

**ENTREPRENEURIAL BEHAVIOUR OF VEGETABLE
FARMERS IN CENTRAL KERALA**

BY
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(2013-25-101)

THESIS

*Submitted in partial fulfillment of the requirement
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**DEPARTMENT OF RURAL MARKETING MANAGEMENT
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2019

DECLARATION

I, hereby declare that this thesis entitled “**Entrepreneurial behaviour of vegetable farmers in central Kerala**” 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, fellowship or other similar title, of any other University or Society.

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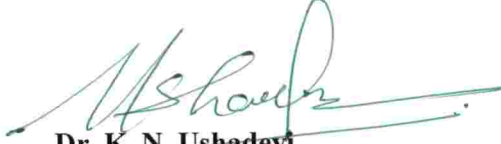
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ABBREVIATIONS

EB – Entrepreneurial Behaviour

VFPCCK – Vegetable and Fruit Promotion Council Kerala

Zone 1 – Coastal sandy

Zone 2 – Central Midlands

Zone 3 – Malayoram

Zone 4 – Palakkadan plains

Zone 5 – Chittoor black soil

KAU – Kerala Agricultural University

CHAPTER I

INTRODUCTION

“Agriculture is the locomotive of our economy and a prosperous rural economy based on agriculture will ultimately make the nation prosperous”

-Sardar Vallabhbhai Patel

The agricultural production in India which was 50 million tonne in 1950-51 has increased to 277.49 million tonne in the year 2017-18 (Government of India, 2018). India stands first or second in the production of many agricultural crops such as coconut, rice, wheat, fruits and vegetables, tea, coffee, leguminous crops, chilli, cotton etc. Vegetables play a major role in Indian agriculture by providing food, nutritional and economic security. More importantly, giving higher returns per unit area within short span of time, i.e., vegetables have higher productivity, shorter maturity cycle, more value and provide higher income leading to improved livelihoods. Further it is very essential now to enhance the per hectare productivity so as to boost vegetable production. Efforts are being made from various angles to encourage farmers to increase the area under important vegetable crops. If we look into the expenditure for vegetable cultivation, about 47.84 per cent being spent as labour charges (Government of Kerala, 2009). In other words vegetable cultivation absorbs a substantial amount of labour and it is well known that they constitute mostly low income and landless labour force including women and children of rural area (Government of Kerala, 2012).

In Kerala, the total area under the cultivation of vegetables during 2017-18 was 46363 ha. (Government of Kerala, 2018). ‘The Hindu’ Daily (Feb 8, 2010,) reported that around Rs. 1000 crores worth of vegetables were brought into our state yearly which empirically state the demand supply gap of vegetables, even though the gap is decreasing over the years. National Horticulture Mission came up with an action plan for Kerala during Eleventh Five Year Plan which clearly pointed out that

our state was highly deficient in its requirement of vegetables. Even though total requirement of vegetables in the state was 8.18 lakh tonnes, the production was only 3.47 lakh tonnes and the rest is accounted by the neighbouring states. If the requirement is worked out based on Indian Council of Medical Research (ICMR) norms, the state requires as much as 24.11 lakh tonnes of vegetables.

Although the production and productivity of agricultural crops have increased over the years, the income and standard of living of the farmers have not increased proportionally. The Central and State Governments have come out in a big way with a number of promotional programmes for agri-business entrepreneurs, to motivate and train them through organised programmes by different agencies and institutions like District Industries Centre, Krishi Bhavans, HortiCorp, Horticulture Mission, Vegetable and Fruit Promotion Council of Kerala, Kudumbashree Mission, etc. However, the efforts made by promotional agencies are yet to bring the desired impact among the farmers in increasing vegetable production.

1.1 Statement of the problem

Approaching agriculture without considering the elements of commerce and business created problems in this sector such as production cost – income mismatch, failure in marketing aspects, lack of value addition etc. Due to the lack of co-ordination and competition between the value chain actors of agricultural products, the consumers have to buy the products at higher price and on the other side the producer gets only a small percentage of the market price and has to satisfy with that. Except a few crops, farmers do not get more than 30% of the retail price for majority of their produces. There is also a wide scope for safe to eat food products among the public due to the increasing awareness about health and its maintenance. Although the vegetable requirement of Kerala is 4000 to 5000 tonnes per day, the production is limited to just 1000-1500 tonnes per day. This requirement for consumption is met by bringing the vegetables from neighbouring states.

Adopting scientific agricultural practices along with careful study of market conditions and applying suitable management techniques will help the agri entrepreneurs becoming successful in their business. Kerala has got a very conducive climate for starting enterprises. The Government of Kerala aims the elevation of educated youth from their status of 'job seekers' to 'job providers'. Kerala has distinction of becoming the first-state to allocate 5% in the budget of each government department for developing entrepreneurial skills among students and youth.

Agricultural incubation centres assist those who are willing to start agribusiness enterprises. Many private equity funds are ready to invest in India's agricultural and allied sectors, especially in agri-start-up companies which help the development of small and marginal farmers. Small Farmers' Agribusiness Consortium (SFAC) is another institution which provides financial support to entrepreneurs in agribusiness activities like agriculture processing, diversification and value addition. SFAC gives a subsidy of 25 per cent subject to a maximum of Rs.10 lakhs for processing fruits and vegetables, coconut and spices which costs Rs.5 lakhs to Rs.50 lakhs under its state scheme.

Besides these, many public and private companies have designed projects to support agribusiness entrepreneurs. The human resource in Kerala Agricultural University has a well equipped expertise in agriculture and allied activities. A considerable amount of research about the personal qualities and behaviour of entrepreneurs have been conducted in recent years, but the precise identification of entrepreneurial skill remains elusive. The World Wide Bibliography on entrepreneurial research prepared by East West Centre, Hawaii reports that studies in behaviour of entrepreneurs in agriculture are very limited. Hence the research gap about the behavioural aspects of entrepreneurs in agriculture makes it significant in conducting the study in the central Kerala with the following objectives:

1.2 Objectives of the study

1. To examine the entrepreneurial behaviour of vegetable farmers,
2. To identify the factors influencing the entrepreneurial behaviour of vegetable farmers,
3. To analyse the constraints which affect the entrepreneurial behaviour of vegetable farmers,
4. To study the extent of adoption of KAU technologies among vegetable farmers,
5. To suggest strategies to promote entrepreneurial behaviour of vegetable farmers.

1.3 Scope of the study

The findings of the study may help the administrators and policy makers know the entrepreneurial behaviour of vegetable farmers and factors affecting their entrepreneurial behaviour. It will help to identify the major constraints which affect the entrepreneurial behaviour of vegetable farmers in the Kerala scenario which may help in bringing suitable action plan to minimize the intensity of the constraints. It will also explore the extent of adoption of KAU technologies among the vegetable farmers so that the study can be fruitful to KAU in order to strengthen the dissemination of its own technologies through the various sister organisations. Ultimately the study will bring out strategies for promoting vegetable based entrepreneurship among the farmers of central Kerala and thus it will help to develop a protocol of entrepreneurship (Ideal entrepreneurship behaviour) among the vegetable farmers.

1.4 Limitations of the study

The study was mainly based on the primary data collected from central zone of Kerala (comprising five agro ecological zones from the three districts namely, Palakkad, Thrissur and Ernakulam) and the results and interpretations will definitely

be effected by the interest and attitudes of individual farmers. Also very high sample size fixed for the study has lead to delay in completion of survey.

1.5 Plan of the thesis

The scheme of the study consists of five chapters. Chapter one deals with introduction, statement of the problem, scope of the study, limitations and plan of the thesis. Detailed review of the existing literature related to the topic has been done in chapter two. Methodology adopted for the study is presented in chapter three. Chapter four presents the analysis and discussions. The final chapter presents summary, findings and conclusions.

CHAPTER II

REVIEW OF LITERATURE

Entrepreneurial behaviour of farming community is an unexplored area when compared to the industrial sector. However the review of the available literature is quite essential in order to finalise the focus of any research study. In this chapter an attempt is made to review the available literature under the following sub heads.

2.1 Entrepreneur

2.2 Entrepreneurship

2.3 Entrepreneurial behaviour

2.4 Factors influencing entrepreneurial behaviour

2.5 Constraints affecting entrepreneurial behaviour

2.6 Adoption of technologies

2.1 Entrepreneur

Schumpeter (1954) defined entrepreneur as an innovator who combines the innovations and initiations and speed up the economic development through production and sales. Innovation includes introduction of new goods and ideas, introduction of new technologies, inventing new markets and organizational arrangements and finding new sources of raw materials.

Cole (1959) in his study named 'Business enterprise in its social setting', mentioned that entrepreneur is the one who is capable of taking decisions in his enterprise. He is the only person who has the right to decide what, when, why and how to do things his business.

An attempt was made by Joshi and Kapur (1973) to define farm entrepreneur in their book on 'Fundamentals of farm business management'. A farm entrepreneur is the one who organizes all the factors which affect his business and operates it in such a manner to gain some results. The result may be positive or negative, i.e, it may be a gain or a loss. But he will be the leader and innovator for his business and will be solely responsible for the results.

An entrepreneur is a person one who takes risks and decisions and coordinates the activities and thus initiates the production to generate income out of it and continues the process as long as the firm gets liquidated. Leeds and Staintonne (1978) tried to explain this concept in their publication.

Patel (1987) in his book named 'Entrepreneurship development programmes in Indian and its relevance to developing countries' stated that an entrepreneur is the person who acts as a catalyst for organizing the factors included in an entrepreneurship. He is the one who sources the resources including capital, arranges and coordinates the activities and manages the risks so as to create a sustainable and viable business activity which in turn generates employment.

In his writing regarding 'Small scale industries-ills and remedies' (1988) Dixit defined entrepreneur as an agent who creates a concept, take the initiative to work out the concept, grabs the opportunity, takes risks, promotes his organization and the one who manages the events in the course of business to achieve the set goals. He referred an entrepreneur as a 'spark plug' who transfers the opportunities around him to make profit out of it. He is the one who controls the economic activities in his firm according to the economic scenario prevailing in the market.

Chatterjee (1992) defined an entrepreneur as one who creates something new, undertakes risk, organizes production and handles the economic uncertainty. He termed entrepreneurship as the mission and entrepreneur as the missionary.

Twaalfhoven and Indivers (1993) observed that dynamic entrepreneurs look for growth, they did not have only a vision but were also capable of making it happen. They think and act globally, look for expansion, rely on external resources, seek professional advice or they work with professional teams. They challenged competitors instead of avoiding them and take and share risks in a way that leads to success.

Sharma and Sing (1994) said that an entrepreneur is one who transforms the resources and raw materials into goods and services. The resources may include both financial and physical resources which will create new products. The sale of these products brings income and wealth to the entrepreneur and also generates employment in the society. The standardization and upgradation of the products by the entrepreneur will create a space for it in the market and new customers are also brought into the fold. Thus the entrepreneur expands his business and enlarges his enterprise which in turn brings him more profit and recognition.

Porchezian (1998) viewed entrepreneur as the central figure of economic activity and prime mover of development. They were persons who initiate, organize, manage and control the affairs of an enterprise that combine the factors of production to supply goods and services in any sector. Entrepreneurial skill, therefore, is to be regarded as the most needed component for the development.

Khanka (2002) in his book on 'Entrepreneurial development', defined entrepreneur as an innovator who tries to innovate or create new ideas or products or services and organizes the production or development of the same and to produce that he will take risks which in turn will bring profit or gains to his organization. He is the one who handles the uncertainty in the business regarding production, economics and all other factors included in the growth of the enterprise.

According to Bheemappa (2003) an entrepreneur is a person who innovates and introduces a new product or service into the market or to the economy. He is the one

who takes capital, i.e, investment required for the production or innovation, the one who decides about what to be done in the enterprise, who calculates risks involved and act accordingly to overcome those risks, one who plans and take correct prompt decisions at right time. He is the one who decides the product mix, technology mix and marketing.

Palanivelu and Rajanarayanan (2005) said that an entrepreneur is the one who brings in resources including capital, labour, raw materials and other assets which are required for the production of goods or for development of services and combines those to get the output and thus to earn profit. She or he has the characteristics of an innovator, leader, decision maker and risk bearer.

2.2 Entrepreneurship

Rao and Mehta (1978) in their book named Psychological factors in entrepreneurship described entrepreneurship as a result of innovation and modification as a response to the environment and economy. It may be in the field of agriculture, business, education, industry, social work, etc. the changes may happen in any field which in turn create demand for certain product or service and the entrepreneur finds opportunity to start an enterprise according to those changes in the economy.

Reddy (1989) in his study regarding the role of State Bank of India in entrepreneurship development in India has defined entrepreneurship with respect to risk taking ability of the entrepreneur. Entrepreneurship is the urge of an entrepreneur to take risk to overcome the uncertainties faced in the due course of action and to bring the expected result.

Vijayalakshmi (1992) in her study regarding women entrepreneurship, stated that entrepreneurship as the ability to organise and co-ordinate, maintain and manage

the resources wisely so as to get the best result even under the worst scenario. Thus entrepreneurship becomes the overall management of happening in the enterprise.

Sharma and Singh (1994) in their study about determinants of entrepreneurship in agriculture said that it is the skill of a person to shift and to transform the resources from areas where productivity is less to higher productivity. Entrepreneurship is the art of finding opportunity to generate income from the resources available. It includes the creativity of the entrepreneur as a main function of the entrepreneurship.

Sheela (1994) in her book regarding Role of women entrepreneurship in spice industry, defined entrepreneurship as the ability to grab the investment opportunities, organising money and other resources to create an enterprise which contributes to the economic growth and enhance personal standard of living.

Patil (1999) identified that the farmers who were progressive could not be identified as agricultural entrepreneurs but those who were entrepreneurs were essentially progressive farmers. The entrepreneur was an economic man, who strived to maximize his profits by innovations. He was a man with a will to act, to assume risk and to bring about a change through organization of human efforts.

According to Reddy (2004), entrepreneurship was a composite skill, the resultant of a mix of many qualities and traits like tangible factors as imagination, readiness to take risks, ability to bring together and put to use other factors of production, capital, labour, land, and also intangible factors such as the ability to mobilize scientific and technological advances.

2.3 Entrepreneurial behaviour

Nandapurkar (1982) in his study named 'Small farmers- A study on their entrepreneurial behaviour' has invented a qualitative instrument to quantify the entrepreneurial behaviour of farmers by considering ten components viz. risk taking ability, leadership quality, and innovativeness, coordination of activities in farming,

decision making ability, achievement motivation, and information seeking ability, cosmopolitanism and assistance of management services.

According to Raghavacharyulu (1983) in his study regarding entrepreneurial behaviour of farmers, found that the small farmer with high education, having high social interaction, with more farming experiences, with large cropping intensity and farm size, earning high income, had shown high entrepreneurial behaviour.

Ganguly (1990) in his study entitled 'Rural industrialization- need and relevance of agro based industries' says that agro based industries paved a way for promoting integrated agriculture and agribusiness activities which in turn created new entrepreneurs in agriculture and employment generation. Like other enterprises, agri business enterprises are also providing job opportunities from the field up to the marketing. Thus the agri business entrepreneur also becomes an employer.

According to Himachalam (1990), he found that in his study on 'Entrepreneurship development in small scale sector', the lack of organizational structure for dissemination of knowledge and information about new technologies, to the farming community and lack of training affect the entrepreneurial behaviour of small farmers. Unless the farmers have the up to dated information about the demand and market scenario, he cannot become a successful entrepreneur.

Nagpal (1990) in his article regarding 'Entrepreneurial venture initiation of financing' says that the role of entrepreneur is inevitable in economic development and can create high employment generation and thus income generation too. An enterprise is started with a social objective also. The entrepreneur is then liable to the society to develop and enhance the economic scenario and he will in turn become an employer.

Muthukrishnan (1993) in his book regarding 'Entrepreneur culture' stated that entrepreneurial behaviour will be achieved by motivation, skills, planning, and

financial requirements. The social fact that agriculture cannot be considered as a profession with social status makes the society not to motivate the farmers. Many of the youngsters are moving in search of white collar job due to the concept that the farming is a job which cannot give social status in the society. Unless a person gets motivation to do a job or to take up an enterprise, he or she cannot do the same. This happens in the case of farming also and people are reluctant to take farming as a profession.

McElwee (2005) mentioned that in the last few years, farmers, agricultural business researchers and governments had recognised the need for a better entrepreneurial culture in the farming business. The development of entrepreneurial skills of farmers was a significant issue, which needs to be addressed by all stakeholders in the agricultural socio-economic network.

Rao and Dipak (2009) pointed out that the different dimensions of the entrepreneurial behaviour were management orientation, farm decision making, leadership abilities, risk taking ability, knowledge of vegetable farming, achievement motivation, innovativeness, self- confidence, and utilization of available assistance.

2.4 Factors influencing entrepreneurial behaviour

Dean *et.al* (1958) in their study regarding factors related to rationality in decision making among farm operations found that highly educated entrepreneurs can take effective decisions. Highly educated entrepreneurs will go for updating of knowledge and search for market conditions and hence the decision making will become more precise. Also in their study entitled some factors related to rationality in decision making among farm operations say that the size of land holding has an effect in decision making of the farmers. Higher the land holding higher will be the entrepreneurial characteristics of the farmer, since the farmer has taken farming as an entrepreneurship.

English and English (1958) in their book named a comprehensive dictionary of psychological and psycho analytical terms have defined level of aspiration as the measurement of a person's own performance with his goal and analyze whether it is success or failure and trying to improve himself. An entrepreneur having set the goal, tries for achieving the same and he plans accordingly. The strong desire to achieve the goals is termed as level of aspiration.

Sengupta (1960) in his article on Women Workers of India took occupation as a major variable for adoption and came to a conclusion that efficiency in farming depends upon adoption and main occupation also depends upon adoption. If a farmer has taken farming as his or her main occupation, he or she will try to bring maximum perfection to the farming and hence the efficiency also increases.

The study of Singh (1968) was conducted to analyse the relationship between anxiety and risk taking amongst successful and unsuccessful agricultural entrepreneurs of Delhi says that a successful agricultural entrepreneur has accepted modern agricultural technologies and thus her or him become successful in agriculture. Their attitude towards modernization will be positive. Higher the risk taking ability to accept new technologies made the farmers get more productivity and more income.

The characteristics of entrepreneurs are listed by Christopher (1969) and they are perseverance, risk taking ability, hard word, urge to learn, innovative, dynamic, communication and salesman ship skills, adaptability, takes initiative, ability to gain friend and crisis management, self confident, personality will power, tactful, responsible, urge to succeed and time management.

Gaikwad and Tirupathi (1970) in their case study of socio psychological factors influencing industrial entrepreneurship in rural areas in Tanuku region of West Godavdara of Andhra Pradesh say that the entrepreneurship formation is correlated with the socio-economic background of the entrepreneur and the economic factors

and status. The socio economic back ground such as age, occupation, financial and economic factors encourage a person to become an entrepreneur and it decides the degree of entrepreneurship behaviour of the entrepreneur.

Das and Sarkar (1970) prove that there is a direct relationship between main occupation and the entrepreneurial behaviour of farmers in their study named economic motivation and adoption of farming practices. If the farmer takes farming as his main occupation, he will get motivated more and will adopt more farming practices for improving their farming activities.

According to Sundararajan (1972) in his study on role and participation of rural farm family in decision making said that the farmers with high income would consult their family members for taking important decisions. Decisions are not taken independently by the big farmers since the activities require expert and efficient decisions.

According to Sawyer (1973) in his article on predictors of the farm involvement in general management and adoption decisions says that women's involvement in decision making has a negative association with the size of farm. It means that when the size of land holding increases the involvement of women in decision making decreases. As the size of land increases, farming becomes more professional and becomes entrepreneurial and thus professional agriculturists handle it. Gradually the involvement of women also decreases.

SIET (1974) in its study on socio-psychological factors influencing the adoption of innovation of starting a small scale industry unit-statistics that the entrepreneurial behaviour varies depending upon the economic gain, which is the main reward of entrepreneurship. Ambition, education, prestige, age, responsibility, aspiration, risk taking ability and degree of adaptation determine the entrepreneurial behaviour. All the entrepreneurs work to get rewarded more and accordingly their entrepreneurship behaviour also changes.

Ambastha and Singh (1975) in their study could find a positive and significant correlation with cosmopolitanism and information of technologies of farmers. When the farmers become more cosmopolite they acquire more knowledge. They then try to get knowledge and information from their surroundings and from other sources.

Chauhan (1976) in his study of some socio-psychological and communication correlates of adoption behaviour of the rural audience with respect to SITE stated the positive relationship between level of aspiration and the adaptation of new technologies. When an entrepreneur wants to achieve his goals he starts to search new ways and methods to achieve it and thus the level of aspiration and adaption of new technologies become positively correlated. The same was stated by Sushama *et.al* (1981) and Sanoria and Sharma (1982) also.

Thangaraju (1979) compared the characteristics of trained and untrained farmers who are doing sericulture and concluded that there is no difference between them in their entrepreneurial behaviour with respect to their annual income but depends on the experience and knowledge. Experience and knowledge is very essential in sericulture since it requires some technical skill in its production and hence those two factors affect entrepreneurial behaviour of sericulturists than annual income.

Nandapurkar (1982) in his study on the entrepreneurial behaviour of small farmers says that the income of farmer is positively and significantly correlated with his entrepreneurial behaviour. So as to get higher income, farmers show high degree of entrepreneurial behaviour and become more mobile.

Ferreira *et.al* (1983) in their study made on adoption of maize production technology at Lavras Minas reported that those farmers having high social interaction adopt more improved and modern farming technologies because they get to know about what are the changes undergoing in the field of farm mechanization and modernization.

Raghvacharyulu (1983) found that the mass media participation has a role in determining entrepreneurial behaviour of small farmers. As farmers watch and listen to more mass communication media, they acquire more knowledge and try to apply those in the field. Thus in turn their degree of entrepreneurship increases.

According to Saradmoni (1983) the women in farming sector listen to the radio programmes regarding farming and will follow those techniques if they find those as useful. This will result in more productivity and more income which will increase their entrepreneurial behaviour.

Renukaradhya (1983) made a conclusion that there is a significant relation with the mass media participation of farmers who are trained with their economic performance. Mass media participation will enhance the knowledge of farmers which results in higher productivity, after the application of new technologies into the field.

Raghavacharyulu (1983) in his study got to know that high income farmers have high entrepreneurial behaviour but Singh and Chander (1983) said that income has non significant effect on participation by women in farming activities and Seema (1986) found that income has non significant effect on participation by women in decision making.

Singh and Chander (1983) in their study about involvement of rural women in farm credit say that age of women affects the efficiency in taking decisions and has a non- significant effect on it. Even though the age is a factor in influencing taking the decisions, it doesn't have a significant impact on it. More the age means more the experience and hence they can take efficient decisions.

Murthy (1983) in his study on entrepreneurship in small towns in Andhra Pradesh says that education is not mandatory for entrepreneurship but will act as a complementary quality for it. Even uneducated people will also become an

entrepreneur but when compared to educated entrepreneurs, they show less degree of entrepreneurship behaviour and lag in decision making.

Raghavacharyulu (1983) in his thesis about entrepreneurial behaviour of farmers depicted the positive correlation with occupation and entrepreneurial behaviour of farmers. If the farmers opt farming as their main and prime occupation for their livelihood, they give the best effort to make it a success so as to earn maximum income. And hence they show high degree of entrepreneurial behaviour.

In a study conducted by Aswathy (1983) regarding role of women in economic planning it-statistics that the land holding has no significance in decision making but it varies from country to country and depends on the culture. As far as Kerala is considered, land holding is fragmented and has no significant relation in the decision making. But in other states and countries agriculture is carried out in an extensive manner and it affects the decision making ability also.

A study made by Govind (1984) regarding participation of farm women in farm and home activities says that there is a negative significant relation between social interaction and extent of involvement in farm activities by rural women. When the involvement in farming activities increases the social interactions decrease due to time constraint.

Ranganathan (1984) in his thesis on aspiration of farm youth and their attitude towards farming stated that education has positive and significant role in making young agriculturists aspiring and innovative. If the farmers are educated, then they will make themselves updated with knowledge and information which in turn will make them take appropriate decisions and thus they will show more degree of entrepreneurial behaviour.

Seema (1986) in her thesis related to role of farm women in decision making process of a farming community stated that there is non significant relation between

occupation and performance of farm women. Although there is a relationship between the occupation and the decision making and performance of farm woman, it is not significant. This may be due to that the farm women may not have taken farming as their main occupation. Also in her study regarding the role of farm women in decision making process of a farming community in Trivandrum District-statistics that the age has a significant role in decision making of farm women. Young women entrepreneurs may not have more experience and may not know how to take effective decisions, whereas the aged women entrepreneurs may have experience in their business and in their life which will help them take suitable and effective decisions.

In his study about entrepreneurship, Rao (1986) concluded that income factor motivates the farmers in entrepreneurship whereas Porchezian (1991) said that there is a non significant relation with annual income and entrepreneurial behaviour of farmers and Kokate and Nand (1991) in their study say that income has a positive significant relation with entrepreneurial behaviour of farmers growing potato.

When Seema (1986) in her study found that there is no significant relation with level of aspiration to the performance, Jayalekshmi (1996) in her study named entrepreneurial behaviour of rural women said that level of aspiration and entrepreneurial behaviour of rural women are significantly related. Also in her thesis on role of farm women in decision making process says that the educational level of farm women has significant role in participation in entrepreneurship and farming. Educated farmers will get more updated with market scenario, demand for produces and they keep on updating themselves and it makes them to enhance their entrepreneurial behaviour.

George *et.al* (1987) in their study reported that the education level will help the entrepreneurs to take risk and to handle crisis. When people are aware about the facts, they take more risks and get ideas to handle the crisis and thus they become more flexible.

Mohiuddin (1987) found in a study that the women entrepreneurs in Kerala start their venture in the age of 36 to 40 years from different economic classes. Young women in rural areas are not interested into entrepreneurship and once they get married, with the support of the family, they are coming into businesses and so most of the women entrepreneurs start their career at the age of 36 to 40 years.

Rao and Alagendhi (1989) in their study on entrepreneurship development through TRYSEM reported that nonfarm activities and allied agriculture activities provide throughout employment and income to the farmers. Farmers whose main occupation is farming have allied and other non farm activities which add additional income to them and increases their living standard.

Ramamurthy *et.al* (1990) in their article regarding entrepreneurs' profile-some aspects states that there is an influence of age upon entrepreneurial behaviour. Most of the entrepreneurs start their venture between the age group of 20 to 40 years. Most of the people will get graduated in the age of 20 and then start the search for getting a job. At this point of time people will think of starting an enterprise and getting settled. At the age of 40 most of the people will get settled with the business or occupation in which they are into. Hence the range of age spreads between 20 to 40.

Porchezian (1991) in his study found that the age is positively correlated with the entrepreneurial behaviour of farmers. To become an entrepreneur a minimum level of knowledge and experience is required. Experience can be acquired over the years and gradually the aged entrepreneurs will show more level of entrepreneurial behaviour and thus it becomes positively correlated.

Patel (1990) in his study about 'entrepreneurial behaviour of progressive and non progressive farmers - a comparative analysis, found that, the entrepreneurial behaviour of upcoming farmers is directly related to the land holding, education and age. Each of these factors has a great role in determining the degree of entrepreneurial behaviour in farmers. Larger the land holding, larger will be the extent of operation.

Higher the education, higher will be the planning in activities. If age is considered, aged people will have more experience and knowledge about farming.

Perumal *et.al* (1990) in their study regarding 'Entrepreneurial characteristics of successful women entrepreneur- a case analysis approach, depicts the relation between the start of a new entrepreneurial venture and economic and risk orientation, i.e, the economic and risk orientation are the factors responsible for entrepreneurial venture. The changes happening in the economy and market pave way for creation of new ventures. In short it acts as a catalyst for innovation of new ventures.

Shilaja (1990) in her study regarding 'Role of women in mixed farming' found that the mixed farming productivity depends upon the orientation of management of farmwomen in small and developing or progressive villages. If the activities in mixed farming are arranged and managed in an effective manner, the productivity can be increased. The term farm woman refers to the women who are engaged in farming activities in the field. They may be either the farmers or the family members of farmers.

Porchezian (1991) in his thesis regarding 'An analysis of entrepreneurial behaviour of farmers' says that farmers who are having more experience in farming, high annual income, social interaction, scientific knowledge and orientation along with innovations, who are more self reliant and are motivated highly, including sufficient financial support, will have more entrepreneurial behaviour. All these factors are playing a major role in the development of entrepreneurial behaviour. When these factors are more in the farmers they have a high degree of entrepreneurial behaviour.

Porchezian (1991) in his study got to know that the educational status has non-significant relation with the entrepreneurial behaviour of farmers. Even though there is a relationship between the educational status and entrepreneurial behaviour, it doesn't have a significant role in determining entrepreneurial behaviour.

The positive significant relation between social participation and entrepreneurial behaviour is reported in the studies of Nandapurkar (1982), Raghavacharyulu (1983) and Porchezian (1991). As the social participation increases, the degree of entrepreneurial behaviour also increases. This is because the farmers get new ideas and information while they are interacting with the public which in turn will add to their entrepreneurship behaviour.

According to Chandra (1991) the successful entrepreneurs have great involvement in social activities in comparison with unsuccessful entrepreneurs. A comparison among the successful and unsuccessful entrepreneurs was made to analyse the factors which influence the success of entrepreneurs by him and social interaction was one of the variables taken. That who has high level of social interaction is successful in their field because while interacting with the society they were able to get an idea about the do's and don'ts.

Kokate and Nand (1991) in their study said that the entrepreneurial behaviour of small and marginal potato farmers increased after participation in extension activities. The agriculture extension workers add more inputs to the knowledge of the farmers which made the farmers to implement those information in their fields and it enhances the entrepreneurial behaviour of the farmer.

Natarajan and Thenmozhy (1991) found that the Entrepreneurship Development Programmes (EDP) conducted by different institutions encourage women in rural area to get in to new ventures and to excel in those. These programmes may help the rural women as a guidelines for starting new ventures as a group and as individuals.

Singh (1992) reported that most of the entrepreneurs will not seek any training and it doesn't make any impact on their entrepreneurial behaviour. But this is not applicable to the rural women sector. Rural women are less exposed to education and so training is inevitable for the development of entrepreneurship behaviour in rural women.

Susamma (1994) in her study about Adoption behaviour of sericulturists concluded that sufficient training should be given to the farmers in their respective field so as to develop their farming and attached enterprises. It will make them understand the concept of cost reduction, risk analysis, productivity, cost benefit comparison, possibilities of new market and business ventures etc.

Perumal and Vijayaraghavan (1994) in their study on strengthening agricultural extension for sustainable development systems say that training should be given at different levels and aspects such as policies, programmes, implementation, technicality and economics so that farmers can implement those in field to get more income.

Sharma and Singh (1994) in their article on determinants of entrepreneurship in agriculture reported that educated farmers are ready to accept new and modern technologies in farming. They are more known with information and technologies and so they know the pros and cons of those technologies and hence they are ready to adopt modern technologies by taking risks.

Sabbarwal (1994) in his study of 'Dimensions of entrepreneurial startups-A study of Industrial units in India' found that industrial climate plays a major role in entrepreneurial behaviour, than psychological and sociological factors. He was of a different opinion that the industrial and factors and climate are having major role in molding the entrepreneurial behaviour than the social and market factors.

According to Sharma and Singh (1994) in their study about 'Determinants of entrepreneurship in agriculture', the knowledge level and adoption of practices of cultivation of rice depends on the factors viz. education, social interaction, mechanization and the economic and social status of marginal farmers. A study was made by them to analyse the adoption of practices in rice cultivation with respect to education, social interaction, mehanisation and economic and social status.

Koontz (1994) in his article entitled 'Essentials of Management' says that an entrepreneur is a person who takes risk to initiate change and forecasts reward for it. They will be innovative and have the authority to delegate the powers. He will be in search of new technologies and ideas so as to develop it into a new product and thus to get a return from it. He is the catalyst in initiating the change.

Manjula (1995) in her study on entrepreneurial behaviour of rural women in Ranga Reddy district of Andhrapradesh found that the entrepreneurial behaviour of women in DWCRA (Development of Women and Children in Rural Areas) depends on education, age, socio economic status, income, and exposure to technologies and mass media. These factors are positively correlated with the entrepreneurial behaviour of rural women.

Govindappa and Halasagi (1996) in a case study about entrepreneurship in agro-processing industry reported that the entrepreneurs with high education start their business at an early stage of life. Since education can give more information about positive and negative side of entrepreneurship, educated people are ready to start enterprises at their young age and have a clear view about the same.

According to Thenamudha (1996) 65.83 per cent of respondents had moderate extension activities and 29.30 per cent of them had high level of extension activities and involvement. In a study conducted by Himaja (2001) it shows that majority of the farmers have medium level of extension activities and very few per cent (16.67) has high level of extension activities. Reddy (2003) says that most of the farmers have medium level of extension activities and few have high levels of extension contact. This shows that the farmers are not highly motivated to attend extension activities and only very few are interested in extension activities.

Jayalakshmi (1996) in her thesis on the entrepreneurial behaviour of rural women says that the entrepreneurial behaviour depends on risk taking ability, decision making ability, economic motivation, management orientation, achievement

motivation and competition orientation of the women. These were ranked as the major factors which influence the entrepreneurial behaviour of the rural women.

Sivaprasad (1997) in his study on problems and prospects of self employment of trained rural youth in agriculture found that the entrepreneurial behaviour of young farmers is related to the financial, economic, innovative, technological, managerial and motivational factors along with the market competition. Young farmers take financial and economic matters more into consideration than the other factors since they are more motivated to earn profit. They consider farming as an enterprise when compared to the experienced aged farmers and hence their entrepreneurial behaviour depends more on financial and economic variables.

Vinayagam (1998) observed age, age at entry, scientific orientation, vocational diversification, self confidence, self concept, orientation towards competition, rational orientation, self reliance and media utilisation as the most important variables in predicting the variation in entrepreneurial behaviour of agri-business operators. High rate of interest, seasonality of demand, high cost of raw material, scarcity of electric power, high labour cost and ineffective consultancy service provided by the government agencies were the major constraints perceived by agri-business operators in influencing the entrepreneurial behaviour.

Narmatha *et al.* (2002) stated that innovativeness, achievement, motivation and risk orientation were the most important components of entrepreneurship. Further, the components such as decision making, innovativeness, management orientation, economic motivation, level of aspiration and risk orientation were found to be crucial in influencing the entrepreneurial behaviour.

Murali and Jhamtani (2003) in their article on 'entrepreneurial characteristics of floriculture farmers', say that highly educated young farmers who came from higher socio economic status, have high entrepreneurial behaviour. Socio economic status

includes the size of land holdings, assets owned, education level, family size, occupation, age, etc.

Kumar *et al.* (2013) concluded that socio-economic status, caste, ability to coordinate farming activities and value orientation had higher direct effect on entrepreneurial behaviour of vegetable growers of Uttarakhand. Socio-economic status and caste emerged as the most important factors through which higher indirect effect of other factors were channeled. These factors could be taken care of by the implementing agencies in hill state while selecting the beneficiaries for entrepreneurship development programmes.

2.5 Constraints affecting entrepreneurial behaviour

Harper (1984) in his article about small business in third world-guidelines for practical assistance reveals that the number of employees rarely creates a problem, but the quality of the manpower used becomes a problem in entrepreneurship. Employees can be got if proper payment is given but the quality may not be as expected.

In the study made by Sharma (1985) labour unrest, shortage of raw materials, low demand, cost of production and power cut stand as major constraints for an entrepreneurship. According to him, capital can be sources from one or other way but labourers and raw materials may not be available even if there is enough capital to invest. Demand for the product is not in the control of the entrepreneur and it is based on the market conditions.

In a study conducted among women entrepreneurs named Women entrepreneur, socio-economic study with reference to Ponna, by Nadkarni (1988) it-statistics that the constraints found were the competition raised from similar products, cost and shortage of raw materials, power cut, nonpayment of bills (bills receivables) and recovery of due bills and lack of adequate working capital.

Pandya and Trivedi (1988) in their study have made an attempt to define constraint. Constraints means difficulties or the problems faced while the adoption of technology during the entry in to new venture. All the entrepreneurs face some or other problems while starting a new venture. It may be due to capital, labour shortage, raw materials, market conditions, etc.

Janadevan (1993) said that non availability of labourers, high cost of labour, inadequate supply of seedlings, lack of backward and forward linkages, lack of adequate financial assistance, policies etc. are the major constraints faced by the coconut growers. In a study conducted by Nizamudeen (1996) the major constraints faced by Kuttimulla growers were reported and those were non availability of finance, non availability of inputs and lack of knowledge about the market conditions.

The study made by Banarjee and Talkar (1997) shown the problems faced by women entrepreneurs in farming activities as lack of organizational support and linkages among those organizations, lack of single window systems, mistakes in government policies and lack of infrastructure facilities.

Shankar and Katteppa (2000) conducted a study on potato growers in Chikmagalore district of Karnataka state. They reported that 94.16 per cent respondents faced the problem of lack of technical guidance. Incidence of pests and diseases, high cost of fertilizers, high cost of plant protection chemicals and non-availability of fertilizers in time, were the problems faced by 90.00, 83.33, 85.00, 81.00 and 68.33 per cent of the respondents, respectively.

Sindhu and Geethakutty (2003) stated that high cost of inputs, lack of financial assistance both for fixed capital and working capital, high rate of interest for the credit available from different financial institutions, and the competition from similar enterprises which in turn result in decrease in demand as the major problems faced in farming operations.

Kammaraddi and Halalkatti (2004) reported that non availability of raw material is the major problem faced by the farmers. Second is the problem of lack of knowledge about market conditions. Lack of financial assistance, lack of technical knowledge and skill in farming are the other constraints faced. Proper training given at right time can solve the issue of unawareness of technical knowledge.

2.6 Adoption of technology

The reason for adoption and non adoption of agricultural technologies among the adopters and non adopters were studied by Jabbar *et.al* (1998) in their study of adoption pathways for new agricultural technologies: an approach and an application to versitol management technology in Ethiopia. A farmer adopts a technology either after getting complete information about the technology and after studying about it or after watching the performance of the farmer who has adopted the technology earlier. The study found that the adoption of technology is dynamic and depends upon level of knowledge and learning. The study also stated that the adoption is a long process.

The study made by Dipika Hajong and Padaria (2016) about agripreneurial attitude among the farmers of national capital region of Delhi states that there is a significant difference between agripreneurs and non-agripreneurs in case of agripreneurial attitude with respect to self-esteem, achievement motivation, personal control and innovativeness. The technology factor has more significance in entrepreneurship promotion programmes than the tools and methods for improving soft skills and behavioural traits. Agribusiness centres and incubation centres can increase the number of entrepreneurial ventures and thus in turn it can increase the standard of living.

Rohitha and David (2016) in their article named a study on entrepreneurial attitudes of upcountry vegetable farmers in Sri Lanka says that the entrepreneurial behaviour of the farmers are highly related with the opportunity seeking behaviour, risk taking behaviour and innovation. When compared with the other socio-economic

factors, level of education and farming experience also play a major role in entrepreneurial behaviour of the farmers.

Sophie *et.al.* (2017) in their study found that gender has a role in adoption of technology but after adoption, the impact has no difference either on male or female. The study was made in Ethiopia, Ghana and Tanzania and the farming activities made by the women in those areas were fragmented and adoption of new technologies of irrigation is not cost effective for them and they are having restriction for gaining knowledge regarding those technologies. Even though women demand for technology adoption, to reduce their energy burden, cost is the barrier which stops them.

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CHAPTER III

MATERIALS AND METHODS

The study on entrepreneurial behaviour of vegetable farmers in central Kerala was focused on the objectives such as to examine the entrepreneurial behaviour of vegetable farmers, to identify the factors influencing the entrepreneurial behaviour of vegetable farmers, to analyse the constraints which affect the entrepreneurial behaviour of vegetable farmers, to study the extent of adoption of KAU technologies among vegetable farmers and to suggest strategies to promote entrepreneurial behaviour of vegetable farmers.

The methodology adopted and variables used for the study were summarised under the following subheads:

3.1 Operational definitions

3.2 Study area

3.3 Sources of data

3.4 Sample selection for primary source of data

3.5 Selection and measurement of variables

3.6 Data collection

3.7 Data analysis

3.1 Operational definitions

Main occupation: An activity that serves as one's regular and main source of livelihood; a vocation.

Subsidiary occupation: An activity which is serving to assist or supplement the main source of livelihood and add additional income to the respondent apart from his/her main income source.

Income: The amount of money received from the main and subsidiary occupation.

Economic status: It is a measure of respondents' wealth by means of his/her house type (Thatched, Tiled, single storey terrace and double storey terrace), material possession (Four wheeler, Two wheeler, Tractor and Tiller), Land (Marginal, Small and other farmer) and agricultural assets (Poultry, milch animals, fish and others).

Land utilization pattern: This describes the type of land (Homestead, garden land, dry land, wet land, leased in land and leased out land) the farmer owns and also the area of each land type.

Mass media participation: It shows the interest of the farmers in collecting agricultural information (especially vegetable related information) collected from agricultural related columns in the newspaper/ All India Radio/ Television/ Agricultural magazines and its interval too.

Social participation: Farmer participation in relation with frequency and type of services availed from different institutions like Krishibhavan, VFPC, Panchayath, Co-operatives, Farmers Club/ Associations and banks.

Adoption of improved practices: It refers to the extent of adoption of agricultural technologies like Organic farming, Biological methods of pests and disease management, Integrated Nutrient Management in vegetables, Mixed farming, Mixed cropping, Green house and rain shelter cultivation of vegetables, Use of mist and drip irrigation, Protected cultivation, Intercropping, Use of botanicals and organic manures, Processing and marketing, Bio control agents, Organic nutrient management, Quality seed production, Integrated farming system, Sprinkler irrigation, Integrated Pest Management technologies and Terrace farming.

Market ecosystem: The physical infrastructure put in place for the collection, transportation and storage of products in the value chain from the source of production (farm gate) to market place.

Level of aspiration: A will to succeed, cherish or a strong ambition to success and grow further over the years personally and socially.

Innovation orientation: The degree to which an entrepreneur is relatively earlier in adopting and searching new ideas also keen to develop new ways and means of doing things.

Farm decision making ability: The degree to which an entrepreneur justifies the selection (whether he took the decision independently or in consultation with others) from most effective means among the available alternatives and on the basis of scientific criteria for achieving maximum economic profit).

Achievement motivation: The strong desire or dedication or excellence to attain a strong sense of personal accomplishment.

Risk taking ability: It is the degree to which an entrepreneur is oriented towards risk and uncertainty and the courage to face the problems in the commercial vegetable cultivation.

Information seeking behaviour: The extent to which an entrepreneur is seeking information from different communication sources both formal (Scientists of KAU, Agriculture extension worker, Agriculture officer, KVK, VFPC, Agricultural seminar) and informal (Family members, peer group, Pioneer/experienced vegetable farmers, Print media and electronic media).

Leadership ability: The degree to which an entrepreneur can initiate the actions of other individual or the ability to create an interpersonal influence directed towards the achievement of a goal or goals.

Cosmopolitaness: The degree to which an entrepreneur is oriented to his/her immediate, outside social system.

Market orientation: It is the farming activity or responsiveness of the vegetable farmer by making profits through selling farm products in the market on a regular basis by identifying and meeting the stated or hidden needs or wants of the market.

Production constraints: These are the difficulties or threats in the production of vegetables which affect the productivity and profitability.

Constraints in technology factor: These are the difficulties or threats faced by the vegetable farmers in the field of technology (Practical application enhancing the production and quality of vegetables) which is meant to improve the vegetable production.

Organisational support constraints: These are the difficulties or threats a vegetable farmer experiences by the improper functioning of organizations which are meant to provide all support for the vegetable cultivation.

Economic constraints: These are the difficulties or threats faced by the vegetable farmer due to the economic barriers.

Financial constraints: These are the difficulties or threats in the vegetable production due to the financial problems.

Social constraints: These are the difficulties or threats that a vegetable farmer may face as being a part of the society.

Marketing constraints: These are the difficulties or threats experienced by the vegetable farmer while selling his/her produce in the market.

VFPCCK and ordinary farmers: In this study VFPCCK farmer refers to those commercial farmers who had registered in the VFPCCK whereas ordinary farmers are those who are not registered in the VFPCCK.

Entrepreneurial behaviour: A set of characteristics or the way of conduct exhibited by the commercial vegetable farmers which results in the total revamping in vegetable production and the upliftment of vegetable farmers who have taken the vegetable production in a systematic and commercial manner with an urge to achieve the set goals

3.2 Study area

Central zone of Kerala was selected as the area under the study. According to the NARP classification, Kerala is divided into different agro ecological zones in which coastal sandy, central midlands, malayoram, Palakkadan plains and Chittoor black soil – five zones in the districts of Ernakulam, Thrissur and Palakkad were selected.

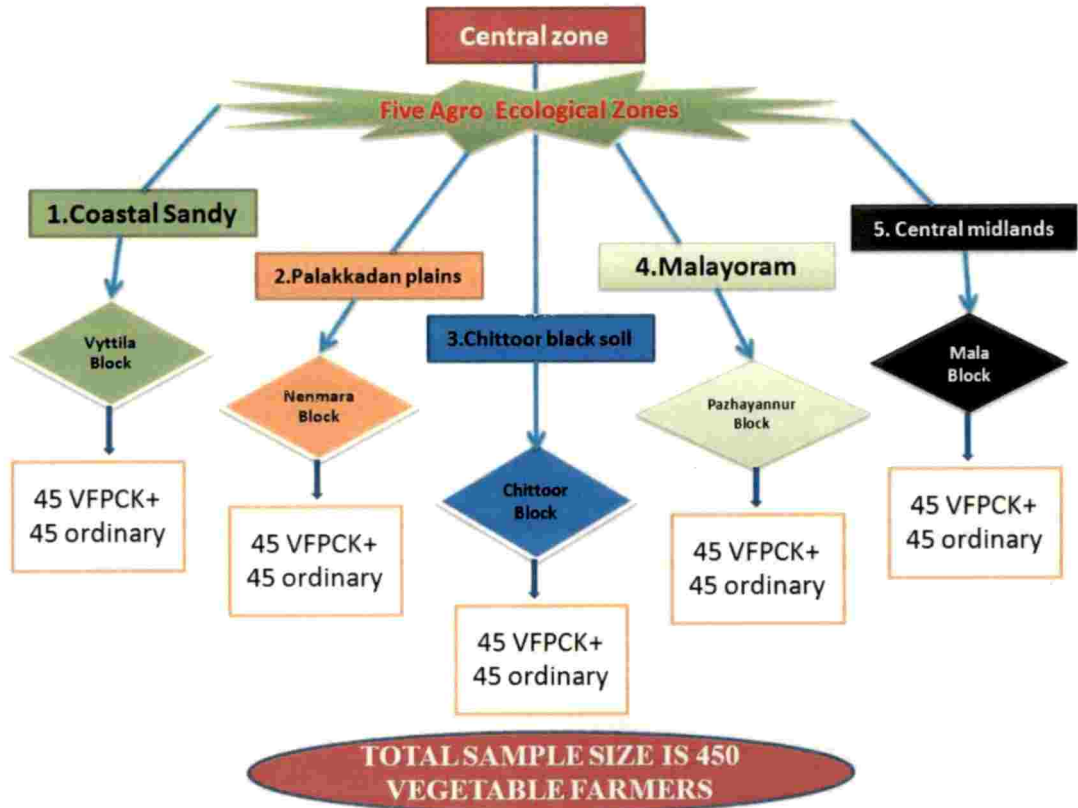
3.3 Sources of data

Data were collected from both primary and secondary sources.

3.4 Sample design

From each agro ecological zone, namely coastal sandy (Zone – 1), central midlands (Zone – 2), malayoram (Zone – 3), Palakkadan plains (Zone – 4) and Chittoor black soil (Zone – 5) one block having maximum area under vegetable cultivation was selected. From each of the five selected blocks, 90 vegetable farmers (45 VFPCCK farmers and 45 ordinary farmers) involved in intensive vegetable cultivation were purposively selected. Thus a total sample of 450 vegetable farmers (fifty percentage farmers from VFPCCK and fifty percentage from ordinary vegetable farmers) were selected for the study.

Graphical representation of the sample design



3.5 Selection and measurement of variables

(i) Entrepreneurial behaviour:

The present study attempts to examine the entrepreneurial behaviour of vegetable farmers. Based on the earlier studies conducted in this direction, elaborate review of relevant literature available and discussion with the experts, traits determining entrepreneurial behaviour were listed out with suitable explanation. The traits listed out were screened by verifying its applicability in relation to the assessment of entrepreneurial behaviour of vegetable farmers. The appropriateness of the items was assessed with a group of judges (Appendix xxix - xxxvi). To examine the entrepreneurial behaviour, innovation orientation, farm decision making, achievement

motivation, risk taking ability, information seeking behaviour, leadership ability, cosmopolitaness, market orientation, etc were taken into account. Statistical tools like percentages, indices, t-test and ANOVA technique were used to analyse the data.

(ii) The factors influencing the entrepreneurial behaviour:

The factors influencing the entrepreneurial behaviour was analysed by considering the variables like age, education, occupation, size of the land holding, annual income, assets, social participation, mass media participation, extension participation, adoption of improved practices, training received, return from farming activity, influence of successful farmers, market ecosystem, level of aspiration etc. Analysis was done by using percentages, correlation coefficient, Chi square test etc.

(iii) Constraints which affect the entrepreneurial behaviour of vegetable farmers:

For finding the constraints which affect the entrepreneurial behaviour of vegetable farmers, the following variables were considered - production constraints, constraints in technological factors, organisational support constraints, social constraints, marketing constraints and financial constraints and economic constraints. Analysis was done by means of percentages, indices, ANOVA technique, Spearman's rank correlation coefficient and t-test.

(iv) Adoption of KAU technologies

For studying the adoption of KAU technologies, they were categorised under 8 areas of importance in the cultivation of crops viz; season, varieties, seed rate, sowing, manuring, irrigation, pest control, disease management etc., were taken into account.

3.5. Data Collection

(i) Primary data collection was made during the months from August 2017 to January 2018. A pre-tested, structured interview schedule was prepared after the extensive review of literature, discussions and suggestions of the experts for the finalisation of variables under study.

(ii) Secondary data were collected from the Government/ KAU publications, Krishibhavans, agriculture related journals, economic review, online sources etc.

Based on the detailed review of available literature, around 15 items were identified for each trait. The relevancy of the listed items generated was determined by sending these items to 30 judges with proper explanation. The judges were asked to indicate the relevancy of items on a five point continuum of MOR- Most Relevant, MR- More Relevant, R-Relevant, LR- Least Relevant and NR- Not Relevant. The responses of 30 judges were taken into account for calculating the relevancy index for all the items were worked out and presented in the table below.

Selection of relevant variable using the judges opinion				
Sl. No.	Variables	Score	Index	Relevancy Category
1	Age	121	80.67	M
2	Sex	117	78.00	M
3	Educational status of the respondent	118	78.67	M
4	Educational status of the family	92	61.33	R
5	Family type	86	57.33	R
6	Main occupation and corresponding monthly income of the respondent	121	80.67	M
7	Main occupation and corresponding monthly income of family members	98	65.33	R
8	Subsidiary occupation and corresponding monthly income of the respondent	109	72.67	R
9	Subsidiary occupation and corresponding monthly income of family members	91	60.67	R
10	Average family income per month	108	72.00	R
11	Economic status	110	73.33	R
12	Land utilisation pattern	111	74.00	M
13	Vegetable wise area, production and income from each season	126	84.00	M
14	Expenditure incurred	128	85.33	M
15	Cost of production	126	84.00	M
16	Sources, method and potential of irrigation	122	81.33	M
17	Mass media participation	116	77.33	M
18	Place/ Channel of selling produces	125	83.33	M
19	Social participation	120	80.00	M
20	Adoption of improved practices	125	83.33	M

21	Training received	109	72.67	R
22	Influence of successful farmers	132	88.00	M
23	Market ecosystem	127	84.67	M
24	Level of aspiration	129	86.00	M

M- More Relevant, R-Relevant

The item having relevancy index above 110.72 were selected for the study.

Relevancy categorisation

More Relevant (M)	>110.72
Relevant (R)	80.10-110.72
Least Relevant (L)	<80.10

3.6 Data analysis

The details of the tools used for the analysis are given below.

3.6.1 Chi- square test

The chi-square test is used to determine whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories.

$$\chi^2_{(n-1)} = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i}$$

Where n is the number of categories,

$\chi^2_{(n-1)}$: χ^2 with (n-1) degrees of freedom

O_i : observed frequency in i^{th} category

E_i : expected frequency in i^{th} category

3.6.2 Correlation coefficient

Pearson correlation coefficient: Pearson correlation coefficient, r is the most widely used tool to measure the degree of linear relationship between two variables. The following formula is used to calculate the correlation coefficient:

$$r = \frac{\sum xy - \frac{(\sum x)(\sum y)}{N}}{\sqrt{\left[\sum x^2 - \frac{(\sum x)^2}{n} \right] \left[\sum y^2 - \frac{(\sum y)^2}{n} \right]}}$$

r : Pearson correlation coefficient

n : number of observations

$\sum xy$: sum of the products of paired scores

$\sum x$: sum of x scores

$\sum y$: sum of y scores

$\sum x^2$: sum of squared x scores

$\sum y^2$: sum of squared y scores

3.6.3 Spearman's rank correlation coefficient

It is a non-parametric test that is used to measure the degree of association between ranks of two variables.

The following formula is used to calculate the Spearman rank correlation:

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2 - 1)}$$

ρ : Spearman rank correlation

d_i : the difference between the ranks of corresponding variables

n : number of observations

3.6.4 Arithmetic mean

It shows the central tendency of a discrete set of numbers and in this study it is used in categorisation the farmers according to their Entrepreneurial Behaviour (EB). The following formula is used to calculate the mean.

Arithmetic Mean (AM), $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$

3.6.5 Standard Deviation

Standard deviation (SD, represented by the Greek letter sigma 'σ') is the measure of variation which is used to quantify the amount of variation.

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2}, \quad \bar{x} = \frac{\sum x_i}{n}$$

n: number of observations

3.6.6 t – test

This is used to test whether means of two samples differ significantly and the test statistic is computed using the formula given below:

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where, $\bar{x} = \frac{\sum_{i=1}^{n_1} x_i}{n_1}$, mean of first sample

and $\bar{y} = \frac{\sum_{i=1}^{n_2} y_i}{n_2}$, mean of second sample

$$S_1^2 = \frac{1}{n_1 - 1} \sum (x_i - \bar{x})^2$$

$$S_2^2 = \frac{1}{n_2 - 1} \sum (y_i - \bar{y})^2$$

3.6.7 Likert's summated ratings

To measure the degree of agreement/seriousness of farmers with respect to the constraints which affect the entrepreneurial behaviour, a qualitative scale was constructed by following the method of Likert summated ratings suggested by Edwards (1969). All possible statements which discriminated the positive and negative attitudes of the farmers towards organic vegetable cultivation were collected and included in the scale. The attitude scale developed by Jaganathan (2004) was modified and adopted according to the requirements of the study.

The respondents were asked to indicate how much they agree with the factors influencing the entrepreneurial behaviour and the degree of seriousness of the constraints which affect the entrepreneurial behaviour. Five point continuum was presented for each statement, viz., "Strongly Agree/Most Serious; Agree/More Serious; No Opinion/Undecided/Serious; Disagree/Less Serious; Strongly disagree/Least Serious".

To analyse the constraints which affect the EB of vegetable farmers, questions were graded on a five point Likert scale. Response choices were given weightage in the following manner:

Response Choice	Scoring Weight
SDA- Strongly Disagree/Least serious	1
DA- Disagree/Less serious	2
NO- No Opinion/ UD- Undecided/Serious	3
A- Agree/More serious	4
SA- Strongly Agree/Most serious	5

3.6.8 Index method

The indices were calculated using the following formulae:

$$i) \text{ Index} = \left[\frac{\sum_{i=1}^n \sum_{j=1}^m x_{ij}}{n \times \text{maximum score}} \right] \times 100$$

were, x_{ij} denotes the actual score obtained for i^{th} respondent for j^{th} statement

i denotes the respondent, $i = 1, 2, \dots, n$

j denotes the statements, $j = 1, 2, \dots, m$

n denotes the number of respondents

m denotes the number of statements

$$ii) \text{ Overall Index} = \left[\frac{\text{Sum of the Scores of all Statements for all Respondents under each Scale}}{\text{Maximum Score} \times \text{Number of Statements} \times \text{Number of Respondents}} \right] \times 100$$

The scale scores were determined by summing up the weights for the responses chosen for the statements in each scale. The raw scores for each statement were converted into indices which indicate the relative position in a norm group.

3.6.9 Analysis of Variance (ANOVA)

ANOVA is the technique of partitioning of observed variance in a particular variable into components attributable to different sources of variation. ANOVA provides a statistical test of whether the means of several groups are equal, and therefore generalizes the t-test to more than two groups. The test statistic used is F. In this study this is used to test whether there is any significant difference in the mean scores between the vegetable farmers from the five selected agro climatic zones.

3.6.10 Other tools for Analysis

The study used simple statistical tools like percentages, averages and indices.

Based on the above mentioned methodology, the objectives of the research were analysed and the results are presented in chapter 4 under the head results and discussions.

CHAPTER IV

RESULTS AND DISCUSSION

The study entitled Entrepreneurial behaviour of vegetable farmers in central Kerala was focused on the objectives such as to examine the entrepreneurial behaviour of vegetable farmers, to identify the factors influencing the entrepreneurial behaviour of vegetable farmers, to analyse the constraints which affect the entrepreneurial behaviour of vegetable farmers, to study the extent of adoption of KAU technologies among vegetable farmers and to suggest strategies to promote entrepreneurial behaviour of vegetable farmers.

For the research purpose Central zone of Kerala (comprising Ernakulam, Thrissur and Palakkad districts) was selected as the area under the study.

From each agro ecological zone, namely coastal sandy, central midlands, malayoram, Palakkadan plain and Chittoor black soil, a block having the maximum area under vegetable cultivation was selected. Data were collected from both primary and secondary sources. A sample of 450 vegetable farmers (fifty per cent of farmers from VFPCCK and fifty per cent of farmers from ordinary vegetable farmers) were selected from the five selected blocks. The analysis was carried out with the help of statistical tools like percentages, correlation coefficient, Chi square test, indices, t-test, ANOVA, Spearmans rank correlation coefficient.

The results and discussion are presented in this chapter in accordance with the objectives under following sub heads:

- 4.1. Socio economic profile of selected vegetable farmers
- 4.2. Entrepreneurial behaviour of selected vegetable farmers
- 4.3. Factors influencing entrepreneurial behaviour
- 4.4. Constraints which affect the entrepreneurial behaviour
- 4.5. Adoption of KAU technologies
- 4.6. Concluding remarks

SECTION 1

4.1 Socio-economic and agriculture details of commercial vegetable farmers

Socio economic characteristics of the vegetable farmers play a crucial role in their entrepreneurial behaviour. In addition to this, their agriculture status with respect to land holding, trainings received related to farming, their level of social participation, adoption of the agriculture technologies may also have an impact on the entrepreneurial behaviour of farmers. Therefore it is worthwhile to assess the socio economic and farming profile of the farmers before proceeding to the analysis of the objectives.

For the purpose of primary data collection, a sample of 450 vegetable farmers were surveyed. The details of the socio-economic and agricultural status of the farmers are given in the Table 4.1.1

Table No. 4.1.1. Socio-economic details of commercial vegetable farmers (n=450)

Sl. No.	Variable	Category	VFPCCK Farmers		Ordinary Farmers	
			Number	Percentage	Number	Percentage
1	Age (years)	35-45	35	15.56	31	13.78
		45-55	78	34.67	75	33.33
		55-65	106	47.11	116	51.56
		>65	6	2.66	3	1.33
		Total	225	100.00	225	100.00
2	Gender	Male	222	98.67	223	99.11
		Female	3	1.33	2	0.89
		Total	225	100.00	225	100.00
3	Education	Primary	56	24.89	31	13.78
		Secondary	93	41.33	91	40.44
		Higher secondary	66	29.33	92	40.89
		Above HSE	10	4.45	11	4.89
		Total	225	100.00	225	100.00
4	Occupation	Agriculture	206	91.56	209	92.89
		Business	5	2.22	2	0.89
		Retired	10	4.44	10	4.44

		Private job	4	1.78	4	1.78
		Total	225	100.00	225	100.00
5	Land holding	0-1 ha	155	68.89	132	58.67
		1-2 ha	55	24.44	80	35.56
		>2 ha	15	6.67	13	5.77
		Total	225	100.00	225	100.00
6	Annual income (Rs.)	<1 lakh	200	88.89	210	93.33
		1-2 lakh	10	4.44	11	4.89
		>2 lakhs	15	6.67	4	1.78
		Total	225	100.00	225	100.00
7	Experience in farming (years)	<5 years	13	5.78	11	4.89
		5-10 years	34	15.11	31	13.78
		10-15 years	70	31.11	69	30.67
		>15 years	108	48.00	114	50.66
		Total	225	100.00	225	100.00
8	Social participation	Low	1	0.44	2	0.89
		Medium	188	83.56	217	96.44
		High	36	16.00	6	2.67
		Total	225	100.00	225	100.00
9	Extent of adoption	Low	21	9.33	7	3.11
		Medium	204	90.67	218	96.89
		High	0	0.00	0	0.00
		Total	225	100.00	225	100.00
10	Training	Received	198	88.00	204	90.67
		Not received	27	12.00	21	9.33
		Total	225	100.00	225	100.00
11	Market ecosystem	Poor	168	74.67	4	1.78
		Good	57	25.33	118	52.44
		Better	0	0.00	103	45.78
		Total	225	100.00	225	100.00
12	Level of aspiration	Low	219	97.34	3	1.33
		Medium	3	1.33	159	70.67
		High	3	1.33	63	28.00
		Total	225	100.00	225	100.00

Source: Primary data

From Table 4.1.1, it is clear that the vegetable farming on commercial basis is male-centric among VFPCCK farmers and ordinary farmers. All are literate and most of them passed secondary and higher secondary level of education. Half of the respondents in both the category lies in the age group of 55-65 years and the vegetable farming are considered significantly between the age group 45-65 years. None of the respondents were in the age group of below 35 years, which showed that youth were not in farming. Majority (more than 90%) of the respondents had agriculture as primary occupation. There was also a retired person who has taken the vegetable cultivation earnestly as his profession. When the income level of the farmers was considered, very few had an income greater than Rs.2 lakh/annum in which the VFPCCK farmers dominated. Many of the respondents lie in the income category of less than Rs. one lakh/annum.

Majority of VFPCCK farmers were males (98.67%), aged between 55-65 years (47.11%), having secondary education (41.33%) and agriculture as occupation (91.56%). They were marginal farmers (68.89%), trained (88%) having annual income less than Rupees 1 lakh (88.89%), more than 15 years experience (48%) in agriculture, medium level social participation (83.56%), medium level of extent of adoption (90.67%), with an opinion of poor market ecosystem (74.67%) and with low level of aspiration (97.33%).

Majority of ordinary farmers were males (99.11%), aged between 55-65 years (51.56%), having higher secondary education (40.89%) and agriculture as occupation (92.89%). They were marginal farmers (58.67%), trained (90.67%) having annual income less than Rupees 1 lakh (93.33%), more than 15 years of experience (50.67%) in agriculture, medium level of social participation (96.44%) and extent of adoption (96.89%), with an opinion of good market ecosystem (52.44%) and with medium level of aspiration (70.67%).

Table 4.1.2. Economic status and assets details of farmers (n=450)

Particulars	VFPCCK Farmers (No.)	Ordinary Farmers (No.)	TOTAL (No.)	Percentage
<i>(a) House type</i>				
Thatched	0	0	0	0.00
Tiled	86	84	170	37.78
Terrace (Single storeyed)	119	111	230	51.11
Terrace (Double storeyed)	20	30	50	11.11
Total	225	225	450	100
<i>(b) Material possession</i>				
Four wheeler	37*	41*	78	17.33
Two wheeler	211*	211*	432	96.00
Tractor	0	0	0	0.00
Tiller	3*	2*	5	1.11
Total	225	225	450	100

Source: Primary data

*multiple responses

According to the table 4.1.2, all respondents possessed either tiled or terraced house and none of them had thatched one. Most of them had single storied terrace houses and possessed two-wheelers. Very few possessed tiller and none had tractor because almost every 'Padasekharasamithi' had tractors and was also available for rent. Tractor was not required in the Ernakulum district due to the specialty of the agro-climate zone (coastal sandy).

Table 4.1.3 Land utilization details of the vegetable farmers

(n=450)

Classification	VFPCCK Farmers (No.)				Ordinary Farmers (No.)			
	Homestead	Garden Land	Wet Land	Dry Land	Homestead	Garden Land	Wet Land	Dry Land
Below 0.5 acre (No.)	17	5	15	31	22	7	10	28
Average area (in acre)	0.23	0.2	0.28	0.25	0.32	0.23	0.22	0.24
%	11.41	6.58	21.43	22.96	14.29	8.33	31.25	23.73
0.5 acre- 1 acre (No.)	64	25	33	68	56	32	12	54
Average area (in acre)	0.94	0.92	0.86	0.83	0.9	0.93	0.79	0.85
%	42.95	32.89	47.14	50.37	36.36	38.10	37.50	45.76
Above 1 acre (No.)	56	35	20	32	62	37	10	33
Average area (in acre)	2.78	2.75	2.12	2.63	2.8	3.07	2.09	2.09
%	3.76	4.61	2.86	2.37	4.03	4.40	3.13	2.80
Above 5 acre (No.)	12	11	2	4	14	8	0	3
Average area (in acre)	6.6	7	6	6.12	6.4	6.43	0	5.54
%	8.05	14.47	2.86	2.96	9.09	9.52	0.00	2.54

Source: Primary data

Above table 4.1.3 gives an idea about the land utilization pattern of the respondents. Both VFPCCK and ordinary farmers used their homesteads and dry land for vegetable cultivation widely, but among them, more number of VFPCCK farmers

cultivated vegetable in the dry land compared to ordinary farmers, whereas, the ordinary farmers outnumbered the VFPCCK farmers in cultivating vegetables in the homesteads.

VFPCCK farmers also outnumbered ordinary farmers in the use of wetlands while taking the land classification categories. Whereas garden land was widely used by ordinary farmers in all area classification except in above 1 acre and above 5 acre category.

Table 4.1.4. Experience of vegetable cultivation (n=450)

Experience in years	VFPCCK Farmers (n=225)	Ordinary Farmers (n=225)	Total	Percentage
< 5 years	13	11	24	5.33
5-10 years	35	28	63	14.00
10-15 years	69	71	140	31.11
> 15 years	108	115	223	49.56
Total			450	100.00

Source: Primary data

From the table 4.1.4, it is understood that half of the respondents had an experience of above fifteen years and only very few (five percentage) of them had less than five years of experience in vegetable farming. More than one third of VFPCCK farmers (35%) had experience less than 10 years in vegetable cultivation, whereas, less than one – third of ordinary farmers (28%) had experience less than 10 years in vegetable cultivation.

Table 4.1.5. Average income, productivity, cost and net income per annum obtained by vegetable farmers (n=450)

Sl. No.	Selected vegetables	VFPC farmers				Ordinary farmers					
		Avg. Income	Avg. area (acre)	Productivity (kg/acre)	Avg. Cost	Net income	Avg. Income	Avg. area (acre)	Productivity (kg/acre)	Avg. Cost	Net income
1	Bitter gourd	171028	1.85	4548	37147	133881	153718	1.28	6036	25381	128337
2	Cow pea	90368	1.005	3273	20867	69501	106897	1.168	3712	22034	84863
3	Snake gourd	62120	0.48	7187	6678	55442	58774	0.478	6843	5863	52911
4	Okra	64869	0.264	5542	7979	56890	114150	0.402	6286	10303	103847
5	Pumpkin	48892	0.234	9255	7846	41046	37631	0.268	7012	8006	29625
6	Ash gourd	26168	0.091	12934	6308	19860	37607	0.174	11986	8246	29361
7	Brinjal	50343	0.224	5076	8146	42197	53900	0.207	6608	6101	47799
8	Chilli	78804	0.148	3186	3241	75563	101122	0.245	3592	3585	97537
9	Ivy gourd	115687	0.491	8893	7865	107822	110300	0.554	6921	6101	104199
10	Amaranthus	68360	0.38	9349	4235	64125	56698	0.54	4959	5820	50878

*selected vegetables

Source: Primary data

The table no. 4.1.5 shows costs incurred, productivity and income generated from vegetable cultivation by the VFPCCK farmers and the ordinary framers. Since the VFPCCK farmers follow the scientific method of cultivation and the spacing recommended by KAU, the productivity was comparatively high except in the crops like bitter gourd, cowpea, okra, brinjal and chilli when compared to the ordinary farmers. Even though the number of vegetables incurring high cost of cultivation was same for the VFPCCK and ordinary farmers among the ten vegetables considered, the numeric value showed that the VFPCCK farmers incurred less cost for cultivation especially in cowpea, okra, pumpkin, ash gourd, chilli and amaranthus. This may be due to the farming practices adopted by them, which were transferred by the VFPCCK and other technical institutions. But coming to the productivity factor, the vegetables cultivated by the ordinary farmers showed more productivity in the case of bitter gourd, cow pea, okra, brinjal and chilli since they might not have followed the scientific spacing advised by the experts. The VFPCCK farmers got more income for the commonly grown vegetables like bitter gourd, snake gourd, pumpkin, ivy gourd and amaranthus because the VFPCCK farmers utilised proper marketing channel, facilitated by VFPCCK. There lies the importance of VFPCCK in enhancing income for the farming community.

Zone wise profile of Vegetable farmers.

Table 4.1.6 Socio-economic details of commercial vegetable farmers (Zone - 1)

Sl. No.	Variable	Category	VFPCCK Farmers		Ordinary Farmers	
			Number	Percentage	Number	Percentage
1	Age	35-45	5	11.11	3	6.67
		45-55	15	33.33	16	35.56
		55-65	24	53.33	25	55.56
		>65	1	2.22	1	2.22
		Total	45	100.00	45	100.00
2	Gender	Male	45	100.00	45	100.00
		Female	0	0.00	0	0.00
		Others	0	0.00	0	0.00
		Total	45	100.00	45	100.00
3	Education	Illiterate	0	0.00	0	0.00
		Primary	7	15.56	4	8.89
		Secondary	17	37.78	17	37.78
		Higher secondary	21	46.67	22	48.89
		Above HSE	0	0.00	2	4.44
		Total	45	100.00	45	100.00
4	Occupation	Agriculture	31	68.89	33	73.34
		Business	4	8.89	1	2.22
		Retired person	10	22.22	10	22.22
		Private job	0	0.00	1	2.22
		Total	45	100.00	45	100.00
5	Land holding	0-1 ha	28	62.22	20	44.44
		1-2 ha	12	26.67	21	46.67
		>2 ha	5	11.11	4	8.89
		Total	45	100.00	45	100.00
6	Annual	<1 lakh	41	91.11	40	88.89

	income	1- 2 lakh	2	4.44	3	6.67
		>2 lakhs	2	4.44	2	4.44
		Total	45	100.00	45	100.00
7	Experience	<5 years	3	6.67	3	6.67
		5-10 years	7	15.56	6	13.33
		10-15 years	14	31.11	14	31.11
		>15 years	21	46.66	22	48.89
		Total	45	100.00	45	100.00
8	Social participation	Low	0	0.00	0	0.00
		Medium	38	84.44	44	97.78
		High	7	15.56	1	2.22
		Total	45	100.00	45	100.00
9	Extent of adoption	Low	6	13.33	0	0.00
		Medium	39	86.67	45	100.00
		High	0	0.00	0	0.00
		Total	45	100.00	45	100.00
10	Training	Received	40	88.89	42	93.33
		Not received	5	11.11	3	6.67
		Total	45	100.00	45	100.00
11	Market ecosystem	Poor	35	77.78	0	0.00
		Good	10	22.22	19	42.22
		Better	0	0.00	26	57.78
		Total	45	100.00	45	100.00
12	Level of aspiration	Low	45	100.00	2	4.44
		Medium	0	0.00	31	68.89
		High	0	0.00	12	26.67
		Total	45	100.00	45	100.00

Source: Primary data

n=90

Age: While analyzing the primary data regarding the age of the farmers in this zone, it was found that majority of the farmers fall under the age group of 55-65. 51.55% ordinary farmers and 40% of VFPCCK farmers come under this age group. There is an

equal distribution of VFPCCK farmers in age groups of 45-55 and 55-65 (40%). None of the ordinary farmers are in the age group above 65 but there are 4.44% of VFPCCK farmers in this group. 15.56% of both ordinary and VFPCCK farmers are between the age group of 35 to 45 years. This clearly shows that the youth are less interested in farming operations.

Gender: Majority of the farmers are male in both the ordinary and VFPCCK farmers groups. 97.78% of ordinary farmers and 95.56% of VFPCCK farmers are males. Just 2.22% of ordinary farmers and 4.44% of VFPCCK farmers are females in the sample taken. This shows that females are less engaged in farming ventures.

Education: Most of the farmers are having secondary level education in both the farmer groups. 42.22% of ordinary farmers and 48.89% of VFPCCK farmers are SSLC pass. 35.56% of ordinary farmers are having higher secondary qualification, whereas 42.22% VFPCCK farmers have primary education and only 4.44% VFPCCK farmers have higher secondary education. Only 2.22% of ordinary farmers and 4.44% of VFPCCK farmers have studied above higher secondary. None of the farmers were illiterate. This data shows that highly educated people do not come to front to take up agriculture as their main occupation.

Occupation: All the VFPCCK farmers have taken farming as their main occupation since they carry out farming in a more professional way. 97.78% of ordinary farmers also have taken farming as their major occupation. Only a single person has a private job among the ordinary farmers.

Land holding: Since the land holdings in Kerala are fragmented, most of the farmers have land below one hectare. 71.11% of ordinary farmers and 88.89% VFPCCK farmers possess land below one hectare. 26.67% and 2.22% of ordinary farmers own land between one to two hectares and above two hectares respectively. 2.22% of VFPCCK farmers own land above two hectares.

Annual income: 97.78% of ordinary farmers and 93.33% of VFPCCK farmers have an annual income below Rs.1 lakh. Only a nominal percentage of farmers have annual income above Rs.2 lakhs. 2.22% of VFPCCK farmers have an income between Rs. 1-2 lakhs and 4.44% of VFPCCK farmers have income above Rs.2 lakhs.

Experience: Most of the farmers taken as the sample have an experience above 15 years. 55.56% of ordinary farmers and 51.11% of VFPCCK farmers have an experience above 15 years. 31.11% ordinary farmers and VFPCCK farmers have an experience between 10 to 15 years. 11.11% of ordinary farmers have 5-10 years experience whereas 13.33% of VFPCCK farmers have 5-10 years experience. This data shows that most of the established farmers are experienced in their area of operation.

Social participation: Most of the farmers have a medium level of social participation. Around 95.56% of ordinary farmers and 93.33% of VFPCCK farmers have medium level of social participation. Since farmers have to be in their field most of the time, they cannot involve much in social forums.

Extent of adoption: Around 97.78% and 93.33% of ordinary and VFPCCK farmers respectively have a medium level of adoption. 2.22% and 6.67% of ordinary and VFPCCK farmers have low level of adoption. None of them have high level of adoption. It means that the farmers are adoptive and also innovative.

Training: Since the VFPCCK farmers are organized, around 91.1% of VFPCCK farmers have received training and 86.67% of ordinary farmers have also received training. There are only 13.33% of ordinary farmers and 8.89% of VFPCCK farmers who have not received training.

Market Ecosystem: Since the VFPCCK farmers are more aware about the market conditions and ecosystem, most of them (82.22%) rate the current market ecosystem as poor whereas the ordinary farmers (62.22%) rate it as good. 35.56% of ordinary

farmers rate it as better and 17.78% VFPCCK farmers rate it as good. This is because the farmers face the problem in marketing their produces.

Level of aspiration: 93.33% of VFPCCK farmers have low level of aspiration and 66.67% of ordinary farmers have medium level of aspiration. Ordinary famers show more level of aspiration when compared to VFPCCK farmers. 33.33% of ordinary farmers show high level of aspiration whereas only 2.2% of VFPCCK farmers have high level of aspiration.

Table 4.1.7 Socio-economic details of commercial vegetable farmers (Zone - 2)

Sl. No.	Variable	Category	VFPCCK Farmers		Ordinary Farmers	
			Number	Percentage	Number	Percentage
1	Age	35-45	11	24.44	13	28.89
		45-55	11	24.44	23	51.11
		55-65	23	51.11	8	17.78
		>65	0	0.00	1	2.22
		Total	45	100.00	45	100.00
2	Gender	Male	44	97.78	44	97.78
		Female	1	2.22	1	2.22
		Others	0	0.00	0	0.00
		Total	45	100.00	45	100.00
3	Education	Illiterate	0	0.00	0	0.00
		Primary	20	44.44	8	17.78
		Secondary	21	46.67	19	42.22
		Higher secondary	2	4.44	16	35.56
		Above HSE	2	4.44	2	4.44
		Total	45	100.00	45	100.00
4	Occupation	Agriculture	40	88.89	44	97.78
		Business	1	2.22	0	0.00
		Retired person	0	0.00	0	0.00
		Private job	4	8.89	1	2.22
		Total	45	100.00	45	100.00

5	Land holding	0-1 ha	40	88.89	34	75.56
		1-2 ha	4	8.89	10	22.22
		>2 ha	1	2.22	1	2.22
		Total	45	100.00	45	100.00
6	Annual income	<1 lakh	39	86.67	41	91.11
		1- 2 lakh	3	6.67	3	6.67
		>2 lakhs	3	6.67	1	2.22
		Total	45	100.00	45	100.00
7	Experience	<5 years	2	4.44	1	2.22
		5-10 years	5	11.11	5	11.11
		10-15 years	14	31.11	14	31.11
		>15 years	24	53.33	25	55.56
		Total	45	100.00	45	100.00
8	Social participation	Low	0	0.00	0	0.00
		Medium	37	82.22	43	95.56
		High	8	17.78	2	4.44
		Total	45	100.00	45	100.00
9	Extent of adoption	Low	3	6.67	3	6.67
		Medium	42	93.33	42	93.33
		High	0	0.00	0	0.00
		Total	45	100.00	45	100.00
10	Training	Received	38	84.44	40	88.89
		Not received	7	15.56	5	11.11
		Total	45	100.00	45	100.00
11	Market ecosystem	Poor	33	73.33	1	2.22
		Good	12	26.67	25	55.56
		Better	0	0.00	19	42.22
		Total	45	100.00	45	100.00
12	Level of aspiration	Low	45	100.00	1	2.22
		Medium	0	0.00	39	86.67
		High	0	0.00	5	11.11
		Total	45	100.00	45	100.00

Source: Primary data

n=90

Age: While analyzing the primary data regarding the age of the farmers in this zone, it is found that majority of the farmers fall under the age group of 55-65. 17.78% ordinary farmers and 51.11% of VFPCCK farmers come under this age group. There is an equal distribution of VFPCCK farmers in age groups of 45-55 and 35-45 (24.44%). None of the ordinary farmers are in the age group above 65 but there are 2.22% of ordinary farmers in this group. 28.89% of ordinary farmers are between the age group of 35 to 45 years. This clearly shows that the youth are less interested in farming operations.

Gender: Majority of the farmers are male in both the ordinary and VFPCCK farmers groups. 97.78% of ordinary farmers and 97.78% of VFPCCK farmers are males. Just 2.22% of ordinary farmers and 2.22% of VFPCCK farmers are females in the sample taken. This shows that females are less engaged in farming ventures.

Education: Most of the farmers have secondary level education in both the farmer groups. 42.22% of ordinary farmers and 46.67% of VFPCCK farmers are SSLC pass. 35.56% of ordinary farmers have higher secondary qualification, whereas 44.44% VFPCCK farmers have primary education and only 4.44% VFPCCK farmers have higher secondary education. Only 4.44% of ordinary and VFPCCK farmers have studied above higher secondary. None of the farmers were illiterate. This data show that highly educated people do not come to front to take up agriculture as their main occupation.

Occupation: 88.89% of the VFPCCK farmers have taken farming as their main occupation since they carry out farming in a more professional way. 97.78% of ordinary farmers also have taken farming as their major occupation. Only a single person has a private job among the ordinary farmers and 8.89% of VFPCCK farmers have private business as their main occupation.

Land holding: Since the land holdings in Kerala are fragmented, most of the farmers have land below one hectare. 75.56% of ordinary farmers and 88.89% VFPCCK

farmers possess land below one hectare. 22.22% and 2.22% of ordinary farmers own land between one to two hectares and above two hectares respectively. 2.22% of VFPCCK farmers own land above two hectares and 8.9% of them have one to two hectares of land.

Annual income: 91.11% of ordinary farmers and 86.67% of VFPCCK farmers have an annual income below Rs.1 lakh. Only a nominal percentage of farmers have annual income above Rs.2 lakhs. 6.67% of VFPCCK farmers have an income between Rs. 1-2 lakhs and above Rs.2 lakhs. 2.22% of ordinary farmers have income above Rs.2 lakhs.

Experience: Most of the farmers taken as the sample have an experience above 15 years. 55.56% of ordinary farmers and 53.33% of VFPCCK farmers have an experience above 15 years. 31.11% ordinary farmers and VFPCCK farmers have an experience between 10 to 15 years. 11.11% of ordinary farmers and VFPCCK farmers have 5-10 years experience. This data shows that most of the established farmers are experienced in their area of operation. A nominal percentage of ordinary and VFPCCK farmers have experience below 5 years.

Social participation: Most of the farmers have a medium level of social participation. Around 95.56% of ordinary farmers and 82.22% of VFPCCK farmers have medium level of social participation. Since farmers have to be in their field most of the time, they cannot involve much in social forums.

Extent of adoption: Around 93.33% of ordinary and VFPCCK farmers have a medium level of adoption and 6.67% of ordinary and VFPCCK farmers have low level of adoption. None of them have high level of adoption. It means that the farmers are adoptive and also innovative.

Training: Since the VFPCCK farmers are organized, around 84.44% of VFPCCK farmers have received training but being an unorganized sector also, 88.89% of

ordinary farmers too have received training. There are only 11.11% of ordinary farmers and 15.56% of VFPCCK farmers who have not received training.

Market Ecosystem: Since the VFPCCK farmers are more aware about the market conditions and ecosystem, most of them (73.33%) rate the current market ecosystem as poor whereas the ordinary farmers (55.56%) rate it as good. 42.22% of ordinary farmers rate it as better and 26.67% VFPCCK farmers rate it as good. This is because the farmers face the problem in marketing their produces.

Level of aspiration: The entire set of VFPCCK farmers has low level of aspiration and 86.67% of ordinary farmers have medium level of aspiration. Ordinary farmers show more level of aspiration when compared to VFPCCK farmers. 11.11% of ordinary farmers show high level of aspiration whereas only 2.2% of them show low level of aspiration.

Table 4.1.8 Socio-economic details of commercial vegetable farmers (Zone - 3)

Sl. No.	Variable	Category	VFPCCK Farmers		Ordinary Farmers	
			Number	Percentage	Number	Percentage
1	Age	35-45	1	2.22	0	0.00
		45-55	17	37.78	12	26.67
		55-65	25	55.56	32	71.11
		>65	2	4.44	1	2.22
		Total	45	100.00	45	100.00
2	Gender	Male	45	100.00	45	100.00
		Female	0	0.00	0	0.00
		Others	0	0.00	0	0.00
		Total	45	100.00	45	100.00
3	Education	Illiterate	0	0.00	0	0.00
		Primary	5	11.11	2	4.44
		Secondary	16	35.56	20	44.44
		Higher secondary	21	46.67	22	48.89
		Above HSE	3	6.67	1	2.22
		Total	45	100.00	45	100.00

4	Occupation	Agriculture	45	100.00	45	100.00
		Business	0	0.00	0	0.00
		Retired person	0	0.00	0	0.00
		Private job	0	0.00	0	0.00
		Total	45	100.00	45	100.00
5	Land holding	0-1 ha	25	55.56	24	53.33
		1-2 ha	16	35.56	17	37.78
		>2 ha	4	8.89	4	8.89
		Total	45	100.00	45	100.00
6	Annual income	<1 lakh	38	84.44	43	95.56
		1- 2 lakh	2	4.44	2	4.44
		>2 lakhs	5	11.11	0	0.00
		Total	45	100.00	45	100.00
7	Experience	<5 years	3	6.67	3	6.67
		5-10 years	8	17.78	6	13.33
		10-15 years	14	31.11	14	31.11
		>15 years	20	44.44	22	48.89
		Total	45	100.00	45	100.00
8	Social participation	Low	0	0.00	0	0.00
		Medium	40	88.89	44	97.78
		High	5	11.11	1	2.22
		Total	45	100.00	45	100.00
9	Extent of adoption	Low	4	8.89	2	4.44
		Medium	41	91.11	43	95.56
		High	0	0.00	0	0.00
		Total	45	100.00	45	100.00
10	Training	Received	42	93.33	43	95.56
		Not received	3	6.67	2	4.44
		Total	45	100.00	45	100.00
11	Market ecosystem	Poor	32	71.11	1	2.22
		Good	13	28.89	21	46.67
		Better	0	0.00	23	51.11
		Total	45	100.00	45	100.00

12	Level of aspiration	Low	45	100.00	0	0.00
		Medium	0	0.00	31	68.89
		High	0	0.00	14	31.11
		Total	45	100.00	45	100.00

Source: Primary data

n=90

Age: While analyzing the primary data regarding the age of the farmers in this zone, it is found that majority of the farmers fall under the age group of 55-65. 71.11% ordinary farmers and 55.56% of VFPCCK farmers come under this age group. 2.22% of the ordinary farmers are in the age group above 65 but there are 4.44% of VFPCCK farmers in this group. 26.67% of ordinary farmers and 37.78% VFPCCK farmers are between the age group of 35 to 45 years. This clearly shows that the youth are less interested in farming operations.

Gender: All the farmers are male in both the ordinary and VFPCCK farmers groups in this zone. This shows that females are less engaged in farming ventures.

Education: Most of the farmers have higher secondary level education in both the farmer groups. 44.44% of ordinary farmers and 35.56% of VFPCCK farmers are SSLC pass. 48.89% of ordinary farmers have higher secondary qualification, whereas 46.67% VFPCCK farmers have higher secondary education and only 11.11% VFPCCK farmers have primary education. Only 2.22% of ordinary farmers and 6.67% of VFPCCK farmers have studied above higher secondary. None of the farmers were illiterate. This data shows that highly educated people do not come in front to take up agriculture as their main occupation but it is better when compared to zone 1 and 2.

Occupation: All the VFPCCK farmers and ordinary farmers have taken farming as their main occupation since they carry out farming in a more professional way.

Land holding: Since the land holdings in Kerala are fragmented, most of the farmers have land below one hectare. 53.33% of ordinary farmers and 55.56% VFPCCK farmers possess land below one hectare. 37.78% and 8.89% of ordinary farmers own land between one to two hectares and above two hectares respectively. 35.56% of

VFPCCK farmers own land between one and two hectares. 8.89% of them have land above 2 hectares.

Annual income: 95.56% of ordinary farmers and 84.44% of VFPCCK farmers have an annual income below Rs.1 lakh. Only a nominal percentage of farmers have annual income above Rs.2 lakhs. 4.44% of VFPCCK farmers have an income between Rs. 1-2 lakhs and 11.11% of VFPCCK farmers have income above Rs.2 lakhs.

Experience: Most of the farmers taken as the sample have an experience above 15 years. 48.89% of ordinary farmers and 44.44% of VFPCCK farmers have an experience above 15 years. 31.11% ordinary farmers and VFPCCK farmers have an experience between 10 to 15 years. 13.33% of ordinary farmers have 5-10 years experience whereas 17.78% of VFPCCK farmers have 5-10 years experience. There is 6.67% ordinary and VFPCCK farmers who have experience below 5 years also. This data shows that most of the established farmers are experienced in their area of operation.

Social participation: Most of the farmers have a medium level of social participation. Around 97.78% of ordinary farmers and 88.89% of VFPCCK farmers have medium level of social participation. As a difference from other zones, 2.22% of ordinary farmers and 11.11% of VFPCCK farmers show high social participation in this zone. Since farmers have to be in their field most of the time, they cannot involve much in social forums.

Extent of adoption: Around 95.56% and 91.11% of ordinary and VFPCCK farmers respectively have a medium level of adoption. 4.44% and 8.89% of ordinary and VFPCCK farmers have low level of adoption. None of them have high level of adoption. It means that the farmers are adoptive and also innovative.

Training: Since the VFPCCK farmers are organized, around 93.3% of VFPCCK farmers have received training and 95.56% of ordinary farmers have also received training,

even though they don't have an organized training system. There are only 4.44% of ordinary farmers and 6.67% of VFPCCK farmers who have not received training.

Market Ecosystem: Since the VFPCCK farmers are more aware about the market conditions and ecosystem, most of them (71.11%) rate the current market ecosystem as poor whereas the ordinary farmers (46.67%) rate it as good. 51.1% of ordinary farmers rate it as better and 28.89% VFPCCK farmers rate it as good. Only a single person in ordinary farmers group rate the current market ecosystem as poor. This is because the farmers face the problem in marketing their produces.

Level of aspiration: Cent per cent of VFPCCK farmers have low level of aspiration and 68.89% of ordinary farmers have medium level of aspiration. Ordinary farmers show more level of aspiration when compared to VFPCCK farmers. 31.11% of ordinary farmers show high level of aspiration.

Table 4.1.9 Socio-economic details of commercial vegetable farmers (Zone - 4)

Sl. No.	Variable	Category	VFPCCK Farmers		Ordinary Farmers	
			Numbers	Percentage	Numbers	Percentage
1	Age	35-45	7	15.56	7	15.56
		45-55	18	40.00	15	33.33
		55-65	18	40.00	23	51.11
		>65	2	4.44	0	0.00
		Total	45	100.00	45	100.00
2	Gender	Male	43	95.56	44	97.78
		Female	2	4.44	1	2.22
		Others	0	0.00	0	0.00
		Total	45	100.00	45	100.00
3	Education	Illiterate	0	0.00	0	0.00
		Primary	19	42.22	9	20.00
		Secondary	22	48.89	19	42.22
		Higher secondary	2	4.44	16	35.56
		Above HSE	2	4.44	1	2.22
		Total	45	100.00	45	100.00

4	Occupation	Agriculture	45	100.00	44	97.78
		Business	0	0.00	0	0.00
		Retired person	0	0.00	0	0.00
		Private job	0	0.00	1	2.22
		Total	45	100.00	45	100.00
5	Land holding	0-1 ha	40	88.89	32	71.11
		1-2 ha	4	8.89	12	26.67
		>2 ha	1	2.22	1	2.22
		Total	45	100.00	45	100.00
6	Annual income	<1 lakh	42	93.33	44	97.78
		1- 2 lakh	1	2.22	0	0.00
		>2 lakhs	2	4.44	1	2.22
		Total	45	100.00	45	100.00
7	Experience	<5 years	2	4.44	1	2.22
		5-10 years	6	13.33	5	11.11
		10-15 years	14	31.11	14	31.11
		>15 years	23	51.11	25	55.56
		Total	45	100.00	45	100.00
8	Social participation	Low	1	2.22	1	2.22
		Medium	37	82.22	43	95.56
		High	7	15.56	1	2.22
		Total	45	100.00	45	100.00
9	Extent of adoption	Low	3	6.67	1	2.22
		Medium	42	93.33	44	97.78
		High	0	0.00	0	0.00
		Total	45	100.00	45	100.00
10	Training	Received	41	91.11	39	86.67
		Not received	4	8.89	6	13.33
		Total	45	100.00	45	100.00
11	Market ecosystem	Poor	37	82.22	1	2.22
		Good	8	17.78	28	62.22
		Better	0	0.00	16	35.56
		Total	45	100.00	45	100.00

12	Level of aspiration	Low	42	93.33	0	0.00
		Medium	2	4.44	30	66.67
		High	1	2.22	15	33.33
		Total	45	100.00	45	100.00

Source: Primary data

n=90

Age: While analyzing the primary data regarding the age of the farmers in this zone, it is found that majority of the farmers fall under the age group of 55-65. 51.11% ordinary farmers and 40% of VFPCCK farmers come under this age group and between 45 to 55 years also. There are 4.44% of VFPCCK farmers in the group of above 65 years. 15.56% of ordinary farmers as well as VFPCCK farmers are between the age group of 35 to 45 years. This clearly shows that the youth are less interested in farming operations.

Gender: Majority of the farmers are male in this zone also. 97.78% of ordinary farmers and 95.56% VFPCCK farmers are male and the rest are females. This shows that females are less engaged in farming ventures.

Education: Most of the farmers have secondary level education in both the farmer groups. 42.22% of ordinary farmers and 48.89% of VFPCCK farmers are SSLC pass. 35.56% of ordinary farmers have higher secondary qualification, whereas only 4.44% VFPCCK farmers have higher secondary education and around 42.22% VFPCCK farmers have primary education. Only 2.22% of ordinary farmers and 4.44% of VFPCCK farmers have studied above higher secondary. None of the farmers were illiterate. This data shows that highly educated people do not come in front to take up agriculture as their main occupation.

Occupation: All the VFPCCK farmers and have taken farming as their main occupation since they carry out farming in a more professional way and a major portion of ordinary farmers (97.78%) have also taken agriculture as their main occupation.

Land holding: Since the land holdings in Kerala are fragmented, most of the farmers have land below one hectare. 71.11% of ordinary farmers and 88.89% VFPCCK farmers possess land below one hectare. 26.67% and 2.22% of ordinary farmers own land between one to two hectares and above two hectares respectively. 8.89% of VFPCCK farmers own land between one and two hectares. 2.22% of them have land above 2 hectares.

Annual income: 97.78% of ordinary farmers and 93.33% of VFPCCK farmers have an annual income below Rs.1 lakh. Only a nominal percentage of farmers have annual income above Rs.2 lakhs. 2.22% of VFPCCK farmers have an income between Rs. 1-2 lakhs and 4.44% of VFPCCK farmers have income above Rs.2 lakhs.

Experience: Most of the farmers taken as the sample have an experience above 15 years. 55.56% of ordinary farmers and 51.11% of VFPCCK farmers have an experience above 15 years. 31.11% ordinary farmers and VFPCCK farmers have an experience between 10 to 15 years. 11.11% of ordinary farmers have 5-10 years experience whereas 13.33% of VFPCCK farmers have 5-10 years experience. There is 2.22% ordinary farmers and 4.44% VFPCCK farmers who have experience below 5 years also. This data shows that most of the established farmers are experienced in their area of operation.

Social participation: Most of the farmers have a medium level of social participation. Around 95.56% of ordinary farmers and 82.22% of VFPCCK farmers have medium level of social participation. As a difference from other zones, 2.22% of ordinary farmers and 15.56% of VFPCCK farmers show high social participation in this zone. Since farmers have to be in their field most of the time, they cannot involve much in social forums.

Extent of adoption: Around 97.78% and 93.33% of ordinary and VFPCCK farmers respectively have a medium level of adoption. 2.22% and 6.67% of ordinary and

VFPCCK farmers have low level of adoption. None of them have high level of adoption. It means that the farmers are adoptive and also innovative.

Training: Since the VFPCCK farmers are organized, around 91.11% of VFPCCK farmers have received training and 86.67% of ordinary farmers have also received training, even though they don't have an organized training system. There are only 13.33% of ordinary farmers and 8.89% of VFPCCK farmers who have not received training.

Market Ecosystem: Since the VFPCCK farmers are more aware about the market conditions and ecosystem, most of them (82.22%) rate the current market ecosystem as poor whereas the ordinary farmers (62.22%) rate it as good. 35.56% of ordinary farmers rate it as better and 17.78% VFPCCK farmers rate it as good. Only a single person in ordinary farmers group rate the current market ecosystem as poor. This is because the farmers face the problem in marketing their produces.

Level of aspiration: 93.33 per cent of VFPCCK farmers have low level of aspiration and 66.67% of ordinary farmers have medium level of aspiration. Ordinary farmers show more level of aspiration when compared to VFPCCK farmers. 33.33% of ordinary farmers show high level of aspiration.

Table 4.1.10 Socio-economic details of commercial vegetable farmers (Zone - 5)

Sl. No.	Variable	Category	VFPCCK Farmers		Ordinary Farmers	
			Numbers	Percentage	Numbers	Percentage
1	Age	35-45	11	24.44	8	17.78
		45-55	17	37.78	9	20.00
		55-65	16	35.56	28	62.22
		>65	1	2.22	0	0.00
		Total	45	100.00	45	100.00
2	Gender	Male	45	100.00	45	100.00
		Female	0	0.00	0	0.00
		Others	0	0.00	0	0.00
		Total	45	100.00	45	100.00

3	Education	Illiterate	0	0.00	0	0.00
		Primary	5	11.11	8	17.78
		Secondary	17	37.78	16	35.56
		Higher secondary	20	44.44	16	35.56
		Above HSE	3	6.67	5	11.11
		Total	45	100.00	45	100.00
4	Occupation	Agriculture	45	100.00	43	95.56
		Business	0	0.00	1	2.22
		Retired person	0	0.00	0	0.00
		Private job	0	0.00	1	2.22
		Total	45	100.00	45	100.00
5	Land holding	0-1 ha	22	48.89	22	48.89
		1-2 ha	19	42.22	20	44.44
		>2 ha	4	8.89	3	6.67
		Total	45	100.00	45	100.00
6	Annual income	<1 lakh	40	88.89	42	93.33
		1-2 lakh	2	4.44	3	6.67
		>2 lakhs	3	6.67	0	0.00
		Total	45	100.00	45	100.00
7	Experience	<5 years	3	6.67	3	6.67
		5-10 years	8	17.78	9	20.00
		10-15 years	14	31.11	13	28.89
		>15 years	20	44.44	20	44.44
		Total	45	100.00	45	100.00
8	Social participation	Low	0	0.00	1	2.22
		Medium	36	80.00	43	95.56
		High	9	20.00	1	2.22
		Total	45	100.00	45	100.00

9	Extent of adoption	Low	5	11.11	1	2.22
		Medium	40	88.89	44	97.78
		High	0	0.00	0	0.00
		Total	45	100.00	45	100.00
10	Training	Received	37	82.22	40	88.89
		Not received	8	17.78	5	11.11
		Total	45	100.00	45	100.00
11	Market ecosystem	Poor	31	68.89	1	2.22
		Good	14	31.11	25	55.56
		Better	0	0.00	19	42.22
		Total	45	100.00	45	100.00
12	Level of aspiration	Low	42	93.33	0	0.00
		Medium	1	2.22	28	62.22
		High	2	4.44	17	37.78
		Total	45	100.00	45	100.00

Source: Primary data

n=90

Age: While analyzing the primary data regarding the age of the farmers in this zone, it is found that majority of the farmers fall under the age group of 55-65. 62.22% ordinary farmers and 35.56% of VFPCCK farmers come under this age group. There are 2.22% of VFPCCK farmers in the group of above 65 years. 15.56% of ordinary farmers as well as VFPCCK farmers are between the age group of 35 to 45 years. 20.00% of ordinary farmers and 37.78% of VFPCCK farmers fall under the age group of 45-55. This clearly shows that the youth are less interested in farming operations.

Gender: All the farmers were males in this zone. This shows that females are less engaged in farming ventures.

Education: Most of the farmers are having higher secondary level education in both the farmer groups. 35.56% of ordinary farmers and 37.78% of VFPCCK farmers are SSLC pass. 35.56% of ordinary farmers have higher secondary qualification, whereas 44.44% VFPCCK farmers have higher secondary education and around 11.11%

VFPCCK farmers have primary education. Only 11.11% of ordinary farmers and 6.67% of VFPCCK farmers have studied above higher secondary. None of the farmers were illiterate. This data shows that highly educated people do not come in front to take up agriculture as their main occupation.

Occupation: All the VFPCCK farmers and have taken farming as their main occupation since they carry out farming in a more professional way and a major portion of ordinary farmers (95.56%) have also taken agriculture as their main occupation.

Land holding: Since the land holdings in Kerala are fragmented, most of the farmers have land below one hectare. 48.89% of ordinary farmers and 48.89% VFPCCK farmers possess land below one hectare. 44.44% and 6.67% of ordinary farmers own land between one to two hectares and above two hectares respectively. 42.22% of VFPCCK farmers own land between one and two hectares. 8.89% of them have land above 2 hectares.

Annual income: 93.33% of ordinary farmers and 88.89% of VFPCCK farmers have an annual income below Rs.1 lakh. Only a nominal percentage of farmers have annual income above Rs.2 lakhs. 4.44% of VFPCCK farmers have an income between Rs. 1-2 lakhs and 6.67% of VFPCCK farmers have income above Rs.2 lakhs.

Experience: Most of the farmers taken as the sample have an experience above 15 years. 44.44% of ordinary VFPCCK farmers have an experience above 15 years. 28.89% ordinary farmers and 31.11% VFPCCK farmers have an experience between 10 to 15 years. 20% of ordinary farmers have 5-10 years experience whereas 17.78% of VFPCCK farmers have 5-10 years experience. There are 6.67% ordinary and VFPCCK farmers who have experience below 5 years also. This data shows that most of the established farmers are experienced in their area of operation.

Social participation: Most of the farmers have a medium level of social participation. Around 95.56% of ordinary farmers and 80% of VFPCCK farmers have medium level of social participation. Since farmers have to be in their field most of the time, they cannot involve much in social forums.

Extent of adoption: Around 97.78% and 88.89% of ordinary and VFPCCK farmers respectively have a medium level of adoption. 2.22% and 11.11% of ordinary and VFPCCK farmers have low level of adoption. None of them have high level of adoption. It means that the farmers are adoptive and also innovative.

Training: Since the VFPCCK farmers are organized, around 82.22% of VFPCCK farmers have received training and 88.89% of ordinary farmers have also received training, even though they don't have an organized training system. There are only 11.11% of ordinary farmers and 17.78% of VFPCCK farmers who have not received training.

Market Ecosystem: Since the VFPCCK farmers are more aware about the market conditions and ecosystem, most of them (68.89%) rate the current market ecosystem as poor whereas the ordinary farmers (55.56%) rate it as good. 42.22% of ordinary farmers rate it as better and 31.11% VFPCCK farmers rate it as good. Only a single person in ordinary farmers group rates the current market ecosystem as poor. This is because the farmers face the problem in marketing their produces.

Level of aspiration: 93.33 per cent of VFPCCK farmers have low level of aspiration and 62.22% of ordinary farmers have medium level of aspiration. Ordinary farmers show more level of aspiration when compared to VFPCCK farmers. 37.78% of ordinary farmers show high level of aspiration.

In order to identify different factors that influence the entrepreneurial behaviour of vegetable farmers, correlation analysis and chi square tests were carried out. The different factors considered were age, gender, education, occupation, assets, size of land holding, annual income, experience, social participation, adoption of improved practices, training received, market ecosystem and level of aspiration.

SECTION II

4.2 Entrepreneurial behaviour of selected vegetable farmers

“Entrepreneurial behaviour is a subset of entrepreneurial activities concerned with understanding, predicting and influencing individual behaviour in entrepreneurial settings” (McAdam and Cunningham, 2019).

For analysing the entrepreneurial behaviour of the vegetable farmers, the variables like innovation orientation, farm decision making, achievement motivation, risk taking ability, information seeking behaviour, leadership ability, cosmopolitaness, market orientation, etc. were taken into account. Statistical tools like percentages, indices, t-test and ANOVA were used to analyse the data. Zone wise analysis of data with respect to VFPCCK farmers and ordinary farmers were done in this section.

Table 4.2.1 Entrepreneurial behaviour of selected farmers (n=450)

Sl. No.	Statements	VFPCCK farmers	Ordinary farmers
		Index	Index
(a) Innovation orientation			
1	I search out new working methods, techniques or instruments	92.98	91.82
2	I generate original solutions for problems	89.51	92.27
3	I find new approaches to execute tasks	87.11	91.82
4	I systematically introduce innovative ideas into work practices	83.38	83.20
5	I put effort in the development of new things	79.02	80.44
6	I would feel restless unless, you tryout an innovative method which you have come across.	84.71	85.87
7	I am cautious about trying new practices.	89.78	92.44
8	I like to keep up to date information about the subjects of my interest.	95.11	94.22
9	I would not prefer to wait for others to try out new practices first.	74.58	80.18
Overall Index		86.24	88.03

(b) Achievement motivation

1	I am enjoying my work very much.	96.00	95.64
2	I work hard at everything I undertakes until I am satisfied with the result.	96.71	95.38
3	I succeed in my occupation even if I have been neglectful of my family.	77.24	76.18
4	I have determination and driving ambition to achieve certain things in life even if these qualities make me unpopular	82.58	83.91
5	I won't take rest until I finish my work	95.47	95.20
6	Even when my interests are in danger, I concentrate on my job and forget my obligation to others.	77.69	77.42
7	I set difficult goals for myself and try to attain them.	87.47	89.16
Overall Index		87.59	87.56

(c) Risk taking ability

1	I should adopt mixed cropping to avoid greater risks involved in single crop cultivation.	95.29	95.29
2	I should rather take more of a chance in making more profit than to be content with a smaller but less profit.	88.18	89.33
3	I am willing to take a greater risk than an average one and it usually does better financially.	85.78	86.40
4	I should take risks when I know that chance of success is fairly high.	89.87	90.31
5	I should try new ideas that may enhance the production/ profitability even though no one is adopted it yet.	77.42	75.91
6	I should try an entirely new method which involves risk but worthy.	75.47	72.36
Overall Index		85.33	84.93

(d) Farm decision making ability

1	I take decision to start commercial vegetable production	98.52	98.96
2	I take decision to avail loans	89.33	91.70
3	I take decision to tryout other crops	88.44	91.11
4	I take decision to hire labourers	90.81	93.63
5	I take decision regarding storage and marketing of vegetables	69.33	69.33
6	I take decision regarding the value addition of the produce	35.70	35.26
7	I take decision to purchase or hire machinery and equipments	82.81	83.41
8	I decide to meet the agricultural extension worker or any organization	90.37	86.81
9	I decide to subscribe for magazines	86.67	83.85
10	I decide to attend training	83.41	86.07
Overall Index		81.54	82.01

(e) Information seeking behaviour

Formal sources

1	Scientists of KAU	33.78	36.11
2	Agriculture extension worker	64.67	52.44
3	Agriculture officer	63.67	62.56
4	KVK	67.56	66.22
5	VFPCCK	99.44	25.78
6	Agricultural Seminars	63.67	39.33
7	Print media (Newspapers, magazines, books, brochures etc.)	98.33	99.33
8	Electronic media (Television, Radio, Internet and mobile phone)	100.00	100.00

Informal sources

1	Family members	100.00	92.89
2	Peer group	99.44	96.44
3	Pioneer/experienced vegetable farmers	77.89	77.00
Overall Index		78.95	68.01

(f) Cosmopolitaness			
1	I think there is a need to collect additional information from outside the village for successful vegetable cultivation	97.93	96.15
2	I should try to get information on vegetable crop management practices from outside village by using mass media facilities	91.11	93.19
3	I should learn many things not only from the happenings and experiences of my village only	98.96	98.52
4	Keeping contact with progressive vegetable growers is useful for me for managing the vegetable cultivation	99.11	97.78
5	Visiting the subject matter specialist is not a waste of time for me	97.48	98.37
6	VFPCCK/KVK/KAU exhibitions or seminars / Agricultural exhibition helps me to gather recent information	99.41	96.74
Overall Index		97.33	96.79
(g) Leadership ability			
1	I like to see problems of fellow farmers resolved.	95.29	95.56
2	I enjoy sharing information with others.	97.69	98.22
3	I persevere on an activity until I completed.	97.42	98.49
4	I enjoy success and strive for it.	96.98	97.96
5	I consider myself to be a flexible person.	96.27	97.42
6	I work at maintaining good interpersonal relationships.	97.87	97.24
7	People look to me for advice.	91.73	90.93
8	I am an effective decision maker.	97.60	96.53
9	I am original in my ideas/activities.	95.56	94.93
10	I like Initiating new things.	94.13	94.84
11	I feel confident with my capabilities.	99.11	98.49
12	I consider myself to be an achiever in life.	97.51	97.51
Overall Index		96.43	96.51

(h) Market orientation			
1	I cultivate vegetables to earn profits	96.44	98.58
2	I always be watchful about the demand of each vegetable in the market.	99.56	97.16
3	I always seek what the market wants.	99.29	97.69
4	I cultivate vegetables after assuring there is a market	99.29	98.93
5	I sell my produce in the market on a regular basis	99.64	99.91
6	I know the inputs requirements for vegetable cultivation	99.73	99.73
7	I am aware about the input supply source	99.38	99.47
8	I know which markets to sell to	99.73	99.73
9	I know the differences in prices and costs (conscious of prices, delivery costs, transport, storage etc.)	99.73	98.93
Overall Index		99.20	98.91

Source: Primary data

Table 4.2.2 Ranking of entrepreneurial behaviour traits of farmers (n=450)

Sl. No.	Variables	VFPCK farmers	Rank	Ordinary farmers	Rank
		Overall index		Overall index	
1	Innovation orientation	86.24	5	88.03	4
2	Achievement motivation	87.59	4	87.56	5
3	Risk taking ability	85.33	6	84.93	6
4	Farm decision making ability	81.54	7	82.01	7
5	Information seeking behaviour	78.95	8	68.01	8
6	Cosmopolitaness	97.33	2	96.79	2
7	Leadership ability	96.43	3	96.51	3
8	Market orientation	99.20	1	98.90	1

Source: Primary data

The analysis reveals that among the selected variables, market orientation was ranked first among all the entrepreneurial traits among the selected vegetable farmers. VFPCCK farmers and ordinary farmers agreed in ranking the statements under different traits except for traits innovation orientation and achievement motivation. According to VFPCCK farmers, achievement motivation outranked the innovation orientation whereas ordinary farmers believed that innovation orientation should be a little more essential than achievement motivation. According to the vegetable farmers cosmopolitaness, leadership ability, innovation orientation, achievement motivation, risk-taking ability and farm decision making ability were the other important entrepreneurial traits after the market orientation which were observed among vegetable farmers (entrepreneurs whose main source of income is from commercial vegetable cultivation).

Innovation orientation and achievement motivation: VFPCCK farmers considered achievement motivation as more important than innovation orientation, while in the case of ordinary farmers it is viz versa, as important factor in determining entrepreneurial behaviour. Both the VFPCCK farmers and ordinary farmers were ready to update their knowledge about the subjects of their interest. Since they keep their knowledge and information up to date, they search for new working method, techniques and instruments.

The respondents in both the categories had enjoyed the farming activity and due to that they worked hard to find a result which satisfied them. They worked until they finish the work even if the result is not as much as expected, but tried for the best result.

Risk taking ability: According to the survey conducted among the VFPCCK farmers and ordinary farmers, it was observed that both the categories of farmers were not ready to take risk and they liked to follow the conservative practices. The farmers were eager to adopt mixed cropping pattern so as to avoid the risk of loss involved in

single crop cultivation. They were ready to take risk only if they find that the chance of success is considerably high.

Farm decision making ability and information seeking behaviour: These two factors which influence the entrepreneurial behaviour were ranked the last, compared to the other factors influencing entrepreneurial behaviour. The farmers decided what to cultivate based on the commercial production and the demand for the specified crop. They rarely considered the scope for value addition in deciding what to be cultivated in the field. Farmers in both the categories preferred the electronic media such as television, radio, internet and mobile phones for getting updated with information, from formal sources, followed by print media such as newspaper, magazines, books, brochures, etc. along with the information provided by scientists of KAU, agricultural extension workers, agricultural officers, KVK, VFPCCK and agricultural seminars. When coming to the informal sources, the VFPCCK farmers prefer the information from their family members and peer group, whereas the ordinary farmers go with their peer group.

Cosmopolitaness: Gathering information from all the other places and directions related to the subject is equally important while focusing only in our surroundings. According to the respondents as well as the view of the expert, cosmopolitaness is the next important trait for a vegepreneur after the market orientation. But there were some differences between the respondent's groups in which the rankings were given to the variables under cosmopolitaness. VFPCCK farmers, due to their exposure from the VFPCCK, had already understood that they should learn many things through seminars and exhibitions conducted by agencies which helped them to gather recent information other than their knowledge and experiences gained from their own village. But ordinary farmers agreed strongly about gathering information not only from the happenings and experience of their own village but also through visiting the subject matter specialist which was not at all a waste of time.

Respondents in both groups strongly agreed to the fact that they should keep in contact with other progressive vegetable farmers that might be useful for them in managing vegetable cultivation. But among the two respondent categories VFPCCK farmers had given higher agreeable ratings than ordinary farmers. From all these observations it was clear that VFPCCK farmers were practising cosmopolitanism while the ordinary farmers got to start or just started.

Leadership ability: Without any doubt, anyone will say that leadership is an essential quality for an entrepreneur and there is no difference between the cases of vegpreneurs too. Both the respondent categories almost equally agreed that leadership ability was very important for an entrepreneur. VFPCCK farmers considered confidence, good interpersonal relationships, finding joy while sharing useful information with others, decision making, considering themselves to be an achiever, preserving on an activity till the level of completion were the factors determining leadership ability. Whereas for the ordinary farmers, confidence about their own capabilities, to see an activity from starting to its completion, joy in sharing information with others, enjoying the success after putting great effort for achieving it were the main components of the leadership ability.

Market orientation: When considering this trait there was a difference among the VFPCCK farmers who were more conscious or they gave much focus to select the market where they received more price for their produce and well aware about the input requirements of each vegetable. They were too conscious of prices, delivery cost, transport, and storage because they knew well about the differences between the costs and prices. They had a strong intention to sell their products in the market on regular basis and also very much attentive about the demand of each vegetable they produce and according to that, they plan the vegetable production. Whereas the ordinary farmers considered all the above aspects strictly even though they had given much attention and care to sell their products in the market on a regular basis and about its input requirements and supply sources. VFPCCK farmers were not much

bothered about profit compared to other variables under market orientation and more watchful about the demand of each vegetable in the market.

In order to compare the entrepreneurial behaviour of ordinary farmers and VFPCCK farmers, two sample t- test was carried out with the following hypotheses:

H_0 : There is no significant difference between the mean scores of ordinary farmers and VFPCCK farmers with respect to their entrepreneurial behaviour.

H_1 : There is significant difference between the mean scores of ordinary farmers and VFPCCK farmers with respect to their entrepreneurial behaviour.

	EB of VFPCCK farmers	EB of ordinary farmers
Mean	89.08	87.84
Variance	15.03	7.66
t-statistic	3.89**	
t critical (two-tail)	1.97	

** significant at 1% level

The value of test statistic ($t=3.89$) is greater than the critical value ($t=1.97$). Hence, it is concluded that there is significant difference between the mean scores of ordinary farmers and VFPCCK farmers with respect to their entrepreneurial behaviour. The mean values showed that the EB of VFPCCK farmers are higher than that of ordinary farmers.

Since there is significant difference between the mean scores of ordinary farmers and VFPCCK farmers with respect to their entrepreneurial behaviour, categorisation of farmers was done based on the mean and standard deviation. The values in parenthesis are percentages.

Table 4.2.3 Extent of entrepreneurial behaviour of farmers (n=450)

Entrepreneurial behaviour	Type of farmer		Total
	VFPCCK	ordinary	
High	23 (10.22)	33 (14.67)	56 (12.44)
Moderate	162 (72.00)	161 (71.56)	323 (71.78)
Low	40 (17.78)	31 (13.77)	71 (15.78)
Total	225 (100)	225 (100)	450 (100)

Source: Primary data

High: mean + Standard deviation,

Moderate: values greater than mean – Standard deviation and less than mean +
Standard deviation,

Low: mean – Standard deviation

Values in parenthesis indicate percentages.

In case of entrepreneurial behaviour, majority of the VFPCCK farmers (72%) as well as ordinary farmers (71.56%) were found to have moderate level of entrepreneurial behaviour.

In order to see whether there is any significant association between the type of farmer and his entrepreneurial behaviour, chi-square test was carried out and the Pearson Chi-square value was obtained as 2.93 and it was not significant ($p < 0.05$). This shows that the type of farmer and his entrepreneurial behaviour are independent.

Entrepreneurial behaviour of Vegetable farmers (Zone wise)

The entrepreneurial behaviour (EB) for each zone among VFPCCK farmers as well as ordinary farmers was studied by considering their innovation orientation, achievement motivation, risk taking ability, farm decision making ability, information-seeking behaviour, cosmopolitness, leadership ability and market orientation. Entrepreneurial behaviour was measured by the summation of the scores

obtained from the above mentioned variables. The analysis was carried out using frequencies and percentages. The values in parenthesis indicate percentages.

Table 4.2.4 Innovation orientation of VFPCCK farmers – Zone wise (n=225)

Innovation orientation	Ratings	VFPCCK farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Strongly Agree	29(64.44)	29(64.44)	29 (64.44)	30(66.67)	31(68.89)
	Agree	16(35.56)	16(35.56)	16(35.56)	15(33.33)	14(31.11)
	Undecided	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0(0.00)
	Disagree	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0(0.00)
	Strongly Disagree	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0(0.00)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

Table 4.2.5 Innovation orientation of ordinary famers – Zone wise (n=225)

Innovation orientation	Ratings	Ordinary farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Strongly Agree	41(91.11)	41(91.11)	33(73.33)	37(82.22)	36(80.00)
	Agree	4 (8.89)	4 (8.89)	12(26.67)	8(17.78)	9(20.00)
	Undecided	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Strongly Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

In case of innovation orientation, majority of the VFPCCK farmers as well as ordinary farmers of each zone are found to have a high orientation towards innovation. On the other hand ordinary farmers were found to be comparatively more innovation oriented than VFPCCK farmers in all zones. Even though both the category were commercial vegetable farmers, VFPCCK farmers getting all inputs through the VFPCCK easily whereas ordinary farmers collects new ideas and new methods in all possible way and they trying it too.

Table 4.2.6 Achievement motivation of VFPCCK farmers – Zone wise (n=225)

Achievement Motivation	Ratings	VFPCCK farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Strongly Agree	30 (66.67)	30(66.67)	31(68.89)	35(77.78)	35(77.78)
	Agree	15 (33.33)	15(33.33)	14(31.11)	10(22.22)	10(22.22)
	Undecided	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Strongly Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

Table 4.2.7 Achievement motivation of ordinary farmers – Zone wise (n=225)

Achievement motivation	Ratings	Ordinary farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Strongly Agree	40(88.89)	40(88.89)	30(66.67)	35(77.78)	31(68.89)
	Agree	5(11.11)	5(11.11)	15(33.33)	10(22.22)	14(31.11)
	Undecided	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Strongly Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

In case of achievement motivation, majority of the VFPCCK farmers as well as ordinary farmers are found to have highly motivated to achievement of their goals. Achievement motivation of ordinary farmers is higher in zone 1 and zone 2 and that of VFPCCK farmers are higher in zone 3 and zone 5. It remains same for both types of farmers in zone 4. In zone 1, zone 2 and zone 4 both the category of farmers were very active, productive and with better standard of living compared to other zones.

Table 4.2.8 Risk taking ability of VFPCCK farmers – Zone wise (n=225)

Risk Taking Ability	Ratings	VFPCCK farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Strongly Agree	29 (64.45)	29 (64.45)	28(62.22)	28(62.22)	29(64.44)
	Agree	14 (31.11)	14 (31.11)	15(33.34)	16(35.56)	15(33.34)
	Undecided	2 (4.44)	2 (4.44)	2 (4.44)	1(2.22)	1(2.22)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Strongly Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

Table 4.2.9 Risk taking ability of ordinary farmers – Zone wise (n=225)

Risk Taking Ability	Ratings	Ordinary farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Strongly Agree	29 (64.44)	29 (64.44)	29(64.45)	26(57.78)	32(71.11)
	Agree	16 (35.56)	16 (35.56)	14(31.11)	17(37.78)	12(26.67)
	Undecided	0 (0.00)	0 (0.00)	2(4.44)	2(4.44)	1(2.22)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Strongly Disagree	0 (0.00)	0 (0.00)	0(0.00)	(0.00)	0(0.00)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

In case of risk taking ability, majority of the VFPCCK farmers as well as ordinary farmers were found to have higher ability to undertake risks. Risk taking ability of ordinary farmers were higher in zone 3 and zone 5. It remains same for both types of farmers in zone 1 and zone 2. Farmers of zone 3 and zone 5 face many constraints than other zones and for the ordinary farmers in these zones risk increases as they were not registered under VFPCCK in relation with the marketing of their produce.

Table 4.2.10 Farm decision making ability of VFPCCK farmers – Zone wise (n=225)

Farm decision making ability	Ratings	VFPCCK farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Independently	44 (97.78)	44(97.78)	43(95.56)	44(97.78)	43(95.56)
	Others	1 (2.22)	1 (2.22)	2(4.44)	1(2.22)	2(4.44)
	Neither	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
Total		45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

Table 4.2.11 Farm decision making ability of ordinary farmers – Zone wise (n=225)

Farm decision making ability	Ratings	Ordinary farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Independently	42 (93.33)	42 (93.33)	45(100)	42(93.33)	45(100)
	Others	3 (6.67)	3 (6.67)	0(0.00)	3(6.66)	0(0.00)
	Neither	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
Total		45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

In case of farm decision making ability, majority of the VFPCCK farmers as well as ordinary farmers are found to take farm decision independently. Cent per cent of the ordinary farmers of zone 3 and zone 5 take farm decisions independently.

Table 4.2.12 Information seeking behaviour of VFPCCK farmers – Zone wise (n=225)

Information seeking behaviour	Ratings	VFPCCK farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Daily	30 (66.67)	30 (66.67)	28(62.22)	30(66.67)	28(62.22)
	Weekly	15 (33.33)	15 (33.33)	17(37.78)	15(33.33)	17(37.78)
	Rarely	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Never	0 (0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Total		45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

Table 4.2.13 Information seeking behaviour of commercial farmers – Zone wise (n=225)

Information seeking behaviour	Ratings	Ordinary farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Daily	2 (4.44)	2 (4.44)	1(2.22)	2(4.44)	1(2.22)
	Weekly	43 (95.55)	43(95.55)	44(97.78)	43(95.55)	44(97.78)
	Rarely	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Never	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
Total		45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

In case of information seeking behaviour, majority of the VFPCCK farmers are found to seek information on a daily basis in all zones, whereas, majority of the ordinary farmers are found to seek information on a weekly basis in all zones. Because VFPCCK farmers were exposed to VFPCCK officials and their fellow farmers in the Self Help Group i.e. they are in contact with the VFPCCK office almost every day.

Table 4.2.14 Cosmopolitaness of VFPCCK farmers – Zone wise (n=225)

Cosmopolitaness	Ratings	VFPCCK farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Agree	45 (100.00)	45 (100.00)	45(100)	45(100)	44(97.78)
	Undecided	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	1(2.22)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
Total		45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

Table 4.2.15 Cosmopolitaness of ordinary farmers – Zone wise (n=225)

Cosmopolitaness	Ratings	Ordinary farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Agree	45 (100.00)	45 (100.00)	45(100)	42(93.33)	45(100)
	Undecided	0 (0.00)	0 (0.00)	0(0.00)	3(6.67)	0(0.00)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
Total		45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

In case of Cosmopolitaness, 100% of the VFPCCK farmers as well as Ordinary farmers are found to be cosmopolite. Because it is very essential and compulsory to

know the things happening outside their territory or locality though they were undergoing commercial vegetable cultivation.

Table 4.2.16 Leadership ability of VFPCCK farmers – Zone wise (n=225)

Leadership Ability	Ratings	VFPCCK farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Strongly Agree	43 (95.55)	43 (95.55)	44(97.78)	45(100)	45(100)
	Agree	2 (4.44)	2 (4.44)	1(2.22)	0(0.00)	0(0.00)
	Undecided	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Strongly Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

Table 4.2.17 Leadership ability of ordinary farmers – Zone wise (n=225)

Leadership Ability	Ratings	Ordinary farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Strongly Agree	43 (95.56)	43 (95.56)	44(97.78)	44(97.78)	44(97.78)
	Agree	2 (4.44)	2 (4.44)	1(2.22)	1(2.22)	1(2.22)
	Undecided	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Strongly Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

In case of leadership ability, majority of the VFPCCK farmers as well as ordinary farmers are found to have high ability for leadership. Leadership ability of VFPCCK farmers are higher than that of ordinary farmers in zone 4 and zone 5.

Table 4.2.18 Market orientation of VFPCCK farmers – Zone wise (n=225)

Market orientation	Ratings	VFPCCK farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Strongly Agree	44 (97.78)	44 (97.78)	45(100)	45(100)	45(100)
	Agree	1 (2.22)	1 (2.22)	0(0.00)	0(0.00)	0(0.00)
	Undecided	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Strongly Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

Table 4.2.19 Market orientation of ordinary farmers – Zone wise (n=225)

Market orientation	Ratings	Ordinary farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	Strongly Agree	45 (100)	45 (100)	45(100)	45(100)	45(100)
	Agree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Undecided	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Strongly Disagree	0 (0.00)	0 (0.00)	0(0.00)	0(0.00)	0(0.00)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

In case of market orientation, majority of the VFPCCK farmers as well as ordinary farmers are found to have oriented highly towards market. Market orientation of ordinary farmers is higher than that of VFPCCK farmers in zone 1 and zone 2.

Hypothesis testing

1. In order to compare the entrepreneurial behaviour of ordinary farmers and VFPCCK farmers of each zone, t- test was carried out for which the hypothesis was formulated as:

Ho: There is no significant difference between the mean scores of ordinary farmers and VFPCCK farmers with respect to their entrepreneurial behaviour.

H₁: There is significant difference between the mean scores of ordinary farmers and VFPCCK farmers with respect to their entrepreneurial behaviour.

Particulars	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Mean of VFPCCK farmers	88.98	88.99	88.92	89.19	89.31
Mean of ordinary farmers	88.03	88.01	87.99	86.99	88.19
Variance of VFPCCK farmers	24.25	24.25	12.43	8.50	6.96
Variance of ordinary farmers	8.80	8.45	6.19	8.73	5.87
t-statistic value	1.11	1.14	1.44	3.54**	2.10*
t critical (two-tail)	1.98	1.98	1.98	1.98	1.98

*Significant at 5% level **significant at 1% level

The value of test statistic t is less than the critical value in zone 1, zone 2 and zone 3. The t statistic is greater than table value in zone 4 and zone 5 which showed that there is significant difference between the mean scores of ordinary farmers and VFPCCK farmers with respect to their entrepreneurial behaviour in the two zones.

It is concluded that there is no significant difference between the mean scores of ordinary farmers and VFPCCK farmers of zone 1, zone 2 and zone 3. Among these three zones two of them coming under Thrissur district and the selected two blocks (Mala and Pazhayannur) had very intensive vegetable cultivation. Also the farmers in these three zones had a very good reach to KAU. Above all VFPCCK in these two zones are very dynamic in nature.

To know the extent of entrepreneurial behaviour, categorisation of farmers was done based on the mean and standard deviation. The values in parenthesis are percentages.

Table 4.2.20 Extent of entrepreneurial behaviour of VFPCCK farmers –Zone wise (n=225)

Entrepreneurial behaviour	Category	VFPCCK farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	High	7 (15.56)	7 (15.56)	6(13.33)	9(20.00)	8(17.77)
	Moderate	29 (64.44)	29 (64.44)	29(64.44)	29(64.44)	30(66.67)
	Low	9 (20.00)	9 (20.00)	10(22.23)	7(15.56)	7(15.56)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

High : Values greater than Mean + SD

Moderate: Values lies between Mean+SD and Mean-SD

Low: Values less than Mean - SD

Table 4.2.21 Extent of entrepreneurial behaviour of ordinary farmers–Zone wise (n=225)

Entrepreneurial behaviour	Category	Ordinary farmers				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	High	6 (13.33)	6 (13.33)	7(15.55)	1(2.22)	6(13.33)
	Moderate	34 (75.56)	34 (75.56)	30(66.67)	39(86.67)	32(71.11)
	Low	5 (11.11)	5 (11.11)	8(17.78)	5(11.11)	7(15.56)
Total		45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Primary data

Majority of the VFPCCK farmers as well as ordinary farmers were found to have moderate level of entrepreneurial behaviour.

- In order to see whether there is any significant association between the type of farmer and his entrepreneurial behaviour, chi-square test was carried out.

H₀: Type of farmer and his entrepreneurial behaviour are independent.

H₁: Type of farmer and his entrepreneurial behaviour are dependent.

Zone	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Pearson chi-square value	1.62	1.62	0.32	8.20*	0.35
Probability (p)	0.446	0.446	0.854	0.017	0.839

*p<0.05

Chi-square values obtained in zone 1, zone 2, zone 3 and zone 5 were not significant at 5% level and it was significant at 5 per cent level in zone 4. This shows that type of farmer and his entrepreneurial behaviour are independent in zone 1. Zone 2, zone 3 and zone 5 whereas they are dependent in zone 4.

- In order to compare the entrepreneurial behaviour of farmers' from five selected zones, one way analysis of variance was carried out with five zones as treatments and 45 farmers as sample size for each zone. Analysis of Variance (ANOVA) was conducted separately for VFPCCK and ordinary farmers. A detailed description of ANOVA along with the results and interpretations are given below.

H0: There is no significant difference between five zones with respect to mean scores of entrepreneurial behaviour of farmers

H1: There is significant difference between zones with respect to mean scores of entrepreneurial behaviour of farmers

ANOVA table – VFPCCK farmers				Mean scores of VFPCCK farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	4.80	0.079 ^{NS}	88.99	88.99	88.92	89.19	89.31
Within zones	220	3361.98						
Total	224	3366.78						
ANOVA table – ordinary farmers				Mean scores of ordinary farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	41.95	1.378 ^{NS}	88.03	88.02	87.99	86.99	88.18
Within zones	220	1674.87						
Total	224	1716.82						

NS –Non Significant at 5 per cent level, df- degree of freedom, SS – Sum of Squares

Results of ANOVA showed a non significant F value which indicates that there is no significant difference between five zones with respect to mean scores of entrepreneurial behaviour for both VFPCCK and ordinary farmers.

4. In order to compare and identify the difference in the entrepreneurial behaviour traits of five selected zones one way analysis of variance was carried out with 5 zones with respect to the selected entrepreneurial behaviour traits. A detailed description of ANOVA along with their results and interpretations are given below.

A. H0: There is no significant difference between five zones with respect to mean scores of innovation orientation of vegetable farmers

H1: The zones differ significantly with respect to mean scores of innovation orientation of vegetable farmers

ANOVA table – VFPCCK farmers				Mean scores of VFPCCK farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	87.96	0.216 ^{NS}	86.22	86.22	86.22	85.28	87.26
Within zones	220	22346.19						
Total	224	22434.15						
ANOVA table – ordinary farmers				Mean scores of ordinary farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	259.62	1.374 ^{NS}	89.23	89.23	86.71	86.96	88.00
Within zones	220	10394.49						
Total	224	10654.10						

NS – Non Significant

Results of ANOVA showed a non significant F value which indicates that there is no significant difference between five zones with respect to mean scores of innovation orientation for both VFPCCK farmers and ordinary farmers.

B. H0: There is no significant difference between five zones with respect to mean scores of achievement motivation of vegetable farmers

H1: The zones differ significantly with respect to mean scores of achievement motivation of vegetable farmers

ANOVA table – VFPCCK farmers				Mean scores of VFPCCK farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	234.22	0.660 ^{NS}	86.79	86.79	86.92	88.06	89.39
Within zones	220	19506.09						
Total	224	19740.32						
ANOVA table – ordinary farmers				Mean scores of ordinary farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	50.43	0.181 ^{NS}	87.75	87.75	88.06	86.67	87.55
Within zones	220	15323.5						
Total	224	15373.93						

NS – Non Significant

Results of ANOVA showed a non significant F value which indicates that there is no significant difference between five zones with respect to mean scores of achievement motivation for both VFPCCK farmers and ordinary farmers.

C. H0: There is no significant difference between five zones with respect to mean scores of risk taking ability of vegetable farmers

H1: The zones differ significantly with respect to mean scores of risk taking ability of vegetable farmers

ANOVA table – VFPCCK farmers				Mean scores of VFPCCK farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	37.52	0.058 ^{NS}	85.48	85.48	84.74	85.92	85.04
Within zones	220	35338.45						
Total	224	35375.97						
ANOVA table – ordinary farmers				Mean scores of ordinary farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	274.77	0.620 ^{NS}	84.74	84.74	85.41	83.18	86.59
Within zones	220	24387.27						
Total	224	24662.04						

NS – Non Significant

Results of ANOVA showed a non significant F value which indicates that there is no significant difference between five zones with respect to mean scores of risk taking ability for both VFPCCK farmers and ordinary farmers.

D. H0: There is no significant difference between five zones with respect to mean scores of farm decision making ability of vegetable farmers

H1: The zones differ significantly with respect to mean scores of farm decision making ability of vegetable farmers

ANOVA table – VFPCCK farmers				Mean scores of VFPCCK farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	2.67	0.015 ^{NS}	81.63	81.63	81.41	81.63	81.41
Within zones	220	9574.32						
Total	224	9576.99						
ANOVA table – ordinary farmers				Mean scores of ordinary farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	2.69	0.017 ^{NS}	81.92	81.92	82.15	81.92	82.15
Within zones	220	8663.37						
Total	224	8666.06						

NS – Non Significant

Results of ANOVA showed a non significant F value which indicates that there is no significant difference between five zones with respect to mean scores of farm decision making ability in the case for both VFPCCK and ordinary farmers.

E. H0: There is no significant difference between five zones with respect to mean scores of information seeking behaviour of vegetable farmers

H1: The zones differ significantly with respect to mean scores of information seeking behaviour of vegetable farmers

ANOVA table – VFPCCK farmers				Mean scores of VFPCCK farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	19.83	0.150 ^{NS}	79.19	79.19	78.59	79.19	78.59
Within zones	220	7280.37						
Total	224	7300.20						
ANOVA table – ordinary farmers				Mean scores of ordinary farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	149.47	1.889 ^{NS}	67.12	67.12	69.14	67.98	68.69
Within zones	220	4351.95						
Total	224	4501.43						

NS – Non Significant at 5 per cent level

Results of ANOVA showed a non significant F value which indicates that there is no significant difference between five zones with respect to mean scores of information seeking behaviour for both VFPCCK and ordinary farmers.

F. H0: There is no significant difference between five zones with respect to mean scores of cosmopolitanness of vegetable farmers

H1: The zones differ significantly with respect to mean scores of cosmopolitanness of vegetable farmers

ANOVA table – VFPCCK farmers				Mean scores of VFPCCK farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	35.09	0.324 ^{NS}	97.65	97.65	97.65	96.91	96.79
Within zones	220	5959.10						
Total	224	5994.19						
ANOVA table – ordinary farmers				Mean scores of ordinary farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	849.12	6.596 ^{**}	98.27	98.27	97.65	93.08	96.66
Within zones	220	7080.58						
Total	224	7929.70						

NS – Non Significant, ** significant at one per cent level

Results of ANOVA showed a non significant F value which indicates that there is no significant difference between the five zones with respect to mean scores of cosmopolitaness for both VFPCCK farmers.

Results of ANOVA showed a significant F value which indicates that the zones differ significantly with respect to mean scores of cosmopolitaness of ordinary farmers.

Using the Least Significant Difference test for pair wise comparison of zones, it was found that zone 4 differs significantly from all other zones with respect to mean scores of cosmopolitaness of ordinary farmers.

G. H0: There is no significant difference between five zones with respect to mean scores of leadership ability of vegetable farmers

H1: Zones differ significantly with respect to mean scores of leadership ability of vegetable farmers

ANOVA table – VFPCCK farmers				Mean scores of VFPCCK farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	18.81	0.220 ^{NS}	96.22	96.22	96.59	96.92	96.18
Within zones	220	4712.79						
Total	224	4731.59						
ANOVA table – ordinary farmers				Mean scores of ordinary farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	38.56	0.474 ^{NS}	96.67	96.67	95.92	97.11	96.18
Within zones	220	4474.96						
Total	224	4513.52						

NS – Non Significant

Results of ANOVA showed a non significant F value which indicates that there is no significant difference between the five zones with respect to mean scores of leadership ability for both VFPCCK and ordinary farmers.

H. H0: There is no significant difference between five zones with respect to mean scores of market orientation of vegetable farmers

H1: Zones differ significantly with respect to mean scores of market orientation of vegetable farmers

ANOVA table – VFPCCK farmers				Mean scores of VFPCCK farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	43.09	1.896 ^{NS}	98.72	98.72	99.21	99.55	99.80
Within zones	220	1249.85						
Total	224	1292.94						
ANOVA table – ordinary farmers				Mean scores of ordinary farmers				
Source of variation	df	SS	F	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Between zones	4	41.53	2.067 ^{NS}	98.57	98.42	98.86	99.01	99.65
Within zones	220	1104.91						
Total	224	1146.44						

NS – Non Significant

Results of ANOVA showed non significant F value for both VFPCCK and ordinary farmers. Hence it is clear that there is no significant difference between the five zones with respect to mean scores of market orientation of VFPCCK farmers as well as ordinary famers.

**Table 4.2.22 Summary of ANOVA**

Characteristics	F value		Remarks
	VFPCK	Ordinary	
Entrepreneurial behaviour	0.079	1.378	No significant difference between zones
Innovation orientation	0.216	1.374	No significant difference between zones
Achievement motivation	0.660	0.181	No significant difference between zones
Risk taking ability	0.058	0.620	No significant difference between zones
Farm decision making ability	0.015	0.017	No significant difference between zones
Information seeking behaviour	0.150	1.889	No significant difference between zones
Cosmopolitaness	0.324	6.596**	Zone 4 differ significantly for ordinary farmers
Leadership ability	0.220	0.474	No significant difference between zones
Market orientation	1.896	2.067	No significant difference between zones

From the summary of analysis of variance it was further observed that there is no difference in the entrepreneurial traits among the selected zones except in the case of cosmopolitaness, where zone 4 differs significantly for ordinary farmers.

VFPCK is very dynamic in zone 4, i.e. Palakkadan plains conducting various trainings and extension activities rigorously. They are taking every single possible step to uplift and promote those vegetable farmers registered in VFPCK. So naturally there was a significant difference in this zone especially in the case of ordinary farmers. Ordinary famers in this zone showed some hesitation towards new approaches rather they wanted to stick to the traditional practices which were known to them.

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SECTION III

4.3 Factors influencing the entrepreneurial behaviour

In order to identify different factors that influence the entrepreneurial behaviour of vegetable farmers, correlation analysis and chi square tests were carried out. The different factors considered were age, gender, education, occupation, assets, size of land holding, annual income, experience, social participation, adoption of improved practices, training received, market ecosystem and level of aspiration.

In this section, a total of 450 farmers were taken into consideration and inferences were made separately for VFPCCK and ordinary farmers. The details regarding the different factors analysed for the study in central Kerala are given in Table 4.1.6. As the variables include quantitative and qualitative, different statistical tools were used for analysis.

Correlation analysis was carried out for quantitative variables like annual income, social participation, adoption of improved practices, market ecosystem and level of aspiration. Interpretations were done based on Pearson's correlation coefficient.

Since some of the variables were qualitative in nature, chi square test was carried out to test the influence of attributes such as age, gender, education, occupation, assets, size of land holding, experience and training received on entrepreneurial behaviour. The entrepreneurial behaviour of farmers was coded in ordinal scale of high, medium and low category.

Table 4.3.1 (A) Correlation: EB and quantitative variables (n=225)

Sl. No.	Factors	Correlation Coefficient	
		VFPCCK farmers	Ordinary farmers
1	Annual income	0.038*	0.01 (NS)
2	Social participation	0.081*	0.01 (NS)
3	Adoption of improved practices	-0.099 (NS)	0.04 (NS)
4	Market ecosystem	0.030*	0.05 (NS)
5	Level of aspiration	0.057*	0.08*

Source: Primary data

In case of VFPCCK farmers, annual income, social participation, market ecosystem and level of aspiration were found significantly correlated with their entrepreneurial behaviour at 5 per cent level of significance. But, in case of ordinary farmers, their level of aspiration only was found to have significant correlation with entrepreneurial behaviour at 5 per cent level of significance. As far as ordinary farmers are considered, their only aim is to improve their farming activities, increase their income and to enhance their living standards and so their level of aspiration is significantly associated with the EB.

Table 4.3.1 (B) χ^2 test: EB and qualitative variables (n=225)

Sl. No.	Factors	Chi square value	
		VFPCCK farmers	Ordinary farmers
1	Age	0.079*	2.31 (NS)
2	Gender	0.890 (NS)	0.75 (NS)
3	Education	0.074*	15.21 (NS)
4	Occupation	0.067 (NS)	15.01 *
5	Assets	0.005 (NS)	4.17 (NS)
6	Size of land holding	0.041*	17.73 *
7	Experience	0.092*	5.62*
8	Training received	0.054*	6.5 *

Source: Primary data

*significant at 5% level

The chi square test result showed that in case of ordinary farmers, attributes such as occupation, size of land holding, experience and training received were found significantly associated with their entrepreneurial behaviour at 5 per cent level. But in case of VFPCCK farmers, attributes such as age, education, size of land holding, experience and training received were significantly associated with their entrepreneurial behaviour at 5 per cent level.

Factors influencing the entrepreneurial behaviour – Zone wise

Methodology adopted for analyzing factors influencing the entrepreneurial behaviour of vegetable farmers (Correlation analysis was carried out for quantitative variables and chi square test was carried out to test the influence of qualitative variables) was followed here also for analyzing the factors influencing the entrepreneurial behaviour of VFPCCK and ordinary farmers in the five different zones.

Table 4.3.2(A) Correlation: EB of VFPCCK farmers and quantitative variables–Zone wise

Sl. No.	Factors	Correlation coefficient (VFPCCK farmers)				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	Annual income	0.162	0.062	-0.178	0.183	0.118
2	Social participation	-0.141	0.288*	-0.035	0.336*	-0.067
3	Adoption of improved practices	0.080	-0.462 **	-0.027	-0.269	-0.048
4	Market ecosystem	-0.080	-0.100	0.043	-0.017	-0.032
5	Level of aspiration	0.136	0.078	-0.033	-0.049	-0.061

Source: Primary data *significant at 5% level **significant at 1% level n=225

In case of VFPCCK farmers, social participation had significant positive correlation with entrepreneurial behaviour in zone 2 and zone 4 at 5 per cent level, whereas, adoption of improved practices had high significant negative correlation with entrepreneurial behaviour ($p < 0.01$). None of the variables in the other zones were found significantly associated with entrepreneurial behaviour. The people

residing in these two zones are basically social in nature and hence the level of social interaction is very high. Also VFPCCK had brought many activities and trainings in these two zones which in turn resulted in strengthening the co-operation among the members as a team. The unity and team work of VFPCCK groups of these two zones had definitely helped them to improve their EB.

Table 4.3.3 (A) Correlation:EB of ordinary farmers and quantitative variables– Zone wise

Sl. No.	Factors	Correlation coefficient (Ordinary farmers)				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	Annual income	-0.033	0.079	-0.372*	0.226	0.115
2	Social participation	0.172	0.199	-0.288*	0.126	-0.267
3	Adoption of improved practices	0.168	-0.166	0.064	-0.056	0.080
4	Market ecosystem	-0.128	-0.124	0.136	-0.016	0.204
5	Level of aspiration	0.006	-0.010	0.107	0.123	0.192

Source: Primary data

*significant at 5% level

n=225

In case of ordinary farmers, annual income and social participation were significantly negatively correlated with entrepreneurial behaviour. None of the other variables in any zone had significant correlation with entrepreneurial behaviour.

Since some of the variables were qualitative in nature, chi square test was carried out to test the independence of attributes such as age, gender, education, occupation, assets, size of land holding, experience and training received with entrepreneurial behaviour. For the same, entrepreneurial behaviour was coded in ordinal scale of high, medium and low.

Table 4.3.2 (B) χ^2 test: EB of VFPCCK farmers with qualitative variables– Zone wise

Sl. No.	Factors	Chi-square value (VFPCCK farmers)				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	Age	3.946	14.096*	8.240	7.996	7.022
2	Gender	-	4.091	-	1.271	-
3	Education	4.297	6.876	4.183	12.394*	7.843
4	Occupation	1.626	3.103	-	-	-
5	Assets	3.747	1.408	0.805	4.440	1.755
6	Size of land holding	1.455	4.899	3.983	7.268	8.878
7	Experience	4.431	11.685	7.977	7.671	3.109
8	Training received	1.318	0.089	3.501	2.666	3.103

Source: Primary data

*significant at 5% level

n=225

In case of VFPCCK farmers, age was significantly associated with entrepreneurial behaviour in zone 2 and education was significantly associated with entrepreneurial behaviour in zone 4 at 5 per cent level. None of the other variables in any zone were significantly associated with entrepreneurial behaviour at 5 per cent level.

Table 4.3.3 (B) χ^2 test: EB of ordinary farmers with qualitative variables– Zone wise

Sl. No.	Factors	Chi-square value (Ordinary farmers)				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	Age	2.246	4.296	0.514	0.460	9.779
2	Gender	-	0.415	-	0.462	-
3	Education	10.612	5.894	3.140	8.902	1.371
4	Occupation	15.140*	0.415	-	4.091	5.924
5	Assets	4.152	2.903	3.781	4.761	1.419
6	Size of land holding	2.647	9.495*	6.878	4.185	9.505*
7	Experience	3.407	11.661	3.552	6.968	3.713
8	Training received	1.552	1.552	0.671	2.691	3.008

Source: Primary data

n=225

The chi square test result showed that in case of ordinary farmers, attributes such as occupation in zone 1, size of land holding in zone 2 and zone 5 were found significantly associated with their entrepreneurial behaviour at 5 per cent level.

SECTION IV

4.4 Constraints which affect the entrepreneurial behaviour of vegetable farmers

The constraints which affect the entrepreneurial behaviour of vegetable farmers in central Kerala were categorised into mainly seven. They are production constraints, technological constraints, organisational constraints, financial constraints, economic constraints, social constraints and marketing constraints.

Analysis was done by means of percentages, indices ANOVA tables, Sparemans rank correlation coefficient and t-test.

Table 4.4.1 Constraints affecting entrepreneurial behaviour of farmers (n=450)

Sl. No.	Statements	VFCK farmers	Ordinary farmers	Rank
		Index	Index	
I. Production constraints				
1	Non availability of good quality of seeds	45.33	43.64	2
2	Unreasonable seed price	84.80	81.96	
3	Non availability of seeds in a proximal distance	44.89	42.58	
4	Pest and diseases	99.47	99.82	
5	Non availability of good quality fertilizers and pesticides	46.93	50.13	
6	Quantity of fertilizers and pesticides getting in a subsidized rate is low	63.64	62.58	
7	Non availability of fertilizer and pesticides in a proximal distance	49.96	46.93	
8	Water scarcity	52.36	43.11	
9	Seasonal nature of vegetables	98.76	98.84	
10	Non availability of equipments for plant protection	43.02	39.64	
11	High labour charge	95.82	97.96	
12	Labour management	79.11	79.91	

13	Non availability of quality labour/ Absenteeism	86.76	88.44	
14	Problems of transport	72.09	74.58	
15	Change in weather/ Climate	99.64	100.00	
Overall Index		70.84	70.01	
II. Constraints in technology factor				
1	Lack of technology	38.84	36.44	4
2	Lack of follow up services	35.47	36.18	
3	Lack of knowledge about technology	37.60	37.07	
4	Lack of training in adopting the technology	33.33	33.69	
5	Lack of location specific recommendations	70.40	68.89	
6	Inadequacy of capital	94.40	94.67	
7	High expense to adopt technology	86.84	86.49	
8	Non-availability of skilled workmen	88.62	91.38	
9	Non- availability of mass media sources of information	44.18	43.91	
10	Lack of information about post harvest technology	33.87	32.89	
11	Use of Obsolete technologies	62.67	61.24	
12	Lack of land consolidation	63.82	64.80	
Overall Index		57.50	57.30	
III. Organisational support constraints				
1	Lack of proper training	31.91	32.09	7
2	Lack of Co-ordination and co-operation among grass root extension workers.	51.73	52.09	
3	Lack of credibility of extension workers.	53.07	52.62	
4	Lack of technical guidance and untimely advice	33.16	32.89	
5	Red-tapism in government agencies	64.53	65.51	
6	Lack of financial assistance from government agencies	62.49	63.73	
7	Indifferent behaviour from Krishibhavan/ KVK/ KAU	37.42	37.42	
Overall Index		47.76	48.05	

IV. Economic constraints				
1	Uneconomic holding size	54.04	49.42	3
2	High cost of technology	87.91	88.00	
3	Poor socio-economic status	44.44	44.89	
4	Low risk bearing capacity	58.04	56.98	
5	Low income	73.42	70.49	
6	Irregular income	73.87	72.71	
7	High Labour cost	87.64	90.40	
Overall Index		68.48	67.56	
V. Financial constraints				
1	Non availability of credit	100.00	100.00	5
2	Insufficient quantum of credit	44.62	44.36	
3	High interest rate of credit	45.16	44.44	
4	Inconvenient repayment schedule	47.38	47.64	
5	Untimely availability of fund/subsidies from the government organizations	49.78	49.96	
Overall Index		57.39	57.28	
VI. Social constraints				
1	Lack of education	49.78	49.24	6
2	Traditional beliefs and norms	26.93	26.58	
3	Nuclear family set up	51.38	50.84	
4	Reluctance of youth towards agriculture	96.27	97.33	
5	Social status	40.71	41.24	
6	Socio-political interference	53.69	50.84	
7	Lack of co-operation and co-ordination among farmers	22.40	22.67	
Overall Index		48.74	48.39	

VII. Marketing constraints				
1	Lack of market orientation	41.33	43.11	1
2	Deficiency of marketing ecosystem	76.00	78.40	
3	Low price for output	96.44	96.80	
4	Frequent fluctuation in price	97.16	97.24	
5	Problems of transport (marketing cost)	69.87	71.02	
6	Problems of middleman (marketing cost)	41.51	41.96	
7	Seasonal demand	96.00	96.09	
8	Lack of demand	97.16	97.51	
9	Absence of grading and standardization	71.56	71.82	
10	Short shelf life of vegetables	97.16	98.13	
11	Packaging	73.24	74.58	
Overall Index		77.95	78.79	

Source: Primary data

According to the data collected from the farmers (both VFPCCK and ordinary) it could be stated that marketing constraints were the primary constraint affecting them badly. For the VFPCCK farmers, the VFPCCK provides a platform to market their products and thereby reduces the marketing constraints up to a limit that we can clearly see from the table no. 4.4.1. It could also be seen that conventional farmers face more constraints in the marketing aspects than the VFPCCK farmers. Short shelf life of vegetables, lack of demand in the market after producing, frequent price fluctuations were the much-concerned area under the marketing constraints by both the group of respondents which were followed by low prices of output than they anticipated and varying demand of each vegetable from season to season. Because of this seasonal demand, they were not able to produce more for the next season while looking at the current seasonal demand of a particular vegetable. Since most of the respondents cultivated vegetables commercially they were aware of the fluctuations

in vegetable market and the updates in market trends. Hence they are least bothered about the variable – ‘market orientation’ under the marketing constraint.

Based on the response, production constraints come in the second position in which change in weather/climate disturbs them the most. Due to the climate change and untimely weather issues for the past 2-3 years affected the quantity of production and thereby the income expected lowered very much. Those who were cultivating two to three seasons in a year restricted or limited their cultivation into one to two seasons due to the climate or weather change. Pest and diseases attacking vegetables were other complications in the vegetable production.

Seasonal nature of vegetables was their major concern in the production process because every vegetable had a particular season in which it gives maximum yield. High labour charge, non availability of quality labour and irregularity of labourers were their next concern in production. Because of the labour complication in many places, native labours were replaced by labours from other states and the farmers were forced to increase the family labour. This might not be applicable for farmers who have nuclear family setup.

Respondents also faced problems under social constraints along with the reluctance of young generation to engage in agriculture. The quality of labour among native labourers was far better than the migrant labourers from other states but the labour-management was an easier task when engaging the migrant labourers from other states. Farmers cannot force up on native labourers about the agricultural practices and timing which made the respondents to state that the socio-political interferences as a major problem under social constraints. As far as VFPC farmers were concerned they were free from the exploitation of the middlemen up to an extent because he/she now gets authority (not in every time) to fix product price negotiation with the middlemen. Moreover farmers were free from the transportation cost of produce from field to market while selling it through VFPC market because it was

provided by the middlemen. But under the production constraints both the respondents faced the problems in transportation of inputs where they should arrange vehicles from their source to their fields. There is no difference in opinion among the respondents about the number of fertilizers/pesticides which were not enough to cover one season's production and its untimely availability from the government organizations red tapism was the most bothering factor under the financial constraints and organizational support constraints.

VFPCCK farmers were more concerned about water scarcity than ordinary farmers whereas the ordinary farmers were more bothered about the non availability of good quality fertilizers and pesticides. VFPCCK farmers had much exposure and proximity in receiving the best information in all aspects. Both of them seriously considered that the cost of seeds was unreasonable because hybrid seeds were widely used to increase production.

The high cost of technology and high labour cost were the most serious problem under the economic constraints in which high cost of technology ranked much serious than high labour cost among the VFPCCK farmers wherein the ordinary farmers as vice versa. That might be because VFPCCK farmers were much more curious and adoptive about new technologies than ordinary farmers hence the VFPCCK farmers rated high for constraints in technology factor. Inadequacies of the capital to purchase the wanted technology, non availability of skilled labour at the desirable time for operating the purchased technology and the high expense to adopt and run the technology were the major problems under the technology constraints experienced by both the respondents. Also, technologies might be location specific because a particular technology which is suitable and highly recommended to ease the vegetable production in places like Palakkadan plains may not be suitable to adopt in malayoram or in coastal sandy. Fragmented agricultural land of a farmer (he/she may not be able to consolidate his/her agricultural activities within an area based on the nature of the land he/she possess) and lack of technology up gradation (due to the

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unawareness or due to the additional expense incurred to adopt new technology) were also found as major issues under technology factor and these factors should be in the mind of an expert before he/she suggests a new technology to the farmers.

There is no argument about the income from agriculture activities which were irregular and not a fixed one. These were the two serious problems (irregular income and low income) under the economic constraints which were the sole reason why the farmers were bothered about the high labour cost, input cost, technology cost (their income remains same or fluctuating while all other costs increasing)

According to the ratings of the respondents, social constraints and organizational support constraints were the least bothering constraints among the others. Respondents were most seriously concerned about the non availability of credit under the financial constraints. Also, they were bothered about the untimely disbursement of fund or subsidies from the government organizations.

In addition to the above analysis each constraint was further rated based on its degree of seriousness. Mean and standard deviation were applied for this purpose.

Table 4.4.2 Production constraints affecting the entrepreneurial behaviour

Ratings	Type of farmer	
	VFPCCK	ordinary
Most Serious	22 (9.78)	8 (3.56)
More Serious	192 (85.33)	214 (95.11)
Serious	11 (4.89)	3 (1.33)
Less Serious	0 (0.00)	0 (0.00)
Least Serious	0 (0.00)	0 (0.00)

Source: Primary data

n=450

Majority of the VFPCCK farmers (85.33%) as well as ordinary farmers (95.11%) experienced the production constraints as more serious.

Table 4.4.3 Technological constraints affecting the entrepreneurial behaviour

Ratings	Type of farmer	
	VFPCCK	Ordinary
Most Serious	0 (0.00)	0 (0.00)
More Serious	65 (28.89)	74 (32.89)
Serious	159 (70.67)	147 (65.33)
Less Serious	1 (0.44)	4 (1.78)
Least Serious	0 (0.00)	0 (0.00)

Source: Primary data

n=450

The table revealed that VFPCCK farmers (70.67%) and ordinary farmers (65.33%) felt technological constraints as serious. The rest of the farmers considered it as more serious.

Table 4.4.4 Organisational support constraints affecting the entrepreneurial behaviour

Ratings	Type of farmer	
	VFPCCK	Ordinary
Most Serious	11 (4.89)	8 (3.56)
More Serious	19 (8.44)	21 (9.33)
Serious	113 (50.23)	113 (50.22)
Less Serious	81 (36.00)	81 (36.00)
Least Serious	1 (0.44)	2 (0.89)

Source: Primary data

n=450

Most of the VFPCCK farmers (50.22%) as well as ordinary farmers (50.22%) felt organisational constraints as serious. But, at the same time 36% of VFPCCK farmers and ordinary farmers each felt the same organisational constraints as less serious.

Table 4.4.5 Economic constraints affecting the entrepreneurial behaviour

Ratings	Type of farmer	
	VFCK	ordinary
Most Serious	21 (9.33)	18 (8.00)
More Serious	156 (69.34)	147 (65.33)
Serious	45 (20.00)	56 (24.89)
Less Serious	3 (1.33)	4 (1.78)
Least Serious	0 (0.00)	0 (0.00)

Source: Primary data

n=450

Mainstream of the VFCK farmers (69.33%) and ordinary farmers (65.33%) experienced economic constraints to be more serious.

Table 4.4.6 Financial constraints affecting the entrepreneurial behaviour

Ratings	Type of farmer	
	VFCK	ordinary
Most Serious	14 (6.22)	14 (6.22)
More Serious	62 (27.56)	61 (27.11)
Serious	98 (43.55)	98 (43.56)
Less Serious	51 (22.67)	52 (23.11)
Least Serious	0 (0.00)	0 (0.00)

Source: Primary data

n=450

Equal member of VFCK farmers (43.56%) as well as ordinary farmers (43.56%) faced financial constraints as serious. At the same time, 27.56% of VFCK farmers and 27.11% of ordinary farmers considered it as more serious. Similarly, 22.67% of VFCK farmers and 23.11% of ordinary farmers considered the same constraint to be less serious.

Table 4.4.7 Social constraints affecting the entrepreneurial behaviour

Ratings	Type of farmer	
	VFPCK	ordinary
Most Serious	0 (0.00)	0 (0.00)
More Serious	21 (9.33)	22 (9.78)
Serious	154 (68.44)	150 (66.67)
Less Serious	50 (22.23)	53 (23.55)
Least Serious	0 (0.00)	0 (0.00)

Source: Primary data

n=450

VFPCK farmers (68.44%) and ordinary farmers (66.67%) rated social constraints to be serious.

Table 4.4.8 Marketing constraints affecting the entrepreneurial behaviour

Ratings	Type of farmer	
	VFPCK	ordinary
Most Serious	97 (43.12)	111 (49.33)
More Serious	118 (52.44)	105 (46.67)
Serious	0 (0.00)	2 (0.89)
Less Serious	10 (4.44)	7 (3.11)
Least Serious	0 (0.00)	0 (0.00)

Source: Primary data

n=450

Marketing constraints were rated as more serious by majority (52.44%) of VFPCK farmers while majority of ordinary farmers rated it as most serious (49.33%). But, at the same time, 43.11% of VFPCK farmers rated marketing constraints as most serious while 46.67% of ordinary farmers rated it as more serious. Based on the overall index, constraints were ranked as follows.

Table 4.4.9 Ranking of constraints affecting the entrepreneurial behaviour of farmers

Sl. No.	Constraints	VFPCCK farmers		Ordinary farmers	
		Index	Rank	Index	Rank
1	Production Constraints	70.84	2	70.01	2
2	Technological constraints	57.50	4	57.30	4
3	Organisational constraints	47.76	7	48.05	7
4	Economic constraints	68.53	3	67.56	3
5	Financial constraints	57.39	5	57.28	5
6	Social constraints	48.74	6	48.39	6
7	Marketing constraints	77.95	1	78.79	1

Source: Primary data

n=450

The summation of Index of each constraint was obtained in order to obtain an overall Index of constraints separately for VFPCCK farmers as well as ordinary farmers.

It is well clear that VFPCCK farmers and ordinary farmers felt marketing constraints more serious than any other constraints. Both categories of farmers ranked organisational constraints to be least worried about. Both categories of farmers felt all constraints in the same order of intensity.

Hence the Spearman's rank correlation coefficient was found to be one which indicated that there is a perfect agreement between VFPCCK farmers and ordinary farmers with respect to constraints that affect their entrepreneurial behaviour.

Zone wise analysis of constraints of selected farmers

Each constraint was further rated based on its degree of seriousness with respect to each zone and the details are given in the following tables. The values in parenthesis indicate percentages.

Table 4.4.10 Production constraints affecting VFPCCK farmers – Zone wise

Ratings	VFPCCK farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	0(0.00)	12(26.67)	0(0.00)	10(22.22)	0(0.00)
More Serious	45(100)	28(62.22)	44(97.78)	31(68.89)	44(97.78)
Serious	0(0.00)	5(11.11)	1(2.22)	4(8.89)	1(2.22)
Less Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Table 4.4.11 Production constraints affecting ordinary farmers – Zone wise

Ratings	Ordinary farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	0(0.00)	1(2.22)	0(0.00)	0(0.00)	7(15.56)
More Serious	44(97.78)	42(93.34)	45(100)	45(100)	38(84.44)
Serious	1(2.22)	2(4.44)	0(0.00)	0(0.00)	0(0.00)
Less Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Majority of the VFPCCK farmers as well as ordinary farmers experienced the production constraints to be more serious. Some VFPCCK farmers in zone 2 (26.67%) and zone 4 (22.22%) as well as some of the ordinary farmers in zone 5 (15.55%) felt production constraints to be most serious.

Table 4.4.12 Technological constraints affecting VFPCCK farmers – Zone wise

Ratings	VFPCCK farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
More Serious	17(37.78)	14(31.11)	11(24.44)	11(24.44)	12(26.67)
Serious	28(62.22)	30(66.67)	34(75.56)	34(75.56)	33(73.33)
Less Serious	0(0.00)	1(2.22)	0(0.00)	0(0.00)	0(0.00)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Table 4.4.13 Technological constraints affecting ordinary farmers – Zone wise

Ratings	Ordinary farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
More Serious	13(28.89)	17(37.78)	13(28.89)	17(37.78)	14(31.11)
Serious	31(68.89)	27(60.00)	31(68.89)	27(60.00)	31(68.89)
Less Serious	1(2.22)	1(2.22)	1(2.22)	1(2.22)	0(0.00)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Majority of the VFPCCK farmers as well as ordinary farmers felt technological constraints to be serious. A noticeable percentage of VFPCCK farmers as well as ordinary farmers felt technological constraints to be more serious in each zone.

Table 4.4.14 Organisational support constraints affecting VFPCCK farmers – Zone wise

Ratings	VFPCCK farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	1(2.22)	2(4.44)	2(4.44)	3(6.67)	3(6.67)
More Serious	5(11.11)	5(11.11)	4(8.89)	4(8.88)	1(2.22)
Serious	25(55.56)	25(55.56)	19(42.22)	21(46.67)	23(51.11)
Less Serious	14(31.11)	12(26.67)	20(44.45)	17(37.78)	18(40.00)
Least Serious	0(0.00)	1(2.22)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Table 4.4.15 Organisational support constraints affecting ordinary farmers – Zone wise

Ratings	Ordinary farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	2(4.44)	2(4.44)	2(4.44)	2(4.44)	0(0.00)
More Serious	1(2.22)	5(11.11)	1(2.22)	8(17.78)	6(13.34)
Serious	23(51.11)	21(46.68)	22(48.89)	18(40.00)	29(64.44)
Less Serious	19(42.23)	16(35.55)	20(44.45)	16(35.56)	10(22.22)
Least Serious	0(0.00)	1(2.22)	0(0.00)	1(2.22)	0(0.00)

Source: Primary data

n=225

Majority of the VFPCCK farmers as well as ordinary farmers (50.22%) felt organisational constraints to be serious. But, at the same time a noticeable percentage of the VFPCCK farmers as well as ordinary farmers felt the same organisational constraints to be less serious too. Though there is no difference between the levels of seriousness among the category of farmers, some difference was noticed among zones.

Table 4.4.16 Economic constraints affecting VFPCCK farmers – Zone wise

Ratings	VFPCCK farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	2(4.44)	4(8.89)	6(13.33)	4(8.89)	5(11.11)
More Serious	30(66.67)	34(75.56)	29(64.45)	35(77.78)	28(62.22)
Serious	13(28.89)	6(13.33)	9(20.00)	6(13.33)	11(24.45)
Less Serious	0(0.00)	1(2.22)	1(2.22)	0(0.00)	1(2.22)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Table 4.4.17 Economic constraints affecting ordinary farmers – Zone wise

Ratings	Ordinary farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	3(6.67)	4(8.89)	2(4.44)	6(13.33)	3(6.67)
More Serious	29(64.44)	29(64.44)	29(64.44)	28(62.22)	32(71.11)
Serious	12(26.67)	11(24.44)	14(31.11)	9(20.00)	10(22.22)
Less Serious	1(2.22)	1(2.22)	0(0.00)	2(4.44)	0(0.00)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Majority of the VFPCCK farmers as well as ordinary farmers experienced economic constraints to be more serious. A noticeable percentage of VFPCCK farmers as well as ordinary farmers felt economic constraints to be serious. High labor cost, high cost of technology and low income from vegetable cultivation are the major economic related problems which they considered as serious.

Table 4.4.18 Financial constraints affecting VFPCCK farmers – Zone wise

Ratings	VFPCCK farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	1(2.22)	3(6.67)	4(8.89)	3(6.67)	3(6.67)
More Serious	14(31.11)	14(31.11)	12(26.67)	12(26.67)	10(22.22)
Serious	21(46.67)	20(44.44)	18(40.00)	20(44.44)	19(42.22)
Less Serious	9(20.00)	8(17.78)	11(24.44)	10(22.22)	13(28.89)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Table 4.4.19 Financial constraints affecting ordinary farmers – Zone wise

Ratings	Ordinary farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	2(4.44)	3(6.67)	2(4.44)	5(11.11)	2(4.44)
More Serious	10(22.22)	12(26.67)	10(22.22)	13(28.89)	16(35.56)
Serious	21(46.67)	19(42.22)	21(46.67)	18(40.00)	19(42.22)
Less Serious	12(26.67)	11(24.44)	12(26.67)	9(20.00)	8(17.78)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Majority of the VFPCCK farmers as well as ordinary farmers considered financial constraints either serious or more serious. Only few farmers rated it as less serious. Not much difference was noticed between zones and category of farmers.

Table 4.4.20 Social constraints affecting VFPCCK farmers – Zone wise

Ratings	VFPCCK farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
More Serious	6(13.33)	5(11.11)	4(8.89)	3(6.67)	3(6.67)
Serious	31(68.89)	31(68.89)	30(66.67)	32(71.11)	30(66.67)
Less Serious	8(17.78)	9(20.00)	11(24.44)	10(22.22)	12(26.67)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Table 4.4.21 Social constraints affecting ordinary farmers – Zone wise

Ratings	Ordinary farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
More Serious	4(8.89)	5(11.11)	4(8.89)	5(11.11)	4(8.89)
Serious	29(64.44)	30(66.67)	29(64.44)	30(66.67)	32(71.11)
Less Serious	12(26.67)	10(22.22)	12(26.67)	10(22.22)	9(20.00)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Majority of VFPCCK farmers as well as ordinary farmers rated social constraints to be serious. A noticeable percentage of VFPCCK farmers as well as ordinary farmers rated it as less serious.

Table 4.4.22 Marketing constraints affecting VFPCCK farmers – Zone wise

Ratings	VFPCCK farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	20(44.44)	20(44.44)	22(48.89)	20(44.44)	15(33.33)
More Serious	24(53.34)	23(51.12)	20(44.44)	23(51.12)	28(62.23)
Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Less Serious	1(2.22)	2(4.44)	3(6.67)	2(4.44)	2(4.44)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Table 4.4.23 Marketing constraints affecting ordinary farmers – Zone wise

Ratings	Ordinary farmers				
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Most Serious	18(40.00)	22(48.89)	17(37.78)	30(66.67)	24(53.33)
More Serious	25(55.56)	21(46.67)	26(57.78)	13(28.89)	20(44.45)
Serious	0(0.00)	1(2.22)	0(0.00)	1(2.22)	0(0.00)
Less Serious	2(4.44)	1(2.22)	2(4.44)	1(2.22)	1(2.22)
Least Serious	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Primary data

n=225

Marketing constraints were rated as either more serious or most serious by majority of VFPCCK farmers and ordinary farmers. However slight difference can be noticed from the zone wise analysis.

Based on overall index, constraints were ranked in each zone as given below.

Table 4.4.24 Ranking of constraints affecting VFPCCK farmers – Zone wise

Sl. No.	Constraints	Ranks (VFPCCK farmers)				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	Production Constraints	2	2	2	2	2
2	Technological constraints	4	5	5	5	5
3	Organisational constraints	7	7	7	6	7
4	Economic constraints	3	3	3	3	3
5	Financial constraints	5	4	4	4	4
6	Social constraints	6	6	6	7	6
7	Marketing constraints	1	1	1	1	1

Source: Primary data

n=225

Table 4.4.25 Ranking of constraints affecting ordinary farmers – Zone wise

Sl. No.	Constraints	Ranks (Ordinary farmers)				
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	Production Constraints	2	2	2	2	2
2	Technological constraints	4	4	4	5	5
3	Organisational constraints	7	6	7	6	6
4	Economic constraints	3	3	3	3	3
5	Financial constraints	5	5	5	4	4
6	Social constraints	6	7	6	7	7
7	Marketing constraints	1	1	1	1	1

Source: Primary data

n=225

It is well clear that VFPCCK farmers and ordinary farmers felt marketing constraints more serious than any other constraints in all zones. Both categories of farmers in zone 1 and zone 4 felt all constraints in the same order of intensity.

Testing of hypothesis

1. To test the significance of difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers, two sample t-test was carried out with the following hypotheses

H_0 : there is no significant difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers.

H_1 : there is significant difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers.

	Constraints VFPCCK	Constraints Ordinary
Mean	61.24	61.05
Variance	68.32	57.83
t-statistic	0.25	
P(T<=t) two-tail	0.80	
t critical (two-tail)	1.97	

Since the calculated value of test statistic ($t=0.25$) is less than the critical value (1.97), H_0 is accepted at 5 per cent level. It is concluded that there is no significant difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers.

2. In order to see whether there is any agreement between VFPCCK farmers and ordinary farmers of each zone with respect to the intensity of constraints felt, Spearman's rank correlation coefficients were calculated for each zone with the following hypotheses.

H_0 : There is no agreement between VFPCCK farmers and ordinary farmers in any zone with respect to intensity of constraints felt.

H_1 : there is an agreement between VFPCCK farmers and ordinary farmers in at least one zone with respect to intensity of constraints felt.

Zones	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Spearman's rank correlation coefficient	1**	0.929**	0.964**	1**	0.964**

**significant at 1% level

The Spearman's rank correlation coefficient in each zone was found to be significant at 1 per cent level which indicated that there is some agreement between VFPCCK farmers and ordinary farmers in all zones with respect to constraints that affect their entrepreneurial behaviour.

3. The summation of scores of each constraint was obtained in order to obtain an overall score of constraints separately for VFPCCK farmers as well as ordinary farmers in each zone. To test the significance of difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers in each zone, two sample t-tests were carried out with the following hypotheses.

H_0 : there is no significant difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers in any zone.

H_1 : there is significant difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers in at least one zone.

Particulars	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Mean (VFPCCK)	61.33	62.23	60.79	61.87	59.99
Mean (Ordinary)	59.87	61.02	59.67	62.22	62.49
Variance (VFPCCK)	41.69	83.93	68.70	85.25	65.01
Variance (Ordinary)	50.35	73.38	48.72	68.39	46.68
t – value	1.02 ^{NS}	0.65 ^{NS}	0.69 ^{NS}	0.19 ^{NS}	1.58 ^{NS}
P value	0.31	0.52	0.48	0.84	0.11
t critical value	1.98	1.98	1.98	1.98	1.98

NS – Non significant

Since the calculated value of test statistic in all zones is less than the critical value, H_0 is accepted at 5 per cent level. It is concluded that there is no significant difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers in any zone

SECTION V

4.5 Extent of adoption of KAU technologies

Kerala Agricultural University (KAU) plays a major role in the upliftment of agricultural sector in the country. The university provides agriculture education to develop skilled, analytical and globally competitive human resource to meet the national needs for sustainable agriculture development. It also develops technologies through continuous research on various areas of agriculture and engages in extension activities through training, interacting with farmers, disseminating agriculture related information and through frequent monitoring of the agriculture activities of farmers. Development of farmer friendly technologies is a major mandate of KAU. The university developed large number of technologies related to various agricultural crops including vegetables.

In this section an attempt was made to analyse the extent of adoption of the technologies developed by KAU for vegetable cultivation. The extent of adoption of different KAU technologies was studied for different vegetables according to the crop cultivated by each farmer in both categories viz., VFPCCK farmers and ordinary farmers. It was studied mainly in eight stages of importance in crop production. They were season, varieties, seed rate, spacing and sowing, manuring, irrigation, pest control and disease. The variable extent of adoption was measured based on their level of adoption in terms of fully adopted, partially adopted and not adopted.

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Table 4.5.1 Extent of adoption of KAU technologies by VFPCCK farmers

Sl. No.	KAU Technologies	VFPCCK farmers					
		Fully Adopted (No.)	%	Partially Adopted (No.)	%	Not Adopted (No.)	%
1	Season	114	50.67	54	24.00	57	25.33
2	Varieties	68	30.22	44	19.56	113	50.22
3	Seed rate	21	9.33	97	43.11	107	47.56
4	Spacing and sowing	26	11.56	93	41.33	106	47.11
5	Manuring	26	11.55	98	43.56	101	44.89
6	Irrigation	14	6.22	70	31.11	141	62.67
7	Pest control	10	4.44	87	38.67	128	56.89
8	Disease	8	3.56	62	27.56	155	68.88

Source : Primary data

n=225

From the table 4.5.1, it could be observed that half of VFPCCK farmers, fully adopted KAU technologies related to season (50.67%). It was a clear observation that majority did not adopt KAU technologies in other areas like varieties (50.22%), seed rate (47.56%), spacing and sowing (47.11%), manuring (44.89%), irrigation (62.67%), pest control (56.89%) and diseases (68.89%). It was also noted that there was 43.11%, 41.33% and 43.56% of VFPCCK farmers partially adopted KAU technologies in seed rate, spacing and sowing and manuring respectively on par with the percentages of farmers who have not adopted technologies in these areas.

Table 4.5.2 Extent of adoption of KAU technologies by the ordinary farmers

Sl. No.	KAU Technologies	ordinary farmers					
		Fully Adopted (No.'s)	%	Partially Adopted (No.'s)	%	Not Adopted (No.'s)	%
1	Season	112	49.78	51	22.67	62	27.55
2	Varieties	58	25.78	48	21.33	119	52.89
3	Seed rate	11	4.89	91	40.44	123	54.67
4	Spacing and sowing	20	8.89	93	41.33	112	49.78
5	Manuring	26	11.56	108	48.00	91	40.44
6	Irrigation	11	4.89	72	32.00	142	63.11
7	Pest Control	5	2.22	71	31.56	149	66.22
8	Disease	6	2.67	57	25.33	162	72.00

Source: Primary data

n=225

Table 4.5.2 depicts that the KAU technologies related to season were fully adopted by nearly half of the ordinary farmers (49.78%). The technologies related to varieties, were fully adopted by 25.77 per cent of the ordinary farmers. Remaining technologies were fully adopted by very less percentage of farmers (ranged from 11.56 to 2.22 %). Almost half of the ordinary farmers (45%) partially adopted the technologies related to manuring, followed by spacing and sowing (41.33%), seed rate (40.44%), irrigation (32%) and pest control (31.56%). It was also clear from the table 4.5.2 that more than two – third of the ordinary farmers were not adopting the KAU technologies related to disease management (72%) and pest control (66.22%). Appreciable number of ordinary farmers did not adopt KAU technologies related to irrigation (63.11%), varieties (52.89%), spacing and sowing (49.78%), manuring (40.44%) and season (27.56%).

Table 4.5.3 Reasons for not adopting KAU technologies

(n=450)

Reasons	VFCK farmer (Percentage)								Ordinary farmers (Percentage)							
	Season	Varieties	Seed rate	Spacing and sowing	Manuring	Irrigation	Pest Control	Disease identification and remedies	Season	Varieties	Seed rate	Spacing and sowing	Manuring	Irrigation	Pest Control	Disease identification and remedies
Not aware/ Partially aware						4			42	27	38	29	46	46	70	78
No knowledge/ Partial Knowledge							52	57	8			25				
Neighbours are not adopting	49					27	16	9	5					6	21	4
Consuming more labour				100	36							46	9			
Required inputs are not available in time					21	15	32	34					12	8	9	18
Costly inputs/ more cost inquired			52		30						48		24			
Recommended inputs are high/low					13								9			
Reluctance to change the traditional practice		15	55			54					14			40		
High yield from non KAU varieties – perception		42														49
KAU varieties are not disease resistant		22														24
Used but not satisfied		21														
Location specific recommendation failure	51															45

Source: Primary data

The above table 4.5.7 depicts the reasons for not adopting KAU technologies by the farmers (both VFPCCK and ordinary). In case of ordinary farmers majority of them were not adopting KAU technologies because of their unawareness. The detailed analysis is given below:

Season: In areas such as Vyttila block of Ernakulam district where rain fed agriculture practices were followed and in some areas of Chittoor and Palakkadan plains of Palakkad district where canal irrigation had not reached, also depended on rainfed agriculture. In these areas, the farmers could not adopt the technologies related to the seasons prescribed by KAU. Lack of location specific technologies and adopting the practices followed by neighbours were the reasons cited by the farmers for not adopting KAU technologies.

Varieties: In case of ordinary farmers, most of them were unaware about the KAU varieties and those who were aware about the varieties of KAU, they perceived that those varieties were not high yielding and opined that those varieties were not resistant to diseases. When VFPCCK farmers were considered, along with the reasons pointed out by ordinary farmers (except unawareness about the varieties) they were not ready to change from the traditional practices, which made them not to adopt KAU varieties.

Seed rate: Most of the ordinary and VFPCCK farmers were of the opinion that the seed rate prescribed by KAU was not feasible and they were reluctant to come out from the traditional practices.

Spacing and sowing: VFPCCK farmers and ordinary farmers were of the opinion that the labour requirement was high to maintain the spacing and sowing prescribed by KAU and therefore they were not adopting the spacing recommended by KAU.

Manuring: According to VFPCCK and ordinary farmers manuring prescribed by KAU was more labour consuming and of high cost. They were of the opinion that the

recommended inputs were low when compared to the manuring practices followed by them.

Irrigation: Apart from unawareness and partial awareness about the irrigation practices recommended by KAU, non adoption by neighbours, non availability of required inputs and reluctance to change from the traditional practices were the main reasons for not adopting the irrigational practices prescribed by KAU.

Pest and disease management: According to VFPCCK farmers, they had partial knowledge about pest control, disease identification and remedies which made them non adoption of KAU technologies. In case of ordinary farmers, they were unaware about those practices. For both the categories, they were ignorant of using KAU technologies in pest and disease management because their neighbours did not adopt it and non availability of required inputs locally.

Most of the VFPCCK farmers were well aware about the various agricultural technologies disseminated by KAU. Those who adopted KAU technologies were interested to continue further because they found it effective. Those who did not adopt KAU technologies were not ready to change the traditional practices which they were following. Those who had partially adopted KAU technologies were ready to adopt the technologies of KAU in pest and disease management.

Testing of hypothesis

In order to see the independence of attributes like extent of adoption and type of farmer, Pearson chi square test for 2 x 3 contingency table was done in each area of adoption separately with following hypothesis.

H_0 : extent of adoption and type of farmers were independent.

H_1 : extent of adoption and type of farmers were dependent.

Sl. No.	Area of adoption	Chi Square value
1	Season	0.31 (0.86)
2	Varieties	1.12 (0.57)
3	Seed rate	4.43 (0.11)
4	Spacing and sowing	0.95 (0.62)
5	Manuring	1.01 (0.61)
6	Irrigation	0.39 (0.82)
7	Pest Control	4.88 (0.09)
8	Disease	0.65 (0.72)

The values in parenthesis indicate p values. It could be seen that since, none of the chi square values were significant at 5 per cent level null hypothesis was failed to reject in each area of adoption. Hence, it could be concluded that attributes like type of farmer and extent of adoption were independent.

SECTION VI

4.5 Concluding remarks

The socio-economic profile, entrepreneurial behaviour of the farmers and the factors influencing entrepreneurial behaviour, constraints which affect the entrepreneurial behaviour and extent of adoption of KAU technologies were studied among the VFPCCK and ordinary farmers in central Kerala and arrived at the following inferences:

Farming in central Kerala is male centric. Since farming activity required high level of physical work and had to be in field almost all the time, women were less interested to take up farming as their main occupation. Since the study was carried out in Kerala, the most literate state in India, all the farmers were educated and most of them had secondary or higher secondary level education. But only a very few who were highly educated have come to the farming sector, because today's society consider farming as job with less social status. Another important fact was that the number of youth who had taken farming as their livelihood was very less. Most of the respondents were in the age group of 45-65 years old. After this generation, the number of farmers will also come down, an alarming warning for us. These farmers were having experience above 10 years. Only a few farmers earned an annual income of Rs. 2 lakhs and above. Although farmers were working whole day in their field and were producing crops sufficiently for feeding the community, they didn't receive enough returns to feed themselves sufficiently. This may be due to the involvement of middlemen and lack of opportunities for processing of produce. Since the study was carried out among the commercial vegetable farmers, most of them had taken agriculture as their main occupation. Since Kerala is a small state when compared to other states in India and its density of population is high, farmers had fragmented lands for farming. Most of the farmers had land holding below one hectare. Most of the farmers had a medium level of social participation since they had to be in their

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field for a long time. They could not spare much time for social activities. But only a negligible percentage of farmers had shown low social interaction because the farmers had to be interactive to know the market conditions. Most of the farmers showed medium level of adoption of agricultural technologies. Ordinary farmers showed more level of adoption than VFPCCK farmers, since VFPCCK farmers were familiar with the agricultural technologies which were informed by the officials of VFPCCK, whereas there was no one to guide ordinary farmers. So whenever they received knowledge about technologies, they tried it in their field. Although VFPCCK farmers were under the guidance of VFPCCK, ordinary farmers received more number of trainings because they didn't have any organized structure to provide training for them and so they themselves attended almost all the training programmes provided by institutions including KAU. When coming to the market ecosystem rating, since VFPCCK farmers were more aware about the market scenario, majority of them were of the opinion that they had a poor market ecosystem whereas ordinary farmers were found to be comfortable with the present conditions. The ordinary farmers had more level of aspiration than the VFPCCK farmers since they didn't have any organizational support. VFPCCK farmers had the feeling of support from VFPCCK was enough to market their produces.

The ordinary farmers' entrepreneurial behaviour showed a significant relationship with occupation. When ordinary farmers were considered, they didn't have any organizational support and hence they had to take farming as the main occupation which would bring out the entrepreneur in them and determines the entrepreneurial behaviour in them. When VFPCCK farmers were considered, age and education had significant relation with entrepreneurial behaviour. The aged farmers did not depend completely on VFPCCK for marketing of their produces. They had their own production, marketing techniques and channels. Thus as age increased, the entrepreneurial behaviour of VFPCCK farmers also increased. Education status of VFPCCK farmers also showed significant relationship with the

entrepreneurial behaviour of farmers because, when the farmer was educated he would explore more about the modern technologies and marketing channels other than the information provided by VFPCCK which in turn increases the entrepreneurial behaviour of the farmers. Size of land holding, experience and training received are also significantly related to entrepreneurial behaviour of both ordinary and VFPCCK farmers. As size of land increases, farmers consider farming as an enterprise. If experience is more, they can apply more of their practical knowledge into the field and have more forward and backward linkages. When more number of training is received farmers get more knowledge and get updated with new information and technologies. All these will add to the entrepreneurial behaviour of the farmers.

While examining entrepreneurial behaviour is considered, market orientation stands first in determining the entrepreneurial behaviour of both the VFPCCK and ordinary farmers. Farmers act in accordance with market ecosystem and the market scenario. This is the basic matter which they take into consideration when they go for taking decision about what, when and how to produce. The next factor is cosmopolitaness which contributes for the entrepreneurial behaviour of the farmers. Farmers are cosmopolite to get information from any sources to apply it in their field. Higher the degree of cosmopolitaness, higher will be the degree of entrepreneurial behaviour. Leadership ability followed by achievement motivation, innovation orientation, risk taking ability, farm decision making ability, and information seeking behaviour ranked respectively as the factors which contribute for the development of entrepreneurship development in farmers. When t-test was carried out to find the significant difference between the mean scores of ordinary and VFPCCK farmers, it was found that VFPCCK farmers show higher degree of entrepreneurial behaviour than the ordinary farmers. Although both the category of farmers rank the variables taken as same, the difference came out due to the information seeking behaviour variable of VFPCCK and ordinary farmers. VFPCCK farmers collect and update the information on a

day to day basis where as ordinary farmers do this process on a weekly basis. This made the VFPCCK farmers show more level of entrepreneurial behaviour. But if this variable is taken away, there is no much difference in entrepreneurial behaviour between VFPCCK and ordinary farmers. This is because, even though the ordinary farmers are not registered in VFPCCK, they are also availing the facilities provided by VFPCCK. They can also sell their produces in VFPCCK if they can't get expected price and they can opt for other marketing channels if price offered by VFPCCK is less. Another observation from the study was that from the summary of analysis of variance it was further observed that there is no difference in the entrepreneurial traits among the selected zones except in the case of Cosmopolitaness where zone 4 differ significantly for ordinary farmers. Zone 4 is Palakkadan plains agro ecological zone which falls under Nenmara block. A few farmers in the region were not cosmopolite and they stick on to the practices what they follow and were not ready to be receptive of information from surroundings.

When the constraints faced by the farmers are considered, both the category of farmers ranked marketing constraint as the most serious constraint. Even though VFPCCK farmers have a support for marketing their produce, they also face marketing constraints. This is because; VFPCCK just acts as a platform for promotion of vegetables and fruits but not completely as a marketing body. But the strain in marketing the produces is reduced up to an extent by the intervention of VFPCCK.

Coming to the adoption level of KAU technologies, (developed by Kerala Agricultural University related to vegetable cultivation) most of the ordinary farmers were unaware of the technologies prescribed by KAU since they don't have any organizational set up to train them about that. Those who were aware (both VFPCCK and ordinary farmers) about the technologies and prescriptions by KAU are of the opinion that those are not cost effective and are not location based. For example, seasons prescribed by KAU cannot be followed by farmers who depend upon rain fed agricultural practices. Seed rate prescribed by KAU is

not viable for the farmers and they are of the opinion that it won't yield maximum production. According to them spacing prescribed by KAU consumes more labour and land and was not acceptable among the farmers. Both the VFPCCK and ordinary farmers are of the opinion that manuring prescribed by KAU cannot be followed due to non availability of inputs at right time. Most of the farmers were not adopting the KAU technologies in many aspects because their neighbours (fellow farmers) are not adopting the same. Many of the VFPCCK farmers were either fully or partially aware about KAU technologies. Since they know other technologies also and keep on practicing those, they stick on to those itself without opting KAU technologies.

Most of the VFPCCK farmers were well aware about the various agricultural technologies put forward by KAU. One, who followed KAU technologies, was interested to continue further because they found it effective. One, who was not following KAU technologies, was not ready to change the traditional practices which he was following. Those who had partially adopted KAU technologies were ready to adopt the technologies of KAU in pest control, disease identification and remedies only.

CHAPTER V

SUMMARY AND CONCLUSION

The study entitled “Entrepreneurial behaviour of vegetable farmers in central Kerala”, examined the entrepreneurial behaviour of vegetable farmers, identified the factors influencing the entrepreneurial behaviour of vegetable farmers, analysed the constraints affecting entrepreneurial behaviour of VFPCCK and ordinary farmers in Central Kerala and to study the extent of adoption of KAU technologies among the farmers. The study was conducted in five agro-climatic zones viz, coastal sandy, Palakkad plains, Chittoor black soil, Malayoram and central midlands of central Kerala, pertaining to Ernakulam, Thrissur and Palakkad districts. The sample size was 450 and among them 50% was VFPCCK farmers and the rest 50% was ordinary farmers. Since the study was to examine the entrepreneurial behaviour of vegetable farmers, the respondents selected were commercial farmers, i.e, the sampling made was purposive, so that the clear picture of influencing determinants and constraints which mould the entrepreneurial behaviour of them can be drawn. An attempt was also made to study the extent of adoption of KAU technologies among the farmers. From the detailed survey and analysis made, the following were the summary and findings that were extracted.

5.1 Socio economic and agricultural status of farmers

- All respondent farmers are literate and mostly passed secondary and higher secondary level of education.
- Commercial vegetable farming is male-centric both among VFPCCK farmers as well as ordinary farmers.
- Half of the respondents in both the category lies in the age group of 55-65 years and the vegetable farming were considered significant between the age group of 45-55 years. None of the respondents were in the age group of below 35 years.

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- A considerable number of the respondents' primary occupation was found to be agriculture. There was also retired person who has taken the vegetable cultivation earnestly as their profession.
- When the income level of the farmers was considered, very few had an income greater than Rs.4, 80,000/- in which the VFPCCK farmers dominated (income category V). Many of the respondents lie in between the income category II.
- With respect to ordinary farmers majority of them were males (99.11%), aged between 55-65 years (51.56%), having higher secondary education (40.89%) and agriculture as occupation (92.89%). They were trained (90.67%), marginal farmers (58.67%) having annual income less than Rupees 1 lakh (93.33%), more than 15 years of experience (50.67%) in agriculture, medium level social participation (96.44%), medium level of extent of adoption (96.89%), good market ecosystem (52.44%) and medium level of aspiration (70.67%).
- Majority of VFPCCK farmers were males (98.67%), aged between 55-65 years (47.11%), having secondary education (41.33%) and agriculture as occupation (91.56%). They were trained (88%), marginal farmers (68.89%) having annual income less than Rupees 1 lakh (88.89%), more than 15 years of experience (48%) in agriculture, medium level of social participation (83.56%), medium level of extent of adoption (90.67%), poor market ecosystem (74.67%) and low level of aspiration (97.33%).

5.2 Entrepreneurial behaviour of farmers

- The dimension innovation orientation was high (index= 86.24) among most of the VFPCCK as well as ordinary farmers.
- More number of VFPCCK farmers than ordinary farmers strongly agreed that they were highly motivated to achieve their goals and in total majority of the

farmers, irrespective of zones, strongly agreed that achievement motivation was a factor which influenced the entrepreneurial behaviour of the farmers.

- In case of risk taking ability, irrespective of the zones, most of the ordinary and VFPCCK farmers strongly agreed that they would like to take risks so as to gain more profit and it had a clear role in molding the entrepreneurial behaviour of the farmers.
- Almost all the farmers took the decision regarding farming independently since they were capable of doing so because of their experience in the field.
- When coming to the information seeking behaviour of the farmers, VFPCCK farmers updated their knowledge and information about the market on a day to day basis, whereas the ordinary farmers updated once in a week.
- Majority of the farmers were found to be cosmopolite in all the zones.
- The leadership ability of farmers in all the zones was found to be high. This was because the farmers themselves had to influence their fellow farmers about their farming activities. They had to coordinate those activities and had to find the source for marketing and this in turn made them capable of leading a group.
- All the ordinary farmers were highly oriented to market. Since they didn't have any organized institution for marketing, they themselves had to get updated with the market conditions and demands. Even though VFPCCK farmers have an organised institutional structure, majority of the VFPCCK farmers were also highly market oriented.
- There was no significant difference between the mean scores of ordinary farmers and VFPCCK farmers of zone 1, zone 2 and zone 3 but, the mean scores of ordinary farmers and VFPCCK farmers of zone 4 and zone 5 differ significantly with respect to their entrepreneurial behaviour at 5% level of significance.

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- The, majority of the VFPCCK farmers as well as ordinary farmers were found to have moderate level of entrepreneurial behaviour.
- Pearson Chi-square values obtained in zone 1, zone 2, zone 3 and zone 5 was not significant at 5% level and it was significant at 5 per cent level in zone 4. This showed that type of farmer and his entrepreneurial behaviour are independent in zone 1. Zone 2, zone 3 and zone 5 whereas they are dependent in zone 4.
- From the summary of analysis of variance it was further observed that there was no difference in the entrepreneurial traits among the selected zones except in the case of cosmopolitaness where zone 4 differs significantly among ordinary farmers.

5.3 Factors influencing the entrepreneurial behaviour of farmers

- Among VFPCCK farmers, annual income, social participation, market ecosystem, level of aspiration, age, education, size of land holding, experience and training received were significantly associated with their entrepreneurial behaviour at 5 per cent level.
- With respect to ordinary farmers, their level of aspiration, occupation, size of land holding, experience and training received were found significantly associated with their entrepreneurial behaviour at 5 per cent level.
- Zone wise analysis revealed that social participation is significantly positively correlated with entrepreneurial behaviour of VFPCCK farmers in zone 2 and zone 4 at 5 per cent level, whereas, adoption of improved practices was significantly negatively correlated with entrepreneurial behaviour at 1 per cent level. Age was significantly associated with entrepreneurial behaviour in zone 2 and education was significantly associated with entrepreneurial behaviour in zone 4 at 5 per cent level. None of the other variables in any zone was significantly associated with entrepreneurial behaviour at 5 per cent level.

- In case of ordinary farmers, annual income and social participation were significantly negatively correlated with entrepreneurial behaviour at 5 per cent level. None of the other variables in any zone was significant at 5 per cent level. Study also revealed that attributes such as occupation in zone 1, size of land holding in zone 2 and zone 5 were found significantly associated with their entrepreneurial behaviour at 5 per cent level.

5.4 Constraints which affect the entrepreneurial behaviour of farmers

- It was clear that VFPCCK farmers and ordinary farmers felt marketing constraints more serious than any other constraints. Both categories of farmers ranked organisational constraints to be the least worried about. Both categories of farmers felt that all constraints in the same order of intensity.
- Even though the VFPCCK farmers had a proper marketing channel, they also felt, marketing constraint was the prime issue. VFPCCK made interventions in marketing to solve the issue, but still the problem persists.
- Short shelf life of the produce, lack of demand at the time of a bumper crop and fluctuations in rate were found to be the most bothered variables under marketing constraints.
- The next major problem faced by the farmers was the production constraints. Since the farming activity is highly dependent on the climatic changes and weather conditions, the farmers may not, at time, get the expected return.
- Economic constraints were ranked 3rd by the farmers and high cost of labour was the important cause for this problem. Majority of the Keralites prefer white collar jobs and are not ready to work in the fields and in turn the farmers had to engage labourers from other states and thus the cost of labour increases.

- Since the farm technologies are new and rare, the cost of those technologies would be high and the farmer faces the difficulty in adopting those technologies in their fields.
- Irregular income and low income are the variables under economic variables, which the farmers felt as severe problems.
- Technological constraints were ranked 4th by the farmers and the main reasons for this were inadequacy of capital for adopting these costly technologies in the field, non availability of skilled workforce and lack of location specific recommendations.
- Financial constraints were ranked 5th by the farmers and the main variable which contribute to this constraint was lack of credit facilities, untimely availability of subsidies and grants from government, inconvenient repayment schedules of credits taken without considering the crop seasons, high rate of interest for the credit facilities offered and insufficient quantum of credit.
- According to the ratings of the respondents, social constraints and organizational support constraints were the least bothering constraints. Both the VFPCCK and ordinary farmers ranked social constraints at 6th position and organizational constraint at the 7th position. The main problem under social constraint was the reluctance of youth towards agriculture and the main problem under organizational constraint was red tapism in government agencies and offices. The farmers ranked organisational constraint as the least bothered constraint, since the farmers knew where, when and how to get the assistance from the government departments.
- It was clear that VFPCCK farmers and ordinary farmers felt marketing constraints more serious than any other constraints in all zones. Both categories of farmers in zone 1 and zone 4 felt all constraints in the same order of intensity.

- There is no significant difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers.
- The Spearman's rank correlation coefficient in each zone was found to be significant at 1 per cent level which indicated that there was some agreement between VFPCCK farmers and ordinary farmers in all zones with respect to constraints that affect their entrepreneurial behaviour.
- There was no significant difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers in any zone.

5.5 Extent of adoption of KAU technologies among vegetable farmers

- VFPCCK farmers had fully adopted KAU technologies only related season (50.67%). It is a clear observation that majority had not adopted KAU technologies in other areas like varieties (50.22%), seed rate (47.56%), spacing and sowing (47.11%), manuring (44.89%), irrigation (62.67%), pest control (56.89%) and diseases (68.89%). One thing to be noted here is that 43.11%, 41.33% and 43.56% of VFPCCK farmers had partially adopted KAU technologies in seed rate, spacing and sowing and manuring respectively on par with the percentages of farmers who had not adopted technologies in these areas.
- Results of the study showed that among ordinary farmers, majority of the farmers had fully adopted KAU technologies only in case of season (49.78%). It was observed that majority had not adopted KAU technologies in other areas like varieties (52.89%), seed rate (54.67%), spacing and sowing (49.78%), irrigation (63.11%), pest control (66.22%) and diseases (72%). In case of manuring, majority of ordinary farmers (48%) had partially adopted KAU technologies. Based on the percentages and frequencies, it could be seen that in all areas except manuring, the VFPCCK farmers and ordinary farmers showed similarity in the extent of adoption.

- The study found that attributes like type of farmer and extent of adoption were independent (chi square test).
- Most of the VFPCCK farmers were well aware about the various agricultural technologies put forward by KAU. One, who followed KAU technologies, was interested to continue further because they found the technologies effective. One, who was not following KAU technologies, was not ready to change the traditional practices which he was following. Those who had partially adopted KAU technologies were ready to adopt the technologies of KAU in pest control, disease identification and remedies only. According to KAU, farmers have to dig 1000 pits in a hectare, but farmers dig 600-700 pits for sowing (bitter gourd, snake gourd and pea), in order to reduce seed rate, manure costs and labour employed. According to the farmers' experience, productivity and quality of the agricultural produce was less if KAU practices were adopted than their normal course of practices.

5.6 Suggested strategies to promote entrepreneurial behaviour

- The study pointed out that the shortage of labourers as one of the constraints faced by the farmers. Shortage of labourers could be reduced by forming farmer clusters and if the farmers and their family members are engaged themselves as labour in a cyclic manner. If job rotation was done among the farmers in the group to go to the fields of other farmers, the scarcity of labourers could be solved. The farmers and their family members could be paid from the profit earned by selling their produces as a group.
- As the social participation and training considered as the major factors influencing the entrepreneurial behaviour, more training programmes to be imparted to them to create opportunities for social participation. Panchayath and Krishibhavans can play major role in this respect.

- Even though VFPCCK provides better price, reduction in exploitation by middlemen up to an extent, provides bargaining power to farmers, a feeling of security which gives confidence for the farmers to produce more, knowledge and information about the agricultural inputs (seeds, fertilizers, subsidies) under one roof, marketing facility, it still lags in processing aspect. If VFPCCK is restructured with the qualities of a farmer producer company and with proper marketing outlook and channels, the problem of perishing of produces and marketing can also be resolved. Now VFPCCK is functioning as a platform for promotion of vegetables and fruits.
- Dissemination of knowledge and technology should also be made much stronger through agriculture extension workers under the monitoring of state government through Krishibhavans. Farmers had many misconceptions about the technologies and they were not aware about those technologies. If agriculture extension workers were used effectively, this problem could be resolved. Reviewing the performance of the extension workers could also be done to monitor their activities.
- If a special team of scientists in KAU is formed for monitoring the problems of farmers at the stage of production and if meetings are arranged at Krishibhavans to interact with farmers and to suggest remedies, then it would help to tackle the problems at production stage to a certain extent. This will also help to disseminate the technologies. If there are problems with no remedies, it can be considered as a point of discussion and can be taken for research system.
- The adoption level of KAU technologies is very limited among vegetable farmers, which necessitate the need for proper extension activities by KAU with respect to dissemination, of information, adoptability of farmers with respect to the new technologies released and proper monitoring of the farmers who adopted the technologies.

- Based on the study it may be stated that a vegetable farmer of Kerala should possess market orientation, cosmopolitaness and leadership ability which all together brings an ideal entrepreneurship behaviour of a vegetable farmer.

5.7 Contribution of the researcher

The researcher has attempted to a critical evaluation of the available literature on entrepreneurial behaviour. Literature related to the entrepreneurial behaviour of farmers were very limited and rare. Hence a research gap is identified in this field .The researcher made a humble attempt to fill this gap. The researcher examined mainly four dimensions in the study which include the entrepreneurial behaviour of vegetable farmers, determinants of entrepreneurial behaviour, its constraints and extent of adoption of KAU technologies related to vegetables.

5.8 Areas of future research

- A study on the entrepreneurial behaviour of farmers cultivating different crops may be conducted.
- Study on the behavioural difference of marginal small and large farmer may be attempted.
- Adoption of KAU technologies by the farmers of different crops may be conducted.

5.9 Conclusion

It was clear that vegetable farming on the commercial basis was male-centric both among VFPCCK farmers and ordinary farmers. All the respondent farmers were literate and none of them were in the age group of below 35 years category which implied that the alarming signal about the aversion of younger generation towards agricultural sector area especially in commercial vegetable farming. Majority of their family type was nuclear and marginal farmers. The major findings of the study are: More number of factors was found to influence the entrepreneurial behaviour of VFPCCK farmers than ordinary farmers. Both the category of farmers had same factors i.e. level of aspiration, size of land holding, experience, trainings received as common

which influence their entrepreneurial behaviour. Apart from those factors, annual income, social participation, market ecosystem, age and education were the other factors which influenced significantly with the entrepreneurial behaviour of VFPCCK farmers whereas occupation was the other factor which had a significant association with the Entrepreneurial Behaviour (EB) of ordinary farmers. While examining the entrepreneurial behaviour of vegetable farmers it was clear that as far as Kerala was concerned market orientation, cosmopolitaness and leadership ability were the three most important determinants contributing more towards the entrepreneurial behaviour of the vegetable farmers. In case of VFPCCK farmers three of the above said determinants contributed more whereas in case of ordinary farmers market orientation alone determined more to their entrepreneurial behaviour. When analyzing the various constraints which affected the entrepreneurial behaviour, both the categories of farmers pointed out marketing constraints followed by production constraints as the most serious issue affecting their EB. Study also explored the extent of adoption of KAU technologies and based on the finding it was understood that only the technologies related to season, fifty percentage of VFPCCK and ordinary farmers fully adopted as per the KAU recommendations. Except season all the other listed KAU technologies for vegetable cultivation, fifty percentage and above both the category of farmers (VFPCCK and ordinary farmers) did not adopt those technologies. Major reason for not adopting the KAU technologies were unawareness and partial knowledge about the KAU technologies, reluctance to change the traditional practice, bitter experience from the past especially in adopting the seeds of high yielding varieties and more labour and cost consuming recommendations especially in the case of spacing and sowing etc.

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*Originals not seen

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**ENTREPRENEURIAL BEHAVIOUR OF VEGETABLE
FARMERS IN CENTRAL KERALA**

BY
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ABSTRACT OF THE THESIS

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ABSTRACT

Vegetables play a major role in Indian agriculture by providing food, nutritional and economic security. More importantly, vegetables give higher returns per unit area and time. In addition to this, vegetables have higher productivity, shorter maturity period, high value and provide high income per unit time leading to improved livelihoods. Further there is a great need today to enhance the per hectare productivity so as to boost the vegetable production. Efforts are being made from various angles to encourage farmers to increase the area under the important vegetable crops.

In Kerala, the total area under the cultivation of vegetables during 2017-18 was 46,363 ha. (Government of Kerala, 2018). The Hindu Daily reported that around 1000 crore worth of vegetables were imported into our state yearly and the news empirically stated the demand supply gap of vegetables. National Horticulture Mission came up with an action plan for Kerala in connection with the Eleventh Five Year Plan which clearly pointed out that our state was highly deficient in its requirement of vegetables. The total requirement of vegetables in the state was 8.18 lakh tonnes, of which the production was 3.47 lakh tonnes and the rest is accounted by the neighbouring states. If the requirement is worked out based on Indian Council of Medical Research (ICMR) norms, the state requires as much as 24.11 lakh tonnes of vegetables.

Present study entitled *Entrepreneurial behaviour of vegetable farmers in central Kerala* was focused on to examine the entrepreneurial behaviour of vegetable farmers, to identify the factors influencing the entrepreneurial behaviour of vegetable farmers, to analyse the constraints which affect the entrepreneurial behaviour of vegetable farmers, to study the extent of adoption of KAU technologies among vegetable farmers and to suggest strategies to promote entrepreneurial behaviour of vegetable farmers.

For the purpose of the study five agro ecological zones namely Coastal sandy, Central midlands, Malayoram, Palakkadan plains and Chittoor black soil were selected from the central zone of Kerala (Ernakulam, Thrissur and Palakkad districts). From each agro ecological zone, one block having maximum area under vegetable cultivation was selected. A total sample of 450 vegetable farmers (fifty per cent farmers were receiving assistance from VFPCCK and fifty per cent were not receiving assistance from any other agencies termed as ordinary vegetable farmers) were selected from the five selected blocks. Primary data were collected from the selected farmers by using pre-tested structured interview schedule.

The analysis was carried out using simple statistical tools like percentages, mean and standard deviation, correlation coefficient, Chi square test, indices, t-test, ANOVA and Spearman's rank correlation coefficient.

To examine the entrepreneurial behaviour, innovation orientation, farm decision making, achievement motivation, risk taking ability, information seeking behaviour, leadership ability, cosmopolitaness, market orientation, etc were taken into account. The objective was analysed with the help of statistical tools like percentage, indices, T-test and ANOVA table. The results of the analysis revealed that the majority of the VFPCCK farmers as well as ordinary farmers are found to have moderate level of entrepreneurial behaviour. In most of the VFPCCK as well as ordinary farmers, the determinant innovation orientation was high with index value of 86.24. Zone wise analysis revealed that there was no significant difference between the mean scores of ordinary farmers and VFPCCK farmers of zone 1 (coastal sandy), zone 2 (central midlands) and zone 3 (Malayoram) but, the mean scores of ordinary farmers and VFPCCK farmers of zone 4 (Palakkadan plains) and zone 5 (Chittoor black soil) differ significantly with respect to their entrepreneurial behaviour at 5% level of significance. Pearson Chi-square values obtained in zone 1, zone 2, zone 3 and zone 5 was not significant at 5% level and it was significant at 5 per cent level in zone 4 alone. This showed that type of farmer and his entrepreneurial behaviour were independent in zone 1, zone 2, zone 3 and zone 5 whereas they were dependent in

zone 4. From the summary of analysis of variance it was further observed that there was no difference in the entrepreneurial traits among the selected zones except in the case of cosmopolitanism of farmers of zone 4 significantly different among ordinary farmers.

The analysis of factors influencing the entrepreneurial behaviour of commercial vegetable farmers highlighted that in case of VFPCCK farmers, annual income, social participation, market ecosystem, level of aspiration, age, education, size of land holding, experience and training received by them were significantly associated with their entrepreneurial behaviour at 5 per cent level. But, in case of ordinary farmers, their level of aspiration, occupation, size of land holding, experience and training received were found significantly associated with their entrepreneurial behaviour at 5 per cent level. Zone wise analysis revealed that in case of VFPCCK farmers, social participation was significantly positively correlated with entrepreneurial behaviour in zone 2 and zone 4 at 5 per cent level, whereas, adoption of improved practices was significantly negatively correlated with entrepreneurial behaviour at 1 per cent level. Age was significantly associated with entrepreneurial behaviour in zone 2 and education was significantly associated with entrepreneurial behaviour in zone 4 at 5 per cent level. None of the other variables in any zone was significantly associated with entrepreneurial behaviour at 5 per cent level whereas among ordinary farmers, annual income and social participation were significantly negatively correlated with entrepreneurial behaviour at 5 per cent level. None of the other variables in any zone was significant at 5 per cent level. The study also revealed that attributes such as occupation in zone 1, size of land holding in zone 2 and zone 5 were found significantly associated with their entrepreneurial behaviour at 5 per cent level.

Constraints which affect the entrepreneurial behaviour of vegetable farmers were analysed by considering the variables like production constraints, organisational support constraints, constraints in technology factor, social constraints, marketing

constraints, economical constraints and financial constraints. It was well clear that VFPCCK farmers and ordinary farmers felt marketing constraints were more serious than any other constraints. Both categories of farmers ranked organisational constraints to be least worried about. Both categories of farmers felt that all constraints in the same order of intensity. There was no significant difference between mean scores of constraints felt by VFPCCK farmers and ordinary farmers. The Spearman's rank correlation coefficient in each zone was found to be significant at 1 per cent level which indicated that there is some agreement between VFPCCK farmers and ordinary farmers in all zones with respect to constraints that affect their entrepreneurial behaviour.

The extent of adoption of KAU technologies among vegetable farmers with respect to season, varieties, seed rate, sowing, manuring, irrigation, pest control, disease identification and remedies were examined. It was found that 50.67 per cent of VFPCCK farmers have fully adopted KAU technologies that too only the technologies related to season. It was a clear observation that majority of the VFPCCK farmers had not adopted KAU technologies in other areas like varieties, seed rate, spacing and sowing, manuring, irrigation, pest control and diseases. Just below half of the VFPCCK farmers (43.11 per cent, 41.33 per cent and 43.56 per cent) had partially adopted KAU technologies related to seed rate, spacing and sowing and manuring respectively. Among ordinary farmers also same findings were observed except for manuring, where majority of the ordinary farmers had partially adopted KAU technologies. The study found that attributes like type of farmer and extent of adoption were independent based on chi square test.

The findings of the analysis highlighted certain interventions which were necessary to improve the entrepreneurial behaviour of vegetable farmers. The study pointed out the shortage of labourers as one of the major constraints faced by the farmers. Shortage of labourers can be reduced by forming cluster farmers' group and if the farmers and their family members themselves were engaged in labour on a

cyclic manner. Since social participation and training considered as the major factors influencing the entrepreneurial behaviour, more training programmes are to be imparted to them which create opportunities for social participation. Panchayath and Krishibhavans can play major role in this respect. Now the VFPCCK is functioning as a platform for promotion of vegetables and fruits. If VFPCCK is restructured to promote farmer producer company with proper marketing outlets and channels, the problem of perishing of farm produces and marketing can be resolved. If a special team of scientists in KAU is formed for monitoring the problems of farmers at the stage of production and if meetings are arranged at Krishibhavans to interact with farmers and to suggest remedies, then it would help to tackle the problems faced farmers in vegetable production to a certain extent. This will also help to disseminate the technologies also. If there are problems with no remedies, it can be considered as a point of discussion and can be taken to the research system for finding appropriate solution. The adoption level of KAU technologies is very limited among vegetable farmers which necessitate the need for strengthening extension activities of KAU with respect to dissemination of new technologies through the Department of Agriculture and Farmers' welfare.

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APPENDICES



KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF CO-OPERATION, BANKING and MANAGEMENT,
VELLANIKKARA.

Interview schedule

Entrepreneurial behaviour of vegetable farmers in central Kerala

Name of the farmer and address:

Panchayath :
 Block :
 District :
 Krishibhavan :
 Phone No. :

1. Family Details of the Respondent

Family type: Nuclear Joint

Sex	Age	Education	Main occupation	Monthly income(Rs)	Subsidiary occupation	Monthly income (Rs)

2. Average family income per month (Rs):

APL BPL

3. Economic status

(a) House type:

Thatched Tiled Terraced (Single storey)

Terraced (double storey)

(b) Material possession:

Four wheeler Two wheeler Tractor Tiller

(c) Asset Details

i) Total land holding

Marginal (0-1 ha/ 0- 2.5 acre) Small (1-2 ha/ 5 acre)

Other farmers (More than 2 ha/More than 5 acre)

100

ii) Agricultural asset details

Sl. No.	Asset	Area (in cents)	Annual income
1.	Poultry		
2.	Milch animals (Cow/Buffalo/Goat)		
3.	Fish		
4.	Others		

4. Land utilisation pattern

Sl. No.	Type of Land	Area (in cents/ acre)
1.	Homestead	
2.	Garden land	
3.	Wet land	
4.	Dry land	
5.	Leased in land	
6.	Leased out land	

5. Number of years of experience in vegetable cultivation?

< 5 years 5-10 years 10-15 years > 15 years

6. Vegetable wise area, production and income from each season

Sl. No.	Vegetables	Area (in cents)/ No. of strands	Production (in Kg.) per season						Income from Vegetable			
			Total production	Total sold	HH* consumption	Kept for own seed	Losses	Season I	Season II	Season III		
1.	Bitter gourd											
2.	Cow pea (yard long bean)											
3.	Snake gourd											
4.	Okra											
5.	Pumpkin											
6.	Ash gourd											
7.	Brinjal											
8.	Chilli											
9.	Ivy gourd											
10.	Amaranthus											

*House Hold

7. Expenditure incurred

Current market wages- Male ₹/day if it hourly basis ₹/hour

Female ₹/day or ₹/hour

Particulars	Labour requirements				Crop wise cost of production (in Rs.)									
	Labour (wages)- Hired		Family Labour (Hours)		Bitter gourd	Vegetable cow pea	Snake gourd	Okra	Pumpkin	Ash gourd	Brinjal	Chilli	Ivy gourd	Amaranthus
	Male	Female	Male	Female										
Seed/ Seedling														
Land preparation														
Nursery (if any)														
Planting														
Panthal (if any)														
Fertiliser application														
Weeding														
Plant protection														
Irrigation														
Transportati on														
Processing														

Total machine days/man days in a season.....

Cost of inputs

Inputs:	Type	Price	Quantity	Supplier(s)	Subsidy
Seed/ Seedling					
Manure/ Fertiliser					
Rent/ interest paid on Machineries					
Irrigation charges if any					
Rental Charges for land if leased in					
Machineries					
Agricultural Implements					

8. (a) What about the sources of irrigation?

Well Canal Ground water Lift irrigation

(b) Method of irrigation

Surface Sprinkler Drip Subsurface

Others.....

(c) Irrigation potential

Throughout the year Only during season Unassured and irregular
water supply

9. Which all are the agricultural information sources for you?

Agricultural related columns in the newspaper/ All India Radio/ Television/
Agricultural magazines/ Farming group/ Fellow farmers

10. How do you sell your produce?

Sl. No.	Channel	Always	Occasionally	Rarely	Quantity	Price received
1	Direct selling to consumers					
2	Through commission agents					
3	In wholesale market					
4	In Retail shop					
5	Through farmers market/VFPCK					
6	Others					

11. Do you undertake farming on contract basis?

Yes No

If yes, which crop, for whom:

Conditions:

.....

.....

.....

.....

.....

12. Social participation

Sl. No.	Institutions	Type of Services (Please tick the corresponding services rendered from the listed institutions)	Always	Occasionally	Rarely	Never
1	Krishibhavan	Agricultural information/ Inputs/ Financial assistance/ Trainings/ Interactions with extension officers (after visiting the farm)				
2	VFPCCK	Marketing/ Production technology transfer/ Quality planting materials and seeds/ Extension activities/ Credit support/ Crop insurance/ Value addition				
3	Panchayath	Financial assistance/ Trainings/ Information				
4	Co-operatives	Inputs/ Financial assistance/Trainings				
5	Farmers Club/ Associations	Agricultural information				
6	Banks	Agricultural loans/ personal loans/ vehicle loans				

13. Give your response by marking (√) in the appropriate column

Sl. No	List of Agricultural Technologies	Fully adopted	Partially adopted	Not adopted
1	Organic farming			
2	Biological methods of pestsand disease management.			
3	Integrated Nutrient Management in vegetables			
4	Mixed farming			
5	Mixed cropping			
6	Green house and rain shelter cultivation of vegetables			
7	Use of mist and drip irrigation			
8	Protected cultivation			
9	Intercropping			
10	Use of botanicals and organic manures			
11	Processing and marketing			
12	Bio control agents			
13	Organic nutrient management			
14	Quality seed production			
15	Integrated farming system			
16	Sprinkler irrigation			
17	Integrated Pest Management technologies			
18	Terrace farming			

14. Have you attended any training programme?

Yes No

If yes,

Type of Training	Duration	Agency

15. Do you have a habit of meeting successful growers when you heard about them?

Yes No

16. Are you really curious to hear from them that what brought them success?

Yes No

17. Do you set production targets? How do you plan production and targets?

a. No I do not set any production targets, I

b. Yes, I do I

18. Market ecosystem

“It means the physical infrastructure put in place for the collection, transportation and storage of products in the value chain from the source of production (farm gate) to market place”

Sl. No.	Elements of Market ecosystem	Poor	Good	Better
1	Storage units/ infrastructure facilities			
2	Pre-cooling chamber			
3	Refer vans			
4	Sorting and Grading			

19. Level of aspirations

(a) What would be the level of education you want?

[All of us want to provide education to our children. But each one of us may differ with regard to extend of education are No education (0), primary school (1), middle school (2), high school (3), College (4), Professional and technical (5)]

i) Your sons to have

ii) Your daughters to have

(b) What would be the type of work you expect?

[In the same way as education, all of us want our children to get into some work after they reach a particular stage in life. For instance, there are various kinds of works, Un employed (0), Professional (1), Agriculture (2), Business (3), Government jobs (4)]

i) Your sons to have

ii) Your daughters to have

(c) Compared with previous years what would be the increase in the annual income (in rupees) you expect to get in the next 3 years?

[Each one of us has some earnings as a result of our work either monthly or yearly to sustain us. We also try to improve our income by various methods-either by improving or extending our work]

Low income than the previous year (0)

Same level of income like previous year (1)

Expecting higher income than previous year (2)

[Following are a few questions about some of your professions. You may also like to improve upon it in the next few years. Please let me know what you expect to happen regarding these in the next 3 years]

(d) What would you expect to be the increase in your farm income (especially from vegetables) income in the next 3 years?

Increased by Same income (0)

Some income (1)

Two times (2)

Three times (3)

Four times (4)

Five times and above (5)

(e) What would you expect to be the increase in the produce of the farm (especially from vegetables) in the next three years?

Lower than the previous year (0)

Same level like previous year (1)

Expecting more than the previous year (2)

(f) What would be the type of house you expect to have in next three years?

Three roomed one storey house (0)

Four roomed one storey house (1)

Four roomed double storey house (2)

Five roomed double storey house (3)

Five + roomed double storey house (4)

(g) What would be the machineries and equipments you expect to possess in the next 3 years?

Tractor (1)

Tiller (2)

Pick up van (3)

Grass

cutter (4)

20. Innovation orientation

Sl. No.	Statements	SA	A	UD	DA	SDA
1	I search out new working methods, techniques or instruments					
2	I generate original solutions for problems					
3	I find new approaches to execute tasks					
4	I systematically introduce innovative ideas into work practices					
5	I put effort in the development of new things					
6	I would feel restless unless, you tryout an innovative method which you have come across.					
7	I am cautious about trying new practices.					
8	I like to keep up to date information about the subjects of my interest.					
9	I would not prefer to wait for others to try out new practices first.					

21. Achievement motivation

Sl. No.	Statements	SA	A	UD	DA	SDA
1	I am enjoying my work very much.					
2	I work hard at everything I undertakes until I am satisfied with the result.					
3	I succeed in my occupation even if I have been neglectful of my family.					
4	I have determination and driving ambition to achieve certain things in life even if these qualities make me unpopular					
5	I won't take rest until I finish my work					
6	Even when my interests are in danger, I concentrate on my job and forget my obligation to others.					
7	I set difficult goals for myself and try to attain them.					

22. *Risk taking ability*

Sl. No.	Statements	SA	A	UD	DA	SDA
1	I should adopt mixed cropping to avoid greater risks involved in single crop cultivation.					
2	I should rather take more of a chance in making more profit than to be content with a smaller but less profit.					
3	I am willing to take a greater risk than an average one and it usually does better financially.					
4	I should take risks when I know that chance of success is fairly high.					
5	I should try new ideas that may enhance the production/ profitability even though no one is adopted it yet.					
6	I should try an entirely new method which involves risk but worthy.					

23. *Farm decision making ability*

Sl. No.	Decision making area	Response pattern		
		Independently	In consultation with others	Neither
1	I take decision to start commercial vegetable production			
2	I take decision to avail loans			
3	I take decision to tryout other crops			
4	I take decision to hire labourers			
5	I take decision regarding storage and marketing of vegetables			
6	I take decision regarding the value addition of the produce			
7	I take decision to purchase or hire machinery and equipments			
8	I decide to meet the agricultural extension			

	worker or any organization			
9	I decide to subscribe for magazines			
10	I decide to attend training			

24. Information seeking behaviour

Formal sources of information (Institutional)

Sl. No.	Sources of Information	Once in fortnight/ Daily	Once in a month/ Weekly	Whenever problem arises/ Rarely	Never
1	Scientists of KAU				
2	Agriculture extension worker				
3	Agriculture officer				
4	KVK				
5	VFPCK				
6	Agricultural Seminars				
7	Print media (Newspapers, magazines, books, brochures etc.)				
8	Electronic media (Television, Radio, Internet and mobilephone)				

Information seeking from Informal sources

Sl. No.	Sources of Information	Regularly	Occasionally	Rarely	Never
1	Family members				
2	Peer group				
3	Pioneer/experienced vegetable farmers				

25. Cosmopolitaness

Sl. No.	Statements	Agree	Undecided	Disagree
1	I think there is a need to collect additional information from outside the village for successful vegetable cultivation			
2	I should try to get information on vegetable crop management practices from outside village by using mass media facilities			
3	I should learn many things not only from the happenings and experiences of my village only			
4	Keeping contact with progressive vegetable growers is useful for me for managing the vegetable cultivation			
5	Visiting the subject matter specialist is not a waste of time for me			
6	VFPCCK/KVK/KAU exhibitions or seminars / Agricultural exhibition helps me to gather recent information			

26. Leadership ability

Sl. No.	Statements	SA	A	NO	DA	SDA
1	I like to see problems of fellow farmers resolved.					
2	I enjoy sharing information with others.					
3	I persevere on an activity until I completed.					
4	I enjoy success and strive for it.					
5	I consider myself to be a flexible person.					
6	I work at maintaining good interpersonal relationships.					
7	People look to me for advice.					
8	I am an effective decision maker.					
9	I am original in my ideas/activities.					
10	I like Initiating new things.					
11	I feel confident with my capabilities.					
12	I consider myself to be an achiever in life.					

SA- Strongly Agree; A-Agree; NO-No Opinion; DA-Disagree; SDA-Strongly Disagree

27. Market orientation

Sl. No.	Statements	SA	A	NO	DA	SDA
1	I cultivate vegetables to earn profits					
2	I always be watchful about the demand of each vegetable in the market.					
3	I always seek what the market wants.					
4	I cultivate vegetables after assuring there is a market					
5	I sell my produce in the market on a regular basis					
6	I know the inputs requirements for vegetable cultivation					
7	I am aware about the input supply source					
8	I know which markets to sell to					
9	I know what are the differences in prices and costs (conscious of prices, delivery costs, transport, storage etc.)					

28. Constraints which affect the entrepreneurial behaviour of vegetable farmers

Sl. No.	Statements	Most serious	More serious	Serious	Less serious	Least serious
I. Production constraints						
1	Unavailability of good quality of seeds					
2	Unreasonable seed price					
3	Unavailability of seeds in a proximal distance					
4	Pest and diseases					
5	Unavailability of good quality fertilizers and pesticides					
6	Quantity of fertilizers and pesticides getting in a subsidized rate is low					
7	Unavailability of fertilizer and pesticides in a proximal distance					
8	Water scarcity					
9	Seasonal nature of vegetables					
10	Unavailability of equipments for plant protection					
11	High labour charge					
12	Labour management					
13	Unavailability of quality labour/ Absenteeism					
14	Problems of transport					
15	Change in weather/ Climate					

II. Constraints in technology factor						
1	Lack of technology					
2	Lack of follow up services					
3	Lack of knowledge about technology					
4	Lack of training in adopting the technology					
5	Lack of location specific recommendations					
6	Inadequacy of capital					
7	High expense to adopt technology					
8	Non-availability of skilled workmen					
9	Non-availability of mass media sources of information					
10	Lack of information about post harvest technology					
11	Use of Obsolete technologies					
12	Lack of land consolidation					
III. Organisational support constraints						
1	Lack of proper training					
2	Lack of Co-ordination and co-operation among grass root extension workers.					
3	Incredibility of extension workers.					
4	Lack of technical guidance and untimely advice					
5	Red-tapism in government agencies					
6	Lack of financial assistance from government agencies					
7	Indifferent behaviour from Krishibhavan/ KVK/ KAU					
IV. Economic constraints						
1	Uneconomic holding size					
2	High cost of technology					
3	Poor socio-economic status					
4	Low risk bearing capacity					
5	Low income					
6	Irregular income					
7	High Labour cost					
V. Financial constraints						
1	Unavailability of credit					
2	Insufficient quantum of credit					
3	High interest rate of credit					

4	Inconvenient repayment schedule					
5	Untimely availability of fund/subsidies from the government organizations					
VI. Social constraints						
1	Lack of education					
2	Traditional beliefs and norms					
3	Nuclear family set up					
4	Reluctance of youth towards agriculture					
5	Social status					
6	Socio-political interference					
7	Lack of co-operation and co-ordination among farmers					
VII. Marketing constraints						
1	Lack of market orientation					
2	Deficiency of marketing ecosystem					
3	Low price for output					
4	Frequent fluctuation in price					
5	Problems of transport (marketing cost)					
6	Problems of middleman (marketing cost)					
7	Seasonal demand					
8	Lack of demand					
9	Absence of grading and standardization					
10	Short shelf life of vegetables					
11	Packaging					

29. Which of the farming practice are you following?

Organic Conventional

30. Please give tick marks in the relevant column and give reasons for discontinuing and for not willing to adopt

KAU Technologies	Recommended technologies for Bitter gourd cultivation							Willingness to adopt		Reasons
	Fully adopted	Partially adopted	Year of adoption	Discontinued	Not adopted	Reasons	Yes	No		
Season										
Varieties										
Seed rate										
Spacing and sowing										
Manuring										
Irrigation										
Pest control										
<i>Fruit Fly</i>										
<i>Epilachna beetle</i>										
<i>Red pumpkin beetle</i>										
<i>Plant lice</i>										

Disease identification and remedies										
<i>Downy mildew</i>										
<i>Powdery mildew</i>										
<i>Mosaic</i>										

Recommended technologies for Vegetable cow pea (yard long bean) cultivation										
KAU Technologies	Fully adopted	Partially adopted	Year of adoption	Discontinued	Not adopted	Reasons	Willingness to adopt		Reasons	
							Yes	No		
Season										
Varieties										
Seed rate										
Spacing and sowing										
Manuring										
Irrigation										
Pest control										
<i>Aphis craccivora</i>										
<i>pod borers and pod bug</i>										

<i>root-knot nematode and reniform nematode</i>																				
Disease identification and remedies																				
<i>fungal diseases</i>																				
<i>Anthraxnose</i>																				

Recommended technologies for Snake gourd cultivation										
KAU Technologies	Fully adopted	Partially adopted	Year of adoption	Discontinued	Not adopted	Reasons	Willingness to adopt		Reasons	
							Yes	No		
Season										
Varieties										
Seed rate										
Spacing and sowing										
Manuring										
Irrigation										
Pest control										
<i>Fruit Fly</i>										
<i>Epilachna beetle</i>										

<i>Red pumpkin beetle</i>																	
<i>Plant lice</i>																	
Disease identification and remedies																	
<i>Downy mildew</i>																	
<i>Mosaic</i>																	

Recommended technologies for Okra cultivation																	
KAU Technologies	Fully adopted	Partially adopted	Year of adoption	Discontinued	Not adopted	Reasons	Willingness to adopt		Reasons								
							Yes	No									
Season																	
Varieties																	
Seed rate																	
Spacing and sowing																	
Manuring																	
Irrigation																	
Pest control																	
<i>Jassids</i>																	
<i>fruit and shoot</i>																	

<i>borers</i>												
<i>Aphids</i>												
<i>Nematodes</i>												
Disease identification and remedies												
<i>Yellow vein mosaic</i>												

Recommended technologies for Pumpkin cultivation												
KAU Technologies	Fully adopted	Partially adopted	Year of adoption	Discontinued	Not adopted	Reasons	Willingness to adopt		Reasons			
							Yes	No				
Season												
Varieties												
Seed rate												
Spacing and sowing												
Manuring												
Irrigation												
Pest control												
<i>Fruit Fly</i>												
<i>Epilachma beetle</i>												

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<i>Red pumpkin beetle</i>													
Disease identification and remedies													
<i>Downy mildew</i>													
<i>Powdery mildew</i>													
<i>Mosaic</i>													

Recommended technologies for Ash gourd cultivation													
KAU Technologies	Fully adopted	Partially adopted	Year of adoption	Discontinued	Not adopted	Reasons	Willingness to adopt		Reasons				
							Yes	No					
Season													
Varieties													
Seed rate													
Spacing and sowing													
Manuring													
Irrigation													
Pest control													
<i>Fruit Fly</i>													
<i>Epilachna</i>													

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<i>beetle</i>																			
<i>Red pumpkin beetle</i>																			
<i>Aphids</i>																			
Disease identification and remedies																			
<i>Downy mildew</i>																			
<i>Powdery mildew</i>																			
<i>Mosaic</i>																			

Recommended technologies for Brinjal cultivation																				
KAU Technologies	Fully adopted	Partially adopted	Year of adoption	Discontinued	Not adopted	Reasons	Willingness to adopt		Reasons											
							Yes	No												
Season																				
Varieties																				
Seed rate																				
Spacing and sowing																				
Manuring																				
Irrigation																				
Pest control																				

<i>fruit and shoot borer and Phomopsis fruit rot</i>													
Disease identification and remedies													
<i>bacterial wilt</i>													

Recommended technologies for Chilli cultivation													
KAU Technologies	Fully adopted	Partially adopted	Year of adoption	Discontinued	Not adopted	Reasons	Willingness to adopt		Reasons				
							Yes	No					
Season													
Varieties													
Seed rate													
Spacing and sowing													
Manuring													
Irrigation													
Pest control													
<i>mealy bugs and lace wing bugs</i>													
<i>Mites and</i>													

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<i>aphids</i>													
<i>Chilli mite</i>													
Disease identification and remedies													
<i>bacterial wilt</i>													

Recommended technologies for Ivy gourd cultivation													
KAU Technologies	Fully adopted	Partially adopted	Year of adoption	Discontinued	Not adopted	Reasons	Willingness to adopt		Reasons				
							Yes	No		Yes	No		
Season													
Varieties													
Spacing and sowing													
Manuring													

Recommended technologies for Amaranthus cultivation													
KAU Technologies	Fully adopted	Partially adopted	Year of adoption	Discontinued	Not adopted	Reasons	Willingness to adopt		Reasons				
							Yes	No		Yes	No		
Season													
Varieties													

Seed rate													
Spacing and sowing													
Manuring													
Disease identification and remedies													
<i>Leaf webber attack</i>													

23. If adopting fully, from which agency you learned it?

VFPCCK/ NGO' s/ Input agencies/ KAU/ SDA/ Neighbours/ Friends/ Fellow farmers/ Progressive farmers

Any other?



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Kerala Agricultural University
College of Co-operation, Banking and Management
Dept. of Rural Marketing Management
Vellanikkara- 680 656, Thrissur, Kerala, India.

No: CBM/Acad(1)549/2013

Date: 11.11.2015

Dr. K.N. Ushadevi
Major Advisor

Dear Sir/ Madam,

Greetings!

This is in connection with the research study entitled “Entrepreneurial behaviour of vegetable farmers in central Kerala” undertaken by Mr. James Mohan D (2013-25-101) doing his doctoral programme in this department under my guidance. The main objectives of his study are to examine the entrepreneurial behaviour of vegetable farmers. The study also aims to identify the factors influencing the entrepreneurial behaviour of vegetable farmers and to analyse the constraints which affect the entrepreneurial behaviour of vegetable farmers. In this context, he has identified certain variables/items in relation to his study.

Considering your rich experience and expertise, you have been identified as a judge for rating the relevancy of the list of variables furnished in the enclosed appendices you may please indicate your opinion about the inclusion of each variable in the study by marking (✓) against each variable under the appropriate column. You are requested to add other variables, which you may think are related and also rate them under appropriate column.

Amidst your busy schedule, I hope that you may kindly spare sometime for us. Your kind and early action in the matter would greatly help us to complete the

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study in time. Kindly return the duly filed annexure to the self addressed stamped envelope enclosed herewith. Your expertise will be greatly acknowledged.

Thanking you.

With kind regards,

Yours sincerely,
(K. N. Ushadevi)

Encl: List of items.

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**KERALA AGRICULTURAL UNIVERSITY
FACULTY OF AGRICULTURE
COLLEGE OF CO-OPERATION, BANKING AND MANAGEMENT
VELLANIKKARA, THRISSUR**

Title of the study: Entrepreneurial behaviour of vegetable farmers in central Kerala

Objectives of the study:

1. To examine the entrepreneurial behaviour of vegetable farmers.
2. To identify the factors influencing the entrepreneurial behaviour of vegetable farmers.
3. To analyse the constraints which affect the entrepreneurial behaviour of vegetable farmers.
4. To study the extent of adoption of KAU technologies among vegetable farmers.
5. To suggest strategies to promote entrepreneurial behaviour of vegetable farmers.

Please mention the relevancy of the variables (by putting “√” mark) in terms of **MOR- Most Relevant, MR- More Relevant, R-Relevant, LR- Least Relevant and NR- Not Relevant** against the appropriate column.

In this study **vegetable farmer** refers to the producers who produce vegetables (must be raising at least one of the following crops bitter melon, vegetable cow pea, yard long bean, snake gourd, okra, pumpkin, ash gourd, brinjal, chilli, ivy gourd and amaranthus) primarily for commercial purpose.

An **entrepreneur** means one who strived to maximise his/her profits by innovations and he/she is a man with a will to act, to assume risk and to bring about a change through organisation of human effort.

Entrepreneurial behaviour of vegetable farmer refers to the study of farmer behaviour involved in identifying and exploiting opportunities through creating and developing new ventures as well as exploring and creating opportunities while in the process of emerging organisations.

The study area

Central zone of Kerala.

Sources of data

Both primary and secondary data will be used for the study.

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Sample selection for primary source of data

Five agro ecological zones namely coastal sandy, central midlands, malayoram, palakkad plains and chittur black soil will be selected from the central zone of Kerala. From each agro ecological zone, one block having maximum area under vegetable cultivation will be selected. A total sample of 450 vegetable farmers (fifty percentage farmers from VFPCCK and other fifty percentage from ordinary vegetable farmers) will be selected proportionately from the five selected blocks. Farmers will be selected purposively to ensure that they are intensively involved in vegetable cultivation.

Sl. No.	Selected probable variables in the study	Operational definitions for the study	Category of respondents															
			Experts (Academicians)					Experts (Industry)										
			MOR	MR	R	LR	NR	MOR	MR	R	LR	NR						
To identify the factors influencing the entrepreneurial behaviour																		
1	Age	Chronological age of the farmer																
2	Sex	The state of being male or female																
3	Educational status of the respondent	Level of formal education attained by the respondent																
4	Educational status of the family	Level of formal education attained by the members of the family																
5	Family type	Whether the respondent belongs to Joint or Nuclear family																
6	Main occupation and corresponding monthly income of the respondent	An activity that serves as one's regular and main source of livelihood; a vocation. The amount of money received from the main occupation is referred as the corresponding monthly income from the main occupation.																
7	Main occupation and corresponding monthly income of family members	-do-																
8	Subsidiary occupation and corresponding monthly income of the respondent	An activity which is serving to assist or supplement the main source of livelihood and add additional income to the respondent apart from his\her main income source. The amount of money received from the subsidiary occupation is referred as the corresponding monthly income from the subsidiary occupation.																

9	Subsidiary occupation and corresponding monthly income of family members	-do-																	
10	Average family income per month	It is the probable total income of the family for a month by adding the monthly income of all the earning members of the family. (Ration card type, i.e. APL or BPL is also asked)																	
11	Economic status	It is a measure of respondents' wealth by means of his/her house type (Thatched, Tiled, single storey terrace and double storey terrace), material possession (Four wheeler, Two wheeler, Tractor and Tiller), Land (Marginal, Small and other farmer) and agricultural assets (Poultry, milch animals, fish and others).																	
12	Land utilisation pattern	This describes the type of land (Homestead, garden land, dry land, wet land, leased in land and leased out land) the farmer posses and also the area of each land type.																	
13	Vegetable wise area, production and income from each season	Area/ no. of strands of each vegetables grown and each vegetable production in kilograms (total production, total sold, household consumption, kept for own seed and losses) also income from vegetable in season I,IIand III.																	
14	Expenditure incurred	Labour requirements (hired and family labour men and women separately) and crop wise cost of production for seed/ seedling, land preparation, nursery, planting, panthal, fertiliser application, weeding, plant protection, irrigation, transportation and processing are the expenditure included in the vegetable production and sale.																	

15	Cost of production	This analyse the price, type, supplier, quantity and subsidy of various inputs (seed/seedling, manure/fertiliser, labour, rent/interest paid on machineries, irrigation charges, rental charges for leased land, machineries and agricultural implements) used in the production of vegetables. From where, how and how often the farmers get/irrigate/available the water for the crops.																	
16	Sources, method and potential of irrigation																		
17	Mass media participation	Agricultural information (especially vegetable related information) collected from Agricultural related columns in the newspaper/ All India Radio/ Television/ Agricultural magazines.																	
18	Place/ Channel of selling produces	The frequency (rarely, occasionally and always), quantity and price received from different channels of sales, i.e. direct selling, through commission agents, wholesale market, retail shop, through farmer's market/ VFPC or any other.																	
19	Social participation	Type of services and frequency (Always, occasionally and rarely) of these services availed from different institutions (Krishibhavan, VFPC, Panchayath, Co-operatives, Farmers Club/ Associations and banks)																	
20	Adoption of improved practices	Extend of adoption (Fully, partially and not adopted) of agricultural technologies like Organic farming, Biological methods of pest and disease management, Integrated Nutrient Management in vegetables, Mixed farming, Mixed cropping, Green house and rain shelter cultivation of vegetables, Use of mist and drip irrigation, Protected cultivation, Intercropping, Use of botanicals and organic manures, Processing and marketing, Bio control agents,																	

		Organic nutrient management, Quality seed production, Integrated farming system, Sprinkler irrigation, Integrated Pest Management technologies and Terrace farming.																					
21	Training received	Training type, its duration and agency which it rendered for the cultivation of vegetables.																					
22	Influence of successful farmers	A cognitive factor that tends to have an effect on the farming activity after meeting and hearing the stories of successful growers.																					
23	Market ecosystem	The physical infrastructure put in place for the collection, transportation and storage of products in the value chain from the source of production (farm gate) to market place																					
24	Level of aspiration	A will to succeed, cherish or a strong ambition to success and grow further over the years personally and socially. OR The future level of achievement in his/her job, which he is expecting based on the knowledge about the level of past performance.																					
To examine the entrepreneurial behaviour																							
1	Innovation orientation	The degree to which an entrepreneur is relatively earlier in adopting and searching new ideas also keen to develop new ways and means of doing things.																					
2	Farm decision making	The degree to which an entrepreneur justifies the selection (whether he took the decision independently or in consultation with others) of most effective means from among the available alternatives on the basis of scientific criteria for achieving maximum economic profit.																					
3	Achievement motivation	The desire or dedication or excellence to attain a strong sense of personal accomplishment.																					
4	Risk taking	The degree to which an entrepreneur is oriented towards																					

	ability	risk and uncertainty and has courage to face the problems in the commercial vegetable cultivation.																	
5	Information seeking behaviour	The extent to which an entrepreneur is seeking information from different communication sources both formal (Scientists of KAU, Agriculture extension worker, Agriculture officer, KVK, VFPC, Agricultural seminar) and informal (Family members, peer group, Pioneer/experienced vegetable farmers, Print media and electronic media).																	
6	Leadership ability	The degree to which an entrepreneur can initiate the actions of other individual or the ability to create an interpersonal influence directed toward the achievement of a goal or goals .																	
7	Cosmopolitaness	The degree to which an entrepreneur is oriented to his/her immediate, outside social system																	
8	Market orientation	It is the farming activity or responsiveness of the vegetable farmer by making profits through selling farm products in the market on a regular basis by identifying and meeting the stated or hidden needs or wants of the market.																	

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KAU Package of Practices Recommendations for vegetable cultivation

Recommended technologies for Bitter gourd cultivation	
Season	January-March, September-December
Varieties	Priya, Preethi, Priyanka (recommended for acid alluvial soils of Kerala) and Arka Harit.
Seed rate	5.0-6.0 kg per ha.
Spacing & sowing	2.0 m x 2.0 m Pits of 60 cm diameter and 30-40 cm depth are taken. Well rotten FYM and fertilizers are mixed with top soil in the pit and seeds are sown @ 4-5 per pit. Unhealthy plants are removed after two weeks and only 3 plants are retained per pit. (For the rainfed crop, sowing can be started after the receipt of first few showers during May- June)
Manuring	Apply FYM @ 20-25 t per ha as basal dose along with half dose of N (35 kg) and full doses of P ₂ O ₅ (25 kg) and K ₂ O (25 kg). The remaining dose of N (35 kg) can be applied in several split doses at fortnightly intervals.
Irrigation	During the initial stages of growth, irrigate at 3-4 days interval and alternate days during flowering/ fruiting. Irrigation at 15 mm CPE (approximately at 3 days interval for sandy loam soils) is more economical than irrigating once in two days especially during summer months for water economy.
Pest control	Fruit Fly: apply carbaryl 10 per cent DP in pit before sowing of seeds to destroy the pupae. In homestead gardens the fruits may be covered with polythene, cloth or paper bags to ensure mechanical protection. In large gardens apply carbaryl 0.2 per cent or malathion 0.15 per cent suspension containing sugar or jaggery at 10 g/l at fortnightly intervals at flowering and fruit initiation. Spray as coarse droplets on the ventral surface of leaves. Removed and destroy affected and decayed fruits. It can also be effectively controlled by use of banana fruit traps coupled with the removal and destruction of infested fruits. It is more efficient than two sprayings with insecticides. Traps are to be set at a distance of 2m after a border row and they may be replenished after 7 to 9 days. Start bait trapping just before flowering. Epilachna beetle: Remove and destroy egg masses, grubs and adults occurring on leaves. Spray carbaryl 0.2 per cent. Red pumpkin beetle: Adult beetle eats the leaves, makes hole on foliage and causes damage on roots and leaves. Incorporate carbaryl 10 per cent DP in pits before sowing the seeds to destroy grubs and pupae. Plant lice: Apply 1.5 per cent fish oil soap. First dissolve soap in hot water and then make up the volume. Alternatively apply dimethoate 0.05 per cent.
Disease	Downy mildew: It is severe during rainy season. This can be checked by spraying mancozeb 0.2 per cent (waiting period of mancozeb

identification & remedies	<p>is three days).</p> <p>Powdery mildew: Can be controlled by spraying dinocap 0.05 per cent.</p> <p>Mosaic: Control the vectors by spraying dimethoate 0.05 per cent. Uprooting and destruction of affected plants and collateral hosts should be done.</p> <p>(Harvesting can be done only after 10 days of insecticide/fungicide application)</p>
	Recommended technologies for Vegetable cow pea (yard long bean) cultivation
Season	<p>1) Cowpea can be grown during any season.</p> <p>2) As a rainfed crop, sowing is done in the month of June. The most suitable time is after the first week of June.</p> <p>3) During the second crop season (rabi), i.e., September to December, cowpea can be grown as a fringe crop along the rice field bunds. Sowing can be done on either side of bunds on the day of transplanting the paddy crop.</p> <p>4) During summer, cow pea can be grown as a pure crop in rice fallows after the harvest of paddy.</p>
Varieties	<p>(Vegetable type)</p> <p>1) Bushy: Bhagyalakshmi, Pusa Barsathi, Pusa Komal</p> <p>2) Semitrailing: Kairali, Varun, Anaswara, Kanakamony (PTB-1), Arka Garima</p> <p>3) Trailing type: Sharika, Malika, KMV-1, Lola, Vyjayanthi, Manjeri Local, Vyalathur Local, Kurutholapayar, Vellayani Jyothika</p>
Seed rate	Bush: 20-25 kg/ha, Trailing: 4-5 kg/ha
Spacing & sowing	<p>Bush: 30 cm x 15 cm, Semi trailing: 45 x 30 cm, Trailing: 2 m x 2 m (on pandal @ three plants per pit) in channels at 1.5 m x 45 cm spacing for trailing on trellis.</p> <p>Soaking seeds in 500 ppm thiourea solution, followed by two sprays of thiourea (one at vegetative and another at flowering stage) increased the yield of cowpea by 26 per cent and net return by 5 per cent. Cowpea seeds should be inoculated with <i>Rhizobium</i> and pelleted with lime (lime coating is required only for seeds that are to be sown in acid soils)</p>
Manuring	FYM 20 t per ha, Lime 250 kg per ha or Dolomite 400 kg per ha, N 20 kg per ha, P ₂ O ₅ 30 kg per ha, K ₂ O 10 kg per ha. Lime may be applied at the time of the first ploughing. Half the quantity of nitrogen whole of phosphorus and potash may be applied at the time of final ploughing. The remaining nitrogen may be applied 15-20 days after sowing. Fertilizers can be applied in several split doses at fortnightly intervals.
Irrigation	Giving two irrigation is highly beneficial; i.e., at 15 days after sowing and at the time of flowering.
Pest control	Need based application of <i>F. Pallidoroeseum</i> @ 7 x 10 ⁶ /ml specifically for the management of <i>Aphis craccivora</i> . Need based application of neem kernel suspension (NKS) 5 per cent or chlorpyrifos 0.05 per cent at 45 DAS in the case of moderate incidence of <i>A. craccivora</i> , pod borers and a second spray using NKS 5 per cent at 60 DAS if needed against pod borers and pod bug . Adoption of

	mechanical methods of pest control such as application of ash at 10 DAS, keeping yellow sticky trap/ yellow pan tray, collection and destruction of infested leaves, flower buds and pods and sweeping and destruction of the pests. The root-knot nematode and reniform nematode associated with cowpea can be effectively managed by the application of neem and eupatorium leaves @15 t per ha, two weeks before sowing.
Disease identification & remedies	Soil drenching with Bordeaux mixture 1 per cent wherever fungal diseases are prevalent. Spray 1 per cent Bordeaux mixture in early stages to protect the crop from fungal diseases. For protecting the crop from anthracnose , treat the seeds with carbendazim (0.05 per cent) and spray the crop with Bordeaux mixture 1 per cent or carbendazim 0.05 per cent.

Recommended technologies for Snake gourd cultivation

Season	January- March, September- December
Varieties	Kaumudi, Baby, TA-19 and Manusree
Seed rate	3.0-4.0 kg/ha
Spacing & sowing	2.0 m x 2.0 m Pits of 60 cm diameter and 30-45 cm depth are taken. Well rotten FYM and fertilizers are mixed with top soil in the pit and seeds are sown @ 4-5 per pit. Unhealthy plants are removed after two weeks and only 3 plants are retained per pit.
Manuring	Apply FYM @ 20-25 t per ha as basal dose along with half dose of N (35 kg) and full dose of P ₂ O ₅ (25 kg) and K ₂ O (25 kg). The remaining dose of N (35 kg) is applied in several split doses at fortnightly intervals.
Irrigation	During the initial stages of growth irrigate at an interval of 3-4 days. Irrigate on alternate days during flowering and fruiting periods.
Pest control	Fruit Fly: apply carbaryl 10 per cent DP in pit before sowing of seeds to destroy the pupae. In homestead gardens the fruits may be covered with polythene, cloth or paper bags to ensure mechanical protection. In large gardens apply carbaryl 0.2 per cent or malathion 0.15 per cent suspension containing sugar or jaggery at 10 g/l at fortnightly intervals at flowering and fruit initiation. Spray as coarse droplets on the ventral surface of leaves. Removed and destroy affected and decayed fruits. It can also be effectively controlled by use of banana fruit traps coupled with the removal and destruction of infested fruits. It is more efficient than two sprays with insecticides. Traps are to be set at a distance of 2m after a border row and they may be replenished after 7 to 9 days. Start bait trapping just before flowering. Epilachna beetle: Remove and destroy egg masses, grubs and adults occurring on leaves. Spray carbaryl 0.2 per cent. Red pumpkin beetle: Adult beetle eats the leaves, makes hole on foliage and causes damage on roots and leaves. Incorporate carbaryl 10 per cent DP in pits before sowing the seeds to destroy grubs and pupae.

Disease identification & remedies	<p>Downy mildew: It is severe during rainy season. This can be checked by spraying mancozeb 0.2 per cent (waiting period of mancozeb is three days).</p> <p>Mosaic: Control the vectors by spraying dimethoate 0.05 per cent. Uprooting and destruction of affected plants and collateral hosts should be done. (Harvesting can be done only after 10 days of insecticide/fungicide application)</p>
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Recommended technologies for Okra cultivation	
Season	February-March, June-July, October-November
Varieties	Green/ light green fruited: Pusa Sawani, Pusa Makhmali, IARI Selection 2, Kiran, Salkeerthi Red fruited: Co-1, Aruna
Seed rate	8.5 kg/ha for the summer crop sown in February- March and 7 kg/ha for khariff crop
Spacing & sowing	For kharif crop, sow the seeds at a spacing of 60 cm between rows and 45 cm between plants. For the summer crop, soak the seeds in water for 24 hours before sowing and give a spacing of 60 cm x 30 cm
Manuring	Apply FYM or compost as basal dose @ 12 t per ha. At the time of sowing apply N:P ₂ O ₅ :K ₂ O @ 55, 35 and 70 kg per ha. Another 55 kg N per ha. May be applied one month after sowing.
Irrigation	Give pre-sowing irrigation, if soil is not moist enough. During summer, irrigate at intervals of 2 to 3 days.
Pest control	Against jassids , use quinalphos 0.05 per cent as foliar sprays. For controlling fruit and shoot borers , remove all drooping shoots and damaged fruits. Spray carbaryl 0.15 per cent at intervals of 15 to 20 days. For controlling aphids , apply dimethoate 0.05 per cent. For the control of nematodes , apply sawdust or paddy husk at 500 g per plant or neem leaves or <i>Eupatorium</i> leaves at 250 g per plant in basins one week prior to planting and water daily. For managing root knot nematode, seed treatment with <i>Bacillus macerans</i> @ 3 per cent w/w and drenching with <i>B. Macerans</i> @ 3 per cent solution 30 days after sowing.
Disease identification & remedies	Yellow vein mosaic is a common disease in okra, white fly and leaf hoper are vectors of this virus. Use of resistant varieties like Arka Anamika, Arka Abhay and Susthira, and destruction of host weeds are also effective.

Recommended technologies for Pumpkin cultivation	
Season	January- March, September-December

Varieties	Ambili, Suvarna, Saras and Sooraj
Seed rate	1.0 to 1.5 kg per ha
Spacing & sowing	Pits of 60 cm diameter and 30-45 cm depth are taken at a spacing of 4.5 m x 2.0 m. Well rotten FYM and fertilizers are mixed with topsoil in the pit. Four or five seeds are sown per pit. Remove unhealthy plants after 2 weeks and retain three plants per pit.
Manuring	Apply FYM @ 20-25 t per ha as basal dose along with half dose of N (35 kg) and full doses of P ₂ O ₅ (25 kg) and K ₂ O (25 kg). The remaining dose of N (35 kg) can be applied in two equal split doses at the time of vining and at the time of full blooming.
Irrigation	During the initial stages of growth, irrigate at an interval of three or four days. Irrigate on alternate days during flowering and fruiting periods.
Pest control	Fruit Fly: apply carbaryl 10 per cent DP in pit before sowing of seeds to destroy the pupae. In homestead gardens the fruits may be covered with polythene, cloth or paper bags to ensure mechanical protection. In large gardens apply carbaryl 0.2 per cent or malathion 0.15 per cent suspension containing sugar or jaggery at 10 g/l at fortnightly intervals at flowering and fruit initiation. Spray as coarse droplets on the ventral surface of leaves. Removed and destroy affected and decayed fruits. It can also be effectively controlled by use of banana fruit traps coupled with the removal and destruction of infested fruits. It is more efficient than two sprayings with insecticides. Traps are to be set at a distance of 2m after a border row and they may be replenished after 7 to 9 days. Start bait trapping just before flowering. Epilachna beetle: Remove and destroy egg masses, grubs and adults occurring on leaves. Spray carbaryl 0.2 per cent. Red pumpkin beetle: Adult beetle eats the leaves, makes hole on foliage and causes damage on roots and leaves. Incorporate carbaryl 10 per cent DP in pits before sowing the seeds to destroy grubs and pupae.
Disease identification & remedies	Downy mildew: It is severe during rainy season. This can be checked by spraying mancozeb 0.2 per cent (waiting period of mancozeb is three days). Powdery mildew: Can be controlled by spraying dinocap 0.05 per cent. Mosaic: Control the vectors by spraying dimethoate 0.05 per cent. Uprooting and destruction of affected plants and collateral hosts should be done. (Harvesting can be done only after 10 days of insecticide/fungicide application)

Recommended technologies for Ash gourd cultivation

Season	January-March, September- December (For rain fed crop, sowing can also be started after the receipt of the first few showers during May-June)
Varieties	KAU Local, Indu

Seed rate	0.75 to 1.0 kg/ ha
Spacing & sowing	Pits of 60 cm diameter and 30-45 cm depth are taken at 4.5 m x 2.0 m spacing. Well rotten FYM and fertilizers are mixed with topsoil in the pit.
Manuring	Apply FYM @ 20-25 t per ha as basal dose along with half dose of N (35 kg) and full doses of P ₂ O ₅ (25 kg) and K ₂ O (25 kg). The remaining dose of N (35 kg) can be applied in two equal split doses at the time of vining and at the time of full blooming.
Irrigation	During the initial stages of growth, irrigate at an interval of three or four days. Irrigate on alternate days during flowering and fruiting periods.
Pest control	Fruit Fly: apply carbaryl 10 per cent DP in pit before sowing of seeds to destroy the pupae. In homestead gardens the fruits may be covered with polythene, cloth or paper bags to ensure mechanical protection. In large gardens apply carbaryl 0.2 per cent or malathion 0.15 per cent suspension containing sugar or jaggery at 10 g/l at fortnightly intervals at flowering and fruit initiation. Spray as coarse droplets on the ventral surface of leaves. Removed and destroy affected and decayed fruits. It can also be effectively controlled by use of banana fruit traps coupled with the removal and destruction of infested fruits. It is more efficient than two sprayings with insecticides. Traps are to be set at a distance of 2m after a border row and they may be replenished after 7 to 9 days. Start bait trapping just before flowering. Epilachna beetle: Remove and destroy egg masses, grubs and adults occurring on leaves. Spray carbaryl 0.2 per cent. Red pumpkin beetle: Adult beetle eats the leaves, makes hole on foliage and causes damage on roots and leaves. Incorporate carbaryl 10 per cent DP in pits before sowing the seeds to destroy grubs and pupae. Aphids can be controlled by spraying malathion 0.01 per cent or quinalphos 0.05 per cent.
Disease identification & remedies	Downy mildew: It is severe during rainy season. This can be checked by spraying mancozeb 0.2 per cent (waiting period of mancozeb is three days). Powdery mildew: Can be controlled by spraying dinocap 0.05 per cent. Mosaic: Control the vectors by spraying dimethoate 0.05 per cent. Uprooting and destruction of affected plants and collateral hosts should be done. (Harvesting can be done only after 10 days of insecticide/fungicide application)

Recommended technologies for Brinjal cultivation

Season	For rainfed crop, transplant the seedlings during May-June before the onset of South-west monsoon. Planting can also be done during September- October for irrigated crop.
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Varieties	Surya, Swetha and Haritha (bacterial wilt resistant open pollinated varieties), Neelima (bacterial wilt resistant F1 hybrid), Pusa Purple Cluster
Seed rate	370 to 500 g/ha
Spacing & sowing	Brinjal is transplanted vegetable. Seeds are sown in the nursery and one month old seedlings are transplanted to the main field. For sowing the seeds, raised seed beds of 90 to 100 cm width and convenient length are prepared in open space with fertile topsoil to which well decomposed organic matter has been incorporated. After sowing the seeds, mulch with green leaves and irrigate with a rose-can daily in the morning. Remove the mulch immediately after germination of the seeds. Transplanted seedlings may be given temporary shade for 3-4 days during summer. Transplant less spreading varieties like Swetha and Surya at 60 cm x 60 cm. For spreading varieties Haritha and Neelima, provide wider spacing of 75-90 cm x 60 cm.
Manuring	Apply well rotten FYM/ compost @ 20-25 t per ha at the time of land preparation and mix well with soil. A fertilizer dose of 75:40:25 kg N:P ₂ O ₅ :K ₂ O per ha may be given. Half the dose of nitrogen, full phosphorus and half of potash may be applied as basal dose before transplanting. One fourth of nitrogen and half of potash may be applied 20-30 days after planting. The remaining quantities may be applied two months after planting. The economic optimum dose was found to be 60:20:25 kg of N:P ₂ O ₅ :K ₂ O per ha.
Irrigation	Restrict irrigation one week before transplanting and irrigate heavily on the previous day of transplanting. Irrigate at three or four days interval during summer. Stake the plants if necessary.
Pest control	Follow mechanical removal and destruction of pest/ disease affected portions for control of fruit and shoot borer and <i>Phomopsis</i> fruit rot . Spray carbaryl 0.15 per cent at an interval of 15-20 days to control fruit and shoot borer under large scale cultivation. Uproot plants affected by little leaf and spray insecticides for further control. For managing root knot nematode, nursery treatment with <i>bacillus macerans</i> / <i>Paecilomyces lilacinus</i> @ 25 g/m ² + drenching with the same @ 3 per cent solution 7 days after sowing can be recommended.
Disease identification & remedies	Cultivate resistant varieties like Surya, Swetha and Haritha and the hybrid Neelima in bacterial wilt prone area.

Recommended technologies for Chilli cultivation

Season	For a rain fed crop, transplant the seedlings during May- June before the onset of southwest monsoon. Planting can also be done during September- October for an irrigated crop.
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Varieties	High yielding varieties: Jwalasakhi, Jwala, Pant C-1, K-2, Vellayani Athulya and Vellayani Samrudhi (Tolerant to shade and recommended for southern zone of Kerala) Bacterial wilt resistant varieties: Ujwala, Anugraha.
Seed rate	1.0 kg/ ha
Spacing & sowing	Chilli is a transplanted crop. Seeds are sown in the nursery and one month old seedlings are transplanted to the main field. For sowing the seeds, raised seed beds of 90 to 100 cm width and convenient length are prepared to which well decomposed organic matter has been incorporated. After sowing the seeds, mulch with green leaves and irrigate with a rose-can daily in the morning. Remove the mulch immediately after germination of the seeds. Transplant less spreading varieties at 45 cm x 45 cm. For spreading cultivars like white Kanthari provide a wider spacing of 75 cm x 45-60 cm.
Manuring	Apply well rotten FYM/ compost @ 20-25 t per ha at the time of land preparation and mix well with soil. A fertilizer dose of 75:40:25 kg N:P ₂ O ₅ :K ₂ O per ha may be given. Half the dose of nitrogen, full phosphorus and half of potash may be applied as basal dose before transplanting. One fourth of nitrogen and half of potash may be applied 20-30 days after planting. The remaining quantities may be applied two months after planting.
Irrigation	Restrict irrigation one week before transplanting and irrigate heavily on the previous day of transplanting. Irrigate at three or four days interval during summer. Stake the plants if necessary.
Pest control	Spray quinalphos 0.05 per cent for control of mealy bugs and lace wing bugs . Dimethoate at 0.05 per cent is effective for controlling mites, aphids and other sucking insects. Chilli mite: (downward curling of leaves and become brittle and tubular) It can be managed by the application of neem oil 5 per cent and neem oil+garlic emulsion 2 per cent.
Disease identification & remedies	Cultivate resistant varieties like Ujwala and Anugraha in bacterial wilt prone areas. Spray nursery and main field with 1 per cent Bordeaux mixture at monthly intervals during rainy season. Uproot and destroy the plants affected by bacterial wilt and mosaic.

Recommended technologies for Ivy gourd cultivation

Season	Local varieties are grown in May-June and September-October
Varieties	Sulabha
Seed rate	-

Spacing & sowing	Stem cuttings with three or four nodes and 30-40 cm length, selected from high yielding female vines are used as planting material. These are planted at a spacing of 4 m x 3 m.
Manuring	FYM @ 25 kg per pit is given in two doses.
Irrigation	-
Pest control	
Disease identification & remedies	No serious pests or diseases are reported except mild attack of fruit flies and gall insects.

Recommended technologies for Amaranthus cultivation

Season	Throughout the year (Avoid sowing or planting of red leaved varieties during periods of heavy rain)
Varieties	Red: Kannara local, Arun and Krishnasree Green: Co-1, Co-2, Co-3, Mohini and Renusree
Seed rate	1.5 to 2.0 kg/ha
Spacing & sowing	After the land preparation, make shallow trenches of width 30-35cm are made 30 cm apart. Transplant 20-30 day old seedlings at a distance of 20 cm in two rows
Manuring	50 tonnes of FYM per ha. as basal dose before planting. After preparing trenches, apply N:P ₂ O ₅ :K ₂ O @ 50:50:50 kg per ha. Another 50 kg of N can be applied at regular intervals as top dressing. Spraying 1 per cent urea immediately after each harvest will increase the yield.
Irrigation	-
Pest control	-
Disease identification & remedies	Leaf webber attack: As far as possible, avoid use of insecticides or fungicides. In severe cases, spray malathion 0.1 per cent or dust malathion 10 per cent DP.

KAU Package of Practices Recommendations for organic vegetable cultivation

Recommended technologies for Bitter gourd cultivation (Organic)	
Season	Rained: May-August, Irrigated: January-March & September-December
Varieties	Priya, Preethi, Priyanka.
Seed rate	5.0-6.0 kg per ha.
Spacing & sowing	2.0 m x 2.0 m
Manuring	Pits of 60 cm diameter and 30-40 cm depth are taken. Well rotten FYM or other organic manure (12t/ha) is mixed with top soil in the pit and seeds are sown @ 4-5 per pit. Unhealthy plants are removed after two weeks and only 3 plants are retained per pit. Apply anyone of the following manure depending upon the availability: FYM/ Cow dung- 8t/ha or Compost- 8t/ha or Vermicompost- 4t/ha or Greenleaf- 8t/ha. Manures are applied in 2splits at winding and flowering stage. Apply fresh cowdung slurry @1Kg/litre of water at fortnightly intervals starting from flowering.
Irrigation	During the initial stages of growth, irrigate at 2-3 days interval and alternate days during flowering/ fruiting. Irrigation at 15 mm CPE (approximately at 3 days interval for sandy loam soils) is more economical than irrigating once in two days especially during summer months for water economy.
Pest control	Fruit Fly: (i)Cover the fruits (ii)Remove and destroy infested fruits (iii)Apply neem cake 250Kg/ha (100g/pit) at planting and one month later (iv)Use any of the following fruit fly traps- Fish meal trap/ Fruit fly trap using banana pulp/Trap adult fruit flies using cue lure plywood blocks containing 6:4:1 mixture of ethyl alcohol: cue lure: Malathion/ Trap adult fruit flies using food baits/ set yellow painted coconut shell traps containing carbofuran smeared banana pieces (Palayankodan) at 2m spacing at the start of flowering till final harvest. The traps are to be replenished once in seven days (v)Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP (vi)Spraying of leaf extract of <i>Ailanthus</i> 10% and cashew 10% in combination is effective. Aphids, Green Jassid, White fly and Mite: (i)Spray 2% neem oil+ garlic emulsion spray (ii)Dissolve 60g soap in 150ml warm water, add soap solution to neem oil and castor oil slowly and mix well. Dilute with 6litre of water. Add 120g garlic paste. Take the extract and spray (iii)Apply 1.5% fish oil soap (iv)For preventing mite, plant hoppers and jassids, apply 10% magnesium sulphate on leaves, which will provide strength for plants. Leaf and flower feeder (<i>Diaphania sp.</i>): Collect and destroy larvae. Spray, solution containing 1 litre cow's urine + 10g bird chilli + 9 litres water. Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP. Spraying of leaf extract of <i>Ailanthus</i> 10% and cashew 10% in combination is effective.. American Serpentine leaf miner: Spray neem seed kernel emulsion (4%) before 8' O Clock in the morning.

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	<p>Epilachna beetle: (i) Remove and destroy egg masses, grubs and adults occurring on leaves (ii) Use predator (<i>Chrysocaries johnsoni</i>) of larvae and pupae (iii) Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP (iv) Spray 2% neem oil + garlic emulsion spray (v) Spray leaf extract of <i>Ailanthus</i> and cashew (10%).</p> <p>Mosaic: Uprooting and destruction of affected plants and collateral hosts should be done. Spraying neem based insecticide (2%) to control the vector.</p>
Disease identification & remedies	
Recommended technologies for Vegetable cow pea (yard long bean) cultivation (Organic)	
Season	<p>1) Cowpea can be grown during any season.</p> <p>2) As a rainfed crop, sowing is done in the month of June. The most suitable time is after the first week of June.</p> <p>3) During the second crop season (rabi), i.e., September to December, cowpea can be grown as a fringe crop along the rice field bunds. Sowing can be done on either side of bunds on the day of transplanting the paddy crop.</p> <p>4) During summer, cowpea can be grown as a pure crop in rice fallows after the harvest of paddy.</p>
Varieties	<p>(Vegetable type)</p> <p>1) Bushy: Pusa Barsathi, Pusa Komal</p> <p>2) Semitrailing: Kairali, Varun, Anaswara, Kanakamony (PTB-1), Arka Garima</p> <p>3) Trailing type: Sharika, Malika, Lola, Vjayanathi, Vellayani Jyothika</p>
Seed rate	Bush: 20-25 kg/ha, Trailing: 4-5 kg/ha
Spacing & sowing	<p>Plough the land thoroughly 2-3 times and remove weeds and stubbles.</p> <p>Bush: 30 cm between rows x 15 cm between plants, Semi trailing: 45 x 30 cm, Trailing: 2 m x 2 m (on pandal @ three plants per pit) in channels at 1.5 m x 45 cm spacing for trailing on trellis.</p> <p>Seeds should be inoculated with <i>Rhizobium</i> and pelleted with lime.</p>
Manuring	FYM 20 t per ha, Lime 250 kg per ha or Dolomite 400 kg per ha, Lime may be applied at the time of the first ploughing. In addition, apply any of the following combination as supplement- FYM/ Cow dung @ 2 t/ha + Rock phosphate 100 kg/ha or Compost @ 4 t/ha + Rock phosphate 70 kg/ha or Vermi compost @ 2 t/ha + Rock Phosphate 110 kg/ha or Greenleaf @ 3.5 t/ha + Rock phosphate 100 kg/ha

	<p>or Poultry manure @ 1.5 t/ha + Rock phosphate 50 kg/ha (Note: The quantity of Rock phosphate can be reduced to 50% by priming it with the manures and the entire quantity of rock phosphate should be applied as basal dose). The additional organic manures can be applied in splits at fortnightly interval.</p>
Irrigation	<p>Ensure steady supply of water. Avoid too heavy irrigation as it encourages profuse vegetative growth. Irrigation at the flowering stage induces better flowering and fruit set.</p>
Pest control	<p>Pea aphid: This is a major sucking pest. Spray Neemazal T/S 1% @ 2ml/ litre at fortnightly intervals for managing pea aphid in cowpea. The fungus <i>Fusarium pallidoreseum</i> can be used for controlling pea aphid. Bran based fungus can be applied @ 3 kg per 400 m² immediately after infestation is observed. Only one application is necessary. <i>Hyptis suaveolens</i> extract (1 litre) + 60 g soap (in half litre water), dilute the mixture 10 times and spray. Spray leaf extract of <i>Strychnos nuxvomica</i> + soap. Dilute with water and spray.</p> <p>Jassids and white flies: Spray neem seed kernel extract 5%</p> <p>American Serpentine leaf miner: This is the major pest of cow pea. Adoption of the following methods will reduce the infestation of the pest. (i) Destruction of the weed host plants viz. <i>Achyranthus aspera</i>, <i>Amaranthus viridis</i>, <i>Cleome viscosa</i>, <i>Heliotropium indicum</i> and <i>Physalis minima</i>. (ii) Need based application of neem oil, marotti oil or illupai oil @ 2.5%. (iii) Cultivate tolerant accession (VU-12).</p> <p>Pod borers: Spray diluted cow's urine+asafoetida+bird chilli extract, Apply neem cake @ 250 kg/ha at flowering, Apply neem seed kernel extract 5%</p> <p>Leaf folder: Collect leaf folds and destroy the larvae.</p> <p>Pod bugs: Collect with sweep net and destroy different stages of the bug, Wet the crop canopy to destroy the young ones, Destroy weed host plants, Spray amruth neem 5ml/litre, Spray nimbecidin 2 ml/ litre or neemazal 2 ml/ litre or neem seed kernel extract 5 %.</p> <p>Pea stem fly: Increase seed rate in endemic areas.</p> <p>Red spider mite: Apply neem oil 5%/ neem oil garlic emulsion 2%/ garlic emulsion 2%/ fish oil soap 2.5%</p> <p>Root knot nematode and reniform nematode: Apply neem or <i>Eupatorium</i> leaves @ 15 t/ha, two weeks before sowing.</p> <p>Pulse beetle: Smear the seeds with coconut oil or ground nut oil 1:100 (W/W), Apply dry, powdered rhizome of <i>Acorus calamus</i> @ 1kg/100kg seed.</p>
Disease identification & remedies	<p>Soil borne diseases and nematodes: Follow soil solarisation using 150-gauge clear polythene sheets. Cover the soil with these sheets in sunny summer days after slightly moistening the soil. The soil temperature will reach as high as 52^oC. Continue the polymulch for one week during which the soil temperature will rise and kill the soil borne fungi, bacteria, nematodes and weeds near the soil surface and thereby reduce the soil inoculum load. Soil drenching with 1% Bordeaux mixture or 2% Pseudomonas protects the crop from fungal diseases.</p> <p>Collar rot and web blight: Apply neem cake @ 25 kg/ha, Reduce soil moisture, Use organic manure enriched with <i>Trichoderma viride</i></p>

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and drench with 2% *Pseudomonas*

Fusarium wilt: Burn trashes in the pit before sowing. Remove and burn the affected plants along with the root system. Seed treatment with *Trichoderma viride* @ 2 g/kg seed + soil application 2.5 kg/ha at 30 DAS coupled with soil application of neem cake @ 150 kg/ha at the time of land preparation reduce the incidence of *Fusarium* wilt. Drenching with 2% *Pseudomonas*.

Dry root rot: Treat the seed with *Trichoderma viride* @ 4g/kg, *Pseudomonas fluorescens* @10g/kg or soil application of neem cake @ 250 kg/ha. Soil drenching with 2 % (20 g/ litre) *Pseudomonas*.

Recommended technologies for Snake gourd cultivation (Organic)

Season	Rainfed: May-August, Irrigated: January-March & September-December
Varieties	Kaumudi, Baby, TA-19 and Manustree
Seed rate	3.0-4.0 kg/ha
Spacing & sowing	2.0 m x 2.0 m
Manuring	Pits of 60 cm diameter and 30-40 cm depth are taken. Well rotten FYM or other organic manure (12t/ha) is mixed with top soil in the pit and seeds are sown @ 4-5 per pit. Unhealthy plants are removed after two weeks and only 3 plants are retained per pit.
Irrigation	Apply anyone of the following manure depending upon the availability: FYM/ Cow dung- 8t/ha or Compost- 8t/ha or Vermicompost- 4t/ha or Greenleaf- 8t/ha. Manures are applied in 2splits at winding and flowering stage. Apply fresh cowdung slurry @1Kg/litre of water at fortnightly intervals starting from flowering.
Pest control	During the initial stages of growth, irrigate at 2-3 days interval and alternate days during flowering/ fruiting. Irrigation at 15 mm CPE (approximately at 3 days interval for sandy loam soils) is more economical than irrigating once in two days especially during summer months for water economy. Fruit Fly: (i)Cover the fruits (ii)Remove and destroy infested fruits (iii)Apply neem cake 250Kg/ha (100g/pit) at planting and one month later (iv)Use any of the following fruit fly traps- Fish meal trap/ Fruit fly trap using banana pulp/Trap adult fruit flies using cue lure plywood blocks containing 6:4:1 mixture of ethyl alcohol: cue lure: Malathion/ Trap adult fruit flies using food baits/ set yellow painted coconut shell traps containing carbofuran smeared banana pieces (Palayankodan) at 2m spacing at the start of flowering till final harvest. The traps are to be replenished once in seven days (v)Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP Aphids, Green Jassid, White fly and Mite: (i)Spray 2% neem oil+ garlic emulsion spray (ii)Dissolve 60g soap in 150ml warm water, add soap solution to neem oil and castor oil slowly and mix well. Dilute with 6litre of water. Add 120g garlic paste. Take the extract and spray (iii)Apply 1.5% fish oil soap (iv)For preventing mite, plant hoppers and jassids, apply 10% magnesium sulphate on leaves, which

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	<p>will provide strength for plants.</p> <p>Leaf and flower feeder (<i>Diaphania sp.</i>): Collect and destroy larvae. Spray, solution containing 1 litre cow's urine + 10g bird chilli + 9 litres water. Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP. American Serpentine leaf miner: Spray neem seed kernel emulsion (4%) before 8' O Clock in the morning.</p> <p>Epilachna beetle: (i) Remove and destroy egg masses, grubs and adults occurring on leaves (ii) Use predator (<i>Chrysocaries johnsoni</i>) of larvae and pupae (iii) Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP (iv) Spray 2% neem oil+ garlic emulsion spray (v) Spray leaf extract of <i>Ailanthus</i> and cashew (10%).</p> <p>Mosaic: Uprooting and destruction of affected plants and collateral hosts should be done. Spraying neem based insecticide (2%) to control the vector.</p>
Disease identification & remedies	

Recommended technologies for Okra cultivation (Organic)

Season	January-February, May-June and September-October
Varieties	Green/ light green fruited: Pusa Sawani, Kiran, Salkeerthi, Susthira, Arka Anamika Red fruited: Co-1, Aruna Yellow vein mosaic resistant/ tolerant varieties: Arka Anamika, Arka Abhay, Susthira, P7, Varsha Uphar (all green fruited).
Seed rate	8.5 kg/ha for the summer crop sown in January-February and 7 kg/ha for <i>kharif</i> crop
Spacing & sowing	For kharif crop, sow the seeds at a spacing of 60 cm between rows and 45 cm between plants. For the summer crop give a spacing of 60 cm x 30 cm. 45 cm x 45 cm spacing is also found ideal.
Manuring	Apply lime @ 500 kg/ha based on the acidity of soil 15 days before sowing. Apply FYM or compost @ 25 t/ha as basal dose. <i>Trichoderma</i> , PGPR mix 1 @ 2.5 kg/ha each are mixed with the FYM and keep for 15 days at cool atmosphere. These are applied to the soil as basal along with <i>Pseudomonas</i> @ 2 kg/ha.
Irrigation	Give pre-sowing irrigation, if soil is not moist enough. During summer, irrigate at intervals of 2 to 3 days.
Pest control	Jassids: Use neem oil- garlic mixture (2%) / nimbicidine (2ml/litre) / econeem (2ml/litre) / uneem (2ml/litre). Lemon grass suspension (10%) can also be used for the control. Fruit and shoot borer: (i) Remove and destroy affected shoots and fruits, (ii) Spray with neem kernel suspension (5%) / garlic suspension (10%) / neem leaf extract (4%), (iii) Use <i>Trichogramma chilonis</i> and <i>Trichogramma japonicum</i> @ 1 card each/5 cents followed by <i>Bacillus thuringiensis</i> spray (Delphin/Bioasp/Halt-0.7 ml/litre), (iv) Apply <i>Beauveria bassiana</i> 10% WP.

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	<p>Bhindi leaf roller: (i) Collect and destroy the leaf rolls, (ii) Apply <i>Beauveria bassiana</i> 10% WP.</p> <p>Root knot nematode: (i) Apply neem leaves or <i>Eupatorium</i> leaves @ 250g/plant in basins one week prior to planting and water daily. The effect of this treatment persists upto 75 days after sowing in summer season (ii) Apply neem cake/castor cake @ 1 t/ha or growing of marigold (trapcrop) in between okra plants. (iii) Seed treatment with <i>Bacillus macerans</i> @ 3% w/w (2.5 kg/ha) and in heavily infested are, seed treatment with <i>B. macerans</i> @ 3% w/w and drenching with <i>B. macerans</i> @ 3 % solution 30 days after sowing.</p> <p>Yellow vein mosaic is a common disease in okra, white fly and leaf hoper are vectors of this virus. Use of resistant varieties like Arka Anamika, Arka Abhay and Susthira, and destruction of host weeds are also effective. Spraying neem oil- garlic mixture (2%) or nimbicidine/econeem/uneem (2ml/litre) is also effective.</p>
Disease identification & remedies	

Recommended technologies for Pumpkin cultivation (Organic)	
Season	Rainfed: May-August, Irrigated: January-March & September-December
Varieties	Ambili, Suvarna, Saras
Seed rate	1.0 to 1.5 kg per ha
Spacing & sowing	Pits of 60 cm diameter and 30-45 cm depth are taken at a spacing of 4.5 m x 2.0 m. Well rotten FYM or other organic manure (12t/ha) is mixed with top soil in the pit and seeds are sown @ 4-5 per pit. Unhealthy plants are removed after two weeks and only 3 plants are retained per pit.
Manuring	Apply anyone of the following manure depending upon the availability: FYM/ Cow dung- 8t/ha or Compost- 8t/ha or Vermicompost- 4t/ha or Greenleaf- 8t/ha. Manures are applied in 2splits at winding and flowering stage. Apply fresh cowdung slurry @1Kg/litre of water at fortnightly intervals starting from flowering.
Irrigation	During the initial stages of growth, irrigate at an interval of three or four days. Irrigate on alternate days during flowering and fruiting periods.
Pest control	Fruit Fly: (i)Cover the fruits (ii)Remove and destroy infested fruits (iii)Apply neem cake 250Kg/ha (100g/pit) at planting and one month later (iv)Use any of the following fruit fly traps- Fish meal trap/ Fruit fly trap using banana pulp/Trap adult fruit flies using cue lure plywood blocks containing 6:4:1 mixture of ethyl alcohol: cue lure: Malathion/ Trap adult fruit flies using food baits/ set yellow painted coconut shell traps containing carbofuran smeared banana pieces (Palayankodan) at 2m spacing at the start of flowering till final harvest. The traps are to be replenished once in seven days (v)Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP

	<p>Aphids, Green Jassid, White fly and Mite: (i) Spray 2% neem oil+ garlic emulsion spray (ii) Dissolve 60g soap in 150ml warm water, add soap solution to neem oil and castor oil slowly and mix well. Dilute with 6litre of water. Add 120g garlic paste. Take the extract and spray (iii) Apply 1.5% fish oil soap (iv) For preventing mite, plant hoppers and jassids, apply 10% magnesium sulphate on leaves, which will provide strength for plants.</p> <p>Leaf and flower feeder (<i>Diaphania sp.</i>): Collect and destroy larvae. Spray, solution containing 1 litre cow's urine + 10g bird chilli + 9 litres water. Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP. American Serpentine leaf miner: Spray neem seed kernel emulsion (4%) before 8' O Clock in the morning.</p> <p>Epilachna beetle: (i) Remove and destroy egg masses, grubs and adults occurring on leaves (ii) Use predator (<i>Chrysocaries johnsoni</i>) of larvae and pupae (iii) Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP (iv) Spray 2% neem oil+ garlic emulsion spray (v) Spray leaf extract of <i>Ailanthus</i> and cashew (10%).</p> <p>Mosaic: Uprooting and destruction of affected plants and collateral hosts should be done. Spraying neem based insecticide (2%) to control the vector.</p>
Disease identification & remedies	

Recommended technologies for Ash gourd cultivation (Organic)

Season	Rainfed: May-August, Irrigated: January-March & September-December
Varieties	KAU Local, Indu
Seed rate	0.75 to 1.0 kg/ ha
Spacing & sowing	Pits of 60 cm diameter and 30-45 cm depth are taken at 4.5 m x 2.0 m spacing. Well rotten FYM or other organic manure (12t/ha) is mixed with top soil in the pit and seeds are sown @ 4-5 per pit. Unhealthy plants are removed after two weeks and only 3 plants are retained per pit.
Manuring	Apply any one of the following manure depending upon the availability: FYM/ Cow dung- 8t/ha or Compost- 8t/ha or Vermicompost- 4t/ha or Greenleaf- 8t/ha. Manures are applied in 2 splits at winding and flowering stage. Apply fresh cowdung slurry @ 1Kg/litre of water at fortnightly intervals starting from flowering.
Irrigation	During the initial stages of growth, irrigate at an interval of three or four days. Irrigate on alternate days during flowering and fruiting periods.
Pest control	Fruit Fly: (i) Cover the fruits (ii) Remove and destroy infested fruits (iii) Apply neem cake 250Kg/ha (100g/pit) at planting and one month later (iv) Use any of the following fruit fly traps- Fish meal trap/ Fruit fly trap using banana pulp/ Trap adult fruit flies using cue lure

Disease identification & remedies	<p>plywood blocks containing 6:4:1 mixture of ethyl alcohol: cue lure: Malathion/ Trap adult fruit flies using food baits/ set yellow painted coconut shell traps containing carbofuran smeared banana pieces (Palayankodan) at 2m spacing at the start of flowering till final harvest. The traps are to be replenished once in seven days (v)Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP</p> <p>Aphids, Green Jassid, White fly and Mite: (i)Spray 2% neem oil+ garlic emulsion spray (ii)Dissolve 60g soap in 150ml warm water, add soap solution to neem oil and castor oil slowly and mix well. Dilute with 6litre of water. Add 120g garlic paste. Take the extract and spray (iii)Apply 1.5% fish oil soap (iv)For preventing mite, plant hoppers and jassids, apply 10% magnesium sulphate on leaves, which will provide strength for plants.</p> <p>Leaf and flower feeder (<i>Diaphania sp.</i>): Collect and destroy larvae. Spray, solution containing 1 litre cow's urine + 10g bird chilli + 9 litres water. Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP. American Serpentine leaf miner: Spray neem seed kernel emulsion (4%) before 8' O Clock in the morning.</p> <p>Epilachna beetle: (i)Remove and destroy egg masses, grubs and adults occurring on leaves (ii)Use predator (<i>Chrysocaries johnsoni</i>) of larvae and pupae (iii) Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP (iv)Spray 2% neem oil+ garlic emulsion spray (v)Spray leaf extract of <i>Ailanthus</i> and cashew (10%).</p> <p>Mosaic: Uprooting and destruction of affected plants and collateral hosts should be done. Spraying neem based insecticide (2%) to control the vector.</p>
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Recommended technologies for Brinjal cultivation (Organic)	
Season	May-June (before south-west monsoon)/ Sept-Oct (for an irrigated crop). Can be grown throughout the year.
Varieties	Surya, Swetha and Haritha (bacterial wilt resistant open pollinated varieties), Neelima (bacterial wilt resistant F1 hybrid), Pusa Purple, Cluster
Seed rate	370 to 500 g/ha
Spacing & sowing	Brinjal is transplanted vegetable. Seeds are sown in the nursery and one month old seedlings are transplanted to the main field. (An area of 2.5 cents (0.01 ha) required for raising seedlings for one hectare. For sowing the seeds, raised seed beds of 90 to 100 cm width and convenient length are prepared in open space with fertile topsoil to which well decomposed organic matter has been incorporated. For this add one kilogram of Trichoderma to 100kg of dried farmyard manure and 10kg of neem cake spread under shade to which water is sprinkled for maintaining moisture. Keep the mixture for fifteen days with intermittent turning. To the nursery soil, add 1kg of PGPR mix at the time of bed preparation. After sowing the seeds, mulch with green leaves and irrigate with a rose can daily in the morning. At the

	<p>time of irrigation, add <i>Pseudomonas fluorescens</i> @20g/litre at frequent intervals. Remove the mulch immediately after germination of the seeds. Addition of diluted (25g/litre) cow dung slurry or cow urine (diluted 8 times) increase the vigour of the seedlings. Restrict the irrigation one week before transplanting and irrigate heavily on the previous day of transplanting).</p> <p>For spreading varieties Haritha and Neelima, provide wider spacing of 75-90 cm x 60 cm.</p> <p>Apply lime @ 500 kg/ha based on the acidity of soil 15 days before transplanting. Apply FYM or compost @ 25t/ha as basal dose to which <i>Trichoderma</i> and PGPR mix ! each @ 2.5kg/ha are mixed and kept for 15 days in shade. Apply <i>Pseudomonas</i> and AMF at the time of transplanting. Instead of FYM, poultry or powdered goat manure @ 1 t/ha can be applied. Dip the roots in 2% <i>Pseudomonas</i> or PGPR mix 1 before transplanting to the field.</p>
Manuring	<p>Restrict irrigation one week before transplanting and irrigate heavily on the previous day of transplanting. Give pre-transplanting irrigation if the soil is not moist enough. Irrigate at three or four days interval during summer. Stake the plants if necessary.</p>
Irrigation	<p>Shoot and fruit borer: Protect the seedling in the nursery with net. Mechanical hand picking and destruction of the affected part along with the larvae. Place pheromone traps @ 100 nos. /ha. Spray neem-garlic emulsion(2%). Spray Bt available as Dipel, Delphin, Halt, Bioasp, Biolep (0.7 ml/litre). Use S-NPV (250 LE/ha). Spray leaf extract of ailanthus and cashew (10%).</p> <p>Red spider mite: Spray water using sprayer. Spray rice gruel water on under surface of leaves. Spray castor oil- soap emulsion or neem oil-garlic emulsion (2%).</p> <p>Hopper: Spray neem-garlic emulsion (2%) or products like Nimbicidin/ Econeem/ Uneem (2ml/litre). Spraying of lemon grass/ ginger extract (10%) is also effective.</p> <p>Epilachna beetle: Spray soap-garlic-castor oil emulsion (2%). Collect and kill all stages of the pests. Spray Clerodendron plant extract 4-8% or Custard apple seed extract 2-5 %</p> <p>Nematode: Apply Eupatorium and neem leaves, neem cake, rise husk, wood shavings, castor cake @ of 100g/m². Apply VAM, Plant Growth Promoting Rhizobacteria, Paccilomyces to soil @ 2kg/ha. Seed treatment with <i>Bacillus macerans</i> @3% w/w (2.5kg/ha) and drenching with <i>B. Macerans</i> @ 3% solution 30 days after sowing.</p>
Pest control	<p>Cultivate resistant varieties like Surya, Swetha and Haritha and the hybrid Neelima in bacterial wilt prone area.</p>
Disease identification & remedies	

Recommended technologies for Chilli cultivation (Organic)

Season	May-June (before south-west monsoon)/ Sept-Oct (for an irrigated crop). Can be grown throughout the year.
Varieties	High yielding varieties: Jwalasakhi, Jwala, Jwalamughi, Pant C-1, K-2, Bacterial wilt resistant varieties: Ujwala, Anugraha.
Seed rate	1.0 kg/ ha
Spacing & sowing	Chilli is a transplanted crop. Seeds are sown in the nursery and one month old seedlings are transplanted to the main field. (An area of 2.5 cents (0.01 ha) required for raising seedlings for one hectare. For sowing the seeds, raised seed beds of 90 to 100 cm width and convenient length are prepared in open space with fertile topsoil to which well decomposed organic matter has been incorporated. For this add one kilogram of Trichoderma to 100kg of dried farmyard manure and 10kg of neem cake spread under shade to which water is sprinkled for maintaining moisture. Keep the mixture for fifteen days with intermittent turning. To the nursery soil, add 1kg of PGPR mix at the time of bed preparation. After sowing the seeds, mulch with green leaves and irrigate with a rose can daily in the morning. At the time of irrigation, add <i>Pseudomonas fluorescens</i> @20g/litre at frequent intervals. Remove the mulch immediately after germination of the seeds. Addition of diluted (25g/litre) cow dung slurry or cow urine (diluted 8 times) increase the vigour of the seedlings. Restrict the irrigation one week before transplanting and irrigate heavily on the previous day of transplanting). Transplant less spreading varieties at 45 cm x 45 cm. For spreading cultivars like white Kanthari provide a wider spacing of 75 cm x 45-60 cm.
Manuring	Apply lime @ 500 kg/ha based on the acidity of soil 15 days before transplanting. Apply FYM or compost @ 25t/ha as basal dose to which <i>Trichoderma</i> and PGPR mix 1 @ 2.5kg/ha are mixed and kept for 15 days in shade. Apply <i>Pseudomonas</i> and AMF at the time of transplanting. Instead of FYM, poultry or powdered goat manure @ 1 t/ha can be applied. Dip the roots in 2% <i>Pseudomonas</i> or PGPR mix 1 before transplanting to the field.
Irrigation	Restrict irrigation one week before transplanting and irrigate heavily on the previous day of transplanting. Give pre-transplanting irrigation if the soil is not moist enough. Irrigate at three or four days interval during summer. Stake the plants if necessary.
Pest control	Aphids: Spray tobacco decoction or neem oil-garlic emulsion (2%) or <i>Nattapoochedi</i> (<i>Hyptis suaveolens</i>) emulsion (10%). Spray <i>Verticillium lecaniae</i> or <i>Fusarium pallidroseum</i> (10^{10} conidia/litre). Release green lacewing bugs @ 50,000 eggs/ha. Jassids: Spray neemoil-garlic emulsion (2%) or lemon grass/ginger extract (10%). Thrips: Spray Kiriyaith (<i>Andrographis paniculata</i>) extract (10%). Mite: Apply neem oil 5% or neem oil+ garlic emulsion 2%. Spray diluted rice water once in 10 days against mite. White Fly: Spray <i>Verticillium lecaniae</i> (10^{10} conidia/litre) or garlic emulsion (2%). Place sticky yellow traps. Nematode: Apply Eupatorium and neem leaves, neem cake, rice husk, wood shavings, castor cake @ of 100g/m ² . Apply VAM, Plant Growth Promoting Rhizobacteria, Paccilomyces to soil @ 2kg/ha. Seed treatment with <i>Bacillus macerans</i> @3% w/w (2.5kg/ha) and

	drenching with <i>B. Macerans</i> @ 3% solution 30 days after sowing.
Disease identification & remedies	<p>Leaf spot: Spray <i>Pseudomonas fluorescence</i> (2%). Spray Bordeaux mixture (1%).</p> <p>Bacterial wilt: Cultivate resistant varieties (KAU). Use lime in the field. Soil application of <i>Pseudomonas fluorescence</i> or PGPR mix II @ 20g/litre at 15 days interval. Seedling root dip and foliar spray of <i>Pseudomonas fluorescence</i> 1-2%.</p> <p>Leaf curl virus: Spray neem based insecticides (2ml/litre) to control the vectors.</p>

Recommended technologies for Ivy gourd cultivation (Organic)	
Season	Local varieties are grown in May-June and September-October
Varieties	Sulabha, Padappai
Seed rate	-
Spacing & sowing	Stem cuttings with three or four nodes and 30-40 cm length, selected from high yielding female vines are used as planting material. These are planted at a spacing of 4 m x 3 m.
Manuring	Apply anyone of the following manure depending upon the availability: FYM/ Cow dung- 8t/ha or Compost- 8t/ha or Vermicompost- 4t/ha or Greenleaf- 8t/ha. Manures are applied in 2splits at winding and flowering stage. Apply fresh cowdung slurry @1Kg/litre of water at fortnightly intervals starting from flowering.
Irrigation	-
Pest control	No serious pests or diseases are reported except mild attack of fruit flies and gall insects.
Disease identification & remedies	<p>Fruit Fly: (i)Cover the fruits (ii)Remove and destroy infested fruits (iii)Apply neem cake 250Kg/ha (100g/pit) at planting and one month later (iv)Use any of the following fruit fly traps- Fish meal trap/ Fruit fly trap using banana pulp/Trap adult fruit flies using cue lure plywood blocks containing 6:4:1 mixture of ethyl alcohol: cue lure: Malathion/ Trap adult fruit flies using food baits/ set yellow painted coconut shell traps containing carbofuran smeared banana pieces (Palayankodan) at 2m spacing at the start of flowering till final harvest. The traps are to be replenished once in seven days (v)Apply <i>Beauveria bassiana</i> 10% WP and <i>Paecilomyces lilacinus</i> 5% WP</p>

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Recommended technologies for Amaranthus cultivation (Organic)

Season	Though it can be grown throughout the year, summer is found to be the best season.
Varieties	Red: Kannara local (season bound variety- which comes to flowering in November-December), Arun and Krishnasree Green: Co-1, Co-2, Co-3, Mohini Mixed type: Renustree
Seed rate	1.5 to 2.0 kg/ha
Spacing & sowing	Prepare the land by ploughing or digging followed by levelling. Shallow trenches of width 30-35cm are made 30 cm apart. Transplant 20-30 day old seedlings at a distance of 20 cm in two rows. During rainy season planting shall be done on raised beds. Before planting, dip the roots of the seedlings in a solution containing <i>Pseudomonas</i> 20 g/litre for 20 minutes.
Manuring	Apply FYM or compost @ 25 t/ha as basal dose. <i>Trichoderma</i> , PGPR mix 1 @ 2.5 kg/ha each are mixed with the FYM and keep for 15 days at cool atmosphere. These are applied to the soil as basal along with <i>Pseudomonas</i> @ 2 kg/ha. Top dressing can be done with any of the following manures at 7-10 days interval. (i) Soil application of fresh cowdung slurry @ 1 kg/10 litres (50 kg/ha) (ii) Application of biogas slurry @ 1 kg/ 10 litres (50 kg/ha) (iii) Application of cow's urine 500 litres/ha (8 times dilution) (iv) Application of vermicompost- 500 litres / ha (8 times dilution) (v) Application of vermicompost- 1 t/ha (vi) Application of ground nut cake-1kg / 10 litres (50 kg/ha)
Irrigation	During summer irrigate @ intervals of 2 to 3 days.
Pest control	Leaf webber and leaf roller can be controlled mechanically by collecting and destroying them. Dipel or Halt(0.7 ml/litre) can be sprayed for controlling leaf webber. Apply 4% leaf extract of neem, thevetia or clerodendron with soap water.
Disease identification & remedies	Leaf spot is a serious disease in rainy season and it can be controlled to a certain extent through an integrated approach. (i) Grow leaf spot resistant varieties like Co-1, (ii) Seed treatment with <i>Pseudomonas</i> 8g/kg of seed, (iii) Soil application of <i>Trichoderma</i> as enriched cowdung/ neem cake manure, (iv) One kg of fresh cowdung is put in 10 litres of water and the clear solution after filtering the supernatant liquid is sprayed at regular intervals, (v) Soil application of green manures like sunhemp/glyricidia+neemcake (100 kg/ha)+ <i>Trichoderma</i> (1-2 kg/ha) is found to be effective against leafspot disease.

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