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A Study on Adoption Pattern for Technology Driven Horticulture Business Practices in Kerala

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I. Abstract

Horti business covers a broad spectrum of activities which mainly generate revenue from horticultural activities connected with production, processing and distribution of horticultural commodities. Traditionally horticulture is defined as any economic activity which deals with the cultivation, processing and marketing of fruits, vegetables, nuts and ornamental plants. There is a need for shifting from resource based conventional horticultural practices to technology based modern Horti-business practices in order to find solution for the worsening agrarian crisis in the economy. Researchers and policy formulators are now recognising technology driven Horti business as a priority segment for the sustainable development in horticulture. The state of Kerala is blessed with various favourable factors for horticultural entrepreneurship. This study attempts to examine the extent to which technological innovations are employed in the state of Kerala with special reference to the vegetable farm cultivators.

Keywords: Horti business, Hi-tech practices, Entrepreneurship

II. Introduction

Post globalization period in India witnessed radical changes in the entire economic structure of the country. Innovations and advancements in the field of technology brought tremendous changes in the strategy and policy orientations in the three major sectors of the economy namely agriculture, industry and service sector. Compared to the other two sectors, technological adaptation and subsequent changes in farming strategies is slow in the country. “The current agricultural practices are neither economically and environmentally sustainable and India’s yield for many agricultural commodities are low” (Dwivedy, 2011). But still continuous

effort is made especially by the researchers and policy formulators to encourage the cultivators in shifting towards hi-tech practices in agriculture.

Horticulture industry now days considered as one of the crucial segments in agriculture sector in terms of potential for further growth, value addition and employment generation and agri-business development. Horticulture can defined as the “science of growing and management of fruits, vegetables including tubers, ornamental, medicinal and aromatic crops, spices, plantation crops, mushrooms, bamboo- their processing, value addition and marketing” (Chadha and Choudhary, 2007).

Concept of horticulture business involves two specific terms ‘horticulture” and business. Any economic activity which is concerned with the production and distribution of goods and services with the intention of making profit comes under business. Thus, horticulture business can be defined as economic activities concerned with the production (‘Cultivation’ in agricultural terms) and distribution of horticultural crops and associated services. Numerous entrepreneurial and employment opportunities exist in connection with horticulture business in which nursery growers, garden centre employee, poly house operator etc. can be quoted as some of the examples to exhibit the diverse and varied scope of the sector (Carrol, Shry, & Edward Reiley, 2015). The horticultural goods may be either in their primary raw form like banana or as value added products through further processing like pickles.

The land of Kerala which is blessed with fertile land resources and skilful labour resource, both of which gives the state added advantage to make substantial gains from agribusiness. Rich and fertile soil, abundance of rainfall, moderate temperature range etc are all favourable factors to enhance agricultural yield and state in the economy. But agricultural sector in the state is showing a negative growth during the last few years which implies that agriprenurial opportunities in the state is not properly exploited. Technology driven horti business ventures are gradually becoming popular all around the world as a potential solution to enhance horticultural productivity by focussing on cost reduction on one hand yield enhancement on the other. This study highlights the adoption pattern for technology driven Horti business practices among the vegetable farm cultivators in Kerala.

III. Review of Literature

Raj Jaswal, Shiva Seth, Abhijt Das and Paurnami Ray(2020) in their study observed that there are ample opportunities for the agribusiness segment to flourish in India as there is enough demand in the market. Outdated technology and lack of trained personnel are involved among the major constraints they pointed out with regard to the challenges of agribusiness in India.

Dr.Praveen Kumar (2017) in his study attempted to examine the scope and potential of horticulture sector in poverty alleviation, income enhancement and ensuring nutritional security. The crucial role played by the horticulture sector in supporting the agro processing industries is also looked upon. The lack of standard planting materials, exploitation by the middlemen and insufficient post-harvest operation system problems are pointed out as some of the major challenges of the sector. Linkage of farm fields with agro processing industries is suggested as an important measure to overcome problems with regard to the marketing aspect.

Anitha Kumari (2017) examined the importance of horticulture in bringing nutritional security in the economy and highlighted that promotion of horticulture is an effective choice for ensuring food and nutritional security besides helping the farmers to earn a promising income. It is an area where women can be productively employed, both for production and marketing activities. The importance of fruits and vegetables in diet is already established because of its potential in contributing to nutritional security in a cost effective manner.

Major horticultural segments namely fruits, flowers, vegetables, spices and aromatic crops. Nagma Kausar and Shiva Jauhar (2017) studied about the role of bio technology in horticulture development and observed that innovations in bio technology such as tissue culture, molecular diagnostics and Genetically Modified (GM) crops have crucial role in the future horticultural scenario of Indian economy. Institutional support for bio technology application in horticulture is provided by various national level agencies like department of bio technology, department of agriculture, national horticulture board and other related institutions.

IV. Statement of the Problem

Technology driven horticulture business practices is relatively a new concept in Kerala context, which focuses on hi-tech practise in horticulture, substantially helps

to improve the quantity and quality of crop yield and thereby enhances crop productivity and farm profitability. Hi-tech horticulture business practices can be effectively utilised in various stages in the production, processing and marketing of horticultural commodities. What are the various technology driven horticultural practices and to what extent these practices are employed by the vegetable farm cultivators in the state of Kerala in different phases of farm management seems pertinent and these issues constitute the basis for the present study.

V. Objectives of the study

The basic objective of the study is to identify various hi-tech horticultural practices and examine their adoption pattern among the farm cultivators in Kerala. The specific objectives are

1. To provide a conceptual framework about various hi-tech horti business practices that are employed in different faces of farm management with regard to vegetable cultivation in Kerala
2. To examine the level of adoption for various hi-tech Horti business practices in different faces of farm management with regard to vegetable cultivation in Kerala.

VI. Methodology

The present study is both descriptive and analytic and survey method using structured questionnaire is employed for data collection. For analysing the adoption pattern for hi-tech horticultural business practices vegetable farm cultivators in the state registered under the various schemes of agricultural department as beneficiaries constitute the population for the study. Multi stage sampling is used to collect data from 378 farm cultivators in Kerala. For selecting samples, the state of Kerala is divided into three zones namely North, Central and South zones. Two district each from a zone is selected based on highest number of beneficiaries and as such cultivators are selected from Wayanad, Malappuram (North Zone), Idukki, Ernakulam (Central Zone) , Thiruvananthapuram and Kottayam (south Zone). For selecting the sample units, proportionate stratified random sampling method was applied. The data collected from the respondents were analysed using percentage analysis and one sample t test

VII. Results and Discussions

A. Farm Operation Management in Horticulture Business: Conceptual Framework

Farm operations in horticultural business are multidimensional involving a broad range of farm activities. For effective management and control of the farm operations, the farm operation management can be broadly covered under five major heads namely

1. Plant Propagation management Plant propagation which aims at reproduction or duplication of a plant from the mother plant is among the initial operations in horticulture business with a potential impact on yield and productivity. The success and effectiveness of commercialization of horticulture segment depends to a great extent on the practices adopted with regard to plant propagation (Caula & Robert, 2015).Propagation may be sexual propagation using seeds or asexual propagation using parts of the plants other than seeds like stem, leaf etc. All the factors of productivity are directly related with the effectiveness and efficiency of the propagation management strategies adopted in the farm unit. Plant propagation management aims at optimum utilization of the planting materials taking into due consideration the impact of factors like seed quality, age of the seed, atmospheric condition like humidity and technology used in plant germination and propagation.

2. Soil Health Management Just like a diet balanced in nutritional requirements enhances quality of life in the case of human beings, soil fertility is so crucial in raising healthy plants in horticulture industry. “Soil health refers to the capacity of the soil to perform agronomic and environmental functions” (Singh, Annette, & Yin Chan, 2011). The structure and texture of the soil, nutritional requirements for the soil at different stages of plant growth, impact of inorganic and organic fertilizers in soil quality, soil enrichment, acid base balancing of the soil, weed control practices like soil solarisation etc are among the prominent factors related with soil health management in horticulture business. Horticultural crop yield is significantly related to the soil health management practices implemented in the farm field. Soil health management practices which focus on enhancing productivity and health of plants and animals in a manner facilitating sustainable development is equally important to the farm managers at business level and policy formulators at the macroeconomic level.

3. Crop Health Management During the various stages of horticultural crop life cycles, the attack of pests and diseases poses serious challenges to the cultivators anywhere in the world. Diseases are mainly caused by microbial attacks which include bacterial, fungal and viral diseases. Preventive and curative measures to be adopted for diseases require an elaborate knowledge about scientific application of organic and inorganic pesticides. Integrated pest management which involves the judicious application of pest control measures with minimum adverse impact on soil and environment is another important farm strategy in connection with crop health management. Sophisticated technologies and equipment like leaf sensors are developed now days to detect diseases and application of these technologies have a profound impact on improving crop health.

4. Water Resource Management During the last few decades, the state of Kerala which was well known for the richness in rainfall is witnessing a gradual decline in the availability of water resources which have a profound adverse impact on the prospects of horticultural industry in the state. Use of technologies which help in the optimum utilization of water resources like micro irrigation, rain water harvesting, fertigation etc assumes great significance in this context. More over irrigation, in the right quantity and at the right time is of vital significance in promoting horticultural crop yield as both inadequate and excess irrigation acts as constrains in enhancing crop productivity.

5. Weather Management Weather and climatic uncertainties are posing serious concern to the prospects of horticulture business especially at the pre harvesting stage. Occurrence of droughts and floods, increasing temperature on account of global warming, unpredictable rainy seasons etc have to be seriously taken care of in the coming years in horticulture segment. Protected cultivation practices making use of precision farming principles like poly house cultivation and rain shelter farming are pointed out as effective weather management strategies in horticulture business, even though these are capital intensive weather control strategies. Satellite based remote sensing and web based weather forecasting facilities are slowly becoming popular in the country which enables the cultivators to plan in advance and minimise the causalities on account of weather and climatic uncertainties.

VIII. Data Analysis

Hi-tech horticultural practices are diversified in nature and hence for the purpose of examining the adoption level, the practices are categorized into five heads namely plant propagation management, soil health management, crop health management, water resource management, and weather management practices. For each category, components are listed and the adoption level is measured on the basis of response given on a three-point scale.

A. Adoption of Hi-tech Plant Propagation Management Practices

In order to study the extent of adoption of hi-tech practices in plant propagation, the adoption pattern of High yield hybrid seeds, humidity chamber for propagation and germination, grafted seedlings and pre sowing seed treatment among the sample respondents were examined. Table 1 describes the usage pattern among the farmer respondents among these components of plant propagation management.

It can be seen from the table that 37.57 per cent of the cultivators are following full scale adoption of high yield variety seeds where as another 32.54 per cent are partially adopting it. But the mean score of adoption for HYV seeds is 2.08 which are significantly equal to the mean of the response scale. The result shows that the sample farmers have average adoption for HYV seeds as significance level of one sample t test with test value 2 is greater than 0.05. With regard to pre sowing seed treatment also, the adoption level among the farmers equal to the average level as the mean score is 1.95 with significance greater than 0.05. In the case of humidity chamber and grafted seedlings the adoption level is significantly below average level as the mean scores (1.39 and 1.20) are lower than the mean of the response scale.

B. Adoption of Hi-tech Soil Health Management Practices

The adoption pattern of hi-tech soil health management practices among vegetable cultivators in the state is analyzed taking into account the usage pattern for nutritional need diagnosis, soil solarisation, plastic mulching and acidity-alkalinity balancing. Table 2 depicts the sample distribution by their adoption level among these soil management practices.

With regard to nutritional need diagnosis and acidity alkalinity balancing, the mean scores (2.12 each) are significantly higher than the mean of the response scale. The result indicates that the farmers have significantly above average adoption for these

two components. On the other hand for plastic mulching and soil solarisation, the mean scores are 1.68 and 1.60 respectively which mean that they have below average adoption as the mean score is less than response scale mean and one sample t test shows significance less than 0.05.As evident from the table, vegetable cultivators in Kerala have high adoption for nutritional need diagnosis and acidity alkalinity balancing practices. But with regard to the use of soil solarisation and plastic mulching adoption is observed to be low.

C. Adoption of Hi-tech Crop Health Management Practices

In order to understand the extend of adoption of hi-tech crop health management practices by the vegetable cultivators in Kerala, the usage pattern regarding disease detection mechanisms, integrated pest management, scientific nutrient application through fertigation and organic farming practices adopted are considered. The distribution of sample respondents with regard to their adoption level for crop health management practices are indicated in table no- 3

From the table it can be seen that the farmer respondents have significantly above average adoption for organic farming practices and disease detection mechanisms as their mean scores are 2.19 and 2.12 respectively which are higher than response scale mean and one sample t test show significance level less than 0.05. On the other hand adoption level for integrated pest management (mean score= 1.93) and for scientific nutrient application (mean score 1.82), the respondents have below average adoption. It can be concluded from the table results that organic farming practices have the highest adoption rate among the cultivators followed by adoption of scientific disease detection mechanism. But they have low usage for integrated pest management and scientific nutrient management through fertigation.

D. Adoption of Hi-tech Water Resource Management Practices

The technological innovations in water resource management among farm community like micro irrigation, drip fertigation, wick irrigation and rain water harvesting are considered in order to study the extend of adoption and usage pattern for hi-tech water resource management practices among the farmer respondents. The distribution for the same is depicted in Table 4

The mean score of adoption for micro irrigation is 2.26 which is significantly higher than the mean of the response scale. The results shows that the sample have above

average adoption level as one sample t test shows significance level less than 0.05. In the case of wick irrigation the mean score (1.10) is much lower than response scale mean. In the case of drip fertigation and rainwater harvesting also the sample has below average adoption level the mean scores are 1.83 and 1.36 respectively. As observed in the table the vegetable cultivators in the state have high adoption for micro irrigation practices. But with regard to wick irrigation they have least adoption followed by rainwater harvesting. With regard to drip fertigation also the usage is found to be significantly lower than average adoption.

E. Adoption of Hi-tech Weather Management Practices

For examining the adoption pattern for weather management practices among the farm cultivators, the usage pattern and extend of adoption for poly house farming, rain shelter farming, open precision farming and technology driven weather prediction are taken into consideration. Table 5 depicts the adoption level distribution among the sample respondents with regard to hi-tech weather management practices.

The result indicate that the sample have average adoption for poly house farming as one sample t test shows a significance above 0.05. But in the case of other three components namely technology driven weather prediction, open precision farming and rain shelter farming, the respondents have below average adoption as the means scores (1.41,1.29 and 1.24 respectively) are less than response scale mean. It is evident from the table result that the cultivators have low adoption for hi-tech weather management practices. The least adoption is observed for rain shelter farming followed by open precision farming and technology driven weather prediction.

IX. Findings

- The vegetable cultivators in the state have low adoption level with regard to the practices for hi-tech plant propagation. With regard to various elements in plant propagation, cultivators have average adoption for HYV seeds and pre sowing seed treatment. They have least adoption for grafted seedlings followed by humidity chamber for germination.
- With regard to hi-tech soil health management practices, cultivators in Kerala have high adoption for nutritional need diagnosis and acidity alkalinity

balancing practices. But with respect to the use of soil solarisation and plastic mulching adoption is observed to be low.

- Among the various hi-tech crop health management practices, cultivators have the highest adoption rate for organic farming practices followed by adoption of scientific disease detection mechanism. But they have low usage for integrated pest management and scientific nutrient management through fertigation.
- In connection with hi-tech water resource management practices, cultivators in the state have high adoption for micro irrigation practices. But with regard to wick irrigation they have least adoption followed by rainwater harvesting. With regard to drip fertigation also the usage is found to be significantly lower than average adoption.
- The cultivators have low adoption for hi-tech weather management practices. The least adoption is observed for rain shelter farming followed by open precision farming and technology driven weather prediction.

X. Conclusion

An analysis of the hi-tech horticultural practices among the vegetable farm cultivators in Kerala indicates that, the cultivators are not able to take advantage out of the technological innovations mainly because of the capital intensity for some of the hi--tech practices. In general, vegetable cultivators in the state have low adoption for hi-tech horticultural practices. Still the practices are much beneficial in improving productivity and return in terms of land and labour The effectiveness and success of hi-tech practices essentially depends on the extent to which the practice helps in enhancing productivity and profitability in terms of these factors of production.

XI. Reference

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Table 1: Level of adoption in hi-tech plant propagation management practices

		Non Adoption	Partial adoption	Full adoption	Mean	SD	t	Sig.
High yield variety hybrid seeds	n	113	123	142	2.08	0.82	1.822	0.069
	%	29.89	32.54	37.57				
Humidity chamber for germination	n	255	99	24	1.39	0.60	-19.650	0.000
	%	67.46	26.19	6.35				
Grafted Seedlings	n	304	73	1	1.20	0.41	-38.393	0.000
	%	80.42	19.31	0.26				
Pre sowing seed treatment	n	111	176	91	1.95	0.73	-1.409	0.160
	%	29.37	46.56	24.07				

Source: Primary Data

Table 2:: Level of adoption in hi-tech soil health management practices

		Non Adoption	Partial adoption	Full adoption	Mean	SD	t	Sig.
Nutritional need diagnosis	n	70	192	116	2.12	0.69	3.420	0.001
	%	18.52	50.79	30.69				
Soil Solarisation	n	207	114	57	1.60	0.74	-10.476	0.000
	%	54.76	30.16	15.08				
Plastic mulching	n	175	149	54	1.68	0.71	-8.760	0.000
	%	46.30	39.42	14.29				
Acidity Alkalinity Balancing	n	97	138	143	2.12	0.79	3.001	0.003
	%	25.66	36.51	37.83				

Source: Primary Data

Table 3:: Level of adoption in hi-tech crop health management practices

		Non Adoption	Partial adoption	Full adoption	Mean	SD	t	Sig.
Disease detection mechanisms	n	32	267	77	2.12	0.53	4.415	0.000
	%	8.51	71.01	20.48				
Integrated Pest Management	n	88	228	62	1.93	0.63	-2.133	0.034
	%	23.28	60.32	16.40				
Scientific nutrient application through Fertigation	n	185	75	118	1.82	0.88	-3.922	0.000
	%	48.94	19.84	31.22				
Organic Farming	n	80	147	151	2.19	0.76	4.806	0.000
	%	21.16	38.89	39.95				

Source: Primary Data

Table 4:Level of adoption in hi-tech water resource management practices

		Non Adoption	Partial adoption	Full adoption	Mean	SD	t	Sig.
Micro Irrigation	N	121	39	218	2.26	0.91	5.466	0.000
	%	32.01	10.32	57.67				
Drip Fertigation	N	189	64	125	1.83	0.90	-3.671	0.000
	%	50.00	16.93	33.07				
Wick Irrigation	N	344	29	4	1.10	0.33	-52.792	0.000
	%	91.25	7.69	1.06				
Rain water harvesting	N	257	105	16	1.36	0.56	-22.031	0.000
	%	67.99	27.78	4.23				

Source: Primary Data

Table 5:Level of adoption in hi-tech weather management practices

		Non Adoption	Partial adoption	Full adoption	Mean	SD	t	Sig.
Poly House farming	N	183	16	179	1.99	0.98	-0.210	0.834
	%	48.41	4.23	47.35				
Farming under rain shelters	N	319	28	31	1.24	0.59	-25.171	0.000
	%	84.39	7.41	8.20				
Open precision farming	N	304	37	37	1.29	0.64	-21.599	0.000
	%	80.42	9.79	9.79				
Technology driven Weather prediction	N	264	75	39	1.41	0.67	-17.281	0.000
	%	69.84	19.84	10.32				

Source: Primary Data