTIFICATE

We, the undersigned members of the advisory committee of **Mrs. Thasneem. S (2014-11-193)** a candidate for the degree of **Master of Science in Agriculture** with major in Agricultural Extension, agree that thesis entitled **"TECHNOLOGY UTILIZATION OF BANANA IN THIRUVANANTHAPURAM DISTRICT"** may be submitted by **Mrs. Thasneem. S** in partial fulfilment of the requirement for the degree.

7/11/16

**Dr. B. SEEMA**
(Chairman, Advisory Committee)
Professor
Department of Agricultural Extension,
College of Agriculture, Vellayani.

07/11/16

**Dr. V. B. PADMANABHAN**
(Member, Advisory Committee)
Professor and Head
Department of Agricultural Extension
College of Agriculture, Vellayani.

7/11/2016

**Dr. VIJAYARAGHAVA KUMAR**
(Member, Advisory Committee)
Professor and Head
Department of Agricultural Statistics
College of Agriculture, Vellayani.

7-11-16

**Dr. ALLAN THOMAS**
(Member, Advisory Committee)
Assistant Professor (SS), TSS
Vellayani,

7/11/16

**DR. K. R. SHEELA**
(Member, Advisory Committee)
Professor and Head
Department of Agronomy
College of Agriculture, Vellayani.

7/11/16

**EXTERNAL EXAMINER**
(Dr. N. NARASIMHA)

## CERTIFICATE

Certified that this thesis, entitled **"TECHNOLOGY UTILIZATION OF BANANA IN THIRUVANANTHAPURAM DISTRICT"** is a record of research work done independently by **Mrs. Thasneem. S (2014-11-193)** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to her.

Vellayani,
Date: 7/11/16

**Dr. B. Seema**
**Professor**
(Major Advisor, Advisory Committee)
Professor
Department of Agricultural Extension,
College of Agriculture, Vellayani,
Thiruvananthapuram- 695 522

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# LIST OF ABBREVIATIONS

| | | |
|---|---|---|
| KAU | : | Kerala Agricultural University |
| ITK | : | Indigenous Technical Knowledge |
| *et. al* | : | Co-workers |
| *viz.* | : | Namely |
| *i.e.* | : | That is |
| % | : | Percentage |
| Ha | : | Hector |
| F | : | Frequency |
| P | : | Percentage |
| N | : | Number of respondents in panchayaths |
| n | : | Total number of respondents |
| SD | : | Standard deviation |
| Q | : | Quartiles |
| R&D | : | Research and Development |
| INM | : | Integrated Nutrient Management |
| IPM | : | Integrated Pest Management |
| IDM | : | Integrated Disease Management |

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# *INTRODUCTION*

# CHAPTER 1

## INTRODUCTION

**"I'm all for industry, I'm all for steel plants, this and that, but I do say agriculture is far more important than any industry"** these are the words from the great legend Pt. Jawaharlal Nehru. He gave more importance to agriculture than any industry. Those days' agriculture had only status of subsistence farming alone. After 1960's there was a gradual change in agriculture dueto green revolution which acted as a precursor to change agriculture from subsistence farming to commercial farming. Commercial farming is practiced when a farm is set up for the sole purpose of producing crops with sole intention of making a profit usually with the use of modern technology.

Banana, basically a tropical crop, grows well in a temperature range of $15^0$C to $35^0$C with relative humidity of 75% to 85%. It is the second important fruit crops in the world and India. Banana is also known as 'apple of paradise/Adam's fig'. There are mainly two types of banana, culinary and table type. Bananas are cultivated primarily for their fruit, and to a lesser extend for the production of fibre and as ornamental plants. It's unique taste and texture, and the fact they can be obtained year round, makes it very popular. In India banana is cultivated in areas extending from humid tropical to dry mild subtopics.Thirty three percent of the world's banana is produced in India. It is an important fruit crop in Kerala also. In Kerala banana refers to Nendran and all other types like Njalipoovan, Palayamkodan, Poovan *etc* as plantains.

Banana is an important fruit in world wide. It is edible and also used for making value added products. Using new technologies for better cultivation of banana has surpassed climate and all other criteria for cultivation to be favourable in India, moreover in Kerala. Economically we can earn more returns from scientific banana cultivation. Internationally we can achieve greater earnings through commercial banana cultivation.

Banana is one of the main fruit in international trade and is ranking second after citrus fruits. Main banana producing countries are India and Brazil. India exports banana mainly to middle east countries such as UAE, Saudi Arabia, Oman, Bahrain and Qatar. The varieties which are in demand internationally include Grand Naine and Cavendish. India exported 8099 tonnes fresh banana during 2005 (National Horticulture Mission, 2010).

Banana is the second most important fruit crop in India next to mango. It has also good export potential. India leads the world in banana production with an annual output of about 14.2 million tonnes. In India banana ranks first in production and third in area among fruit crops. It accounts for 13 per cent of the total area and 33 per cent of the production of fruits (National Horticulture Board, 2010). Production is the highest in Maharashtra (3924.1 thousand tonnes) followed by Tamil Nadu (3543.8 thousand tonnes). Important cultivars include Dwarf Cavendish, Robusta, Monthan, Poovan, Nendran, Red banana etc.

Banana is an important fruit crop in Kerala. Important banana varieties cultivated in Kerala are Nendran, Palayamkodan, Rasthali, Monthan, Red banana and Robusta. Rainfed crop is planted during April- May and irrigated crop planted in August- September.

In 1995-96 the area under banana cultivation was only 16500 ha and in 2009-2010 area has increased to 59000ha. But productivity decreased from 13816 kg $ha^{-1}$ in 1995-96 to 8075 kg $ha^{-1}$ in 2010. In the case of plantain, during the last 20 years, the area increased by 50 per cent. The productivity increased from 4925 kg $ha^{-1}$ to 7619 kg $ha^{-1}$(Department of Economics and Statistics, Government of Kerala, 2010).

Banana is a rich source of carbohydrate and rich in vitamin particularly vitamin B. It is also a good source of potassium, phosphorus, calcium and magnesium. The fruit is easy to digest free from fat and cholesterol. Banana powder is used as first baby food. It helps in reducing risk of heart diseases when used regularly and is recommended for patients suffering from high blood pressure, arthritis, ulcer gastroenteritis and kidney disorders.

**Scope and importance of the study**

For greater improvements in banana cultivation Kerala Agricultural University and Research and Development agencies had developed many innovative technologies. KAU has evolved and standardized many technologies such as selection and curing of suckers, planting and spacing, manurial practices, bunch spraying of sulphate of potash, inter-cropping, tissue culture, double sucker planting etc. The success of any technology depends on how far it is being adopted by the people and how it continues to provide welfare to the social system. Because of the crop specific complexity of agricultural technology, different institutional arrangements are needed to transfer different types of technologies to beneficiaries (Thomas, 2004). For profitable cultivation of banana, it becomes essential for the farmers to choose the appropriate technology released by R&D agencies. The research should focus on need based technology as perceived by farmers.

In order to increase the crop yield, level of adoption of recommended farm practices ought to be increased. Knowledge of the recommended technologies is the first step in adoption process. The results of the study will throw light on the extent of dissemination of scientific results of KAU research in banana as well as the rate of adoption of KAU technologies in banana cultivation by commercial growers. The study will also help to enlighten the reasons for low adoption so that necessary steps can be taken to redeem this. This study will also identify the constraints faced by the commercial banana growers in the adoption of technologies and bring out suggestions to overcome the constraints identified. With these background the present study was undertaken with the following objectives.

- To assess the level of adoption of selected KAU practices in banana cultivation.
- Analyse the constraints experienced by farmers in adoption of these practices.
- Suggestions for refinement of practices as perceived by the farmers.

**Limitations of the study**

As in the case of any scientific investigation taken by a student researcher in behavioural science, this study too is bounded by limitations of time and resources. The study was conducted in selected panchayaths of Thiruvananthapuram district with 30 farmers from each panchayaths and hence the findings of the study have limited scope for generalisation. The data collected from the respondents may or may not be free from their personal preconceptions and biases. Within these limitations efforts have been made make it fruitful as far as possible.

**Organisation of the thesis.**

The report of the study spread over five chapters. First chapter is introduction and it propound about commercial banana cultivation, scope and importance of the study, objectives and limitations of the study. Theoretical orientation is the second one and it deals with review of literature. The third chapter relates to the details of methodology used in process of investigation and analysis. Fourth chapter emphasis about results and discussions of the study in detail. Fifth and final chapter deals with the summary of the study and suggestions for future research. The thesis is concluded with the references, abstract and appendices.

# *THEORETICAL ORIENTATION*

# CHAPTER II

# THEORETICAL ORIENTATION

The review of previous study helps in finding out the problem areas and provide a basis for developing a conceptual frame work for the study. Review of literature helps the researcher, to get acquainted with the empirical procedures of the research and the possible results available in the area. Such a critical review of literature helps to develop the theoretical frame work of the study. The review of literature for the study presented under the following heads.

2.1 Personal and social characteristics of the respondents

2.2 Level of adoption

2.3 Constraints in adoption

2.4 ITK practices in banana cultivation

## 2.1 PERSONAL AND SOCIAL CHARACTERISTICS OF THE RESPONDENTS

### 2.1.1 Age

Sreedaya (2000) in a study on 'Performance analysis of the Self Help Groups in vegetable production in Thiruvananthapuram' reported that a non-significant relationship between age and extend of adoption of recommended practices among the vegetable growers.

Fayas (2003) in a study on 'Viability of Self Help Groups in vegetable and fruit promotion council Keralam' found that most of the respondents belonged to medium category of age.

Kamalakkannan (2003) in his study on 'Research and extension gaps in commercial vegetable farming in eastern Palakkad' found that 75 per cent of commercial vegetable growers belonged to medium group with respect to age.

Thomas (2004) in his study on 'Problems and prospects of medicinal plant cultivation in Thiruvananthapuram District' reported that age had positive significant relationship with knowledge of the respondents.

Jayawardana (2007) in the study on 'Organic agricultural practices in coconut based homesteads in Thiruvananthapuram' observed that about 84 per cent of the respondents belonged to old aged category.

Thangaraja (2008) in his study on 'Impact of precision farming in Dharmapuri District' reported that majority of the respondents belonged to old aged category followed by 34.44 per cent in middle aged group.

Rakesh (2010) in his study on 'Precision farming in sugarcane A diagnostic study' obtained that majority of respondents (48%) were middle aged category followed by 35.3 per cent old aged.

Esakkimuthu (2012) in a study on 'Innovations in technical back stopping for Thiruvananthapuram district panchayath- an appraisal of samgra project on banana cultivation' observed that majority of the farmers belonged to either middle aged or old aged.

Sujitha (2015) in a study on 'Technology assessment of plant protection practices of economically dominant crops in home garden' reported that 56 per cent of farmers belonged to old aged category.

### 2.1.2 Education

Quazi and Iqbal (1991) in their study on 'Relationship between personnel characteristics and adoption of recommended practices' found that education was an important factor of innovation adoption and there is significant relationship between education and adoption of recommended practices.

Gangadharan (1993) in a study on 'Adoption of improved agricultural practices by pepper growers of Idukki district' reported that there is positive significant relationship between level of adoption and educational status.

Sharma (2000) in his study on 'Influence of personal characteristics in adoption of plant protection measures' reported that there is positive and significant relationship between education and adoption of plant protection practices.

Jaganathan (2004) in a study on 'Analysis of organic farming practices in vegetable cultivation in Thiruvananthapuram district revealed that there is positive and significant relationship between level of education and adoption of organic farming practices.

Sasankan (2004) in a study on 'Production system typology and technology utilization pattern in cassava cultivation in Thiruvananthapuram district' observed that half of the respondents had secondary level of education and there were few number of Illiterate respondents.

Jayawardana (2007) in a study on 'Organic agricultural practices in coconut based homesteads' found that 42 per of respondents had primary school education.

Sudha (2008) in her study on 'Prospects of precision farming in Dharmapuri District – A multidimensional analysis' reported that majority of the Precision Farming beneficiaries (52%) had secondary level of education followed by college level of education (17.5%).

Okwu and umoru (2009) in a study on 'Women farmer's agricultural information needs and accessibility' reported that majority of women farmers had no formal education followed by 18.5% with secondary education.

Gupta *et. al* (2010) in a study on 'Extent of knowledge of vegetable growers about the side effects of pesticides' revealed that education has positive and significant relationship with the knowledge of respondents about side effects of pesticides.

Chinchu (2011) in a study on 'Performance effectiveness of State Horticulture Mission Kerala revealed that most of the farmers (31%) of State Horticulture Mission had high school /higher secondary education.

Dhayal *et. al* (2012) in a study on 'Information seeking behaviour of beer growers in Jaipur district of Rajasthan' reported that there is positive and significant relationship between information seeking behaviour of respondents and level of education.

Esakkimuthu (2012) in a study on 'Innovations in technical back stopping for Thiruvananthapuram district panchayath- an appraisal of samgra project on banana cultivation' indicated that majority of banana growers had up to high school level of education.

Hanjabam (2013) in his study on 'Analysis of constraints and strategies for scaling up of precision farming in Kerala' observed that fifty per cent of the respondents with medium level of education followed by 26.67 per cent had secondary level of education.

Sujitha (2015) in a study on 'Technology assessment of plant protection practices of economically dominant crops in home garden' reported that more than half of the respondents (54%) had high school level of education.

### 2.1.3 Farm size

Sreenivasreddy (1995) in a study on 'Knowledge and adoption of recommended mango cultivation practices among farmers of Kolar district' stated that majority of respondents had less than one acre of land under cultivation.

Sharma (1997) in a study on 'Constraints in adoption of recommended mango practices by growers' reported that 44.4 per cent of the farmer respondents had 50 cents to 75 cents.

Wase (2001) in a study on 'Knowledge and adoption of farmers about Jayanti chilli cultivation' observed that majority of the farmer respondents had less than one acre of land.

Sudhakar (2002) in a study on 'Awareness and adoption of Integrated Pest Management practices in cotton cultivation' revealed that there is positive and significant relationship between adoption and farm size.

Ravikumar (2010) in a study on 'Knowledge and adoption of post-harvest management practices among mango growers of northern Karnataka' stated that majority of respondents had more than 50 cents under cultivation.

### 2.1.4 Area under banana cultivation

Sangili (1980) found that there is inverse relation between the area underbanana and paddy cultivation in Anandanallur Block, Madurai. Another fact pointed out by this study is that banana is a substitute crop for paddy fields and hence people cultivate more banana.

Tamilarasan (1987) found that banana was cultivated in wet lands, dry lands and garden lands of Tamil Nadu, while cultivation in dry lands and garden lands was popular in Tiruchirapalli District because of the availability of both irrigation and drainage facilities.

Muller (1997) in a study on 'An analysis of the characteristics of women's group and their role in rural development' found that farm size has non-significant relationship with area under banana cultivation and group relationship of women.

Manoj (2000) in a study on 'Techno-economic assessment of farming practices in rice cultivation in Thiruvananthapuram district' observed that there is positive and significant relationship between total area under cultivation and adoption behaviour of farmers.

Esakkimuthu (2012) reported that there is no significant relationship between area under banana cultivation and innovative procedures, processes and institution. He also reported that 70 per cent of respondents had upto 60 cents of area under banana cultivation.

### 2.1.5 Risk orientation

Sivaprasad (1997) in a study on 'Problems and prospects of self-employment of trained rural youth in agriculture found that risk bearing capacity of the individual can be increased by imparting proper training orientation.

Fayas (2003) in a study on 'Viability of self help groups in vegetable and fruit promotion council Keralam - a multidimensional analysis opined that most of vegetable growers (90%) had medium level of risk orientation.

Suthan (2003) in his study on 'Analysis of farmers participation in the participatiory technology development (PTD) process *vis-a-vis*plant protection in vegetables at Kunnathukalpanchayath' reported that majority of vegetable growers (58.67%) had high level of risk orientation.

Priya (2003) in a study on 'Micro credit and technology utilization in vegetable production' reported that positive significant relationship between technology adoption behaviour and risk orientation.

Jaganathan (2004) in a study on 'Analysis of organic farming practices in vegetable cultivation in Thiruvananthapuram district' concluded that 73 per cent of the farmers had medium level of risk orientation and positive significant relationship between knowledge of farmers towards organic farming practices and risk orientation.

Thangaraja (2008) in his study on 'Impact of precision farming in Dharmapuri District' revealed that majority of respondents (52.22%) had high level of risk orientation followed by 31.11 per cent with medium level of risk orientation.

Rakesh (2010) in his study on 'Precision farming in sugarcane – A diagnostic study' stated that majority of farmers (45.30%) had medium level risk orientation followed by 36.70 per cent with high level.

Hanjabam (2013) reported that 96.67 per cent of traditional farmers had medium level of risk orientation.

### 2.1.6 Innovativeness

Jose (1998) in his study on 'Promotional strategy utilization of plant based pesticides in vegetable cultivation in Thiruvananthapuram District' reported that innovativeness and knowledge have positive significant relationship.

Priya (2003) reported that majority of respondents were in the high category with respect to their innovativeness, experience in farming and social participation. She also reported non significant relation between adoption behaviour and innovativeness.

Esakkimuthu (2012) in his study on banana growers revealed that most that majority (93.33%) of respondents had high level of innovativeness. He also reported negative and non significant relation between perception about innovations and innovativeness of banana farmers.

### 2.1.7 Economic motivation

Fayas (2003) in a study on 'Viability of Self help groups in vegetable and fruit promotion council Keralam' observed that 86 per cent of farmers had medium level of economic motivation.

Priya (2003) in a study on vegetable growers found that 92 per cent of respondents had medium level of economic motivation.

Suthan (2003) found that 57.3 per cent of the vegetable growers had high level of economic motivation.

Bhavya (2008) reported in her study on 'Cause consequence analysis of indebtedness among farmers in Pulpally panchayath of Wayanad district' reported that majority of the respondents (60%) had medium level of economic motivation.

Thangaraja (2008) in a study about precision farming found that 42.2 per cent of the respondents had medium level of economic motivation followed by 32.2 per cent had high level.

Sangeetha (2009) in a study on 'Factors influencing the adoption of precision farming technologies in tomato cultivation' revealed that more than half of the respondents (58.18%) had higher level of economic motivation.

Rakhesh (2010) reported that majority of the farmers (45.3%) had high level of economic motivation.

Hanjabam (2013) in a study on 'Analysis of constraints and strategies for scaling up precision farming in Kerala' revealed that 90 per cent of the farmers had medium level of economic motivation.

Sujitha (2015) in a study on 'Technology assessment of plant protection practices of economically dominant crops in home gardens' reported that fifty per cent of the respondents had low level of economic motivation.

### 2.1.8 Credit orientation

Nizamudeen (1996) in study on 'A multidimensional analysis of *Kuttimulla* cultivation in Alappuzha district' reported that credit orientation behaviour of Kuttimullai growers lead them towards the successful adoption of cultivation practices.

Jayalekshmi (2001) in a study on 'Empowerment of rural women through SHG- an action Research' observed that there is negative and significant correlation between credit orientation and empowerment.

Esakkimuthu (2012) reported that 41.1 per cent of the farmers had medium level of credit orientation followed by 33.3 per cent with high level of credit orientation.

### 2.1.9 Extension contact

Manjusha (1999) in his study on 'Techno socio economic assessment of farmer's practices in cultivation of bittergourd in Thiruvananthapuram district' reported that majority of respondents had medium level of extension orientation

and there is non significant relationship between adoption and extension orientation.

Manoj (2000) in his study among rice farmers revealed that 48.5 per cent of respondents had high level of extension contact.

Majjusha (2000) in her study on 'Techno socio economic assessment of farmer's practices in cultivation of cowpea' reported that significant positive relationship between adoption and extension contact.

Sharma (2000) in his study on 'Influence of personal characteristics in adoption of plant protection measures' reported that there is positive and significant relationship between extension contact and adoption of plant protection practices.

Wason *et. al* (2009) in a study on 'Farmer's perception and propensity for adoption of integrated pest management practices in vegetable cultivation' indicated that extension contact was significantly related to adoption propensity of farmers.

Hanjabam (2013) in his study among precision farmers observed that 53.33 per cent of respondents had medium level of extension orientation.

### 2.1.10 Market perception

Syamkumar (1999) in a study on 'Extension intervention for sustaining rice production' reported that there is positive significant relationship between extent of awareness of respondents and market perception.

Fayas (2003) in his study on farmers of VFPCK reported that 33.32 per cent of farmers had low level of market perception.

Suthan (2003) in his study on vegetable growers revealed that more than half of the farmers had medium to low level (54.67%) of market perception.

Jaganathan (2004) in his study on vegetable growers reported that more than half of the respondents (55%) had medium level of market perception.

### 2.1.11 Experience in banana cultivation

Esakkimuthu (2012) revealed that 48.33 per cent of the respondents had high (more than 4 years) experience in banana cultivation.

Jacob (2015) in her study among homegarden farmers reported that majority of the farmers had more than 15 years of experience in banana cultivation in home gardens.

Hassan (2016) reported in her study among banana growers reported that most of the farmers had an experience more than 20 years.

### 2.1.12 Trainings undergone

Ashaletha (2000) in study on 'Impact of NARP on Agricultural Development in the Southern Agro Climatic Zone of Kerala'reported that there is positive significant relationship between training attended and awareness about NARP.

Lakshmi (2000) in study on 'Techno- socio- economic consequences of National Watershed Development Project for Rainfed Areas in Thiruvananthapuram District' found that more than half of the respondents did not attend any training.

Meera (2001) in a study on 'Performance of Samathaself help group in the empowerment of rural women in Ulloorpanchayath' revealed that 86.6 per cent of the respondents got low level of training.

Parthasarathi and Govind (2002) reported that knowledge level of trained farmers was much higher on biological and physical methods of IPM, identification of pest and predators on economic threshold level. This shows that training on IPM had positive effect on farmers

Priya (2003) in her study among Self Help Group in vegetable production observed that 95 per cent of respondents got more than three trainings.

Jaganathan (2004) in his study among vegetable growers found that majority of the respondents (57%) had medium level of training followed by low level 33 per cent.

Esakkimuthu (2012) in his study among banana growers reported that majority of farmers(66.63%) attended more than three trainings.

Hanjabam (2013) in his study among precision farmers revealed that 56.67 per cent of the conventional farmers didn't attend any training programmes.

**2.1.13 Information source utilization pattern**

Roy (2004) in his study on 'Communication sources of rural farm youth' found that mass media like television and radio are popular among rural youth.

Banerji (2005) in a study on 'Challenges faced in communication by rural markets in India' reported that television is major information source for rural masses with increase in TV coverage and owenership

Bhavya (2008) in a study on 'Cause- Consequense analysis of Indebedeness among famous Pulpally Panchayat of Wayanad district' reported that fifty per cent of the indebted farmers had medium level of information source utilization.

Sengupta (2008) found in a study on "Why farmers commit suicide" that many farmers were extremely vulnerable to miss information about crops prospects due to lack of mass media exposure.

Palanisamy (2011) in a study on 'Impact Of TN – IAMWARM project on the farm and home of precision farming beneficiaries – an analysis' reported that majority of the respondents(43.23%) had higher level of information source utilization.

Sobha (2013) in her study on "Farm telecast in Kerala" found that 67.78 per cent of farmers were having medium level of mass media exposure.

Sujitha (2015) revealed that 84 per cent of the respondents had high level of information source utilization followed by low level.

Hassan (2016) in her study on 'Technological gap in banana cultivation in southern distracts of Tamil Nadu' reported that all the farmers in study area were in contact with Agricultural Officer and most of them watch TV (91.64%) and read newspaper for agricultural informations.

**2.1.14 Extent of commercialization**

Matz and Murithi (2014) in their study on 'Welfare effects of vegetable commercialization: Evidence from smallholder producers in Kenya' stated that extend of commercialization can be operationalized based on the market pathway of produce. They also reported that there is positive association between vegetable commercialization and household welfare, the effects differs depending on for which market vegetables are being produced through commercialization and that export market is positively associated with income.

**2.1.15Attitude of farmers towards scientific technologies**

Allport (1935) in a study on 'Attitudes in Murchisons' reported that attitude is a mental and neutral state of readiness organised through experience.

Thrustone (1946) defined attitude as the degree of positive or negative affect associated with some psychological objects.

Kartz and Scotland (1959) in a study on 'A preliminary statement to a theory of attitude, structure and change' reported that attitude is a tendency or disposition to evaluate an object or the symbol of the object.

Singh and Singh (1970) in a study on 'A Multi - Variate Ananlysis of Adoption Behaviour of Farmers' reported that high scores on attitude towards farming technologies and decision making were associated with farmer behaviour.

Sajivchandran (1989) in study on 'Impact development programmes in promoting pepper products in Kerala' reported that there is significant difference

in the level of attitude among respondents towards pepper development programmes.

Sharma (1997) in a study on 'Constraints in adoption of recommended mango practices by growers' reported that 34.5 per cent of the farmer respondents with medium level of attitude towards adoption of recommended practices.

Wase (2001) in a study on 'Knowledge and adoption of farmers about Jayanti chilli cultivation' observed that majority of the farmer respondents had high level of attitude towards new technologies in chilli cultivation.

Sudhakar (2002) in a study on 'Awareness and adoption of Integrated Pest Management practices in cotton cultivation' revealed that there is positive and significant relationship between adoption and attitude of farmers about new practices.

Ravikumar (2010) in a study on 'Knowledge and adoption of post-harvest management practices among mango growers of northern Karnataka' stated that majority of respondents (52.6%) had favourable attitude towards mango cultivation practices.

Hanjabam (2013) observed that 76.67 per cent of precision farmers and 73.33 per cent of conventional farmers had medium level of attitude towards precision farming practices.

## 2.2 LEVEL OF ADOPTION

Shivaramakrishnan (1981) in his study on "Differential adoption of selected recommended agricultural practices of selected crops" indicated that adoption of plant protection measures had comparatively less influence in increase in production.

Rogers (1982) defined adoption as an individual process detailing the series of stages one undergoes on first hearing about an innovation to finally adopting it.

Harper *et. al* (1990) in a study on "Factors influencing the adoption of insect management technology" reported that there is significant relationship between education and adoption.

Rajendran (1992) in a study on 'Feasibility and utilization of agricultural technologies among scheduled caste farmers' reported that there was a positive and significant relationship between scientific believes of scheduled caste farming family with regard to recommendations proposed by authorized organization to the extent of adoption.

Sreenivasreddy (1995) in a study on 'Knowledge and adoption of recommended mango cultivation practices among farmers of Kolar district' stated that there is significant relationship between experience in mango cultivation and adoption behaviour of farmers.

Sharma (1997) in a study on 'Constraints in adoption of recommended mango practices by growers' reported that there is significant relationship between adoption of practices and mass media exposure.

Sangeetha (1997) in her study on 'managarial behaviour of commercial banana growers in Thiruvananathapuram District' reported that majority of the respondents adopted more than 75 per cent of the recommended cultivation practices of banana and majority of respondents belonged to category of high level adopters with regard to sucker selection, treatment of suckers, pit size, manuaring, irrigation, weeding and propping. In the case of adoption of spacing and fertilizer application majority of respondents belonged to medium category.

Fernandez (1998) made a survey among vegetable producers in USA reported that farm size credit or debit ratio and farmers age are significantly related to adoption.

Burton *et. al* (1999) in a study on 'Analysis of determinants of adoption of organic horticultural techniques' reported that age, gender and access of information are paramount importance in adoption.

Kumar (2000) in his study on 'knowledge, adoption and economic performance of coffee growers in Virajpet taluk of Coorg district' indicated that coffee growers had low level of adoption with respect to land protection and production practices.

Sudhakar (2002) in a study on 'Awareness and adoption of Integrated Pest Management practices in cotton cultivation' revealed that awareness and adoption are directly related.

Sreedaya and Sushama (2002) in a study on 'Extent of adoption of recommended practices by the vegetable growers' revealed that most of the farmers of both KHDP and SHG are high adopters of the recommended practices.

Mauceri *et. al* (2007) in a study on "Adoption of integrated pest management technologies: a case study of potato farmers in Carchi, Ecuador" found that access to information is the main thing of IPM adoption by potato growers.

Waman and Wagh (2009) in his study on 'Extent of adoption of banana production technology' reported that majority of banana growers possessed medium level of adoption of recommended package of practices of banana cultivation like Time of planting, irrigation interval, removal of daughter suckers.

Ravikumar (2010) stated in a study on 'Knowledge and adoption of post-harvest management practices among mango growers of northern Karnataka' simple correlation revealed that knowledge and adoption of post harvest management practices were significantly determinant by risk orientation, achievement motivation and economic motivation.

Esakkimuthu (2012) reported that majority of the respondents had medium level of adoption of farming practices with perception of innovative process, procedures and institution.

Hanjabam (2013) stated that 73.33% of the precision farmers and 90% of the conventional farmers had medium level of adoption. Moreover, 25% precision farmers had high level of adoption.

Badgujar and Borole (2015) in a study on 'Constraints in banana production at Jargon district of Maharashtra' reported that all characteristics of banana growers like age, education, family size and experience of banana cultivation recorded positive correlation with extend of adoption of recommended banana production technology.

Bennur *et. al* (2015) in their study on 'Adoption of banana farming practices and constraints of growers in Gulbarga district of Karnataka' reported that there is positive significant relationship between level of adoption and attitude of farmers. He observed that majority of the respondents had medium level of adoption in plant protection as well as production practices.

Sujitha (2015) reported that 58.33 per cent of the respondents had medium level of adoption of selected plant protection technologies in banana cultivation in homegardens.

Hassan (2016) in her study among banana growers in Tamil Nadu reported that adoption of recommended practices in banana cultivation had significant relationship with information seeking behaviour. She also observed that farm adoption gap in selected 12 practices studied highest adoption gap was noticed in practices like application of micro nutrients followed by use of growth regulators and intercropping.

## 2.3 CONSTRAINTS IN ADOPTION

Chowdikar and George (1972) in their study on 'Adoption behaviour and characteristics of farmers' reported that lack of knowledge among farmers regarding the recommendation was one of the major factors responsible for the non adoption of the package of practice.

Sivaramakrishnan (1981) in his study on 'Differential adoption of selected recommended agricultural practices of selected crops' indicated that pest and disease problem of coconut, high cost of chemicals and operational difficulties as the major constraints as perceived by the cultivators.

Prasannan (1987) in a study on 'Extend of adoption of messages by contact farmers in T&V system' reported that non availability of inputs and labour and high labour cost as the major constraints experienced by the respondents for adoption of messages in coconut cultivation.

Gangadharan (1993) in a study on 'Adoption of improved agricultural practices by pepper growers of Idukki district' reported that high cost of inputs found to be most important constraint.

Meera (1995) in a study on 'Differential adoption of plant protection technology by farmers of Kerala- critical analysis' concluded that lack of availability and high cost of plant protection inputs and non availability of supply and services as the most serious constraints among the farmers in adopting plant protection technologies.

Sreedaya and Sushama(2002) in a study on 'Constraints faced by the vegetable growers in Kerala' stated that most important constraint felt by the SHG farmers was lack of co-ordination among members of SHG.

Balachandran (2004) in a study on 'Status of organic farming in Kerala' revealed that lack of knowledge and awareness about the organic farming practicesand lack of demonstration about new technologiesas the major constraints in adoption of practices.

Esakkimuthu (2012) reported that non availability of skilled labour and good quality inputs at required time and amount were major constraints faced by banana growers.

Kumari (2012) in a study on 'Constraints in adoption of Integrated Pest Management (IPM) practices by rice growing farmers of Jammu division'

reported that constraints as certain forces or factors that prevent and restrict the action of others.

Hanjabam (2013) reported that the most important constraints experienced by both conventional and precision farming categories of respondents are rainfall and other meteorological problems.

Badgujar and Borole (2015) in a study on 'Constraints in banana production at Jargon district of Maharashtra' reported that characteristics of banana growers like age and experience of banana cultivation recorded negative non significant correlation with constraints faced by banana growers.

Bennur *et. al* (2015) in their study on 'Adoption of banana farming practices and constraints of growers in Gulbarga district of Karnataka' reported that most important constraints faced by banana growers were lack of awereness of correct dosage of chemical fertilizers and plant protection chemicals are not effective in their recommended dosage.

Sujitha (2015) in a study on "Technology assessment of plant protection practices of economically dominant crops in home gardens" reported that major constraints perceived by home garden respondents in adopting selected plant protection practices were plant protection chemicals not effective in their recommended dosages and climate change influence on pest and disease intensity.

## 2.4 ITK PRACTICES IN BANANA CULTIVATION

Sundaramari *et. al* (2002) in a study on 'Adoption of indigenous organic practices for pest and diseases management in different farming system' reported that adoption of indigenous organic practices for pest and diseases management in banana was found to be low, as 14 out of 17 practices were adopted by less than 25 per cent of the respondents.

Sushama *et. al* (2004) in a study on "Indigenous technology practices followed by tribal and settler farmers in western ghats region in Wayanadu" reported that diffusion of ITK in banana was about 80 per cent for all the practices

among settlers. Tribals were aware of the ITK practices in banana and about 50 per cent of the respondents were practicing it.

Sujitha (2015) in a study on "Technology assessment of plant protection practices of economically dominant crops in home gardens" reported that there are a quiet good number of ITK plant protection practices in banana cultivation that are being, still used in homegardens by farmers.

# METHODOLOGY

# CHAPTER III

# METHODOLOGY

This chapter comprises of various procedure adopted in the study and is organised under the following sub headings

3.1 Research design.

3.2 Locale of the study.

3.3 Sampling procedure.

3.4 Selection and operationalization of concept and measurement of variables.

3.5 Method of data collection.

3.6 Statistical techniques used.

## 3.1 RESEARCH DESIGN

Research design is the plan, structure and strategy of investigation conceived so as to obtain answers to the research questions and control variance. Research design is the frame work that has been created to seek answers to the research questions (Kerlinger, 1983).

Different categories of technological dimensions and variables (both independent and dependent) contained in the objectives of the study were identified and included through literature search and discussions with subject matter specialists. Survey method was employed to gather data on profile characteristics and other details of the respondents.

A direct survey approach was followed for recording the primary data from the respondents at the field level, based on the ex post -facto research design. According to Singh (2006), an ex post -facto research is one in which investigators attempt to trace an effect that has already occurred to its possible causes.

Ex post -facto research is systematic enquiry in which the scientist does not have direct control over the variables because their manifestation have already

occurred or because they are inherently not manipulative (Kerlinger, 1983).Thus research design of the study is based on the *ex post facto* approach in finding out the cause effect relationship of the variables involved in the study.

## 3.2 LOCALE OF THE STUDY

The study was conducted in Thiruvananthapuram district of Kerala State. This district was purposively selected for the following reasons.

Lots of commercial banana growers are there in Thiruvananthapuram district, which will facilitate gathering of accurate and up to date information. Data to be collected for the study are to be gathered from the panchayaths which have maximum area of commercial banana cultivation. For a part of the study, the researcher has to depend on data generated from the offices of the various panchayaths which have maximum area under commercial banana cultivation.

## 3.3 SAMPLE AND SAMPLING PROCEDURES

### 3.3.1 Selection of respondents

The respondent groups of the study comprised of commercial banana growers of Thiruvananthapuram district. From eleven blocks of Thiruvananthapuram District, three blocks having maximum area under commercial banana cultivation were selected based on secondary data and in consultation with agricultural department officials. From each block one panchayath was selected which was having maximum area under banana cultivation. From each panchayath, took list of all commercial banana growers. From these list, 30 commercial banana growers were selected with holding size not less than 0.5 acre using Simple Random Sampling. Thus a total of 90 commercial banana grower respondents were selected for the study.

The selected KrishiBhavan/Panchayath from Thiruvananthapuram district was as follows.

**Table :1** List of selected Blocks and corresponding Panchayaths/KrishiBhavans.

| Name of Blocks | Name of Panchayaths |
|---|---|
| Nemom | Kalliyoor |
| Nedumangadu | Vembayam |
| Kattakkada | Vellanadu |

The Agriculture officers in these respective KrishiBhavans were asked to provide the list of commercial banana growers in that area.After obtaining the list of farmers from these Krishi Bhavans,30 farmers were randomly selected from each Krishi Bhavan area and were visited individually with the prepared pretested interview schedule for data collection. Thus 30 farmers from each block were interviewed for data collection. Qualitative measures such as observation, focus group discussion, PRA *etc* were also employed to generate information.

## 3.4 SELECTION AND OPERATIONALISATION OF CONCEPTS AND MEASUREMENT OF VARIABLES

### 3.4.1 Independent variables

Keeping in view objectives of the study and based on the review of relevant literatures and consultation with extension specialists 15 independent variables were identified for the study. These variables were subjected to judges rating by 30 judges. The judges were extension specialists of Kerala Agricultural University and officials from other agricultural universities. The judges were asked to indicate the degree of relevance of each variable to the study on a five point continuum as most relevant, more relevant, undecided, less relevant, least relevant with scores 5, 4, 3, 2 and 1 respectively. The final variables were selected based on criteria of mean relevancy score which was calculated by summing up all the scores obtained by each variable and deciding it by the total number of

judges that responded. Those variables which had scores more than mean score were selected for the study.

**Table 2:** List of Independent Variables and their measurement

| Sl. No | Independent variables | Measurement |
|---|---|---|
| 1. | Age | Actual age of respondents categorised based on census report (2011) |
| 2. | Education | Actual formal education categorised according procedure followed by Sreedaya (2000) |
| 3. | Farm size | In acres |
| 4. | Area under banana cultivation | In acres |
| 5. | Risk orientation | Scale developed by Supe (1969) |
| 6. | Innovativeness | Method developed by Singh (1970) and used by Sobha (2013) |
| 7. | Economic motivation | Scale developed by Supe (1969) and used by Esakkimuthu (2012) |
| 8. | Credit orientation | Method developed by Beal and Sibley (1967) and used by Esakkimuthu (2012) |
| 9. | Extension contact | Method developed by Jaiswal and Arya (1974) Method followed by Sobha (2013) |
| 10. | Market perception | An arbitary scale developed for the study |
| 11. | Experience in banana cultivation | An arbitrary scoring procedure developed for the study |
| 12. | Training attended | Scale followed by Meera (2001) |
| 13. | Information source utilization | An arbitary scale developed for the study |
| 14. | Extend of commercialization | Scale developed by Matz (2014) with slight modification |
| 15. | Attitude of farmers towards scientific technologies | Scale developed by Patel *et. al* (2007) |

### 3.4.1.1 *Age*

Age was operationalized as the number of calendar years completed by the respondent at the time of interview. Based on the chronological age the respondents were classified based on the procedure used in census report 2011.

| Age category | Years | Score |
|---|---|---|
| Young | ≤ 35 years | 1 |
| Middle | 36- 55 years | 2 |
| Old | >55 years | 3 |

### 3.4.1.2 *Education*

Refers to extend of formal education achieved by the respondents. Trivedi (1963) had developed the original scale for measuring educational status. In this study educational status was measured by using the scoring pattern adopted by Sobha (2013). The scoring pattern was as follows.

Respondents with scores less than two were categorised into low group followed by medium group including respondents with primary school, middle school and high school education and college and professional degree were categorised into high group.

| Sl.No | Items | Score |
|---|---|---|
| 1 | Illiterate | 1 |
| 2 | Can read and Write | 2 |
| 3 | Primary school | 3 |
| 4 | Middle school | 4 |
| 5 | High school | 5 |
| 6 | College | 6 |
| 7 | Professional Degree | 7 |

#### 3.4.1.3 *Farm size*

It refers to the total land owned by the respondent at the time of conducting survey. The respondents were asked to give total area of their land in acres. Scoring procedure developed by Sreedaya (2000) was adopted for measuring the farm size of the respondents. The scoring pattern was as follows.

| **Area in acres** | **Code** |
|---|---|
| < 0.5 | 1 |
| 0.51-1 | 2 |
| 1.01-2 | 3 |
| > 2 | 4 |

#### 3.4.1.4 *Area under banana cultivation*

It refers to the total land under banana cultivation owned by the respondents at the time of conducting survey. The respondents were asked to give total area of their land under banana cultivation in acres. Scoring procedure developed by Sreedaya (2000) was adopted for measuring the farm size of the respondents. The scoring pattern was as follows.

| Area in acres | Code |
|---|---|
| < 0.5 | 1 |
| 0.51-1 | 2 |
| 1.01-2 | 3 |
| > 2 | 4 |

#### 3.4.1.5 *Risk orientation*

Risk orientation refers to the degree to which the farmer is oriented towards encountering risk and uncertainty in adopting new ideas in farming.

Risk orientation was measured using the scale developed by Supe (1969) and used by Sobha (2013). The scale consists of six statements. The respondents were asked to state their response on a five point continuum ranging from 'strongly agree', 'agree', 'undecided', 'disagree', to 'strongly disagree' with scores of 4, 3, 2, 1 and 0 respectively. The scoring procedure was reversed in the case of the negative statements (Appendix III). The possible scores range from 0 to 24. Respondents were categorized in to low, medium and high groups based on quartiles.

**3.4.1.6 *Innovativeness***

Rogers and Shoemaker (1971) defined innovativeness as the degree to which an individual is relatively earlier in adopting new ideas than other members of his society.

The procedure developed by Singh (1970) and followed by Sobha (2013) was used to measure innovativeness in this study. In this procedure a question was asked as to when the farmer would like to adopt an improved practice in banana cultivation, and the response categories and scores assigned were as follows

| Sl. No. | Response | Score |
|---|---|---|
| 1 | As soon as it is brought to my knowledge | 4 |
| 2 | After I had seen other farmers tried successfully in farm | 3 |
| 3 | I prefer to wait and take my own time | 2 |
| 4 | I'm not interested in adopting improved practices | 1 |

The classification procedure adopted in innovativeness isless than 2 includes in low group followed by medium group include score 2 to 3 and high group has score 4.

**3.4.1.7 *Economic motivation***

Refers to the extent to which a farmer is oriented towards profit maximization and relative value he places on monetary gains. The original scale for measuring economic motivation was developed by Supe (1969). In this study

the procedure adopted by Hanjabam (2014) was used to measure economic motivation. The scales consisted of six statements of which fifth and sixth were negative. Each statement was provided with five point response categories namely 'strongly agree', 'agree', 'undecided', 'disagree', to 'strongly disagree' with scores of 5, 4, 3, 2 and 1 respectively. The scoring procedure was reversed in the case of the negative statements. The summation of the scores of all the statements formed the score for economic motivation. (Appendix III)

The possible score ranges from 6 to 30. Respondents were categorized into low, medium and high groups based on quartiles.

**3.4.1.8** ***Credit orientation***

It refers to orientation to avail credit by the respondents. The original method developed by Beal and Sibley (1967) which was adopted by Essakkimuthu (2012) was used to measure credit orientation.

This scale consisted of 5 items. The first and last items were measured in 'yes'/'no' response with scores 'two' and 'one', respectively. The second and third items were measured on a four point continuum as 'very difficult', 'difficult','easy' and 'very easy', with scores of 1, 2, 3 and 4 respectively. The 4$^{th}$ item was measured on a four point continuum of SA, A, DA & SDA with scores of 4 3 2 and 1 respectively. Summation of these scores on all these items was the credit orientation score of the respondents.

The possible score ranges from 0 to15. The classification procedure employed in credit orientation was up to 11 low group,12-15 medium group, 16 and above high group.

**3.4.1.9** ***Extension contact***

Extension contact refers to the degree of contact of respondents with various agricultural professionals *viz* Agricultural scientists, Agricultural officer, Agricultural assistant and others. The procedure followed by Sobha (2013) was used. The scores assigned were 4, 3, 2, 1, 0 respectively for contact two or more

times a week, once in week, once in fortnight, once in a month and never. (Appendix III)

The total score was obtained by summing up the scores obtained by the respondents. The scores range from 0-20. Respondents were categorized into low, medium and high groups based on quartiles.

**3.4.1.10 *Market perception***

It is defined as capacity of respondents to identify market trends to sell the produce for greater returns. An arbitrary method developed for the study was used to find out market perception of respondents. The method consisted of scoring the responses obtained to selective questions presented to the respondents to elicit their perception of market of the produce. The scoring pattern was as follows.

- Do you think that you will be able to sell banana at higher price by ensuring quality products through new technologies?

  Yes – 1 No – 0

- How much price banana will fetch by adopting new technologies of cultivation compared to conventional methods?

  (Low/Same/High)

- Do you think, you can overcome the price fluctuation of banana by intercropping?

  Yes – 1 No – 0

- Do you think that value addition can increase consumer preference of your products?

  Yes – 1 No – 0

### 3.4.1.11 *Experience in banana cultivation*

Refers to the total number of years the respondent has been engaged in banana cultivation. The actual number of years of experience was considered as the score. The scoring pattern was as follows.

| Sl. No. | Experience in years | Score |
|---|---|---|
| 1 | ≤ 5 | 1 |
| 2 | 6-10 | 2 |
| 3 | 11-15 | 3 |
| 4 | 16-20 | 4 |
| 5 | > 20 | 5 |

### 3.4.1.12 *Trainings undergone*

It is defined as the number of trainings in various agriculture related activities undergone by the respondent during the last 3 years. Scoring procedure adopted by Meera (2001) was used with slight modification. Here general training and training related to banana cultivation were included. The scoring pattern was as follows.

| Sl. No. | Trainings undergone | Score |
|---|---|---|
| 1 | No training | 0 |
| 2 | One training | 1 |
| 3 | Two training | 2 |
| 4 | Three or more training | 3 |

#### 3.4.1.13 *Information source utilization pattern*

It is operationalized as the pattern of utilizing information sources through which farmers get information about improved practices in farming. An arbitrary method was developed for the study.

Source of information for agricultural technology were listed and grouped into 4 categories as media sources, interpersonal sources, institutions and ICT sources. Respondents were asked to record their nature of utilization on a 4 point continuum and score given were 3 (regular use) 2 (occasional) 1 (rare use) 0 (never). (Appendix III)

The total score was obtained by summing up the scores obtained by the respondents. The scores ranged from 0-48. Respondents were categorized into low, medium and high groups based on quartiles.

#### 3.4.1.14 *Extent of commercialization*

Refers to extend to which a farmer is intending farming for commercial purpose. Extend of commercialization is operationalized based on the market pathway of produce. Extend of commercialization was measured by using the methodology developed by Matz (2014) with slight modification. The respondents were asked to record the mode of marketing as domestic, export oriented and domestic and export oriented marketing.

The scores assigned were 1, 2 and 3 for domestic marketing, export oriented marketing and domestic and export oriented marketing.

#### 3.4.1.15 *Attitude of farmers towards scientific technologies*

Refers to degree of favourableness or unfavourableness of the respondents towards new technologies. The scale developed by Patel *et. al* (2007) with slight modification was used for quantification of farmer's attitude towards new technologies. Scale consisted of 15 statements of which $7^{th}$, $8^{th}$, $10^{th}$,$11^{th}$ and $13^{th}$ were negative. The respondents were asked to state their response on a five point continuum ranging from 'strongly agree', 'agree', 'undecided', 'disagree', to

'strongly disagree' with scores of 5, 4, 3, 2, and 1 respectively. The scoring procedure was reversed in the case of the negative statements (Appendix III)

The possible scores range from 0 to 75. Respondents were categorized in to low, medium and high groups based on quartiles.

### 3.4.2 Dependent variable

#### 3.4.2.1 *Adoption behaviour of the commercial banana growers*

The objective of the study warrants the inclusion of adoption behaviour of the commercial banana growers as the dependent variable.

Chattopadhyay (1963) used adoption quotient for measuring adoption which is a ratio scale that measures a farmer's behaviour on dimension of applicability, potentiality, extent, time, consistency and different nature of innovations.

Supe (1969) developed a scale namely cotton practices adoption scale. He stated ten practices of cotton and for each practice a score of six was assigned for complete adoption. The practice which were divisible had assigned partial score for partial adoption.

Singh and Singh (1970) also used an adoption quotient which was a modification of the one developed by Chattopadhyay (1963). According to this the adoption quotient of each respondent was calculated by using the following formula.

$$A.Q = \{\sum_{i=1}^{n}\left(\frac{ei}{pi}\right) * 100\}/N$$

Where,

AQ = Adoption quotient
ei = Extent of adoption of each practice
pi = Potentiality of adoption of each practice
N = Total number of practices selected.

In this study level of adoption was measured by using the procedure followed by Singh and Singh (1970).For measuring the level of adoption of improved practices by commercial banana growers, a package of improved practices in banana cultivation was selected as follows.

A comprehensive list of important practices in banana cultivation was prepared after reviewing Package of Practice of Kerala Agricultural University and other literature related to subject and detailed discussion with experts. The list consisted of 19 relevant practices which were selected after detailed discussion with subject matter specialists.

Adoption of each practice was given in a four-point continuum with non-adoption, partial adoption, complete adoption and actual adoption with score 0, 1, 2, 3 respectively. Thus the total score secured by an individual was the obtained adoption score. The adoption quotient was worked out for each respondent and it was taken as the adoption score for the individual respondent.

Overall adoption level was worked out by calculating arithmetic mean of the adoption quotient of all the respondents as given below.

$$\text{Overall adoption level} = \sum_{i=1}^{n} A.Qi / N$$

Where,

A.Qi = Adoption quotient for ith respondent

N = Total number of respondents.

**3.4.3 Perceived usefulness and effectiveness of selected KAU technologies for banana cultivation.**

Set of nineteen cultivation practices given in Appendix III as recommended by Kerala Agricultural University were given to commercial banana growers after focus group discussion with subject matter specialists and were asked to score these practices according to usefulness and effectiveness. The

score given were 0, 1 and 2 for not useful, useful and very useful respectively in the case of usefulness, while for effectiveness the scores for not effective, effective and very effective were 0, 1 and 2 respectively. Thus one could get maximum score of 38 and minimum of 0.

### 3.4.4 Technology needs assessment

The needs assessment was worked out using score / rank procedure used by Thomas (2004). Scoring pattern consisted of four statements. The scoring pattern was as follows.

| | |
|---|---|
| Technology not available | 1 |
| Technology available but not applicable | 2 |
| Technology available but not sustainable | 3 |
| Technology available applicable and sustainable | 4 |

### 3.4.5 Indigenous Technical Knowledge on banana cultivation

The banana growers had developed a number of indigenous practices by virtue of their rich practical experience in the field of agriculture acquired through generations to generations.

The respondents were prompted by the researcher with questions so as to get the response from the farmers about the indigenous practices followed by them if any.

Thus the major indigenous practices adopted by the respondents were enumerated and the same expressed in terms of percentage.

### 3.4.6 Constraints perceived by the farmers and suggestions for refinement of technology development

Based on discussion with farmers, scientists, experts in agriculture and also through relevant review of literature, some of the constraints faced by banana

growers were identified. A list containing such constraints was prepared and included in the final interview schedule.

The response to each constraint was obtained on a four-point continuum namely, most important, important and least important, with the score 'three', 'two' and 'one' respectively. Mean rank cumulative index for each constraint was worked out and the constraints were ranked and catalogued under different subheads.

The suggestions for refinement of the technologies to address the constraints were also collected from the farmers and these were prioritised.

## 3.5 METHOD OF DATA COLLECTION

An interview schedule was prepared in English and Malayalam for data collection from 90 respondents. A pretesting was carried out to evaluate the interview schedule. Modifications were made on the basis of evaluation and final interview schedule was prepared. The respondents were interviewed with the help of Malayalam interview schedule and responses obtained from the respondents were entered in the English interview schedule in the appropriate column. The respondents were interviewed individually in the local language.

## 3.6 STATISTICAL TECHNIQUES USED

The following statistical methods were employed in this study.

### 3.6.1 Mean

The commercial banana growers were grouped into categories based on mean values of independent variables. After grouping the categories, their percentage analysis was worked out.

### 3.6.2 Percentage analysis

Percentage analysis was used in descriptive analysis for making simple comparisons. It explains the distribution of respondents for calculating percentages the frequency of the particular cell was multiplied by hundred and

divided by the total number of respondents. Percentage was corrected to two decimal places.

### 3.6.3 Quartile deviation

Quartile deviation was used to categorise the respondents based on the lower quartile $q_1$ and the upper quartile $q_3$. The first quartile, also called lower quartile, is equal to the data at the $25^{th}$ percentile of the data. The third quartile, also called upper quartile, is equal to the data at the $75^{th}$ percentile of the data. It is a measure of dispersion. Quartile deviation uses the difference of first and third quartile as a measure of dispersion.

### 3.6.4 Correlation analysis

Correlation analysis was done to describe the relationship between profile characteristics of respondents and level of adoption of new technologies. It is used to find out the degree of relationship between independent variables and dependent variable.

Significance of correlation coefficient was tested for 5 per cent and 1 per cent level of significance.

# CONCEPTUAL FRAMEWORK OF THE STUDY


**Figure : 1** Conceptual framework of the study

# *RESULTS AND DISCUSSIONS*

# CHAPTER IV

# RESULTS AND DISCUSSIONS

This session deals with results and discussions based on analysis and interpretation of data obtained from the study. The study was conducted in Thiruvananthapuram district involving ninety commercial banana growers, with thirty each from Kalliyoor, Vembayam and Vellanadu panchayaths. The results and discussion are presented keeping the objectives of the study in mind, under the following headings.

**4.1. Distribution of respondents according to their profile characteristics**

**4.2. Level of adoption of recommended practices**

**4.3. Relationship of level of adoption of recommended practices of respondents with their socio-psychological characteristics**

**4.4. Perceived usefulness and effectiveness of selected KAU banana technologies**

**4.5 Technology need assessment**

**4.6 ITK practices in banana cultivation**

**4.7 Constraints perceived by farmers**

**4.8 Suggestions for refinement of technologies in banana cultivation**

## 4.1 DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR PROFILE CHARACTERISTICS

Distribution of respondents according to the socio-economic profile characteristics are presented in this section.

### 4.1.1 Age

**Table 3.** Distribution of respondents according to age (n=90)

| Sl.no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Young (<35yrs) | 3 | 10 | 1 | 3 | 1 | 3 | 5 | 5.6 |
| 2 | Middle (35 -55yrs) | 21 | 70 | 15 | 50 | 17 | 57 | 53 | 58.9 |
| 3 | Old (>55yrs) | 6 | 20 | 14 | 47 | 12 | 40 | 32 | 35.5 |

F- Frequency

From Table 3 it was clearly evident that more than half of the respondents belonged to middle aged group, 35.5 per cent old aged and 5.6 per cent were found to be under young age.

It was noted that majority of respondents belonged to middle aged group whereas the younger group was only 5.6 per cent. The same trend was noticed in the distribution pattern of the respondents in all the three panchayaths. So it can be interpreted that the participation of youth in commercial banana cultivation is quite low.But the middle and old aged respondents have greater experience and knowledge in cultivation practices. So they can easily differentiate the pros and cons of new technologies and hopefully show better acceptance of new

technologies.However, majority of the respondents belonging to the middle age category is also on indication of relatively young farmers are not in agriculture when it comes to cultivation of recommended crops. But the result points to the fact that the youth should to be motivated to take active role in commercial banana cultivation.

This finding that majority of the farmers belonging middle age category is not in conformity with the finding of Thomas (2004). The results are in line with findings of Fayas (2003), Rakesh (2010) and Esakkimuthu (2012).

### 4.1.2 Education

**Table 4.** Distribution of respondents according to educational status

(n=90)

| Sl.no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Low | 11 | 36.7 | 10 | 33.3 | 8 | 26.6 | 29 | 32.3 |
| 2 | Medium | 16 | 53.3 | 13 | 43.3 | 11 | 36.7 | 40 | 44.4 |
| 3 | High | 3 | 10 | 7 | 23.4 | 11 | 36.7 | 21 | 23.3 |

F- Frequency

Data in Table 4 showed that majority of respondents had medium level of education followed by low level of education. Only 23 per cent of total respondents had high level of educational status. The result doesn't depicts that the medium level and low level of education is an indication that majority of the respondents are less educated. They may be ranging from high school level to professional degree. The results are in confirmation with the findings of Esakkimuthu (2012), Hanjabam (2013).

Kerala state has high literacy rate which reflects in the findings also. Nearly forty five per cent (44.4%) of the respondents had medium level of

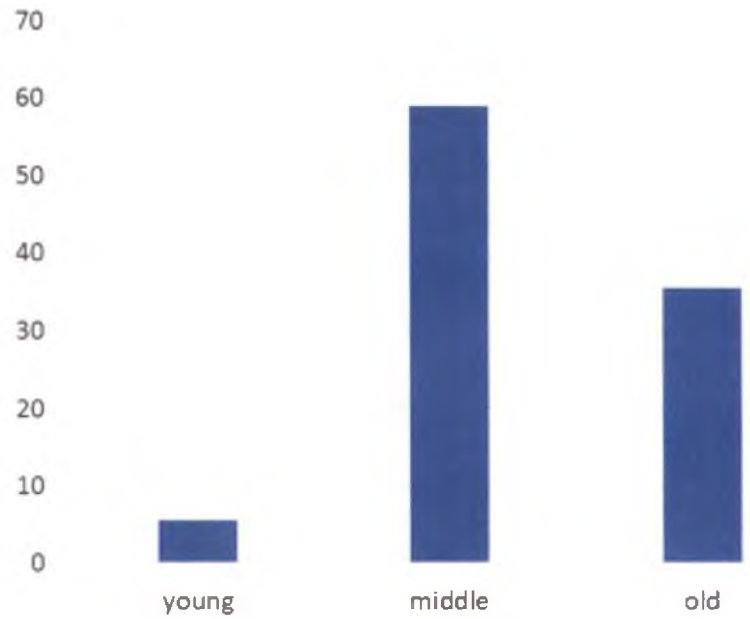



**Figure : 2** Distribution of respondents according to age

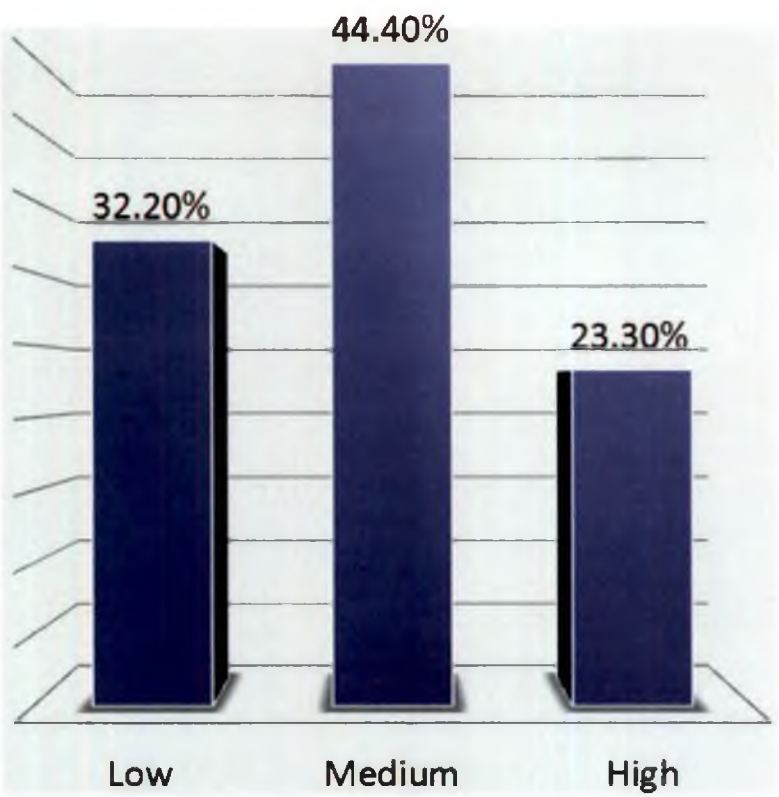



**Figure : 3** Distribution of respondents according to education

education. Though the representation of youth in commercial banana cultivation is low the educational status is found to be medium which is a desirable trend.

### 4.1.3 Farm size

**Table 5.** Distribution of respondents according to Farm size

(n= 90)

| Sl.no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | 0.5-1acre | 8 | 27 | 21 | 70 | 16 | 53.3 | 45 | 50 |
| 2 | 1.1-2acre | 15 | 50 | 3 | 10 | 5 | 16.7 | 23 | 25.6 |
| 3 | > 2acres | 7 | 23 | 6 | 20 | 9 | 30 | 22 | 24.4 |

F- Frequency

Distribution of respondents according to farm size is presented in Table 5. It reveals that fifty per cent of the respondents had 0.5-1acre of land followed by 25.6% of farmers having 1.1-2 acres of land and 24.4% of respondents with >2acres of land under cultivation.

More than half of the respondents had 0.5-1 acres of land under cultivation in Vembayam and Vellanadu. Fifty per cent of the respondents had 1.1-2 acres of land under cultivation in Kalliyoor. Thirty per cent of respondents had more than two acres of land under cultivation in Vembayam.

Banana being a remunerative crop its obvious that the scale of area of banana cultivation would be in the higher order.

The results are confirmation in with the findings of Ravikumar (2010) and Wase (2001).

### 4.1.4 Area under banana cultivation

**Table 6.** Distribution of respondents according to area under banana cultivation

(n=90)

| Sl.no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | 0.5-1acre | 13 | 43.3 | 24 | 80 | 21 | 70 | 58 | 64.4 |
| 2 | 1.1-2acre | 17 | 56.7 | 3 | 10 | 5 | 16.7 | 25 | 27.8 |
| 3 | >2acres | 0 | 0 | 3 | 10 | 4 | 13.3 | 7 | 7.8 |

F- Frequency

Data in Table 5 shows that 64.4 per cent of respondents had 0.5-1acre of land under banana cultivation followed by 27.8 per cent of respondents with 1.1-2acres of land. Only negligible per cent of farmers had more than two acres of land under banana cultivation.

One major thing observed in the Table 5 was that none of the respondent had more than two acres of land under banana cultivation in Kalliyoor. In the case of Vembayam the distribution of farmers in category 1.1-2 acres and >2 acres was equal (10%).

The results are in line with findings of Esakkimuthu (2012).

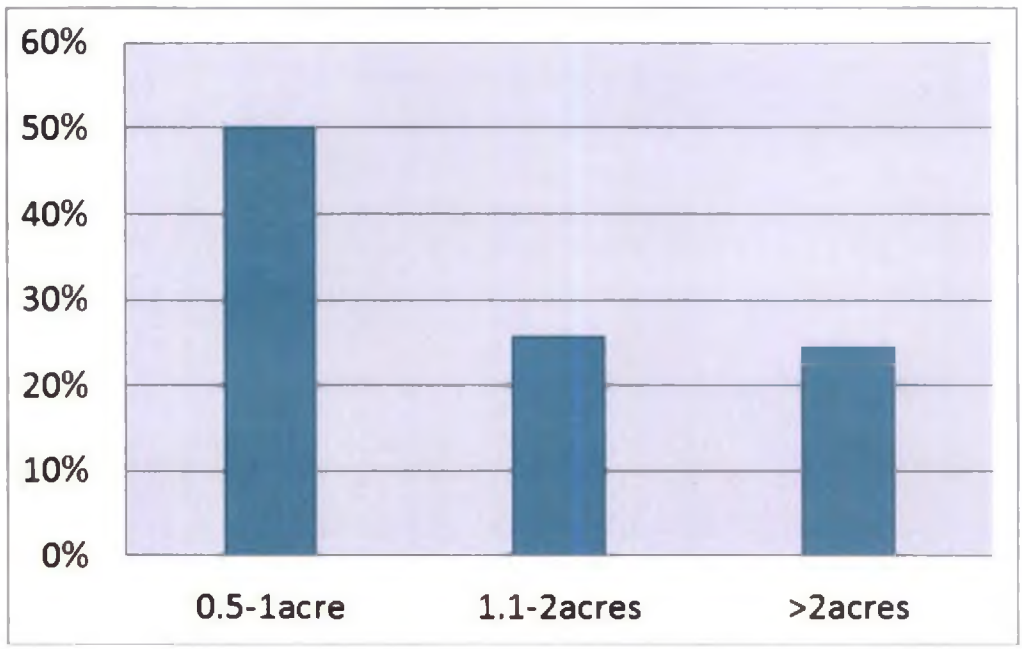



**Figure : 4** Distribution of respondents according to farm size

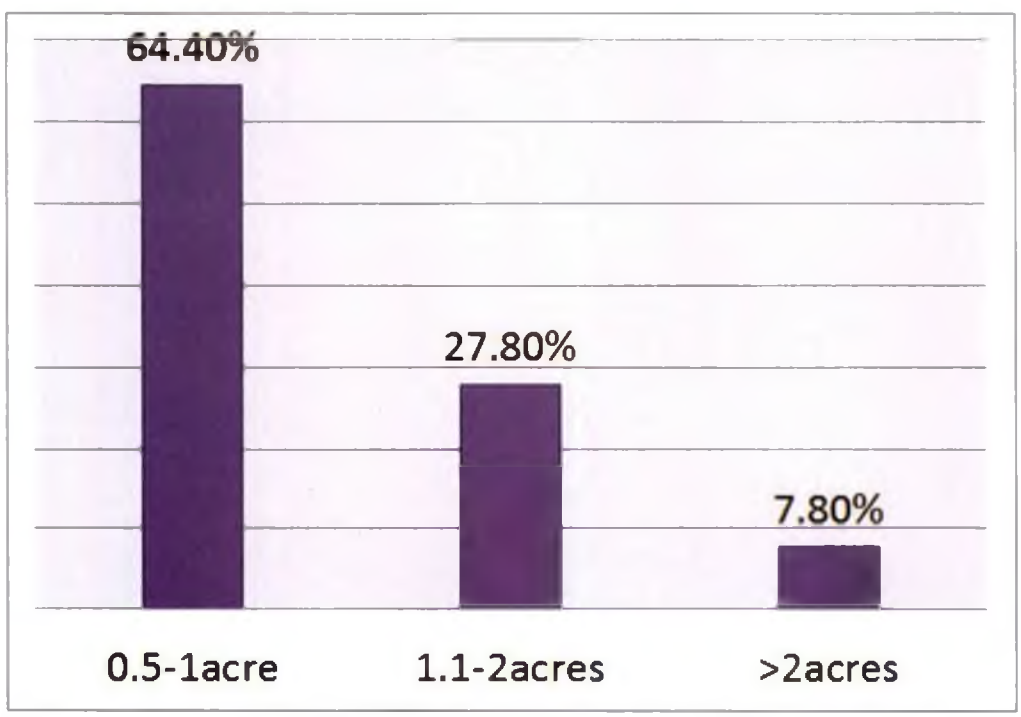



**Figure : 5** Distribution of respondents according to area under banana cultivation

### 4.1.5 Risk orientation

**Table 7.** Distribution of respondents according to risk orientation

(n=90)

| Sl.n | Category | Kalliyoor (N=30) | | Vembaya m (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Low(< Q1) | 6 | 20 | 3 | 10 | 7 | 23.3 | 16 | 17.8 |
| 2 | Medium (Q1-Q3) | 18 | 60 | 20 | 66.7 | 14 | 46.7 | 52 | 57.8 |
| 3 | High(>Q3) | 6 | 20 | 7 | 23.3 | 9 | 30 | 22 | 24.4 |

F- Frequency

Q1 = 12 Q3 = 16.25

Value ranges from 9 – 23

It was clearly evident from Table 7 that more than half of respondents (57.8%) had medium level of risk orientation followed by 24.4 per cent with high level of risk orientation. Only 17.8 per cent had low level of risk orientation.

Risk orientation refers to degree to which farmer is oriented towards encountering risk and uncertainity in adopting new ideas in farming. Since majority of the respondents have fairly good orientation towards risk which is desirable and quite promising, there is also chance for improving the adoption.

The remunerative nature of the crop incites the farmers to understand the various risk associated with the crop management and take precautionary methods to avoid the risk.

Similar result were reported by Fayas (2003), Thangaraja (2008), and Hanjabam (2013) in their respective studies.

### 4.1.6 Innovativeness

**Table 8.** Distribution of respondents according to innovativeness (n=90)

| Sl.no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Low (< 2) | 1 | 3.3 | 0 | 0 | 2 | 6.7 | 3 | 3.3 |
| 2 | Medium (2-3) | 22 | 73.3 | 21 | 70 | 21 | 70 | 64 | 71.1 |
| 3 | High (> 2) | 7 | 23.3 | 9 | 30 | 7 | 23.3 | 23 | 25.6 |

From Table 8, it was clear that 71.1per cent of farmers had medium level of innovativeness followed by 25.6 per cent of respondents with high level of innovativeness. Only 3.3 per cent of farmers had low level of innovativeness. In vembayam panchayath there were no farmers with low innovativeness, which is very desirable and striking.

Innovativeness is operationalised as degree to which a respondent is earlier in adopting an innovation. Most of the commercial banana growers were influenced by success stories of nearby farmers. Monetary and technical assistance given by *Sanghamythri*, a farmer's group Mithranikethan, NGO and Krishibhavan have also encouraged them a lot. This is actually a desirable trend in the adoption behaviour. So we can conclude that it is an encouraging process.

The results are contradictory to the results observed by Esakkimuthu (2012) who observed that majority of the respondents (93.3%) had high level of

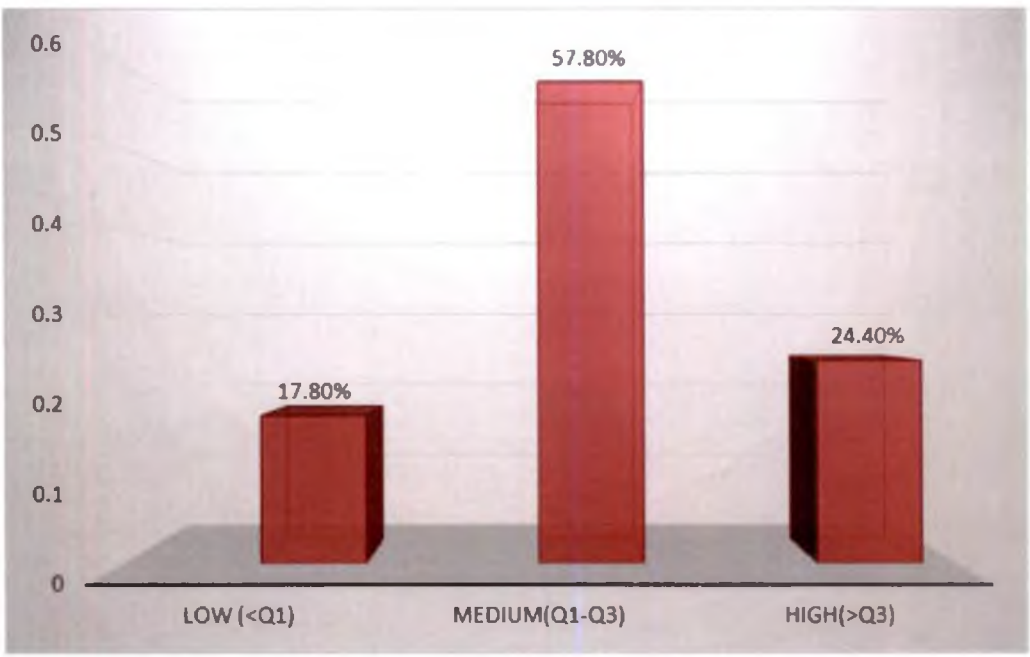



**Figure : 6** Distribution of respondents according to risk orientation

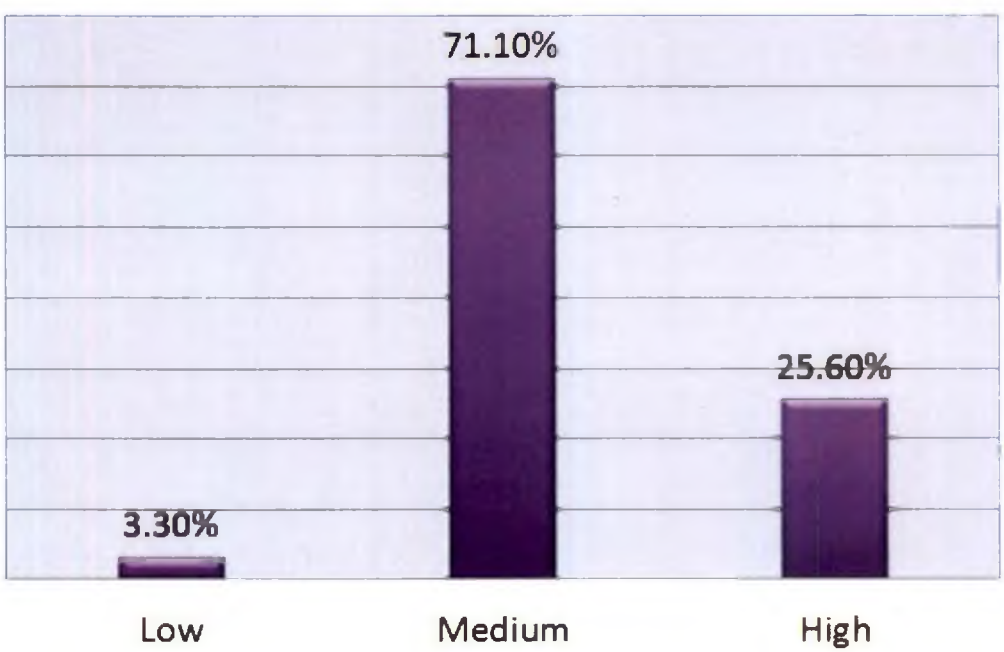



**Figure : 7** Distribution of respondents according to innovativeness

innovativeness. But here in this study also only 3.3 per cent belonged to low category.

### 4.1.7 Economic motivation

**Table 9.** Distribution of respondents according to economic motivation

(n=90)

| Sl. no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Low | 1 | 3.3 | 7 | 23.3 | 6 | 20 | 14 | 15.5 |
| 2 | Medium | 22 | 73.3 | 18 | 60 | 21 | 70 | 61 | 67.8 |
| 3 | High | 7 | 23.3 | 5 | 16.7 | 3 | 10 | 15 | 16.7 |

F- Frequency

Low-<(mean-S.D) Mean =20.21 S.D = 5.13

Medium- between (mean-S.D) and (mean+S.D)

High- >(mean+S.D)

Value ranges from 10 – 32

From Table 9, it was clear that more than half of the respondents (67.8%) had medium level of economic motivation. Rest of 16.7 per cent had high level and 15.5 per cent had low level of economic motivation.

Majority of the respondents had medium level of economic motivation which is in line with the findings of Fayas (2003), Thangaraja (2008)and Hanjabam (2013).

Economic motivation is operationalised as extent to which the respondent is oriented towards profit maximization and relative value he or she plays on monetary gains. In Kalliyoor farmers economic motivation is found to be high (medium and high group). This may be due to the existence of VFPCK- market and *Sanghamythri* which provides assured market for the produce. High level of

economic motivation prompts the commercial banana growers to perform efficiently thereby increasing returns from banana cultivation.

### 4.1.8 Credit orientation

**Table 10.** Distribution of respondents according to credit orientation

( n=90)

| Sl. no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Low (<Q1) | 3 | 10 | 2 | 6.7 | 2 | 6.7 | 7 | 7.8 |
| 2 | Medium (Q1-Q3) | 14 | 46.7 | 21 | 70 | 9 | 30 | 44 | 48.9 |
| 3 | High (>Q3) | 13 | 43.3 | 7 | 23.3 | 19 | 63.3 | 39 | 43.3 |

F- Frequency

Q1 = 7 Q2 = 9

Value ranges from 7 – 12

Distribution of respondents according to their credit orientation as presented in the Table 10 reveals that 48.9 per cent of respondents had medium level of credit orientation followed by 42.2 per cent with high level. Very little part of respondents (7.8%) had low level of credit orientation.

Credit orientation refers to orientation to avail credit by the respondents. Results implicated that there is increased use of capital through credit borrowing for banana cultivation.

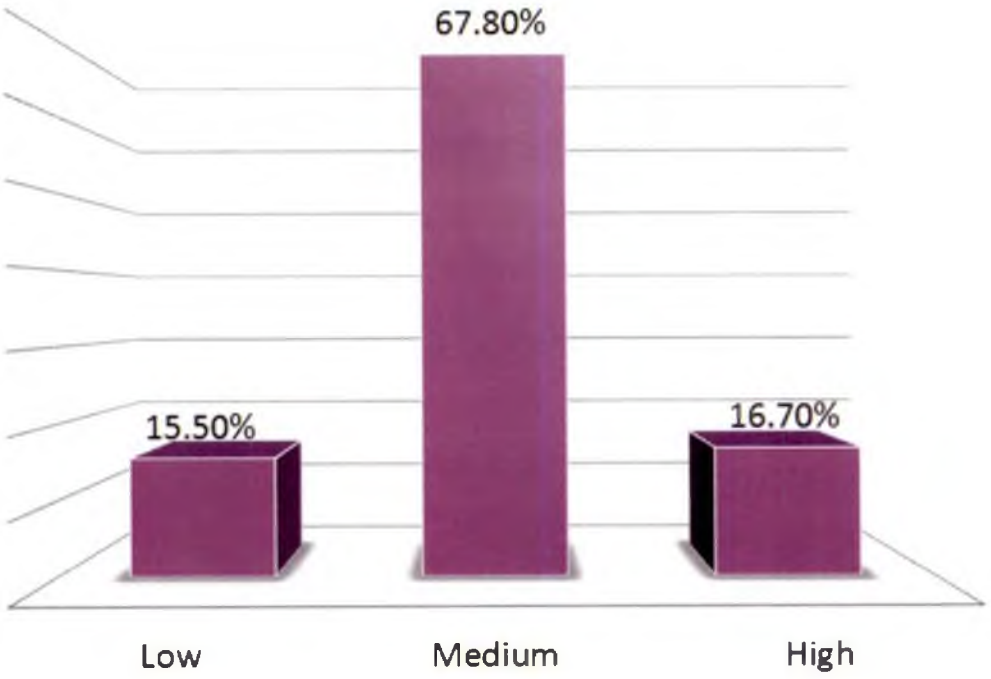



**Figure : 8** Distribution of respondents according to economic motivation

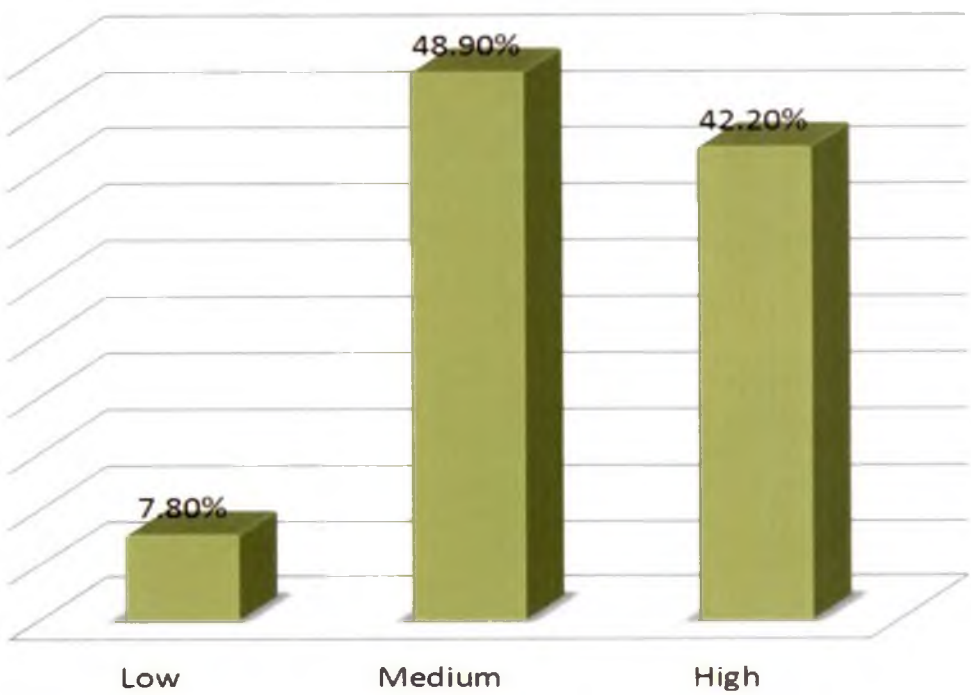



**Figure : 9** Distribution of respondents according to credit orientation

Government credit linked mechanism and subsidy component for banana cultivation by State Horticulture Mission has a positive effect on medium to high level of credit orientation of banana growers.

This finding was in agreement with that of Esakkimuthu (2012).

### 4.1.9 Extension contact

**Table 11.** Distribution of respondents according to extension contact

( n=90)

| Sl. no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Low (<Q1) | 9 | 30 | 11 | 36.7 | 2 | 6.7 | 22 | 24.4 |
| 2 | Medium (Q1-Q3) | 14 | 46.7 | 15 | 50 | 15 | 50 | 44 | 48.9 |
| 3 | High (>Q3) | 7 | 23.3 | 4 | 13.3 | 13 | 43.3 | 24 | 26.7 |

F- Frequency

Q1=2.75 Q3=7

Range 1 – 13

Perusal of Table 11 indicated that majority of farmers (48.9%) had medium level of extension contact. About twenty six per cent of the respondents had high level of extension contact followed by 24.4% of farmers with low level of extension contact.

Extension contact refers to degree of contact of respondents with various agricultural professionals. In Kalliyoor most of the respondents depended on *Sanghamythri* for improved agricultural practice rather than agricultural officer.

Most of the farmers in Vellanadu were continuously contacting with scientists in Mithranikethan also. This might be reason for higher extension contact observed in Vellanadu.

The result are in conformity with the findings of Hanjabam (2013).

### 4.1.10 Market perception

**Table 12.** Distribution of respondents according to market perception

(n=90)

| Sl.no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Low (<4.01) | 20 | 66.7 | 14 | 46.7 | 16 | 53.3 | 50 | 55.6 |
| 2 | High (>4.01) | 10 | 33.3 | 16 | 53.3 | 14 | 46.7 | 40 | 44.4 |

F- Frequency

Mean = 4.01

From Table 12 it was clear that majority of farmers (55.6%) had low market perception followed by 44.4 per cent with high market perception. In Kalliyoor (66.6%) and Vellanadu (53.3%), majority of respondents had low market perception. But in the case of Vembayam most of the farmers (53.3%) had high market perception.

Market perception refers to degree to which a farmer is oriented towards market in terms of demand and price of his produce. Majority of respondents didn't have adequate and updated market information. In Vembayam there are shops exclusively trading banana which might have influenced the market perception of farmers in that locality. This could be the reason for higher market perception of Vembayam farmers.

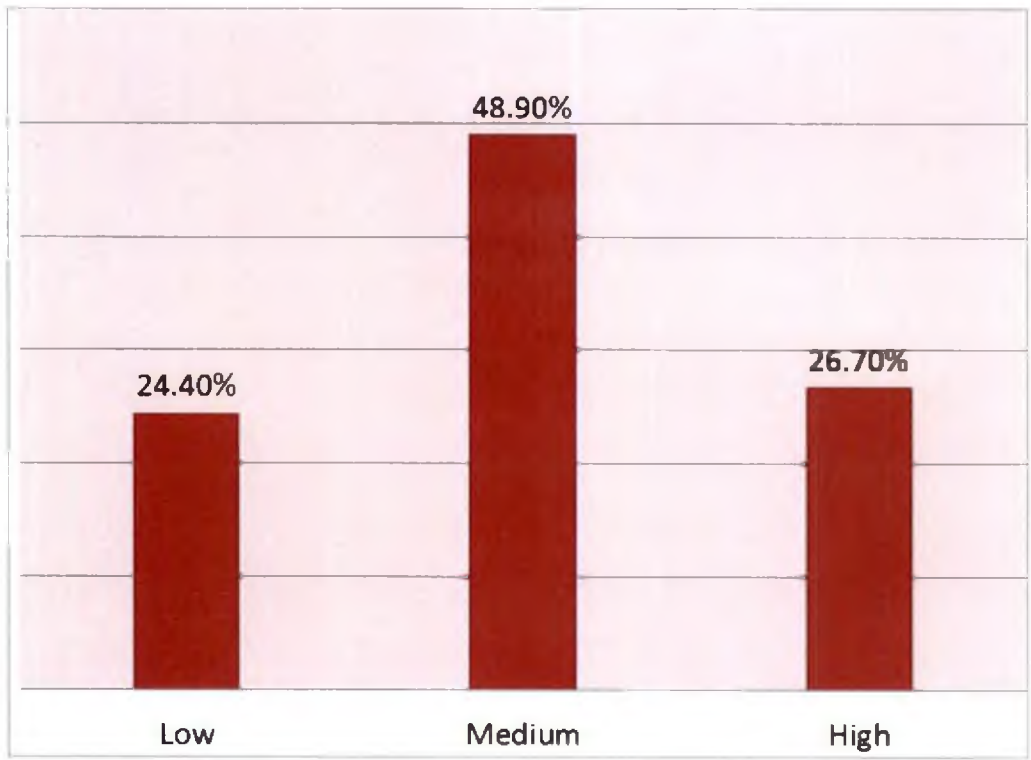



**Figure : 10** Distribution of respondents according to extension contact

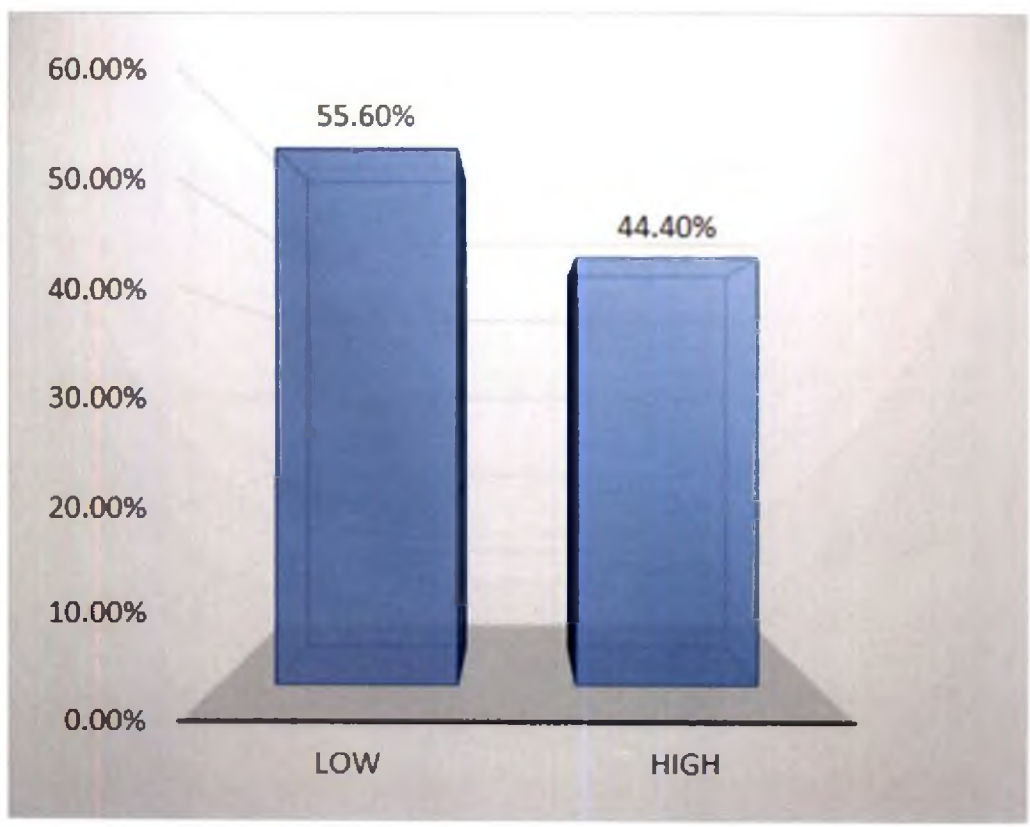



**Figure : 11** Distribution of respondents according to market perception

This finding was agreement with Suthan (2003),Fayaz (2003) and Jaganathan (2004).

### 4.1.11 Experience in banana cultivation

**Table 13.** Distribution of respondents according to experience in banana cultivation (n=90)

| Sl No. | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | <5 years | 4 | 13.3 | 3 | 10 | 2 | 6.7 | 9 | 10 |
| 2 | 6-10 years | 8 | 26.7 | 9 | 30 | 12 | 40 | 29 | 32.2 |
| 3 | 11-15 years | 4 | 13.3 | 3 | 10 | 2 | 6.7 | 9 | 10 |
| 4 | 16-20 years | 6 | 20 | 5 | 16.7 | 6 | 20 | 17 | 18.9 |
| 5 | >20 years | 8 | 26.7 | 10 | 33.3 | 8 | 26.7 | 26 | 28.9 |

F- Frequency

From Table 13, it was clear that majority of respondents (32.2%) had 6-10years of experience followed by 28.9% of respondents with more than twenty years of experience. About eighteen per cent of respondents had 16-20 years of experience in banana cultivation.

Majority of respondents were traditionally banana growers.Moreover majority of the respondents belonging to middle age or old age category implies that farmers were cultivating banana for a quiet long time. So they have rich experience in banana cultivation which is similar to finding of Esakkimuthu (2012) and Hassan (2016) and Jacob (2015).

### 4.1.12 Trainings undergone

**Table 14.** Distribution of respondents according to training attended

(n=90)

| Sl.No | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | No training | 2 | 6.7 | 13 | 43.3 | 7 | 23.3 | 22 | 24.4 |
| 2 | One training | 19 | 63.3 | 6 | 20 | 10 | 33.3 | 35 | 38.9 |
| 3 | Two trainings | 4 | 13.3 | 6 | 20 | 8 | 26.7 | 18 | 20 |
| 4 | >2 training | 5 | 16.7 | 5 | 16.7 | 5 | 16.7 | 15 | 16.7 |

F- Frequency

Data in Table 14 revealed that majority of respondents (38.9%) attended one training. About twenty four per cent of farmers didn't get any training. Twenty per cent of respondents got two training followed by 16.7 per cent of respondents having attended more than two trainings.

In Kalliyoor and Vellanadu, majority of farmers got at least one training. These two survey area had fairly good extension contact also. So that farmers were aware about importance of training, as well as the conduct of training which might have prompted them to attend such trainings. Similar trend was reported by Meera (2001), the extension system effectiveness in organising such extension programme is the reason for majority of the farmers (75.6%) attending at least one training. This also implies the effective functioning of agricultural offices of the region of study.

The result was in contrast with finding of Esakkimuthu (2012) and Hanjabam (2013).

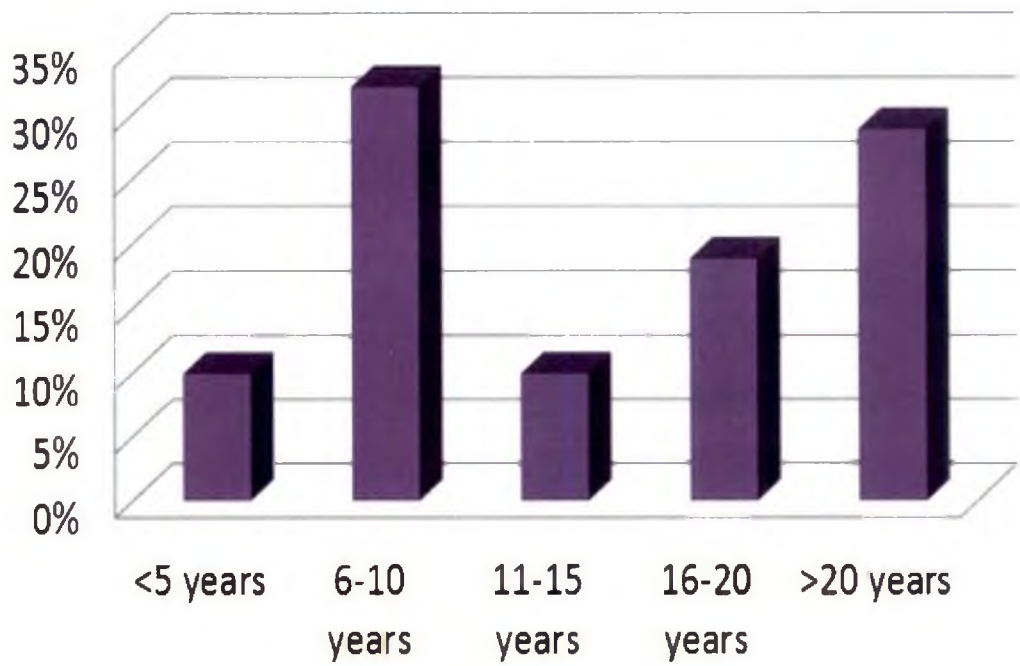



**Figure : 12** Distribution of respondents according experience in banana cultivation

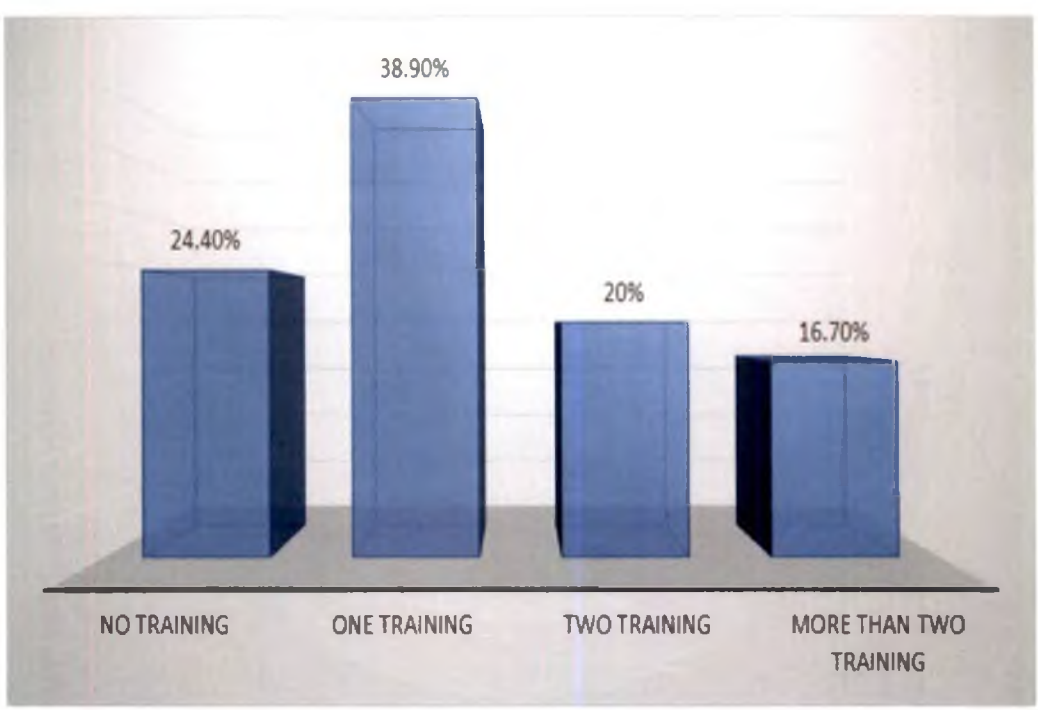



**Figure : 13** Distribution of respondents according to trainings undergone

### 4.1.13 Information source utilization pattern

**Table 15.a.** Distribution of respondents according to information source utilization pattern (n=90)

| Sl No | Sources | F | % |
|---|---|---|---|
| **Media Sources** | | | |
| 1 | Television | 82 | 91.1 |
| 2 | Radio | 25 | 27.8 |
| 3 | Print media | 85 | 94.4 |
| **Interpersonal sources** | | | |
| 1 | Scientists | 48 | 53.3 |
| 2 | Department officials | 67 | 74.4 |
| 3 | Fellow farmer | 73 | 81.1 |
| **Institutions** | | | |
| 1 | KrishiBhavan | 67 | 74.4 |
| 2 | Research stations | 32 | 35.6 |
| 3 | NGO | 36 | 40 |
| 4 | ICAR institutes | 5 | 5.6 |
| 5 | SHG | 22 | 24.4 |
| 6 | Private agencies | 12 | 13.3 |
| 7 | VFPCK | 46 | 51.1 |
| **ICT sources** | | | |
| 1 | Web portals | 16 | 17.8 |
| 2 | Kiosk | 3 | 3.3 |
| 3 | Other online publications | 5 | 5.6 |

F- Frequency

Table 15.a revealed that most commonly used information source is print media (94.4%) followed by television (91.1%). The results that the majority of the

respondents use print media for information source also related to the high percentage of literacy rate that suit in Kerala. This result is inline with findings of Hassan (2016). Fellow farmers (81.1%) were playing an important role in information exchange followed by department officials (74.4%). These are interpersonal source of information. Among the various institutions, Krishibhavan (74.4%) and VFPCK (51.1%) were the major sources of information for the commercial banana growers. Farmers were not aware about the ICT sources, which is reflected in the low use of web portals, Kiosk and other online publications by them.

**Table 15.b.** Distribution of respondents according to information source utilization pattern (n=90)

| Sl.no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Low (<Q1) | 6 | 20 | 9 | 30 | 4 | 13.3 | 19 | 21.2 |
| 2 | Medium (Q1-Q3) | 18 | 60 | 17 | 56.7 | 14 | 46.7 | 49 | 54.4 |
| 3 | High (>Q3) | 6 | 20 | 4 | 13.3 | 12 | 40 | 22 | 24.4 |

F- Frequency

Q1=15, Q3=21

It is evident from Table 15.b. that 54.4 per cent of respondents had medium level of information source utilization followed by 24.4 per cent with high level and 21.1 per cent with low level of information source utilization.

Information source utilization refers to sources from which farmers receive various information related to agriculture. The commercial banana

growers had regular access to newspapers, journals, television and contacts with fellow farmers, which might be reason for observed result. This finding was in line with that of Sobha (2013) and Bhavya (2008) but in contradiction with Palanisamy (2011) where the respondents had higher level of information sourceutilization.

### 4.1.14 Extent of commercialization

**Table 16.** Distribution of respondents according to extent of commercialization

(n=90)

| Sl No. | Farmholds categorized by market pathway | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Domestic Marketing | 15 | 50 | 27 | 90 | 20 | 66.7 | 62 | 68.9 |
| 2 | Export oriented marketing | 0 | 0 | 2 | 6.7 | 0 | 0 | 2 | 2.2 |
| 3 | Both domestic & export oriented marketing | 15 | 50 | 1 | 3.3 | 10 | 33.3 | 26 | 28.9 |

F- Frequency

Data in Table 16 showed that 68.9 per cent of farmers sold their products in domestic market followed by 28.9 per cent selling in both domestic and export oriented market. Only 2.2 per cent had export oriented marketing.

Commercialization refers to extend to which farmer is intending farming for commercial purpose. One thing that has to be highlighted is that two persons of Vembayampanchayath were entirely concentratingon export oriented marketing which is very encouraging. Most of the respondents concentrated on

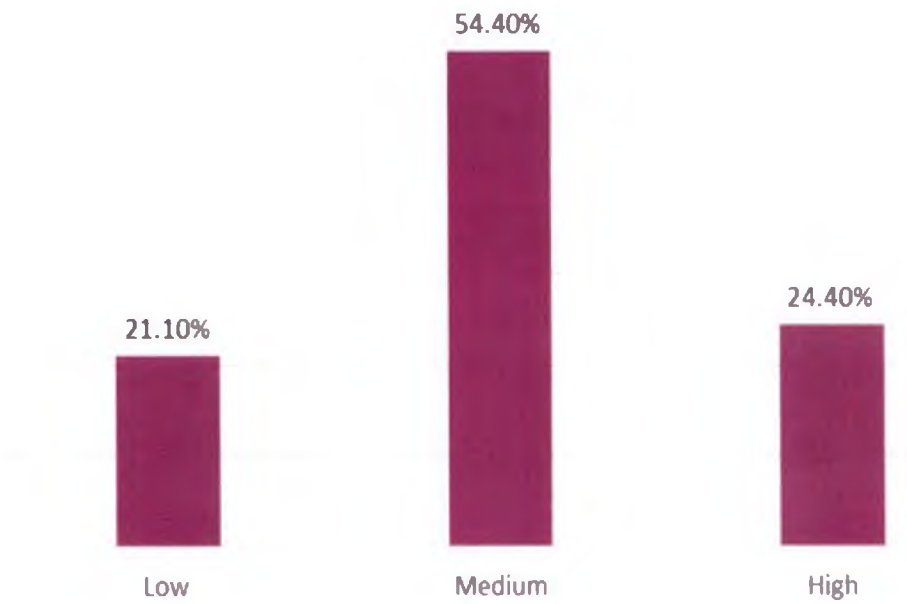



**Figure : 14** Distribution of respondents according to information source utilization

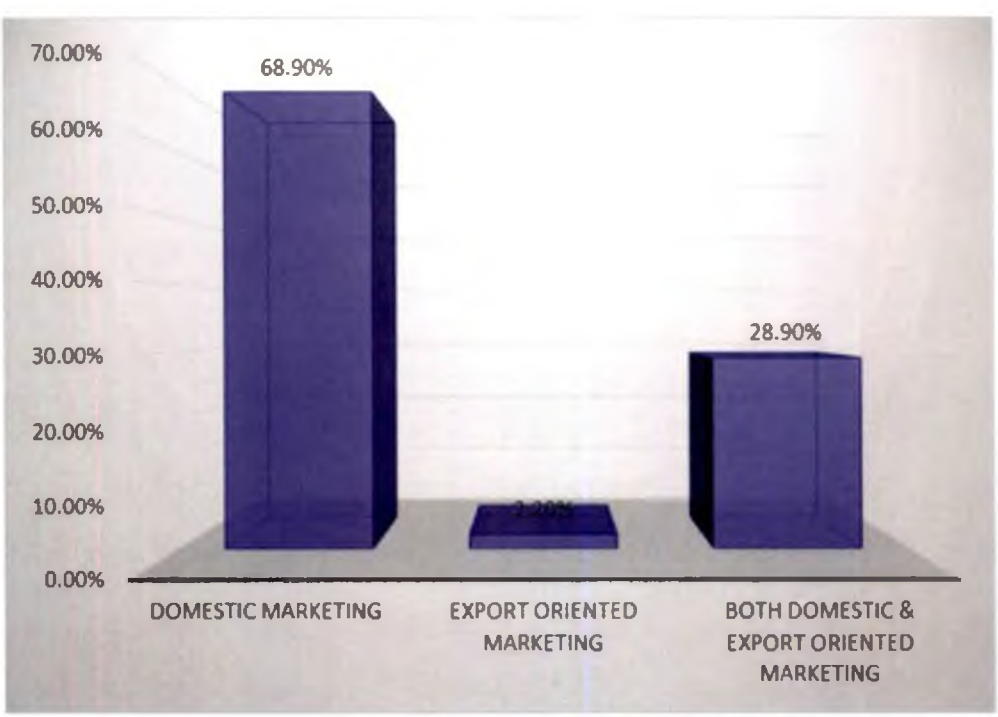



**Figure : 15** Distribution of respondents according to extent of commercialization

domestic marketing. Lack of awareness and knowledge about export markets could be the reason for lesser involvement in exporting. Efforts need to be taken to create awareness among farmers about the scope of export oriented marketing.

### 4.1.15 Attitude of farmers towards scientific technologies

**Table 17.** Distribution of respondents according to attitude of farmers towards scientific technologies (n=90)

| Sl.no | Category | Kalliyoor (N=30) | | Vembayam (N=30) | | Vellanadu (N=30) | | Total(90) | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Low | 5 | 16.7 | 2 | 6.7 | 7 | 23.3 | 14 | 15.6 |
| 2 | Medium | 20 | 66.6 | 21 | 70 | 17 | 56.7 | 58 | 64.4 |
| 3 | High | 5 | 16.7 | 7 | 23.3 | 6 | 20 | 18 | 20 |

F- Frequency

Mean =48.7S.D = 8.02

Value ranges from 28 – 66

Low- <(mean-S.D)

Medium- between (mean-S.D) and (mean+S.D)

High- >(mean+S.D)

Table 17 clearly evidence that 64.4 per cent of farmers had favourable and medium attitude towards new technologies followed by 20 per cent with high attitude and 15.6 per cent with low attitude towards scientific technologies.

The awareness about scientific banana cultivation practices might have led them to develop an interest towards commercial banana cultivation. The results born out of the success stories of the fellow farmers and the profit made by them along with the financial assistance given by different agencies and the active participation of agricultural officers along with the farmers proved the worthiness of commercial banana cultivation. Similar trend was reported by Hanjabam (2013). But the result observed are contradictory to the observations report by Wase (2001).

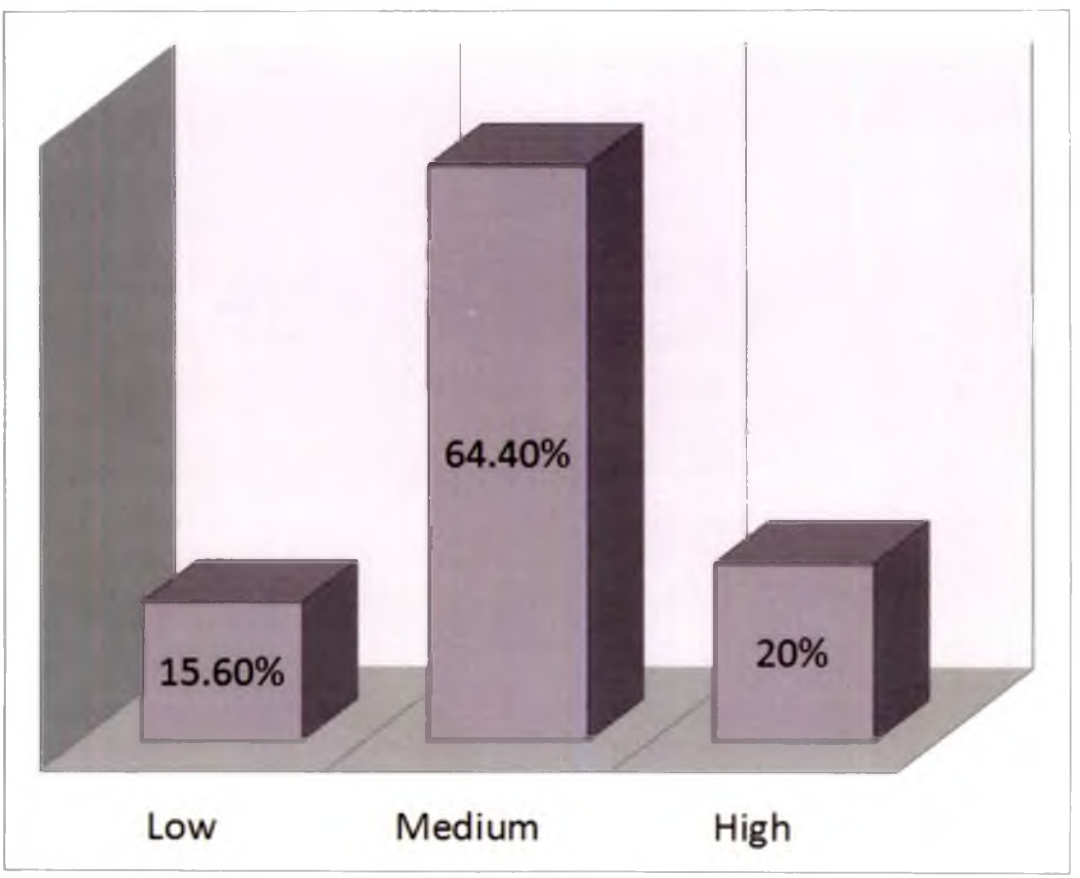



**Figure : 16** Distribution of respondents based on attitude of farmers towards new technologies

## 4.2 Level of adoption of recommended practices

The level of adoption of recommended KAU practices in banana cultivation by commercial banana growers are presented and described which brought out the percentage of banana growers who have high, medium and low level of adoption in recommended practices. Farmer respondents were categorized to different adopter categories as explained by Rogers(1982).

**Table 18.** Distribution of respondents based on their adoption of recommended practices in banana cultivation. (n=90)

| Sl.No | Category | Kalliyoor | | Vembayam | | Vellanadu | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Low | 5 | 16.7 | 8 | 26.7 | 0 | 0 | 13 | 14.4 |
| 2 | Medium | 22 | 73.3 | 19 | 63.3 | 25 | 83.3 | 66 | 73.3 |
| 3 | High | 3 | 10 | 3 | 10 | 5 | 16.7 | 11 | 12.2 |

F- Frequency

Over all adoption quotient (mean) =31.82

S.D = 11.35

Adoption quotient of each respondent ranges from 12.28 – 57.9

Low- <(mean-S.D)

Medium- between (mean-S.D) and (mean+S.D)

High- >(mean+S.D)

Data in Table 18 illustrates distribution of commercial banana growers based on the level of adoption of recommended KAU practices.

From the study of adoption of KAU practices on banana cultivation it could be observed that majority of them (73.3%) had medium level of adoption. Moreover 14.4 per cent of them had low level followed by 12.2 per cent with high level of adoption.

Probably the awareness about the possibilities, profitability and positive attitude would have motivated the farmers to adopt scientific practices in banana cultivation to medium level of adoption. The positive trend towards scientific

practices by majority of the respondents was their favourable attitude and good awareness about new scientific practices.

The reasons for majority of respondents having medium level of adoption category might be their medium level of risk orientation (57.8%), innovativeness (71.1%), economic motivation (67.8%), credit orientation (48.9%), extension contact (48.9%), information source utilization (54.4%) and attitude towards new technologies (64.4%). The finding was in agreement with Esakkimuthu (2012), Bennur *et. al* (2015) and Sujitha (2015).

**Table 19.** Distribution of respondents based on adopter categories (n=90)

| Sl.no. | Category | F | % |
|---|---|---|---|
| 1 | Innovators | 1 | 1.10 |
| 2 | Early adopters | 12 | 13.30 |
| 3 | Early majority | 32 | 35.50 |
| 4 | Late majority | 31 | 34.40 |
| 5 | Laggards | 15 | 15.70 |

F- Frequency

Table 19 depicted that there were 1.1 per cent innovators 13.3 per cent early adopters 35.5 per cent early majority 34.4 per cent late majority and 15.5 per cent laggards. There was slight variation from standard Roger's curve which is depicted in figure 4. More variations are found in innovators and early majority. As per standard Roger's curve, 2.5 per cent innovators and 34 per cent of early majority will be there normally. But in this study only 1.1 per cent innovators and 35.5 per cent early majority present. Even though the adoption curve moreover follows the standard pattern, 1.1 per cent respondents falling in the innovator category implies that innovators are less among the banana growers. Hence there needs to be extension programmes planned and implemented exclusively for banana growers focus up mainly on late majority and laggards, so as to enable overall adoption. This will naturally bring more farmers in innovators, early adopters and early majority category.

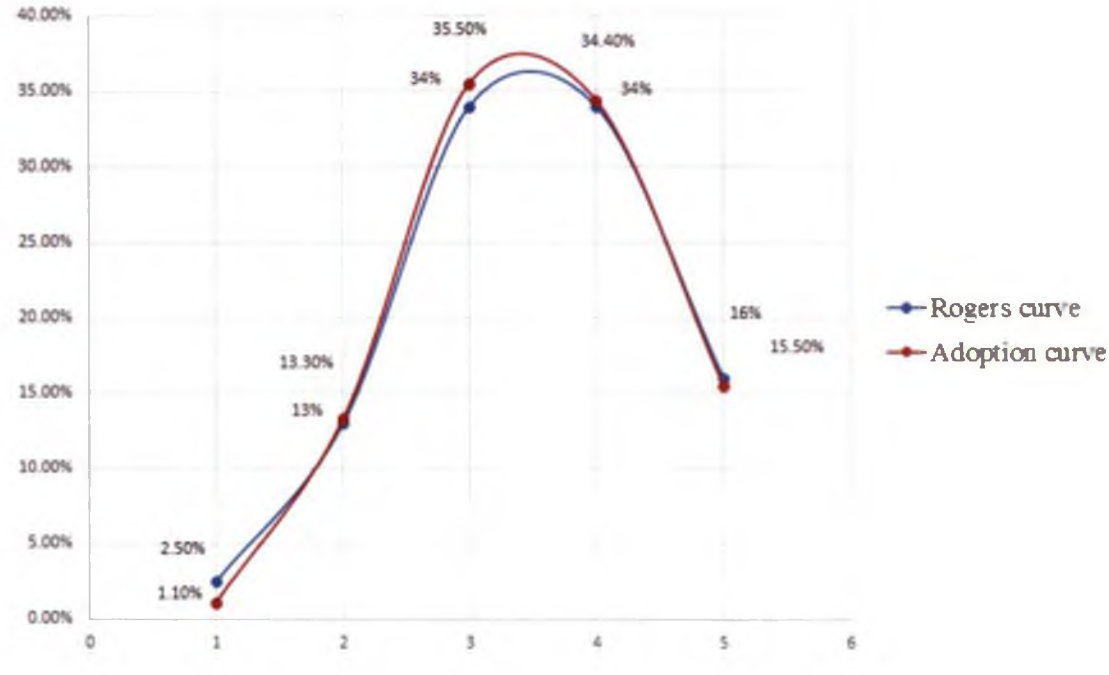



**Figure : 17** Adoption curve

### 4.2.1 Adoption of production practices

**Table 20.** Distribution of respondents based on adoption of production practices

(n=90)

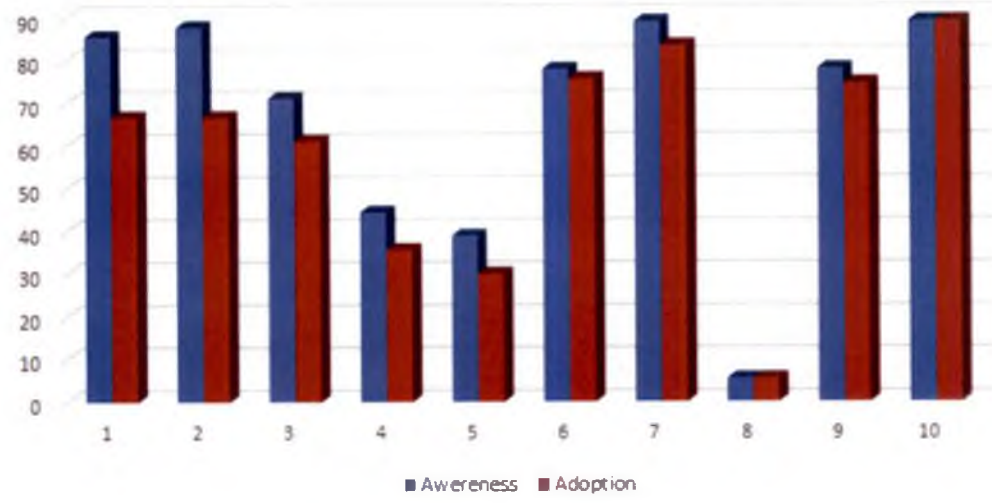
| Sl. no | Practices | Awareness | | Adoption | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 1 | Selection of 3-4 month old disease free sword suckers. | 77 | 85.6 | 60 | 66.7 |
| 2 | Treatments of suckers smeared with cowdung solution and ash and dried in sun for about 3-4 days. | 79 | 87.8 | 60 | 66.7 |
| 3 | Plant suckers upright in the centre of pits with 5cm pseudostem remaining above soil level. | 64 | 71.1 | 55 | 61.1 |
| 4 | Spacing 2m x 2m. | 40 | 44.4 | 32 | 35.6 |
| 5 | Fertilizer recommendation 190:115:300. | 35 | 38.9 | 27 | 30 |
| 6 | Intercropping with cucumber and amaranthus. | 70 | 77.8 | 68 | 75.6 |
| 7 | Propping | 80 | 88.9 | 75 | 83.3 |
| 8 | Pre harvest bunch sprays of 3% $K_2 SO_4$. | 5 | 5.5 | 5 | 5.5 |
| 9 | Bunch covering | 70 | 77.8 | 67 | 74.4 |
| 10 | 6-10 irrigations per crop | 80 | 88.9 | 80 | 88.9 |

F- Frequency

Perusal of Table 20 revealed the comparison of awareness and adoption of each production practices. Wide variation in awareness and adoption was found in selection of sword suckers and paring and prolinage. More than 85 per cent of respondents were aware about these two practices. But only 66.7 per cent of respondents actually adopted in the field. Farmers were making use of ready made planting material from market for cultivation. So they were not actually selecting sword suckers or practicing paring and prolinage directly. About 71.1 per cent of farmers were aware about method of planting in pits, but only 61.1 per cent actually adopted it in the field because majority opined that easy bud initiation is

possible when suckers are planted in pits with more tilt. About 44 per cent of respondents were aware about spacing, but only 35.6 per cent adopted it. This is because of they got higher yield when practicing lesser spacing. They can accommodate more number of plants in lesser spacing. There desperate in the level of awareness and adoption shows that measures are to be taken up by the Agricultural officers.

When it comes to awareness about fertilizer recommendation 38.9 per cent were aware about it but only 30 per cent adopted in the field. The decrease in percentage of adoption is because most of them use organic fertilizers in the field instead of chemical fertilizers. It also indicates the need for creation of awareness among farmers about chemical fertilizer application. Intercropping with cucumber and amaranthus is done by 75.6 per cent farmers but 77.8 per cent had awareness about this practice. Propping is a method of giving support to banana plant to overcome lodging by wind and 88.9 per cent farmers were aware about propping and 83.3 per cent farmers adopted propping. But most of the farmers can't afford the price of the support used in popping. Bunch covering is practiced by 74.4 per cent farmers and 77.8 per cent were aware about the method. One striking observation made is in case of pre harvest bunch spraying with 3 per cent $K_2SO_4$,only 5.5 per cent of the farmers aware about this which points to the need for creation of awareness among farmers about this practice. But in this case as well as in case of irrigation those who were aware were found to be adopting it. Hassan (2016) also observed adoption gap is to be high in the case of intercropping and application of micronutrients.




| | |
|---|---|
| 1 | Selection of 3-4 month old disease free sword suckers. |
| 2 | Treatments of suckers smeared with cowdung solution and ash and dried in sun for about 3-4 days. |
| 3 | Plant suckers upright in the centre of pits with 5cm pseudostem remaining above soil level. |
| 4 | Spacing 2m*2m. |
| 5 | Fertilizer recommendation 190:115:300. |
| 6 | Intercropping with cucumber and amaranthus. |
| 7 | Propping |
| 8 | Pre harvest bunch sprays of 3% K2SO4. |
| 9 | Bunch covering |
| 10 | Irrigation |

**Figure : 18** Awareness and adoption of production practices

### 4.2.2 Adoption of plant protection practices

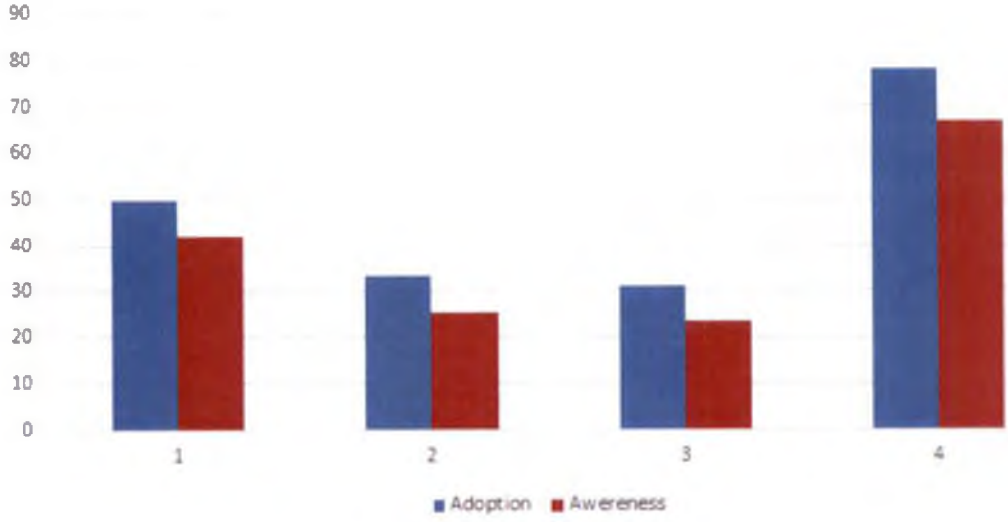
**Table 21.** Distribution of respondents according to adoption of plant protection practices (n=90)

| Sl.no | Practices | Awareness | | Adoption | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 1 | Spray 1% Bordeaux mixture soon after the appearance of the initial symptoms of the **leaf spot.** | 45 | 50 | 38 | 42.2 |
| 2 | Set traps using pseudostem of approximately 0.5m length, which are split length wise and laid in the field for controlling **rhizome weevil.** | 30 | 33.3 | 23 | 25.5 |
| 3 | Apply quinalphos 0.05% or chlorpyrifos 0.03% for controlling **pseudostem weevil.** | 28 | 31.1 | 21 | 23.3 |
| 4 | Use disease free planting material for controlling viral diseases like banana bunchy top | 70 | 77.7 | 60 | 66.6 |

F- Frequency

From the Table 21 we could interpret that 50 per cent of respondents were aware about the chemical control of leaf spot but only 42.2 per cent adopted this practice. The percentage of farmers who were aware about pseudo stem trap for controlling rhizome weevil was 33.3 per cent and 25.5 per cent adopted this method. The low awareness about trap for checking pseudostem weevil points to the need for creating awareness about it among farmers. Control of pseudo stem weevil was done by 23.3 per cent but 31.1 per cent had awareness. Nearly 78 per cent of respondents were aware about the control of diseases like banana bunchy top and 66.6 per cent were controlling it by using disease free planting material.

Here we can see there is a wide gap between awareness and adoption because in farmer's opinion chemical control of pests and diseases are not




| | |
|---|---|
| 1 | Spray 1% Bordeaux mixture soon after the appearance of the initial symptoms of the **leaf spot.** |
| 2 | Set traps using pseudostem of approximately .5m length, which are split length wise and laid in the field for controlling **rhizome weevil.** |
| 3 | Apply quinalphos 0.05% or chlorpyrifos 0.03% for controlling **pseudo stem weevil.** |
| 4 | Use disease free planting material for controlling viral diseases like banana bunchy top |

**Figure : 19** Awareness and Adoption of plant protection practices

sustainable. It also implies that programmes like Front LineDemonstration and training need to be taken to field level,so that farmer can be made aware of scientific practices, made to understand the importance of it by proving the worthiness of scientific practices in farmer's field. Thusthrough FLD's the awareness and adoption gap can be reduced or bridged The findings are contradictory to the reports of Bennur *et. al* (2015) and Sujitha (2015) who reported medium level of adoption in plant protection practices.

### 4.2.3 Adoption of tissue culture banana cultivation

**Table 22.** Distribution of respondents according to adoption of tissue culture banana cultivation (n=13)

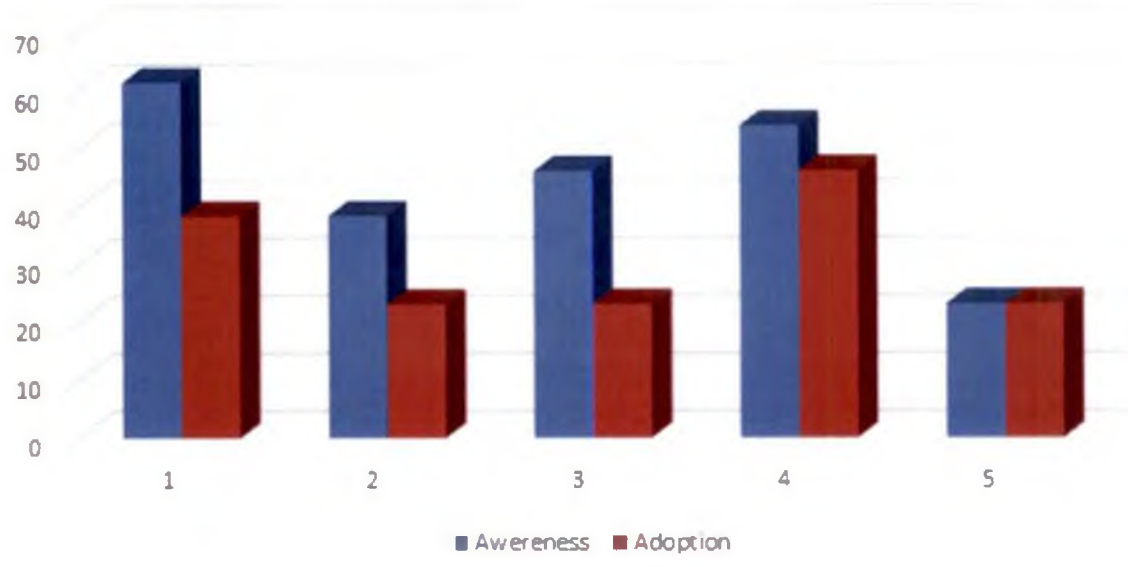
| Sl.no | Practices | Awareness | | Adoption | |
|---|---|---|---|---|---|
| | | F | % | F | % |
| 1 | Spacing 2m x 2m. | 8 | 61.5 | 5 | 38.46 |
| 2 | Pit size 50cm x 50cm x 50cm. | 5 | 38.5 | 3 | 23.07 |
| 3 | Double sucker planting at a spacing of 3m x 2m. | 6 | 46.15 | 3 | 23.07 |
| 4 | Fill the pits with top soil and FYM 15-20 Kg per plant per pit. | 7 | 53.9 | 6 | 46.15 |
| 5 | High density planting with 1.75m x 1.75m with one plant per pit. | 3 | 23.07 | 3 | 23.07 |

F- Frequency

Only 13 farmers cultivated tissue culture banana in commercial basis.

About 61.5 per cent of farmers had awareness about spacing of tissue culture banana but only 38.46 per cent practiced this method. They get good yield when spacing was done at close. Pit size recommended is $50cm^3$ and only 38.5 per cent farmers were aware about the pit size and 23.07 per cent of them adopted this pit size. About 46.15 per cent of them were aware about the double sucker

planting but only and 23.07 per cent adopted it. Only 23.07 per cent of farmers had awareness about high density planting and those who were aware, were adopting it too. So more efforts should be made to create awareness among farmers about advantages and correct recommendations to be followed in cultivating tissue culture banana.Also the results emphasise the importance of popularizing double sucker banana cultivation among the banana growers through implementing model demonstration plots across panchayat and FLD's in selected farmers field through the agricultural officers of the region.




| | |
|---|---|
| 1 | Spacing 2m*2m. |
| 2 | Pit size 50cm*50cm*50cm. |
| 3 | Double sucker planting at a spacing of 3m*2m. |
| 4 | Fill the pits with top soil and FYM 15-20 Kg per plant per pit. |
| 5 | High density planting with 1.75m*1.75m with one plant per pit. |

**Figure : 20** Awareness and adoption of tissue culture banana cultivation

### 4.3. Relationship of level of adoption of recommended practices of respondents with their socio-psychological characteristics

correlation analysis was done to check whether there is any significant relationship between the level of adoption of respondents and selected independent variables. The result is given in Table 23.

**Table 23.** Correlation between level of adoption and independent variables

| Sl.no | variables | Correlation co-efficient |
|---|---|---|
| 1 | Age | 0.073 |
| 2 | Educational status | 0.210* |
| 3 | Farm size | 0.152 |
| 4 | Area under banana cultivation | 0.157 |
| 5 | Risk orientation | 0.302** |
| 6 | Innovativeness | 0.164 |
| 7 | Economic motivation | 0.368** |
| 8 | Credit orientation | 0.045 |
| 9 | Number of trainings undergone | 0.072 |
| 10 | Experience in banana cultivation | -0.16 |
| 11 | Market perception | 0.084 |
| 12 | Attitude of farmers towards scientific technologies | 0.561** |
| 13 | Extend of commercialization | 0.001 |
| 14 | Information source utilization | 0.153 |
| 15 | Extension contact | 0.296** |

** = Significance at 1%  * = Significance at 5%

Overall data in Table 23 revealed that out of the 15 independent variables education, risk orientation, economic motivation, attitude of farmers towards scientific technologies and extension contact were the five independent variables which were positively and significantly related with dependent variable, level of adoption. The result also showed that age, farm size, area under banana cultivation, innovativeness, credit orientation, number of trainings undergone, experience in banana cultivation, market perception, extend of commercialization and information source utilization had no significant relation with dependent variable and also experience in banana cultivation was found to have a negative but non-significant correlation. Out of five variables only education status was significant at 5 per cent level.

Education is a key factor for a person to improve his awareness and knowledge. Educated persons always try to acquire more knowledge and apply it in their lifestyle. That is why education is a positive significant factor in adoption. Moreover, knowledge is the first stage of diffusion process. Similar result has been obtained from the study of Harper *et. al* (1990), Gangadharan (1993), Jaganathan (2004) and Guptha *et. al* (2010).

As per the results in Table.23 the correlation coefficient between risk orientation and level of adoption was 0.302 which is significant. Those who have decided to take risks will have a tendency to adopt new technologies. So risk orientation is a key factor in adoption and hence the result obtained is justified. The result is support from the finding of Priya (2003).

Economic motivation plays an important role in commercial banana growers to perform efficiently there by increasing returns for farmers. To procure latest technologies and methods of farming for achieving greater returns from farms economically motivated farmers would be very keen to utilise all the avenues. This might have resulted in increased rate of adoption.

From Table.23 it was clear that attitude of farmers towards scientific technologies was positively and significantly related to level of adoption,

it'scorrelation coefficient is 0.561. If a farmer has favourable attitude towards a technology, he will be willing to grab the innovations and adopt it so as to reap success in his farming endeavours. Hence the result obtained is logical. Similar result has been obtained from the study of Bennur *et. al* (2015)

Greater the extension contact a farmer has, the more he will be able to gather latest developments in the area of farming. Once he gets exposed to newer developments he will be persuaded to adopt newer technologies. Thus extension contact bears a considerable role in creating awareness and knowledge among farmers which leads to more adoption. This also warrants more contribution of an agricultural officer in terms of support and services to be rendered to the banana growers. Similar result was obtained from the study of Majjusha (2000) and Hassan (2016).

# EMPIRICAL MODEL OF THE STUDY


**Figure : 21** Empirical model of the study

## 4.4. Perceived usefulness and effectiveness of selected KAU banana technologies

Usefulness and effectiveness of selected banana cultivation practices as perceived by commercial banana growers are presented in the Table 24.

**Table 24.** Usefulness of selected banana cultivation practices (n=90)

| Sl.no | Practices | Very useful | | Useful | | Not useful | |
|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % |
| 1 | Selection of 3-4 month old disease free sword suckers. | 24 | 26.7 | 56 | 62.2 | 10 | 11.16 |
| 2 | Treatments of suckers smeared with cowdung solution and ash and dried in sun for about 3-4 days. | 22 | 24.4 | 59 | 65.6 | 9 | 10 |
| 3 | Intercropping with cucumber and amaranthus. | 30 | 33.3 | 52 | 57.8 | 8 | 8.9 |
| 4 | Spray 1% Bordeaux mixture soon after the appearance of the initial symptoms of the **leaf spot.** | 32 | 35.6 | 20 | 22.2 | 38 | 42.2 |
| 5 | Pre harvest bunch sprays of 3% $K_2SO_4$. | 18 | 20 | 22 | 24.4 | 40 | 44.4 |
| 6 | Double sucker planting at a spacing of 3m x 2m. | 50 | 55.6 | 24 | 26.7 | 16 | 17.8 |
| 7 | Fill the pits with top soil and FYM 15-20 Kg per plant per pit for tissue culture plants. | 15 | 16.7 | 32 | 35.6 | 43 | 47.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 | Plant suckers upright in the centre of pits with 5cm pseudostem remaining above soil level. | 34 | 37.8 | 43 | 47.8 | 13 | 14.4 |
| 9 | Spacing 2m x 2m. | 25 | 27.8 | 31 | 34.4 | 34 | 37.8 |
| 10 | Fertilizer recommendation 190:115:300. | 27 | 30 | 36 | 40 | 27 | 30 |
| 11 | Bunch covering | 42 | 46.7 | 35 | 38.9 | 13 | 14.4 |
| 12 | Propping | 52 | 57.8 | 25 | 27.8 | 13 | 14.4 |
| 13 | Set traps using pseudostem of approximately 0.5m length, which are split length wise and laid in the field for controlling **rhizome weevil.** | 42 | 46.7 | 34 | 37.8 | 14 | 15.6 |
| 14 | Apply quinalphos 0.05% or chlorpyrifos 0.03% for controlling **pseudo stem weevil.** | 25 | 27.8 | 29 | 32.2 | 36 | 40 |
| 15 | 6-10 irrigations per crop. | 43 | 47.8 | 22 | 24.4 | 25 | 27.8 |

F- Frequency

Table 24 represents usefulness of selected KAU banana cultivation practices as perceived by farmers. Fifteen practices were categorised into very useful, useful and not useful based on farmer's opinion. From the table, it is clear that very useful practices as perceived by farmers were bunch covering (46.7%), propping (57.8%), pseudo stem trap for controlling rhizome weevil (46.7%), irrigation (47.8%) and double sucker planting (55.6%). Awareness as well as adoption of these practices also found to be higher (table 24) which is logical as they perceive these practices to be very useful.

Some of the practices were perceived as useful practices by farmers and they are: selection of sword suckers (62.2%), Paring and prolinage (65.6%), intercropping with cucumber and amaranthus (57.8%), method of planting in pits (47.8%) and fertilizer recommendation (40%). Farmers perceived some of the practices are not useful and they were chemical control of leaf spot (42.2%), fertilizer application in tissue culture banana cultivation (47.8%), pre harvest bunch spray (44.4%), spacing (37.8%) and chemical control of pseudo stem weevil (40%). Most of the farmers opined that they prefer to go for organic management of pests and diseases and this could be the reason why farmers perceived chemical control of leafspot and pseudostem weevil as not useful practices. Also with respect to spacing they prefer to have closer spacing which according to them yield better bunches and hence more economical for them.

**Table 25.** Effectiveness of selected banana cultivation practices (n=90)

| Sl. no | Practices | Very effective | | Effective | | Not effective | |
|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % |
| 1 | Selection of 3-4 month old disease free sword suckers. | 34 | 37.7 | 41 | 45.6 | 15 | 16.6 |
| 2 | Treatments of suckers smeared with cowdung solution and ash and dried in sun for about 3-4 days. | 42 | 46.6 | 24 | 26.7 | 24 | 26.7 |
| 3 | Intercropping with cucumber and amaranthus. | 51 | 56.7 | 18 | 20 | 21 | 23.3 |
| 4 | Spray 1% Bordeaux mixture soon after the appearance of the initial symptoms of the **leaf spot.** | 24 | 26.7 | 37 | 41.1 | 29 | 32.3 |
| 5 | Pre harvest bunch sprays of 3% $K_2SO_4$. | 26 | 28.9 | 35 | 38.9 | 29 | 32.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | Double sucker planting at a spacing of 3mx2m. | 32 | 35.6 | 34 | 37.7 | 24 | 26.7 |
| 7 | Fill the pits with top soil and FYM 15-20 Kg per plant per pit for tissue culture plants. | 26 | 28.9 | 44 | 48.9 | 20 | 22.2 |
| 8 | Plant suckers upright in the centre of pits with 5cm pseudostem remaining above soil level. | 26 | 28.9 | 51 | 56.7 | 13 | 14.4 |
| 9 | Spacing 2mx2m. | 32 | 35.6 | 24 | 26.7 | 34 | 37.8 |
| 10 | Fertilizer recommendation 190:115:300. | 36 | 40 | 27 | 30 | 27 | 30 |
| 11 | Bunch covering | 45 | 50 | 32 | 35.6 | 13 | 14.4 |
| 12 | Propping | 42 | 46.7 | 35 | 38.9 | 13 | 14.4 |
| 13 | Set traps using pseudostem of approximately 0.5m length, which are split length wise and laid in the field for controlling **rhizome weevil.** | 12 | 13.3 | 64 | 71.1 | 14 | 15.6 |
| 14 | Apply quinalphos 0.05% or chlorpyrifos 0.03% for controlling **pseudo stem weevil.** | 21 | 23.3 | 33 | 36.7 | 36 | 40 |
| 15 | 6-10 irrigations per crop. | 48 | 53.3 | 17 | 18.9 | 25 | 27.8 |

F- Frequency

In Table 25 the effectiveness of selected banana cultivation practices which were classified as very effective, effective and not effective based on farmers view are presented. The practices which were perceived as very effective by farmers were Paring and prolinage (46.67%), intercropping with cucumber and amaranthus (56.67%), fertilizer recommendation (40%), bunch covering (50%), propping (46.67%) and irrigation (53.33%).

The practices which were considered as effective practices were pseudo stem trap for controlling rhizome weevil (71.11%), method of planting in pits (56.67%), fertilizer application in tissue culture banana (48.89%), pre harvest bunch spray (38.89%), chemical control of leaf spot (41.11%) and selection of suckers (45.56%). The practices that was perceived by farmers as 'not effective' were spacing (37.8%) and chemical control of pseudo stem weevil (40%).

There for it can be concluded from Table 24 and 25, KAU practices on banana cultivation were either very useful or useful as perceived by majority of the respondents in the study area.

## 4.5 Technology needs assessment

**Table 26.** Technology needs assessment of respondents (n=90)

| Sl. No | Practices | Technology not available | | Technology available but not application | | Technology available but not sustainable | | Technology available applicable and sustainable | |
|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | F | % | F | % |
| 1 | Sucker treatment with cowdung and ash. | 12 | 13.3 | 25 | 27.8 | 21 | 23.3 | 32 | 35.6 |
| 2 | **Plant protection** | | | | | | | | |
| A | Spray 1% Bordeaux mixture soon after the appearance of the initial symptoms of the leaf spot. | 37 | 41.1 | 6 | 6.7 | 32 | 35.6 | 15 | 16.7 |
| B | Use disease free planting material for controlling viral diseases like banana bunchy top | 10 | 11.1 | 4 | 4.4 | 38 | 42.2 | 38 | 42.2 |
| C | Set traps using pseudostem of approximately 0.5m length, which are split length wise and laid in the field for controlling rhizome weevil. | 22 | 24.4 | 9 | 10 | 28 | 31.1 | 31 | 34.4 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| D | Apply quinalphos 0.05% or chlorpyrifos 0.03% for controlling pseudo stem weevil | 23 | 25.6 | 7 | 7.8 | 43 | 47.8 | 17 | 18.9 |
| 3 | Intercropping with cucumber and amaranthus | 15 | 16.7 | 18 | 20 | 21 | 23.3 | 36 | 40 |
| 4 | Bunch covering with dry banana leaves. | 11 | 12.2 | 42 | 46.7 | 21 | 23.3 | 16 | 17.8 |
| 5 | Pre harvest bunch spray with 3% K2SO4 | 47 | 52.2 | 5 | 5.6 | 22 | 24.4 | 16 | 17.8 |
| 6 | High density planting with spacing of 1.75m*1.75m | 42 | 46.7 | 12 | 13.3 | 27 | 30 | 9 | 10 |
| 7 | Value addition | 33 | 36.7 | 36 | 40 | 15 | 16.7 | 6 | 6.7 |

F- Frequency

The technology needs assessment of selected KAU practices in banana cultivation are presented in the Table 26. Technology needs were assessed using the ordinal scale.A total of 7 practices were categorized into technology not available, technology available but not applicable, technology available but not sustainable and technology available applicable and sustainable based on score obtained from the respondents.

Pre harvest bunch spraying with 3 per cent $K_2$ $SO_4$ and high density planting were the technologies which majority of the farmers perceived as not available (52.2% & 46.7%). Nearly 47 per cent of the farmers perceived bunch covering with dry banana leaves as technology available but not applicable also value addition by 40 per cent. Forty two per cent of farmers perceived application of quinalphos for controlling pseudostem weevil has technology available but not sustainable. Also 42.2 per cent of them considered use of disease free suckers for control of viral diseases like bunchy top as not sustainable technology whereas some percentage consider it as available, applicable and sustainable. Other technologies considered as available, applicable and sustainable were sucker treatment with cowdung and ash (35.65%), set traps for pseudo stem weevil control (34.4%) and intercropping with cucumber and amaranthus (40%).

Chemical control of plant protection practices were not followed by majority farmers,because they felt that these technologies were not sustainable.

### 4.6 ITK practices in banana cultivation

Indigenous technical knowledge on banana cultivation practices were identified from survey area. Results are presented in Table 27.

**Table 27.** ITK practices in banana cultivation (n=90)

| Sl.no | Practices | Frequency | % |
|---|---|---|---|
| 1 | Smearing of cowdung on suckers for bud initiation. | 65 | 72.2 |
| 2 | Covering banana bunches with dried banana leaves to increase bunch size. | 59 | 65.6 |
| 3 | Repeated smearing clay on pseudostem for controlling pseudostem weevil. | 55 | 61.1 |
| 4 | To reduce snail menace placement of salt in leaf axils of banana. | 53 | 58.9 |
| 5 | Placing of bar soap and neem seed powder in the leaf axils of banana to prevent the attack of pseudostem weevil. | 51 | 56.7 |
| 6 | Cutting and burning of infected leaves of banana for controlling sigatoka disease. | 49 | 54.4 |
| 7 | Inserting bar soap into the bore holes of pseudo stem weevil reduce its attack. | 48 | 53.3 |
| 8 | Placing of cut pseudostem on field to control pseudostem weevil. | 46 | 51.1 |
| 9 | For uniform bud initiation smearing of cowdung and pseudomonas mixture on the sucker followed by sprinkling of water thrice a week. | 43 | 47.8 |
| 10 | Application of tobacco decoction in leaf axils against bunchy top disease. | 38 | 42.2 |

The most commonly used ITK practices in banana were smearing cowdung on sucker for speedy bud initiation (72.2%), followed by covering banana bunches with dried banana leaves to increase bunch size (65.6%), repeated smearing clay on pseudostem for controlling pseudostem weevil (61.1%), placement of salt in leaf axils of banana to controlling snail menace (58.9%) and placing of bar soap and neem seed powder in the leaf axils of banana to prevent the attack of pseudostem weevil (56.7%).

More than half of identified ITK practices are used to control pest and diseases of banana. Hence it can be concluded that there are quiet good number of ITK practices used in plant protection which are still being used in banana cultivation.

The results are in conformity to the finding of Sujitha (2015) who reported that there are many ITK practices in plant protection of banana that were still used in homegardens. The result is in confirmation with findings of Sushama *et. al* (2002).

## 4.7 Constraints perceived by farmers in adopting selected banana cultivation practices

**Table 28.** Constraints perceived by farmers in adopting selected banana cultivation practices

| Sl. No | Constraints | Rank over class | Rank over total |
|---|---|---|---|
| **1** | **Environmental Constraints:** | | |
| a) | Rainfall | 3 | 14 |
| b) | Wind | 4 | 15 |
| c) | Attack of insect pest or diseases | 2 | 5 |
| d) | Lack of proper drainage | 5 | 16 |
| e) | Climate change influence on pest intensity | 1 | 4 |
| **2** | **Technology Constraints:** | | |
| a) | Plant protection chemicals are not effective in their recommended dosage. | 1 | 1 |
| b) | Lack of knowledge about INM, IPM, IDM | 3 | 6 |
| c) | Lack of awareness about the correct dosage of chemical fertilizers. | 2 | 2 |
| **3** | **Extension constraints:** | | |
| a) | Lack of accessibility of ICT sources | 4 | 18 |
| b) | Lack of demonstration about new technologies. | 2 | 13 |
| c) | Lack of motivational factors from officials | 5 | 20 |

| | | | |
|---|---|---|---|
| d) | Lack of proper information source to deliver the latest technology on banana cultivation | 1 | 12 |
| e) | Non availability of supply and services | 3 | 7 |
| **4** | **Economic constraints** | | |
| a) | High cost inputs | 3 | 8 |
| b) | High cost of labour: | 1 | 3 |
| c) | Price fluctuation in banana | 2 | 11 |
| d) | Lack of knowledge about market information | 4 | 17 |
| e) | Crop insurance coverage | 5 | 19 |
| **5** | **Physical constraints** | | |
| a) | Non availability of skilled labour on time | 1 | 9 |
| b) | Non-availability of good quality inputs at required time and amount. | 2 | 10 |

Table 28 depicts the constraints experienced as perceived by commercial banana growers in adopting selected KAU banana cultivation practices. Constraints were ranked under sub headings of environmental constraints, technology constraints, extension constraints, economic constraints and physical constraints.

In environmental constraints, climate change influence on pest intensity was ranked first followed by attack of insect pest or diseases, rainfall, wind and proper drainage. Due to climate change farmers felt that the pest and diseases incidence had increased and also evolved new ones too. Improper drainage was found to hinder management operations and also resulted in incidence of diseases. Similar result was reported by Sujitha (2015)

Among the technology constraints plant protection chemicals are not effective in their recommended dosage, lack of awareness about the correct dosage of chemical fertilizers and lack of knowledge about INM, IPM, IDM were

ranked first, second and third respectively. Respondents felt that pests and pathogens become resistant to the recommended dosage so they are applying it in the quantity they felt suitable. Most of the respondents were not skilled enough to find out correct dosage of chemical fertilizers required for their farm and they consider it as a complex technology of calculation and formulas. Majority of the respondents were not aware about the integrated management of pest, disease and nutrient. This results are in line with Bennur *et. al* (2015) and Sujitha (2015).

Lack of proper information source to deliver the latest technology on banana cultivation, lack of demonstration about new technologies, non availabilityof supplyandservices, lack of accessibility of ICT sourcesandlackofmotivationfromofficials were major constraints identified under extension constraints.Moreofextensionintervention can fill this gap among commercial banana growers. This results are in confirmation with findings of Meera (1995) and Balachandran (2004).

In economic constraints, high cost of labour was ranked one followed by price fluctuation in banana, high cost of inputs, lack of knowledge about market information and crop insurance coverage. Due to large area of commercial banana cultivation, farmers cannot afford to purchase expensive planting materials and high cost inputs for farming.

Major physical constraints perceived by respondents were non availability of skilled labour and good quality inputs at required time and amount. Commercial banana growers preferred good quality planting materials and fertilizers for banana cultivation but these were not available to them at required time. Similar result was reported by Esakkimuthu (2012).

Considering the total rank the major constraints perceived by banana growers in adopting selected KAU technologies were plant protection chemicals are not effective in their recommended dosage, lack of awareness about correct dosage of chemical fertilizers, high cost of labour, climate change influences on

pest intensity and attack of insect pest or diseases, lack of knowledge about INM, IDM and IPM.

### 4.8 Suggestions for refinement of technologies in banana cultivation perceived by the farmers

**Table 29.** Suggestions for refinement of technology as perceived by farmer

(n= 90)

| Sl.no | Suggestions | Frequency | Rank |
|---|---|---|---|
| 1 | Standard package of practice recommendation for intercropping banana with tuber crops. | 34 | 1 |
| 2 | Make chemical control of pest and diseases sustainable | 31 | 2 |
| 3 | Quality assurance / enhancement of tissue culture planting materials. | 25 | 3 |
| 4 | More research on ideal spacing of banana cultivation | 23 | 4 |
| 4 | Follow up of schemes / projects in banana. | 22 | 5 |
| 5 | Field level demonstration of new technologies. | 18 | 6 |
| 6 | Support by extension agents on various stages of adoption of recommended practices | 15 | 7 |

It can be seen from Table 29 that the majority of commercial banana growers suggested that they require standard package of practice recommendation for intercropping banana with tuber crops. At present the package of practice KAU recommends intercropping banana with cucumber and amaranthus which the farmers find sustainable. But farmers couldn't overcome price fluctuation of banana by intercropping with cucumber and amaranthus. Because the earning or profit they obtain by selling cucumber and amaranthus

when compared with tuber crops is less. So majority prefer intercropping banana with tuber crops. Hence the result obtained is justified.

Second rank was given for 'make chemical control of pest and diseases sustainable'. Respondents felt that pests and pathogens become resistant to the recommended dosage so they are applying it in the quantity they felt suitable. Hence it is suggested that research should be focused on making chemical control of pest and diseases sustainable by giving emphasis on IPM, INM and IDM. Also efforts should be taken to create make awareness among farmers on INM, IPM and IDM through conciontisation process. Quality assurance / enhancement of tissue culture planting materials was the third suggestion. Government interventions should be stream lined to assure supply of quality planting materials of tissue culture.

Farmers got good yield in lesser spacing than our recommended practice. In lesser spacing they can accommodate more number of plants. So they go for lesser spacing. Hence the farmers are suggesting that more research should be done on spacing of banana and evolve package for cultivating banana with tuber crops as intercrop.

About 22 respondents suggested that follow up of schemes/ projects in banana, should be undertaken systematically. There are so many schemes and projects implemented by government through state department of agriculture. But beneficiaries are not getting any follow up activities. This should be taken into consideration while evolving government policies.Field level demonstration of new technologies got sixth rank. Even though the farmers are aware of the new technologies they are not convinced of the merits of these. In some cases, awareness is also lacking. They have not had any demonstration on advantages of new technologies. Fifteen respondents suggested that support should be provided by extension agents on various stages of adoption of recommended practices, so that respondents can easily adopt new technology. More hand holding is required at various stages of adoption to enhance and sustain the confidence of farmers in recommended practices.

Hence it can be inferred that both research and extension interventions are required to make commercial cultivation of banana sustainable. Research on areas like spacing, control of pest and diseases, intercropping with tuber crops and extension support for creating awareness conviction among commercial banana growers about technologies especially on pest and disease management and fertilizer application.

# CONDUCTING SURVEY IN THE FIELD

Plate: 1

# FOCUSED GROUP DISCUSSION

Plate: 2

# SUMMARY

## SUMMARY

Commercial banana cultivation is done when farm is set up for the purpose of producing banana with sole intension of making profit with the use of modern technology. Banana is an important fruit in world wide. It is edible and also used for making value added products. Using new technologies for better cultivation of banana has surpassed climate and all other criteria for cultivation, favourable in India, moreover in Kerala. For greater improvements in banana cultivation KAU and R&D agencies developed many innovative technologies. The technologies thus developed should reach the farmers and also they must be persuaded to adopt these technologies, to make commercial cultivation of banana a successful venture. In this back drop, the present study was undertaken with the following specific objectives.

- To assess the level of adoption of selected KAU practices in banana cultivation.
- Analyse the constraints experienced by farmers in adoption of these practices.
- Suggestions for refinement of practices as perceived by the farmers.

The study was conducted during 2015-2016 among selected commercial banana growers in Thiruvananthapuram district of Kerala state. A total of 90 commercial banana growers were purposively selected who were having not less than 0.5acres of banana cultivation and were active and operational, with 30 each from three selected panchayaths with maximum area under banana cultivation.

The independent variables selected for the study were age, education, farm size, area under banana cultivation, risk orientation, innovativeness, economic motivation, credit orientation, trainings undergone, experience in banana cultivation, market perception, attitude of farmers towards scientific technologies, extend of commercialization, information source utilization and extension contact while the dependent variable was level of adoption of selected KAU practices in banana cultivation.

The data were collected by conducting personal interviews with the commercial banana growers, using a well-structured and pre tested interview schedule developed for the study. Mean, percentage analysis, quartile deviation and correlation analysis were employed in the data analysis and interpretation of results. The independent variables were quantified using already existing scales and arbitrary scale developed for the study or following established procedures. Rate of adoption of selected KAU practices in banana cultivation were worked out using "Adoption quotient". Relationship between the independent variables and dependent variable were worked out by using simple correlation analysis. Level of perceived usefulness and effectiveness of selected KAU practices in banana cultivation were measured on three-point continuum very useful, useful & not useful and very effective, effective & not effective. The technology needs were assessed using a four point continuum. ITK practices on banana cultivation followed by the respondents were identified. Constraints experienced by the commercial banana growers in adopting the technologies were ranked. Suggestions for refinement of the selected practices in banana cultivation perceived by the commercial banana growers were also analysed.

The major findings of the study are given below.

1. More than half of the farmers belonged to middle aged category.
2. Majority of respondents had medium level of education followed by low level of education.
3. Fifty per cent of the respondents had 0.5-1 acre of land under cultivation.
4. Almost sixty four per cent of farmers had 0.5-1 acre of land under banana cultivation.
5. About fifty seven per cent of the farmers had medium level of risk orientation.
6. More than half of the respondents had medium level of innovativeness.
7. Majority of respondents had medium level of economic motivation.
8. Almost forty nine percent of the respondents had medium level of credit orientation.

9. Majority of commercial banana growers had medium level of extension contact.
10. Fifty five per cent of the respondents had low level of market perception.
11. About thirty two per cent of commercial banana growers had 6-10 years of experience in banana cultivation followed by twenty eight per cent of farmers having more than 20 years of experience in banana cultivation.
12. Majority of respondents (38.9%) attended only one training followed by nearly 25 per cent having not attended any training.
13. More than half of the respondents had medium level of information source utilization pattern.
14. Almost 69 per cent of the farmers sold their products in domestic market. But twenty nine per cent of respondents concentrated on domestic as well as export oriented market. Study also revealed that most of the respondents had high level of commercialization.
15. Sixty four per cent of the farmers had medium level of attitude towards scientific practices.
16. Seventy three per cent of the respondents had medium level of adoption of recommended KAU practices.
17. About 89.9 per cent of the respondents adopted 6-10 irrigations for banana plantain.
18. Wide variation in awareness and adoption was found in selection of sword suckers and paring andprolinage.
19. Most of the farmers opined that chemical control of pest and diseases were not sustainable.
20. There was wide variation between awareness and adoption of tissue culture banana technologies.
21. Level of adoption had positive and significant relationship with education, risk orientation, economic motivation, attitude of farmers towards scientific technologies, and extension contact.
22. Very useful practices as perceived by farmers were propping (57.8%) and double sucker planting (55.6%). Paring and prolinage (65.6%) and

selection of sword suckers (62.2%) were the technologies perceived by farmers as useful.

23. Very effective practices perceived by farmers were intercropping with cucumber and amaranth (56.67%) and bunch covering (50%). Effective practices perceived by farmers were pseudo stem trap (71.11%) and method of planting suckers upright in the centre of pits with 5cm pseudostem remaining above the soil level (56.67%).
24. Technology needs assessment as perceived by commercial banana growers revealed that maximum need was observed for pre harvest bunch spray and high density planting.
25. A total of 10 ITK practices were identified in banana cultivation. In which quite a good number of ITK practices were for plant protection.
26. The major constraints perceived by commercial banana growers in adopting selected banana cultivation practices as recommended by KAU were plant protection chemicals are not effective in their recommended dosage, lack of awareness about correct dosage of chemical fertilizers, high cost of labour, climate change influences on pest intensity and attack of insect pest and diseases.
27. Suggested refinement of KAU technologies in banana cultivation as perceived by commercial banana growers were standard package of practice recommendation for intercropping with tuber crops, sustainable chemical control of pest and diseases and quality assurance/enhancement of tissue culture planting materials.

**Suggestions for future research**

This study was conducted in Thiruvananthapuram District alone that too among only among 90 commercial banana growers. Hence similar studies shall be undertaken in other dominant commercial banana growing districts in Kerala state for more generalizations.

1. The arbitrary scales used in the study should be assessed for its reliability and validity.

2. This study was conducted on a limited scale and so with a view to undertake the study including more independent variables than the ones used here.
3. Focus can be given in future research on sustainable chemical control of plant protection and ideal closer spacing for banana.

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# APPENDICES

**APPENDIX I**

**KERALA AGRICULTURAL UNIVERSITY**

COLLEGE OF AGRICULTURE, VELLAYANI

THIRUVANANTHAPURAM- 695522

From

Dr. B. Seema
Professor
Dept of Agricultural Extension

Dated : 13-09-2015

Sir / Madam

Sub :M.Sc (Agri)- Thesis Research Project- Judges opinion regarding

Mrs. Thasneem . S one of my P.G scholarhas taken up her research project entitled **"Technology utilization of banana in Thiruvananthapuram district"** for her M.Sc (Agri) Research Programme. Considering your vast experience, I request you to spare your valuable time to offer for the rating of the variables and also to add appropriate variables and suggestions to be included in the study.

Thanking you

Place:Vellayani

Date :

Your's sincerely

Dr. B. Seema

OBJECTIVES OF THE STUDY

The objective of the study is to asses the level of adoption of selected KAU practices in banana cultivation and analyse the constraints experienced by farmers in adoption of these practices. Suggestions for refinement of practices as perceived by the farmers will also be studied.

LIST OF VARIABLES

Please rate the statement with a tick mark in the appropriate column against the statement with special reference to its importance to the objective of the study

| SL.No | Variables | Most relevant | More relevant | Undecided | Less relevant | Least relevant |
|---|---|---|---|---|---|---|
| 1 | Age: refers to the number of calendar years completed by the respondent at the time of interview. | | | | | |
| 2 | Gender : indicates whether the respondent belongs to male or female. | | | | | |
| 3 | Education: refers to the informal and formal learning achieved by the respondent. | | | | | |
| 4 | Occupational status: defined as the position of the group member which acts as a source of income in which he or she spends major part of his time and attention. | | | | | |
| 5 | Annual income: refers to the total earning of all the member of the family of the respondent for | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | one year. | | | | | |
| 6 | Farming experience: refers to the total number of years respondent has been engaged in farming. | | | | | |
| 7 | Farm size: refers to the extent of area under banana cultivation possessed by the respondent. | | | | | |
| 8 | Area under crop: It is operationalized as no.of standard acres possessed by farmer at time of enquiry which is under banana cultivation. | | | | | |
| 9 | Credit orientation: It refers to the orientation to avail credit by respondent. | | | | | |
| 10 | Information source utilization: Farmer contact with various sources of information. | | | | | |
| 11 | Risk orientation: it refers to degree to which the farming is oriented towards encountering risk and uncertainty in adopting new ideas in farming. | | | | | |
| 12 | Management orientation: degree to which respondent is scientifically oriented towards farming, production and marketing aspects of cultivation. | | | | | |
| 13 | Progressiveness: extend to which one is relatively early in | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | venturing or putting the innovation into practice. | | | | | |
| 14 | Risk preference: positive or negative effect or feelings towards risk held by the farmer towards cultivation. | | | | | |
| 15 | Land ownership pattern: refers to owner ship of land either by his own possession or by leased it. | | | | | |
| 16 | Experience in banana cultivation: it is the period of years since he/she has started in banana cultivation. | | | | | |
| 17 | Achievement motivation: refers to the striving of respondents to do good work attain a sense of accomplishment. | | | | | |
| 18 | Attitude towards new technologies: refers to the degree of favorableness or unfavorableness of the respondents towards new technologies. | | | | | |
| 19 | Innovativeness: refers to the characteristics of the respondents to accept new ideas in farming. | | | | | |
| 20 | Knowledge in banana cultivation: refers to the quantum of scientific information possessed by the respondents. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 33 | Family labour utilization: extend of utilization of the family members by the respondents for farming activities. | | | | | |
| 34 | Cosmopoliteness: it is the degree to which banana grower has developed contact outside the community. | | | | | |
| 35 | Availability of farm input: refers to availability of inputs to the farmer either from his own possession or by hiring it. | | | | | |
| 36 | Market orientation: refers to degree to which a farmer is oriented towards market in terms of demand and price of his produce. | | | | | |
| 37 | Environmental orientation: degree to which farmer is concern about his environment. | | | | | |
| 38 | Commercialization: extend to which a farmer is intensing farming for commercial purpose. | | | | | |
| 39 | Socio economic status: it is operationally defined as position, a farmer occupies in the community with reference to his occupation, size of land holding, socio political participation. | | | | | |
| 40 | Value addition: set of | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | quality control activities which transform an input to an output that is valuable and acceptable to consumers. | | | | | |
| 41 | Information source: it refers to source from which the farmer get information. | | | | | |
| 42 | Others if any please specify. | | | | | |

## APPENDIX II

### The variables with their mean relevancy score

| Sl.No | Independent variables | Mean relevancy score |
|---|---|---|
| 1 | **Age** | **4.1** |
| 2 | Gender | 3.3 |
| 3 | **Education** | **4.1** |
| 4 | Occupational status | 3.6 |
| 5 | Annual income | 3.7 |
| 6 | Farming experience | 3.9 |
| 7 | **Farm size** | **4.7** |
| 8 | **Area under banana cultivation** | **4.5** |
| 9 | **Credit orientation** | **4.4** |
| 10 | **Risk orientation** | **4.4** |
| 11 | Management orientation | 3.6 |
| 12 | Progressiveness | 3.5 |
| 13 | Risk preference | 3.9 |
| 14 | Land ownership pattern | 3.8 |
| 15 | **Experience in banana cultivation** | **4.2** |
| 16 | Achievement motivation | 3.6 |
| 17 | **Attitude towards new technologies** | **4.6** |
| 18 | **Innovativeness** | **4.2** |
| 19 | Knowledge in banana cultivation | 3.9 |
| 20 | Decision making ability | 3.8 |
| 21 | Self confidence | 3.6 |
| 22 | Work commitment | 3.4 |
| 23 | Assertiveness | 3.5 |
| 24 | Level of aspiration | 3.2 |
| 25 | **Economic motivation** | **4.2** |
| 26 | Rational orientation | 3.5 |
| 27 | Mass media exposure | 3.9 |
| 28 | **Extension agency contact** | **4.5** |
| 29 | Scientific orientation | 3.2 |
| 30 | Social participation | 3.1 |
| 31 | **Training** | **4.3** |
| 32 | Family labour utilization | 3.6 |
| 33 | Cosmopoliteness | 3.3 |
| 34 | Availability of farm input | 3.8 |
| 35 | **Market perception** | **4.1** |
| 36 | Environmental orientation | 3.4 |
| 37 | **Extend of commercialization** | **4.3** |
| 38 | Socio economic status | 3.2 |
| 39 | Value addition | 3.6 |
| 40 | **Information source utilization** | **4.5** |

**APPENDIX III**

**INTERVIEW SCHEDULE**

**College of Agriculture, Vellayani**

**KERALA AGRICULTURAL UNIVERSITY**

# Title: Technology Utilization of banana in Thiruvananthapuram District

**Respondent No: .....**

**Socio-personal variable of the respondents:**

1. Name : ----------
2. Age :----------(Years)
3. Sex : Male☐ Female☐
4. Date : ----------
5. Village :---------- Block:----------
6. Districts :---------- Phone No.:----------
7. Annual Income :----------
8. Educational Status

| Sl No | Level of Education | Response |
|---|---|---|
| 1 | Illiterate | |
| 2 | Can read and write | |
| 3 | Primary school | |
| 4 | Middle school | |
| 5 | High school | |

| | | |
|---|---|---|
| 6 | College | |
| 7 | Professional degree | |

9. Farm size ---- Acre Owned --- Acre Leased in --- Acre

Lowland ---Acre Upland ---Acre

10. Area under banana cultivation: --- Acre Owned --- Acre

Leased in --- Acre

Lowland ---Acre Upland ---Acre

11. Risk Orientation

Please give your degree of agreement or disagreement about each of the following statements

(SA-strongly agree, A- agree, UD- undecided, DA- disagree, SDA- strongly disagree)

| SL No | Statement | SA | A | UD | DA | SDA |
|---|---|---|---|---|---|---|
| 1 | A farmer should grow a large number of crops to avoid greater risks involved in growing one or two crops. | | | | | |
| 2 | A farmer should take more of a change in making a big profit than to be content with smaller but less risky profit. | | | | | |
| 3 | A farmer who is willing to take greater risk than the average farmer usually does it better financially. | | | | | |
| 4 | It is good for a farmer to take risk when he knows his chance of success is fairly high. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | It is better for a farmer not to try a new farming methods unless most other have used it with success. | | | | | |
| 6 | Trying an entirely new method for a farmer involves greater risks but it is worth. | | | | | |

12. Innovativeness

When would you like to adopt an improved practice in farming?

1. As soon as it is brought to my knowledge
2. After I had seen other farmers tried successfully in the farm
3. I prefer to wait and take my own time
4. I am not interested in adopting improved practices

13. Economic motivation

Please give your degree of agreement or disagreement about the each of the following statements

(SA-strongly agree, A-agree, UD- Undecided, DA- disagree, SDA- Strongly disagree)

| SL No | Statement | SA | A | UD | DA | SDA |
|---|---|---|---|---|---|---|
| 1 | A farmer should work towards higher yield and economic returns. | | | | | |
| 2 | The most successful farmer is one who makes the most profit. | | | | | |
| 3 | A farmer must earn his living but the most important thing in life cannot be identified in economic terms. | | | | | |
| 4 | A farmer should try any new farming idea which may help him to earn more money. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | A farmer should grow more food crops for home consumption and to increase monetary profits. | | | | | |
| 6 | It is difficult for the farmers children to make good start unless he provides them with economic assistance. | | | | | |

14. Credit orientation

| **Sl.No.** | **Items** | **Response** | | | |
|---|---|---|---|---|---|
| 1 | Do you think farmer like you should borrow from bank for agriculture purpose. | Yes | No | | |
| 2 | In your opinion how difficult it is to secure credit for agriculture purpose. | Very difficult | Difficult | Easy | Very easy |
| 3 | How a farmer is treated when he goes to secure credit from bank/co-operative societies. | Very badly | Badly | Fair | Very fair |
| 4 | There is nothing wrong in taking credit from institutional sources for increasing production. | SA | A | DA | SDA |
| 5 | Have you taken credit in the last two years for crop production. | Yes | No | | |

15. Extension contact

Please indicate how often you visit the following personnel in connection with agricultural activities

| Sl No | Category of Personal/ activities | Frequency | | | | |
|---|---|---|---|---|---|---|
| | | Two or more times a week | Once in week | Once in fortnight | Once in a month | Never |
| 1 | Agricultural Scientist | | | | | |
| 2 | Agricultural Officer | | | | | |
| 3 | Agricultural Assistant | | | | | |
| 4 | Gram sevaks/ VLWs | | | | | |
| 5 | Any others, specify | | | | | |

16. Market perception

a. Do you think that you will be able to sell banana at higher price by ensuring quality products through new technologies?

Yes No

b. How much price banana will fetch by adopting new technologies of cultivation compared to conventional methods? (Low/Same/High)

c. Do you think, you can overcome the risk of price fluctuation of banana by intercropping? Yes No

d. Do you think that value addition can increase consumer preference of your products? Yes No

17. Experience in banana cultivation : Number of years----------

18. Training Under gone:

| Sl No | Number of trainings undergone in agriculture related activities | Response |
|---|---|---|
| 1 | No training | |
| 2 | 1-5 | |
| 3 | 6-10 | |
| 4 | More than 10 | |

19. Information source utilization pattern:

| Sl No | Sources | Regularly | Occasional | Rarely | Never |
|---|---|---|---|---|---|
| **Media Sources** | | | | | |
| 1 | Television | | | | |
| 2 | Radio | | | | |
| 3 | Print media | | | | |
| **Interpersonal sources** | | | | | |
| 1 | Scientists | | | | |
| 2 | Department officials | | | | |
| 3 | Fellow farmer | | | | |
| **Institutions** | | | | | |
| 1 | Krishi Bhavan | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Research stations | | | | |
| 3 | NGO | | | | |
| 4 | ICAR institutes | | | | |
| 5 | SHG | | | | |
| 6 | Private agencies | | | | |
| 7 | VFPCK | | | | |
| **ICT sources** | | | | | |
| 1 | Web portals | | | | |
| 2 | Kiosk | | | | |
| 3 | Other online publications | | | | |
| 4 | Others if any specify | | | | |

20. Extend of commercialization.

Mode of marketing

- Domestic marketing
- Export oriented marketing
- Both domestic and export oriented marketing
- None of these

21. Level of adoption

| **Technologies** | **Awareness Yes/No** | **PA** | **AA** | **CA** | **NA** |
|---|---|---|---|---|---|
| Selection of 3-4 month old disease free sword suckers. | | | | | |
| Treatments of suckers smeared with cowdung solution and ash and dried in sun for about 3-4 days. | | | | | |
| Plant suckers upright in the centre of pits with 5cm pseudostem remaining above soil level. | | | | | |
| Spacing 2m*2m. | | | | | |
| Fertilizer recommendation 190:115:300. | | | | | |
| Intercropping with cucumber and amaranthus. | | | | | |
| Propping | | | | | |
| Pre harvest bunch sprays of 3% K2SO4. | | | | | |
| Bunch covering | | | | | |
| Pest & Disease<br><br>Spray 1% Bordeaux mixture soon after the appearance of the initial symptoms of the **leaf spot.**<br><br>Set traps using pseudostem of approximately .5m length, which are split length wise | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| and laid in the field for controlling **rhizome weevil.**<br><br>Apply quinalphos 0.05% or chlorpyrifos 0.03% for controlling **pseudo stem weevil.**<br><br>Use disease free planting material for controlling viral diseases like banana bunchy top. | | | | | |
| 6-10 irrigations per crop. | | | | | |
| Tissue Culture Banana | | | | | |
| Spacing 2m*2m. | | | | | |
| Pit size 50cm*50cm*50cm. | | | | | |
| Double sucker planting at a spacing of 3m*2m. | | | | | |
| Fill the pits with top soil and FYM 15-20 Kg per plant per pit. | | | | | |
| High density planting with 1.75m*1.75m with one plant per pit. | | | | | |

22. Farmer's attitude towards scientific technologies.

| Sl.no | Statements | SA | A | UD | DA | SDA |
|---|---|---|---|---|---|---|
| 1 | Improved banana cultivation is adopted extensively by most of farmers. | | | | | |
| 2 | Adopting improved banana cultivation technology one should get higher yield. | | | | | |
| 3 | Improved banana cultivation is an instrument | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | for social and economic change. | | | | | |
| 4 | There is no risk in adoption of improved banana cultivation technology. | | | | | |
| 5 | Only big farmers can do improved banana cultivation efficiently. | | | | | |
| 6 | I would like to advise my son to continue improved banana cultivation. | | | | | |
| 7 | As one of the new technology, drip irrigation in banana cultivation is not preferable because of higher installation cost. | | | | | |
| 8 | Acceptance of new technology is not a solution of perishable nature of banana fruit. | | | | | |
| 9 | Proper technical guidance is essential on agronomical practices on improved banana cultivation. | | | | | |
| 10 | Fertilizer requirement in improved banana cultivation is more, which is not economically affordable. | | | | | |
| 11 | Improved banana cultivation practices are more complex and technical in nature. | | | | | |
| 12 | Improved banana cultivator becomes an example for other fellow farmers. | | | | | |
| 13 | Transplanting of tissue-cultured plants is not at all remunerative. | | | | | |
| 14 | After introduction of new banana cultivation technology, economic condition of farmers has improved. | | | | | |
| 15 | People having less income can also be successful in improved banana cultivation. | | | | | |

23. Perceived usefulness and effectiveness of selected KAU technologies for banana cultivation

| **Technologies** | **VU** | **U** | **NU** | **VE** | **E** | **NE** |
|---|---|---|---|---|---|---|
| Selection of 3-4 month old disease free sword suckers. | | | | | | |
| Treatments of suckers smeared with cowdung solution and ash and dried in sun for about 3-4 days. | | | | | | |
| Plant suckers upright in the centre of pits with 5cm pseudostem remaining above soil level. | | | | | | |
| Spacing 2m*2m. | | | | | | |
| Fertilizer recommendation 190:115:300. | | | | | | |
| Intercropping with cucumber and amaranthus. | | | | | | |
| Propping | | | | | | |
| Pre harvest bunch sprays of 3% K2SO4. | | | | | | |
| Bunch covering | | | | | | |
| Pest & Disease<br><br>Spray 1% Bordeaux mixture soon after the appearance of the initial symptoms of the **leaf spot.**<br><br>Set traps using pseudostem of approximately .5m length, which are split length wise and laid in the field for controlling **rhizome weevil.** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Apply quinalphos 0.05% or chlorpyrifos 0.03% for controlling **pseudo stem weevil.** | | | | | | |
| 6-10 irrigations per crop. | | | | | | |
| Tissue Culture Banana | | | | | | |
| Spacing 2m*2m. | | | | | | |
| Pit size 50cm*50cm*50cm. | | | | | | |
| Double sucker planting at a spacing of 3m*2m. | | | | | | |
| Fill the pits with top soil and FYM 15-20 Kg per plant per pit. | | | | | | |
| High density planting with 1.75m*1.75m with one plant per pit. | | | | | | |

(VU/VE- very useful/very effective, U/E- useful/effective, NU/NE- not useful/not effective)

24. Technology need assessment

| **Sl. No** | **Practices** | **Technology not available** | **Technology available but not application** | **Technology available but not sustainable** | **Technology available applicable and sustainable** |
|---|---|---|---|---|---|
| 1 | Sucker treatment with cowdung and ash. | | | | |
| 2 | **Plant protection** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | Spray 1% Bordeaux mixture soon after the appearance of the initial symptoms of the **leaf spot.**<br><br>Use disease free planting material for controlling viral diseases like banana bunchy top<br><br>Set traps using pseudostem of approximatel y 0.5m length, which are split length wise and laid in the field for controlling **rhizome weevil.**<br><br>Apply quinalphos 0.05% or chlorpyrifos 0.03% for controlling **pseudo stem weevil.** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 3 | Intercropping with cucumber and amaranthus. | | | | |
| 4 | Bunch covering with dry banana leaves. | | | | |
| 5 | Pre harvest bunch spray with 3% K2SO4 | | | | |
| 6 | High density planting with spacing of 1.75m*1.75m | | | | |
| 7 | Value addition | | | | |

25. Constraints in adoption of new technologies in banana cultivation.

| Sl. No | Constraints | Most R | R | Least R |
|---|---|---|---|---|
| 1 | **Environmental Constraints:** | | | |
| a) | Rainfall | | | |
| b) | Wind | | | |
| c) | Attack of insect pest or diseases | | | |

| | | | | |
|---|---|---|---|---|
| d) | Lack of proper drainage | | | |
| e) | Climate change influence on pest intensity | | | |
| 2 | **Technology Constraints:** | | | |
| a) | Plant protection chemicals are not effective in their recommended dosage. | | | |
| b) | Lack of knowledge about INM, IPM, IDM | | | |
| c) | Lack of awareness about the correct dosage of chemical fertilizers. | | | |
| 3 | **Extension constraints:** | | | |
| a) | Lack of accessibility of ICT sources | | | |
| b) | Lack of demonstration about new technologies. | | | |
| c) | Lack of motivational factors from officials | | | |
| d) | Lack of proper information source to deliver the latest technology on banana cultivation | | | |
| e) | Non availability of supply and services | | | |
| 4 | **Economic constraints** | | | |
| a) | High cost inputs | | | |
| b) | High cost of labour: | | | |
| c) | Price fluctuation in banana | | | |
| d) | Lack of knowledge about market information | | | |
| e) | Crop insurance coverage | | | |
| 5 | **Physical constraints** | | | |

| | | | | |
|---|---|---|---|---|
| a) | Non availability of skilled labour on time | | | |
| b) | Non-availability of good quality inputs at required time and amount. | | | |

26. Practices on banana cultivation.

| SL. NO. | ITK PRACTICES |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

# ABSTRACT

# TECHNOLOGY UTILIZATION OF BANANA IN THIRUVANANTHAPURAM DISTRICT

*by*

**THASNEEM. S**

**(2014-11-193)**

**ABSTRACT**

**Of the thesis submitted in partial fulfilment of the**

**requirements for the degree of**

**MASTER OF SCIENCE IN AGRICULTURE**

**Faculty of Agriculture**

**Kerala Agricultural University, Thrissur**


**DEPARTMENT OF AGRICULTURAL EXTENSION**
**COLLEGE OF AGRICULTURE**
**VELLAYANI, THIRUVANANTHAPURAM-695522**
**KERALA, INDIA**
**2016**

## ABSTRACT

The present study entitled "Technology utilization of banana in Thiruvananthapuram district" conducted in Thiruvananthapuram district involved 90 commercial banana growers, with 30 each from Kalliyoor, Vembayam and Vellanadu panchayaths, during the period, 2015-2016. The objectives of the study were to assess the level of adoption of selected KAU practices in banana cultivation and analyse the constraints experienced by the banana growers with suggestions for refinement of practices as perceived by the farmers.

Fifteen independent variables *viz.*, age, education, farm size, area under banana cultivation, risk orientation, innovativeness, economic motivation, credit orientation, extension contact, market perception, experience in banana cultivation, number of trainings under gone, information source utilization pattern, extend of commercialization and farmers attitude towards scientific technologies were selected through judges rating. The level of adoption was the dependent variable. Nineteen recommended practices in banana cultivation were selected in consultation with subject matter specialists.

On analysis of data, it was found that majority of farmers belonged to middle aged group (58.9%) and had medium educational status (44.4%). With respect to farm size 48.9% of farmers had 0.5-1acre of land and 62.2% of them had 0.5-1acre of land under banana cultivation. Majority of farmers had medium, risk orientation (57.8%), innovativeness (71.1%), economic motivation (67.8%), credit orientation (48.9%), extension contact (48.9%), information source utilization (54.4%) attitude of farmers towards scientific technologies (64.4%) and low market perception (55.6%). Thirty two per cent of respondents had 6 to 10 years of experience in banana cultivation. Majority of farmers had attended one training (38.9%) and 68.9% of farmers sold their products in domestic marketing.

The two recommended practices adopted by majority of farmers were irrigation (88.9%) and propping (83.3%). Farmer respondents were categorized to different adopter categories as explained by Rogers (1982). According to the findings major portion of farmers were early adopters (35.5%) followed by late

adopters (34.4%), laggards (15.5%), early majority (13.3%) and 1.1% of the farmers were innovators.

The main factors of influences on technology adoption of recommended practices were risk orientation, economic motivation, farmer's attitude towards new technologies and extension contact at 5% significance followed by educational status at 1% significance.

Perceived usefulness was high for propping (57.8%) and double sucker planting (55.6%). Perceived effectiveness was high for intercropping with cucumber and amaranthus (56.67%) and irrigation (53.3%). Technology needs assessment as perceived by commercial banana growers revealed that maximum need was observed for pre harvest bunch spray and high density planting.

The major constraints as perceived by commercial banana growers in adopting selected banana cultivation practices recommended by KAU were plant protection chemicals are not effective in their recommended dosage, lack of awareness about correct dosage of chemical fertilizers, high cost of labour, climate change influences on pest intensity and attack of insect pest and diseases. Most commonly used ITK practice was smearing cowdung on sucker for speedy bud initiation. The important suggestions for refinement of technologies as perceived by farmers were standard package of practice recommendation for intercropping banana with tubers, make chemical control of pest and diseases sustainable and quality assurance / enhancement of tissue culture planting materials.

Farmers are aware of most of the technologies but are not adopting it in a desired level. This points out the need for more field demonstrations to convince the farmers about the utility of scientific technologies.

# സംഗ്രഹം

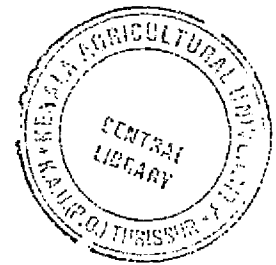
തിരുവനന്തപുരം ജില്ലയിലെ കല്ലിയൂർ, ഒവന്നായം, വെള്ളനാട് പഞ്ചായത്തുകളിലെ 90 വ്യാവസായിക വാഴകർഷകരെ ഉൾകൊള്ളിച്ച് 2015 16 കാലയളവിൽ നടന്ന പഠനത്തിന്റെ സംഗ്രഹമാണ് ഇവിടെ ചേർക്കുന്നത്. വ്യാവസായിക വാഴകർഷകരുടെ ഇടയിൽ കേരള കാർഷിക സർവ്വകലാശാല ക്രമപ്പെടുത്തിയിട്ടുള്ള ശാസ്ത്രീയമായ വാഴകൃഷിയിലെ തെരെഞ്ഞെടുത്ത കൃഷി പരിപാലന രീതികളുടെ അനുവർത്തനവും അതു പ്രാവർത്തികമാക്കുന്നതിൽ അവർ നേരിടുന്ന പ്രധാന പ്രശ്നങ്ങളുടെ അവലോകനവുമായിരുന്നു പ്രധാന പഠനോദ്ദേശം. കൂടാതെ കർഷകരുടെ കാഴ്ചപ്പാടിൽ ഇവയ്ക്കുള്ള പരിഹാരമാർഗ്ഗങ്ങളും, നിർദ്ദശങ്ങളും പഠനവിധേയമാക്കി.

വയസ്, വിദ്യാഭ്യാസ യോഗ്യത, കൃഷിഭൂമിയിടെ വിസ്തൃതി, വാഴകൃഷിയുടെ വിസ്തൃതി, നഷ്ട സാദ്ധ്യതാബോധം, നൂതനാശയങ്ങൾ നേരുത്തേ സ്വീകരിക്കാനുള്ള പ്രവണത, സാമ്പത്തിക പ്രചോദനം, വായ്പ എടുക്കുന്നതിനുള്ള ആഭിമുഖ്യം, വിജ്ഞാന വ്യാപന വിഭാഗവുമായുള്ള ബന്ധം, ക്രയവിക്രയ അവബോധം, വാഴകൃഷിയിലുള്ള പരിചയം, പങ്കെടുത്ത പരിശീലനങ്ങൾ, വിവര വിനിയോഗ ക്രമം, വാണിജ്യ മനോഭാവം, കർഷകർക്ക് വാഴകൃഷിയിലെ ശസ്ത്രീയമായ സാങ്കേതിക വിദ്യകളോടുള്ള മനോഭാവം എന്നിവയാണ് സ്വതന്ത്ര പരിവർത്തി. കേരള കാർഷിക സർവ്വകലാശാലയുടെ തെരെഞ്ഞെടുത്ത വാഴകൃഷി പരിപാലന അനുവർത്തനമാണ് ആശ്രിത പരിവർകത്തി. സ്വതന്ത്ര പരിവർത്തികൾ തെരെഞ്ഞെടുത്തത് വിജ്ഞാന വ്യാപന വിഭാഗത്തിലെ വിദഗ്ദ്ധരുടെ വിധി നിർണയത്തിലൂടെയാണ്. കേരള കാർഷിക സർവ്വകലാശാല ചിട്ടപ്പടുത്തിയിട്ടുള്ള വാഴ കൃഷിയിലെ 19 കൃഷിമുറകൾ തെരെഞ്ഞെടുത്തത് കൃഷി വിദ്യ വിദഗ്ദ്ധരുടെ അഭിപ്രായം പരിഗണിച്ചാണ്.

അഭിമുഖ സന്ദർശനത്തിലൂടെ ലഭിച്ച വസ്തുതകൾ അപഗ്രഥിച്ചപ്പോൾ 58.9 ശതമാനം കർഷകർ മധ്യവയസ്കരും 44.4 ശതമാനം കർഷകർക്ക് ഇടത്തരം നിലയിലുള്ള വിദ്യാഭ്യാസവും ലഭിച്ചവരാണ്. 48.9 ശതമാനം കർഷകർക്ക് 0.5 – 1 ഏക്കർ കൃഷി സ്ഥലം ഉണ്ട്. 62.2 ശതമാനം കർഷകർക്ക് 0.5–1 ഏക്കറോളം വാഴകൃഷിയും ഉണ്ടായിരുന്നു. കൂടുതൽ കർഷകർക്കും നഷ്ടസാദ്ധ്യതാബോധം (57.8%), നൂതനാശയങ്ങൾ നേരുത്തെ സ്വീകരിക്കാനുള്ള പ്രവണത (71.1%), സാമ്പത്തിക പ്രചോദനം (67.8% ) വായ്പ എടുക്കുന്നതിനുള്ള ആഭിമുഖ്യം (48.9%), വിജ്ഞാന വ്യാപന വിഭാഗവുമായുള്ള ബന്ധം (4 8.9%), വിവര വിനിയോഗ ക്രമം (54.4%), കർഷകർക്ക് വാഴ കൃഷിയിലെ ശാസ്ത്രീയ സാങ്കേതിക വി ദ്യകളോടുള്ള മനോഭാവം (64,4%) എന്നിവ ഇടത്തരം നിലയിലാണ്. 55.6 ശതമാനം കർഷകർക്കും ( കയ വിക്രയ അവബോധം വളരെ കുറവാണ്. 32 ശതമാനം കർഷകർക്കും വാഴകൃഷിയിൽ 6 മുതൽ 10 വർഷം വരെ പരിചയം ഉണ്ട്. കൂടുതൽ കർഷകർക്കും ഒരു പരിശീലനം (38.9%) മാത്രമേ ലഭിച്ചി ട്ടുള്ളു. കൂടാതെ 68.9 ശതമാനം കർഷകരും അവരുടെ ഉൽപ്പന്നങ്ങൾ വിൽക്കുന്നത് ഗാർഹിക വിൽ പന ശാലകളിൽ മാത്രമാണ്.

കൂടുതൽ കർഷകരും ഏറ്റവും കൂടുതൽ ഉപയോഗിക്കുന്ന രണ്ട് ശാസ്ത്രീയ വാഴകൃഷിമുറകളാ ണ് ജലസേചനവും (88.9%) താങ്ങു നൽകലും (83.3%). 1982 ൽ റോജർ വർഗ്ഗീകരിച്ചത് പോലെ ക ർഷകരെ വ്യത്യസ്തങ്ങളായ വിഭാഗങ്ങളായി തിരിച്ചു. ഈ പഠനത്തിലെ കണ്ടെത്തലുകൾ അനുസര ിച്ച് കൂടുതൽ കർഷകരും (35.5%) പ്രതീക്ഷിച്ച സമയത്തിനുമുൻപ് തന്നെ നൂതനാശയങ്ങൾ പ്രാവർ വർത്തികമാക്കുന്നവർ ആണ്. 34.4 ശതമാനം കർഷകർ പ്രതീക്ഷിച്ച സമയം കഴിഞ്ഞ് നൂതനാശയ ങ്ങൾ പ്രാവർവർത്തികമാക്കുന്നവർ ആണ്. 15.5 ശതമാനം മന്ദവേഗരിൽ പെടുന്നു. 13.3 ശതമാനം അധിക പക്ഷരും 1.1 ശതമാനം വേഗത്തിൽ നൂതനാശയങ്ങൾ കൈപ്പറ്റുന്നവരുമാണ്.

കർഷകർക്ക് വാഴകൃഷിയിലെ ശാസ്ത്രീയ പ്രയോഗരീതികളെ കുറിച്ച് മിതമായ അവബോധം ഉണ്ടെങ്കിലും അത് ആപേക്ഷികമായ ഒരു നിലയിൽ പ്രാവർത്തികമാകുന്നില്ല. ശാസ്ത്രീയമായ കൃഷിരീതികൾ കർഷകരുടെ കൃഷിയിടങ്ങളിൽ പ്രദർശിപ്പിച്ചു കർഷകരെ അവയുടെ ഉപയുക്തതയെകുറിച്ച് ബോധവാന്മാരാക്കേണ്ടത് അത്യാവശ്യമാണ്.



ശുപാർശ ചെയ്തിട്ടുള്ള സാങ്കേതിക വിദ്യകളുടെ പ്രയോഗരീതിയെ സ്വാധീനിക്കുന്ന പ്രധാന ഘടകങ്ങൾ നഷ്ടസാദ്ധ്യതാബോധം, സാമ്പത്തിക പ്രോത്സാഹനം, വാഴകൃഷിയിലെ ശാസ്ത്രീയ സാങ്കേതിക വിദ്യകളോടുള്ള മനോഭാവം, വിജ്ഞാന വ്യാപന വിഭാഗവുമായുള്ളബന്ധം, വിദ്യാഭ്യാസ യോഗ്യത എന്നിവയാണ്.

താങ്ങുനൽകലും (57.8%), ഇരട്ടക്കന്ന് വാഴകൃഷിയും (55.6%) ആണ് കർഷകരിൽ ഏറ്റവും കൂടുതൽ ഉപയുക്തത ഉളവാക്കുന്ന കൃഷിമുറകൾ. കർഷകർ കൂടുതൽ ഫലപ്രദമായികാണുന്ന പ്രയോഗരീതികൾ വെള്ളരിയും ചീരയും ഉപയോഗിച്ചുള്ള ഇടവിള കൃഷിയും (56.67%) ജലസേചനവും (53.3%) ആണ്. വാഴ കൃർഷകരുടെ സാങ്കേതിക ആവശ്യം വിലയിരുത്തിയപ്പോൾ വിളവെടുക്കുന്നതിന് മുൻപ് $K_2So_4$ വാഴക്കുലയിൽ തളിക്കുന്നതും ഇരട്ടകന്ന് വാഴകൃഷിയിലുമാണ് കൂടുതൽ ശ്രദ്ധ നൽകേണ്ടത് എന്ന് മനസിലായി.

ശുപാർശ ചെയ്തിട്ടുള്ള അളവിൽ രാസകീടനാശിനികളുടെ കുറഞ്ഞകാര്യക്ഷമത, രാസവളങ്ങളുടെ ശരിയായ അളവിലുള്ള പ്രയോഗത്തിനെകുറിച്ചുള്ള അവബോധ ഇല്ലായ്മ, തൊഴിലാളികളുടെ ഉയർന്ന വേതന നിരക്ക്, കാലാവസ്ഥാ വ്യതിയാനം കീടങ്ങളുടെ തീവ്രതയെ സ്വാതീനിക്കുന്നതും കീടങ്ങളുടെയും രോഗങ്ങളുടെയും ആക്രമണവുമാണ് വാഴകർഷകർ ശാസ്ത്രീയമായ കൃഷിരീതികൾ പ്രാവർത്തികമാക്കുന്നതിൽ നേരിടുന്ന പ്രധാന പരിമിതികൾ. വാഴകൃഷിയിൽ കൂടുലായി ഉപയോഗിക്കുന്ന പ്രധാന നാട്ടറിവ് വേഗത്തിൽ മുളപൊട്ടാൻ വാഴത്തട ചാണകത്തിൽ മുക്കിവെക്കുന്നതാണ്. കിഴങ്ങ് വർഗ്ഗങ്ങൾ ഉപയോഗിച്ചുള്ള വാഴയുടെ ഇടവിള കൃഷിയുടെ അംഗീകൃതമായ ശുപാർശയും സ്ഥായിയായ രോഗകീടരാസ നിയന്ത്രണവും, ടിഷ്യുകൾച്ചർ വാഴയുടെ നടീൽ വസ്തുക്കളുടെ ഗുണനിലവാര വർദ്ധനവും ആണ് ശസ്ത്രീയമായ വാഴകൃഷി വേഗത്തിൽ നഷ്ടിലാക്കാൻ കർഷകർ നിർദ്ദേശിച്ചത്.