MULTIDIMENSIONAL ANALYSIS OF APIPRENEURSHIP PROSPECT IN SOUTH KERALA

By

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THESIS

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2020

DECLARATION

I, hereby declare that this thesis entitled **"Multidimensional analysis of apiprepreneurship prospect in South 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, associateship, fellowship or other similar title, of any other University or Society.

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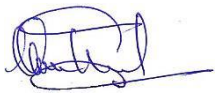

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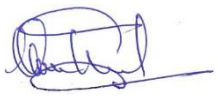

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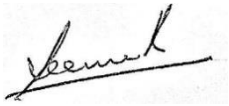

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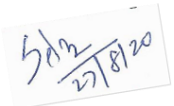

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CONTENTS

LIST OF TABLES

15.	Employment generation by the apipreneurs	
16.	Distribution of apipreneurs based on creativity	
17.	Distribution of apipreneurs based on the level of optimism	
18.	Distribution of apipreneurs based on their knowledge level.	
19.	Distribution of apipreneurs based on the entrepreneurial potential	
20.	Principal component analysis (PCA) of Entrepreneurial potential: Total variance	
21.	Loadings (Eigen vectors) of Correlation Matrix	
22.	Distribution of apipreneurs based on the overall adoption of selected apiculture practices of KAU.	
23.	Distribution of apipreneurs based on the extent of adoption of scientific apiculture practices of KAU	
24.	Adopter categorization of the apipreneurs based on level of adoption of scientific practices of KAU	
25.	Correlation results between level of adoption of the apipreneurs and the independent variables.	
26.	Perceived usefulness of selected apiculture technology of KAU	
27.	Perceived effectiveness of selected apiculture technology of KAU	
28.	Training needs assessment as perceived by the apipreneurs and experts	
29.	Constraints experienced by the apipreneurs	
30.	Suggestions for refinement	

LIST OF ILLUSTRATIONS

LIST OF PLATES

LIST OF ABBREVIATIONS

%	**:**	Percentage
Ag	**:**	Agriculture
et al.	**:**	and coworkers/ co authors
F	**:**	Frequency
Fig.	**:**	Figure
GoK	**:**	Government of Kerala
H0	**:**	Null Hypothesis
Ha	**:**	hectare
i.e.	**:**	That is
IVLP	**:**	Institutional Village Linkage Programme
KAU	**:**	Kerala Agricultural University
KVIB	**:**	Khadi and Village Industries Board
KVIC	**:**	Khadi and Village Industries Commission
KVK	**:**	Krishi Vigyan Kendra
LOT-R	**:**	Life orientation test- Revised
NGO	**:**	Non- governmental organizations
OECD	**:**	The Organisation for Economic Cooperation and Development
PhD	**:**	Doctorate
S.D.	**:**	Standard deviation

S.E.	**:**	Standard error
SRI	**:**	System of Rice Intensification
TSBV	**:**	Thai Sac Brood Virus
Viz.	**:**	Like
Vs	**:**	Versus
Max	**:**	Maximum
Min	**:**	Minimum
KODS	**:**	Kerala Organic Development Society
VU/U/NU	**:**	Very useful/ Useful/Not Useful
VE/E/NE	**:**	Very effective/Effective/Not Effective
AGMARK	**:**	Agricultural Marketing

Introduction

1.

INTRODUCTION

Agriculture frames the foundation of the Indian economy which makes India an agriculture –commanded nation. The current performance of agricultural sector in India is inadequate which demanded the need for agripreneurship development in Indian agriculture. The National Agricultural Policy (NAP) by the Government of India recognized the untapped growth potential of Indian agriculture to strengthen the rural infrastructure to aid the fast agriculture development and accelerate growth of agribusiness through promotion of value addition of the agricultural products. It ensures employment among the masses in rural areas which promises fair standard of living for farmers, women and agricultural labourers.

Agripreneurship is generally a sustainable, community oriented, directly marketed agriculture. It adds the entrepreneurial component to an agricultural activity. Various opportunities can be identified in agriculture and allied sectors at different phases of agriculture process. Basically, the agripreneurial opportunities can be identified at the input stage, farming stage, value chain, output processing and marketing stage, and in other related services. Presently the scope and potential of agripreneurial opportunities is increasing due to globalization and highly webbed world market scenario. Agripreneurship also helps in checking migration of rural youth from villages to urban centers and helps in improving living condition of farmers by providing alternative source of income. With every effort of agricultural development working on diversification of the agricultural income, various enterprises have been recommended such as mushroom cultivation, value addition and processing units, fertilizer production, dairy farming to the farmers as they are considered to be the dominant agripreneurial ventures. Amongst these venture we also have apiculture which is an enterprise that has ample potential to enhance the income and

employment opportunities for the farmers especially the landless and farmers with medium and small landholdings.

Apiculture

The word 'apiculture' derived from the Latin word '*apis*' meaning bee. So, apiculture or beekeeping is the care and management of honey bees for the production of honey and the wax. Beekeeping and use of honey had predominant importance with mentions made in ancient Vedic scriptures since ages in India. But scientific beekeeping practice in India can be traced to the end of nineteenth century. The bee diversity based on the varied climatic conditions and vegetations in India positively fosters mainly the following species of bees *i.e. Apis cerana*, *Apis mellifera*, *Apis dorsata* and *Trigona iridipennis* (Stingless bee), well known for providing crop specific pollination. States that are hunted out for honey production includes Andhra Pradesh, Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Jharkhand Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttaranchal, Uttar Pradesh and West Bengal with maj ority of honey production in India confined to South India, mainly in the states of Kerala and Tamil Nadu that account for nearly 42.00 per cent of the national production, as per the National Bee Board (Sivaram, 2012). According to Srikumar (2015) Kerala is ideal for bee keeping due to the favourable climate, diverse vegetation and flowering plants throughout the year. With the state also being the lead producer of rubber in the country which indicates the reason why Kerala can provide greater honey production, as rubber provides a suitable source of feed to the honey bees. But during the recent years the production of natural rubber in Kerala has collapsed by more than 15 per cent due to the unrenumerative prices which have kept rubber growers away from tapping. Thus Kerala Rubber Board themselves embarked apiculture as one unique initiative to encourage stakeholders to take up apiculture to earn additional revenue from rubber holdings during times when the sector is bleeding. With the state having immense scope due to its wide range of flora and fauna, beekeeping can be the enterprise that can be practiced by illiterate

and resource poor men/women who are willing to start their own venture with no land required. Over the years there has been a significant increase with farmers and youth taking up apiculture and gaining benefits from it.

Hence it is necessary to enumerate the details concerning the socio-personal traits of the apipreneur, the extent of entrepreneurial potential, the knowledge level of the apipreneur and level of adoption scientific technology. Keeping all these aspects in view the present study entitled "A multi-dimensional analysis of apipreneurship prospect in South Kerala" was undertaken with following specific objectives

Objective of the study

To explore the entrepreneurial potential, the extent of knowledge and the adoption of improved apiculture technologies. This study will also diagnose the constraints in apiculture, profile the beekeepers and ascertain their training needs.

Importance of the study

Indian agriculture is currently undergoing a revolutionary shift from traditional agricultural practices to technology intensive specializations for augmenting more returns per unit area. Apiculture, one among the most traditional agricultural practices followed in India, is now an enterprise of great scope as it ensures higher returns as bee venom, honey, royal jelly and bee wax at low initial cost as compared to other subsidiary enterprises. Honey bees are a group of beneficial insects which significantly enhance crop productivity by facilitating pollination in plant. India's contribution in the 500 million kg of total honey produced globally is just merely 1.2 per cent. Apipreneurship exhibits a great scope in India inorder to develop self-employment for more than 15 million rural and tribal families. Kerala and Tamil Nadu were traditionally the leading states in beekeeping among the different states in the country with Kerala contributing a greater proportion of about 70

per cent of the annual production of honey in India (Shende, 1992). Hence, this study on multidimensional analysis of apipreneurship prospect is vital.

Kerala Agricultural University (KAU) through its All India Coordinated Research Project on honey bee pollinators has developed TSBV tolerant nucleus colonies. The centre disseminates technologies to the honey bee growers. Regular orientation and refresher trainings are organized to the beginners and stakeholders in beekeeping. The advanced technologies developed by KAU helped beekeepers to enhance the average yield of honey from 2-3 kg to 20-25 kg per colony making the industry profitable in Kerala, thus attracting new farmers to the api-industry (Sajeev, 2018). The bee keeping today has reformed from subsistence use to commercial interest making it an entrepreneurship, facilitating both direct and indirect employment especially for rural youth and women. Hence it becomes imperative to explore the entrepreneurial potential of apiculturist.

With the development of standardized apiculture technology it becomes very important to assess its impact in terms of adoption and the constraints which hamper the adoption of the technology in bee keeping thus facilitating need based interventions in research, development and extension. The present study will also enable the identification of the training needs of beekeepers as the importance of training in beekeeping practices is an obligatory tool to ensure quick transfer of scientific beekeeping technology inorder to renovate the traditional beekeeping and the economic condition of beekeepers.

1.3 Limitations of the study

The study has inherent time bound period, resources and small sample size. However utmost care was taken to make the study as systematic as possible. The study was carried out in three districts. A wide coverage was not possible as this study was taken as a part of the requirement for M.Sc. (Ag.) programme. Hence generalizability with regard to other districts may not be appropriate. The responses from the respondents were based on

their recall memory. However, in spite of all these limitations, serious efforts and devoted care was taken to carry out the research as objective and systematic as possible.

1.4 Presentation of the study

The report of the study has been presented in five chapters, the first chapter deals with the introduction which explains the topic, statement of problems, objectives, scope of the study and limitations of the research. The second chapter deals with review of literature which covers major studies related to the present study. The third chapter is the methodology which deals with process of investigation, method of data collection, sample size, sampling design, measurement of the dependent and independent variables. Fourth chapter deals with the results and discussions which explains the results of the study obtained and also the discussion of the results. The fifth and final chapter is the summary of the study and suggestions for future research. The references, appendixes and abstract of the thesis are given in the end.

Review of Literature

2.

REVIEW OF LITERATURE

Reviews of previous works provide a ground for developing a theoretical foundation for the current study. It helps in identifying and delineating the problem areas. Review of literature also helps in determining the variables and concepts based on which the necessary data can be collected. In accordance with the objectives of the study, review of literature associated with the study is rendered below under the sub headings listed below

1. Personal and social characteristics of apipreneurs.
2. Entrepreneurial potential of apipreneurs.
3. Knowledge of farmers about the selected apiculture technology.
4. Level of adoption of selected apiculture technology of KAU
5. Perceived usefulness and effectiveness of selected apiculture technology of KAU
6. Training needs in apiculture as perceived by the farmers and the experts.
7. Constraints experienced by the farmers with suggestions for refinement.

2.1. Personal and social characteristics of the apipreneur

2.1.1. Age

Firdoos (2001) found that out of the vegetable growers and beekeepers, 46.70 per cent of them belonged to the age group of 18-35 years who were categorized as the young followed by age group of range 36-53 years (middle category) which consisted 31.50 per cent, and then 21.90 per cent were in the age group of 54-71years categorically named as the old age.

According to Singh (2005) the bulk of the respondents in the sample size *i.e.* 95.00 per cent in mushroom training and 85.00 per cent in case of beekeeping training were aged 35 years or below. The reason behind such a result was delineated as people in the younger age were more energetic and seeking employment whereas middle age person was already settled in other kind of occupations.

Khan *et al.* (2007) in his study conducted in Uttaranchal describing the status of beekeeping in Kumaon Region reported that maximum beekeepers were young with a percentage of 44.50 and belonged to the age between 20 to 30 years.

In a study conducted by Singh *et al.* (2011) beekeeping venture was said to be successful because the majority of the beekeepers (80.00 %) pertained to the age group of young to middle.

Popa *et al.* (2012) in his work on entrepreneurial behavior in the beekeeping sector as determinant of sustainable development reported that the age groups between 25 and 64 years old were found in approximately equal proportions and majority of beekeepers belonged to age group between 35 and 44 years old (24.50%).

Mujuni *et al.* (2012) revealed in their study that 75.00 % of the beekeepers were aged 30 years and above.

According to Abdaga (2014) the study divulged that on an average the beekeepers age was found to be 46.58 years, the range being 22-70 years. Beekeepers younger than 30 years old comprised 5.49% while 18.13% respondents were between 30 and 40 years, and the remaining 76.37% were over 40 years old. The proportion of young people involved in beekeeping was low, eventhough the age distribution of beekeepers depicted in the study were within the active working. The reason mentioned was the presence of alternative job opportunities in the country which hindered the younger age to involve in beekeeping.

Esakkimuthu (2015) reported that majority *i.e.* 43.19 percent of the beekeepers were categorized as young (≤ 33 years). Equal number of respondents were obtained in the middle age category as that of the young category, while the remaining 13.62 per cent were of the age above 48 years.

Poudel *et al.* (2018) stated that the number of entrepreneurs who belonged to the age group (18-24) years of age tallied to 10.00% of the respondents, while 20.00 % of the entrepreneurs belonged to the 41-50 age group and the number of entrepreneurs in the age group categorized as more than 50 years was found to 10.00%.

2.1.2 Education

Singh *et al.* (2011) in the study on assessing the training needs of beekeepers in Haryana stated that majority of the respondents were distributed in low to medium level of family education. 38.00 per cent possessed low level of family education while 42.00 per cent had medium level of family education. The remaining 20.00 per cent possessed high level of family education.

Adgaba (2014) enumerated that 40.70 per cent of the beekeepers had achieved education in higher learning institutes (diploma to PhD), 24.70 per cent attended secondary

school, 26.90 per cent had accomplished primary school, and the remaining 7.70 per cent were illiterate. Majority of them had received formal education and adoption of improved beekeeping technology, both variables also reported significant positive correlation.

According to the study conducted by Esakkimuthu (2015), it was reported that 29.11 percent of the respondents could read and write and an equal number had studied up to primary school level. It was found that 17.85 per cent had education up to class VIII, 12.67 per cent possessed high school level education, and 7.98 per cent of the respondents were illiterate and 3.28 per cent of the respondents possessed college level education.

Abejew and Zeleke (2017) suggested that educational status of the respondents on whom the study was conducted described that about 26.10 per cent did not receive any education while 73.90 per cent were considered literate based on the range that had respondents who could ability to read and write, to respondents with diploma level of education.

Poudel *et al.* (2018) concluded that of the total number of respondents, illiterate respondents constituted 17.00 per cent; literate respondents were 40.00 per cent. 37.00 per cent of respondents secured secondary level of education and both intermediate and the bachelor level was obtained by respondents constituting 3.00 per cent respectively. The number of literate respondents were pretty much high when compared to that of the illiterate respondents who were rearing the beekeeping in Lamjung district.

Verma *et al.* (2018) in the study on socio-personal and economic analysis of apiculture enterprise in Hadauoti region of Rajasthan stated that the maximum number of beekeepers (42.86%) had an educational qualification of up to metriculation, followed by middle level (33.93%), graduation level (17.85%) and post graduation level (5.36%), respectively.

2.1.3 Family Size

Sathyanarayan *et al.* (2010) concluded that more than half of the livestock farmers *i.e.* 53.85 per cent belonged to medium family size category followed by small which comprised of 40.00 per cent and then large family size comprising 6.16 per cent.

Abdaga (2014) reported that the average family size of the beekeepers that were considered as respondents was found to have 8.32 ± 4.49 members which was larger than the national average family size of 5.84.

Esakkimuthu (2015) reported that majority (60.09 per cent) of the respondents belonged to medium size family while 27.70 per cent of respondents belonged to small family. Remaining 12.21 per cent respondents constituted the class of large family.

According Bunde and Kibet (2016) majority of the respondents had family members above ten with a 39.80 per cent followed by 30.30 per cent which had members between 6-8, 10.20 percent had 9-10 members and 19.70 per cent had household members below five.

In a comparative study conducted by Gupta *et al*. (2015) on beekeeping in Haryana and Uttar Pradesh results showed that 20.00 per cent respondents had 2-4 members in the family, 48.57 per cent respondents had 5-6 and the remaining 8.57 per cent had above 8 people in their family. Similar trend with regard to family size was shown in Haryana with 17.14 per cent people living in family with 2-4 members, 51.43 per cent respondents had

5-6 members per family, 25.71% respondents accounted for 7-8 members and only 5.71 per cent respondents have more than 8 members in the family.

Kumwenda (2016) in his study on the impact of beekeeping on the household income of small holder farmers reported that eventhough high number of persons per household indicates a good labour force, the results of the study showed that as the number of members in the family increase, there is less chance of participation in the enterprise.

2.1.4 Total Land holding

The study done by Singh *et al.* (2011) opined that 41.00 per cent of the beekeepers possessed small land holding and 27.00 per cent had medium size land holding followed by 20.00 per cent were landless. The remaining 12.00 percent of the beekeepers owned large land holding. From the study it was concluded that beekeeping was an enterprise that was adoptable for small landholding respondents.

According Qaiser *et al.* (2013) 23.00 per cent landless people were engaged in beekeeping activities. Most of the beekeepers owned small and marginal land holdings. Out of the total beekeepers 76.70 percent of them owned land of 0.06 to 20 acre with an average own land size being 3.91 acres per beekeeper.

Sharma and Dhaliwal (2014) reported that more than 35.70 per cent of beekeepers were farmers having land area less than 2 ha *i.e.* small category farmer and 32.10 per cent were medium category farmers. The successful bee-keepers of the region also were from the marginal category (17.9%) and 14.30 per cent were landless.

Esakkimuthu (2015) opined that greater proportion of the respondents possessed land area less than one hectare (92.49 percent), 7.05 per cent of the respondents possessed

land area between one to two hectares, 0.46 per cent of the respondents owned land area greater than two hectares and none of them possess land holding of more than four hectares

Verma *et al.* (2018) reported 48.21 percent of beekeepers owned small sized land holding ranging 1.0 ha to 2.0 ha, followed by 23.21 per cent of beekeepers with medium size land holding *i.e.* 2.0-10.0 ha. 16.08 per cent possessed large size land area ($\geq$ 10 ha) and marginal size of land holding *i.e*. less than 1.0 ha was owned by 12.50 per cent of the beekeepers.

2.1.5. Institutional interventions

Palaniswamy and Sriram (2001) in a study assessing the extension participation of farmers discovered that greater proportion of the respondents (84.35 per cent) had medium level of extension agency contact. 5.45 per cent and 10.20 per cent of the respondents exhibited extension agency contact of low level and high level respectively.

Shashidhara (2004) in a study on factors influencing adoption of drip irrigation by the horticulture farmers belonged to the Bijapur district found that 40.00 per cent of the respondents participated in group meetings followed by exhibition (41.66 per cent) and 18.34 per cent of the respondents participated in Krishimela.

Dasdena (2008) reported that 62.00 per cent of the respondents had medium level of contact with institutional agencies and experts followed by 20.00 percent beekeepers who had high level of contact and remaining 18.00 percent with low level of contact.

Kumar (2013) opined that beekeepers contacted extension personnel like agriculture extension and development officers, junior agriculture extension officers, university scientists, banks, fellow beekeepers and members of non- governmental organization. Cent per cent of the beekeepers had extension contact with their fellow beekeepers, followed by non- governmental organization (91.90 per cent), junior

agriculture extension officer (90.47 per cent) and agriculture extension officer (88.57 per cent), whereas 3.33 per cent of beekeepers only used the services of the bank officials. The data also unveiled the fact that the beekeepers were still hesitant to establish a healthy relation with institutions inorder to find the solutions to their problems.

2.1.6. Market intelligence

Kumar (2013) identified radio, television, newspaper, SKUAST-Jammu as the main sources of information utilized by the beekeepers. A very high percentage of beekeepers (86.67 and 98.57 per cent respectively) regularly utilized the above mentioned sources of information. The source of information mainly constituted the programmes based on apiculture and Department of Agriculture. In Kathua, Rajouri and Ramban districts, radio and television were the major source of information, whereas television was the major source in Jammu district. The SKUAST-Jammu and Kissan melas were the least utilized source of information by the beekeepers.

Naik (2016) in a study regarding knowledge and adoption of organic farming practices in red gram in dryland areas of Karnataka opined that higher percentage of the farmers had medium level of market intelligence (54.20%) with 23.30 % in the low level category and remaining 22.50 % with high level of market intelligence.

The important findings obtained from the study done by Kumara *et al.* (2016) showed that greater proportion *i.e.* 56.25 per cent of tomato farmers had low level of market intelligence followed by medium level (28.75 per cent) and high level (15 per cent) of market intelligence. It was also identified that the farmers in medium and high category derived 24.13 per cent higher prices accompanied with high economic returns as compared to those tomato farmers who possessed low market intelligence.

According to Taufiq *et al.* (2016) the other issues faced by the agripreneurs were dearth of knowledge (47.88%), lack of support from the family (43.66%), no direct dealership from the company (42.25%), marketing and infrastructure (40.84%), low investment (38.02%), and non-possession of land for demonstration (11.26%). This was attributed to misunderstanding of farmers and tough task of convincing them. Lack of necessary support from the family was due to risk associated in the business arising due to fear of loss, problem of marketing and infrastructure due to poor storage, transportation and poor market intelligence system.

Devi *et al.* (2019) in her study on women agripreneurs in Kadapa District of Andhra Pradesh the data obtained showed that majority (63.33 per cent) of the women agripreneurs were associated with the capable category of market intelligence followed by less capable (25.83 per cent) and (10.84 per cent) were found in most capable category of market intelligence.

2.1.7. Trainings attended

Kumar *et al.* (2013) in the study titled factors influencing entrepreneurial behavior of vegetable growers it was opined that higher percentage of the respondents (85.83 per cent) were under the low training received category. The reasons that were cited by the respondents were lack of information about the venue of training, duration of training along with that other social responsibilities and household which act as a hindrance to attend training sessions.

Poornima (2014) in her study also reported that the beekeepers obtained trainings from mainly the following institutions *viz.*, KVIB and KVIC in 3.90 per cent and 57.97 per cent respectively. Also the trainings were received by 17.68 per cent and 20.48 per cent respondents from non-governmental organizations and training under professional beekeepers was also accounted. While the horticulture department was involved with only

the distribution of bee boxes to the beekeepers, did not organize any training camp during the study period.

The study to analyze the entrepreneurial potential of beekeepers carried out by Esakkimuthu (2015) enumerated that 69.95 per cent of the beekeepers had participated in more than three training programmes, 24.88 per cent attended two training programmes and 5.17 per cent beekeepers had attended only one training programme.

2.1.8. Yield per colony

According to work done by Bhushal and Thapa (2005) it was delineated that out of the 1450 honey bee colonies in the district, 400 constituted traditional honey bee colonies, 250 comprised of improved indigenous (*A. cerana*) and 800 were improved exotic (*A. mellifera*) colonies. The honey productivity obtained was 4 kg, 8 kg and 18 kg per colony per annum from traditional, improved indigenous and improved exotic respectively. In the study it was concluded that modern beekeeping technology exceeded the national average honey productivity.

Poornima (2014) in her work which focused on auditing the social and economic aspects of beekeeping in region of Uttara Kannada, suggested that with the increase in the size of the business, the honey yield per colony per annum and annual income of the beekeeper enhanced significantly. Also multiple factors like hive number, no. of frames used and labour engaged in the beekeeping enterprise played an important role in enhancing the per year honey yield per hive.

Vaziritabar and Esmaeilzade (2016) revealed in their study on profitability and socio economic analysis of beekeeping and honeybee production , carried out in Karaj state of Iran described that the average annual productivity of colonies were obtained as

8.64±5.54 kg honey/colony/annum for modern hives and 3.89±2.52 kg honey/colony/annum for traditional hives.

In the study conducted by Sharma and Das (2018) which focused predominantly on identification of the factors that affect the adoption of beekeeping and technologies associated, in Kamrup district of Assam, attributed that the production per hive in the four districts namely Maniary, Pacharia, Deuduar and Gerua was found to be 2-3, 3, 2.5-3 and 2-3 respectively.

2.1.9. Experience in beekeeping:

According to work done by Kumar (2007) it was reported that 78.33 per cent of beekeepers and 93.33 per cent of the beekeepers belonged to medium category of beekeeping experience in Thiruvananthapuram and Kollam districts respectively.

Masuku (2013) observed that the beekeeper's experience in honey production positively and significantly influenced the honey production. The researcher also stated on the basis of the results obtained that an increase in the farmer's experience by 1 per cent resulted in 0.41 per cent increase in the amount of honey produced.

Adgaba (2014) reported that the respondents in the study possessed average of 18.18 years of experience, ranging from 1-50 years in beekeeping. Also 76.24 per cent of the beekeepers exhibited at least 10 years of experience.

Amulen *et al.* (2017) attributed in their study that a substantial proportion of beekeepers had only 1-3 years of beekeeping experience (43.40 per cent), followed by 31.30 per cent with 4-7 years, and only 25.30 per cent with 8 years or more.

Sharma and Das (2018) concluded that around 37.50 per cent of farmers in Bushenyi had less than 6 years of beekeeping experience while 15.00 per cent had an experience in beekeeping for more than 16 years. While in Kamrup district 40.00 per cent of the farmers had 6-10 years of experience while 17.5 per cent had an experience of 15 years and above.

2.1.10 Risk propensity

Lekshmi *et al.* (2005) stated that greater proportion of the shrimp growers considered as respondents belonged to medium level of credit orientation *i.e.* 56.67 per cent of them. While 25.83 per cent and 17.50 per cent of respondents possessed high and low level of credit orientation respectively.

Naik *et al.* (2016) opined that risk bearing capacity of the respondents had shown positive relationship with the knowledge level of respondents regarding organic farming practices. However the relationship of the risk propensity of the respondents was obtained as non-significant with the knowledge level.

According to Singh *et al.* (2011) in his findings enumerated that medium level of risk bearing capacity was exhibited by 43.00 per cent of beekeepers and 33.00 per cent had low level of risk bearing capacity. The spare 24.00 per cent of the respondents revealed high level of risk bearing capacity. Hence it was summarized that majority of beekeepers (67.00 %) had medium to high level of risk bearing capacity.

da Silveria *et al.* (2014) reported that farmers who used the future market had a higher expectation with regard to a higher coffee harvest, numerically nine times greater than the farmers who were unaware about future market. Regarding behavioral aspects, producers who knew about futures markets displayed a medium-to-low risk propensity.

Carrer *et al.* (2017) suggested that the growers had exhibited medium to high level of risk propensity. They also exhibited medium to high level of overconfidence in management of which 40.00 per cent of the growers showed overconfidence in price. It was also described that risk propensity depicted negative relationship with the adoption of forward contracts.

2.1.11. Credit orientation

Swathi *et al.* (2005) in the study conducted to understand the socio-economic profile of shrimp farmers and its influence on the extent of adoption of shrimp culture technologies opined that majority of respondents had medium level of credit orientation (84.17 per cent) and credit orientation maintained a positive and significant relationship with the extent of adoption.

Esakkimuthu (2012) in the study titled innovation in technical backstopping for Thiruvananthapuram district reported that 41.10 per cent of the respondents exhibited medium level credit orientation while 33.30 per cent exhibited high level credit orientation and remaining 25.60 per cent belonged to the low category.

Singh *et al.* (2010) opined that a positive and significant relationship was exhibited between the credit orientation of the mango growers and the extent of adoption, at 5 per cent level of significance.

Rani and Selvaraj (2013) conducted a study to evaluate the farmers experience in Bt cotton in Tamil Nadu. The findings divulged that significant proportion of the farmers growing Bt cotton possessed high level of credit orientation. The study also enumerated that there was no significant relationship of credit orientation with the extent of adoption.

Raj (2016) in her study described that three forth of the farmers had exhibited medium level of credit orientation and it also showed a positive and significant correlation with the dependent variable of the study *i.e.* entrepreneurial behaviour of the farmers.

2.1.12. Employment generation

Bibhas (2010) reported that SRI method of paddy cultivation created more employment generation (25.00 per cent) as compared to that of traditional line sowing method. Hence it was concluded that SRI method was profitable and generated additional income for farmers with higher employment opportunities.

Singh and Punitha (2012) concluded that post the adoption of anthurium cultivation the per hectare employment level increased by 170 times. The per hectare employment which was 448 man days had now increased to 76,000 mandays post anthurium cultivation.

Satyanarayana and Rao (2013) opined that the farmers who were largely dependent on sole paddy cultivation, provided an employment of 381 man days while farmers who were dependent on paddy cultivation along with subsidiary enterprise like dairy brought about 912 man days of employment. The farmers who practiced paddy cultivation alongwith sheep and goat enterprise created employment of 815 man days and farmers with paddy plus pig enterprise created 492 man days of employment in the study area.

Mukherjee (2013) revealed that the integration of crop with different farming system components had enhanced the employment opportunities and generated enough scope to employ family labour round the year. Off all the various IFS models, Farming System (Crop + Piggery + Poultry + Dairy), was found to be the best compared to all other models for gross income (Rs 101,482/ employment of 193 mandays / year) followed by Farming System (Crop + Poultry + Piggery).

Munyori and Ngugi (2014) reported that the dairy sector was an enterprise that acted as the major employer, employing 841000 people at the farm level and thereby providing further employment opportunities in the formal and informal milk value chains.

2.1.13. Creativity

Vijayalekshmi (1980) reported that respondents with high socio economic status were found to exhibit higher level of creativity.

Sangeetha (1997) reported that extent of adoption of recommended cultivation technologies of commercial Palayankodan growers was positively influenced by the creativity of the respondents. From the study it was reported that majority of the respondents had high creative abilities, 29.00 per cent had medium and the spare 7.00 per cent exhibited low level of creativity.

Simonton (2011) stated in the study on psychology of creativity that creativity of a person enables him/her to adjust to novel circumstances and thereby solve the unexpected problems arising in certain situations.

Raj (2016) in her study on entrepreneurial behaviour of lease land vegetable growers in Thiruvananthapuram district opined that more than half of the respondents *i.e.* 66.25 per cent had used creative ideas inorder to solve issues related to farming. It was concluded that entrepreneurial behavior displayed a positive and significant association with the creativity level of the farmers.

2.1.14. Optimism

Gidariko (1999) reported in his study that 34 young women or 68.00 per cent from the total sample (16 in the first group and 18 in the second) answered that they personally

preferred taking up farming activities as a source of employment and believed that farming had the potential to support their livelihood.

Valesal *et al*. (2007) in his study on conducting a comparative analysis on the conventional farmers and the portfolio farmers, the results indicated that the portfolio farmers perceived themselves to exhibit more entrepreneurial characters. They considered themselves to be growth-oriented, innovative, risk-takers, optimistic, and had more personal control over their business activities.

2.2. Entrepreneurial potential of honey beekeepers.

Entrepreneur

The term "entrepreneur" shares its origin from French language with the word derived from the verb "entreprendre", which means to do or to undertake. It can be divided into two parts where "entre" means "between", and "preneur" means "taker".

Cantillon (1730) defined the entrepreneur as a person who procures raw material at a known price in order to sell it at an unknown price.

Porchezhian (1991) defined farm entrepreneur as an individual who maintains multiple enterprises like poultry, dairy and sericulture apart from their main occupation of crop husbandry.

Harold (1994) stated that entrepreneurs themselves take the personal risks in bringing about changes with an aim to be rewarded for it. A certain degree of freedom is necessary to pursue their ideas, which in turn requires that sufficient authority be delineated.

Sarmah and Singh (1994) stated that an entrepreneur is one who can transform raw materials into goods and services, who can effectively utilize physical and financial

resources for creating wealth, income and employment, who can innovate new products, standardize or upgrade existing products for creating new markets and new customers.

Tyson *et al.* (1994) defined entrepreneur as a person who either creates new combinations of production factors such as new methods of production, new products, new markets, finds new source of supply and new organizational forms or as a person who is willing to take risks or a person who, by exploiting market opportunities, eliminates disequilibrium between aggregate supply and aggregate demand, or as one who owns and operates a business.

According to Desai (1995) entrepreneur is the one who can see possibilities in a given situation, where others see none and has the patience to work out the idea into scheme to which financial support can be provided.

According to Becherer and Maurer (1997) defined entrepreneurs as those individuals who have initiated or owned a small business and are still leading the business that they initiated or purchased.

Drayton (2002) viewed that an entrepreneur is "a person, who is to reform or revolutionize the pattern of production by exploiting an invention or more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way by opening up a new source of supply of materials or a new outlet for products".

Casson (2003) correlates an entrepreneur to a coordinator of all the resources, an innovator, an economic agent and a strategist who can identify opportunities in unfavorable contexts.

Foss *et al.* (2006) defined his capacity to evaluate and judge market opportunities and their profitability as the main attribute of an entrepreneur.

Concepts of Entrepreneurship

Cole (1946) defined entrepreneurship as a purposeful activity of an individual or a group of individuals who initiates, maintains and organizes a profit oriented enterprise or business unit for the production or distribution of economic goods and services.

Schumpeter (1950) stated entrepreneurship being an essentially creative activity or as an innovation function with reference to individual business.

McClelland (1987) defined entrepreneurship as a function of creating of something new, organize, coordinate and undertake the risk associated with it by handling economic uncertainty.

Bhaskaran (2014) defined entrepreneurship as the propensity of mind to take calculated risks with confidence to achieve pre-determined business objectives.

Entrepreneurial potential

Literature on entrepreneurship development views an entrepreneur as a person who has a pertinent role or a function in the economy. Ample numbers of literatures are available explaining the qualities, functions, and behavior of an entrepreneur. Most of the theories on entrepreneurship highlight the contexts that give raise to entrepreneurship and call attention to the role of economic, social and cultural factors in the process of becoming an entrepreneur. In contrast, there exist several psychological theories that associate the inherent characteristics of an individual with that of the manifestation of entrepreneurial ventures. Certain literature has discussed about the models which has viewed that entrepreneurship is essentially the result of an interaction between various components of which an entrepreneur is the prime mover or starting point.

According to Krueger and Brazeal (1994), the actual occurrence of an entrepreneurial activity required a pre-existing preparedness to accept that opportunity which is always required prior to occurrence of an entrepreneurial activity and the pre-

existing preparedness mentioned was defined as the entrepreneurial potential. Literatures showed that entrepreneurial potential alone did not provide the sufficient trigger to an entrepreneurship. It had to be succeeded by something that pertains the decision to initiate and continue the entrepreneurial venture (Shapero, 1982; Reynolds, 1992). Individuals with entrepreneurial potential are said to not always have any serious intention towards initiating a business venture until suitable situation arises or until the occurrence of a trigger event. Until then, the potential of an individual is said to be in dormant phase. Hence, entrepreneurial potential can be viewed not only as a pre-condition and contributory factor for an entrepreneurial event but that exists temporally prior to it.

Delmars (1996) viewed that entrepreneurship had four concepts *viz.,* business performance, entrepreneurial behaviour, the individual, and the environment. The entrepreneur's abilities and motivation also had a drastic impact on his/her entrepreneurial behaviour. The inherent ability of an individual may be defined as the entrepreneurial potential of an individual, which in combination with the knowledge and necessary requirements for a given task can build up a successful entrepreneurial venture. Even an individual with high entrepreneurial potential does promise the occurrence of entrepreneurial activity or its success. It simply enhanced the chances of both to occur. There is said to be a clear cut distinction existing between the ones who liked to be entrepreneurs to the ones who actually became an entrepreneur. Thus entrepreneurial potential can also be defined as the inclination, openness, and a readiness of an individual to grasp a business opportunity: without necessarily having a deliberate intention to become an entrepreneur.

Lumpkin and Dess (1996) had upheld the use of the word entrepreneurial potential. They suggested that entrepreneurial potential was a concept that was distinct and it had depicted the willingness and the likelihood of an individual to take up new ventures. While entrepreneurial "intention" primarily focuses on the desire, the word 'potential' is a summative expression of the ability and the desire. As such, entrepreneurial potential can thus be redefined as "the greater than inclination" behaviour to be an entrepreneur.

Veciana *et al.* (2005) referred entrepreneurial potential as a viewpoint of the individual regarding the desirableness and viability of new venture or enterprise creation.

According to Santos *et al*. (2011) the entrepreneurial potential was defined as the individual's readiness to engage on entrepreneurship typical activities. In the study it was reported that the entrepreneurial potential was the summative outcome of the expression of several entrepreneur's individual characteristics. The main dimensions concerning the constructs domain of entrepreneurial potential are entrepreneurial motivations, management competencies, psychological competencies and social competencies.

Zeffane (2013) in a study used the concept of entrepreneurial potential to refer it as an individual's felt ability and desire to become entrepreneurs. The major advantage of using the concept of entrepreneurial potential is that it considers the felt ability and desire to become an entrepreneur. Individuals who consider themselves capable and psychologically equipped to face the challenges of entrepreneurship are perceived to possess the potential to be an entrepreneur. Such individuals are termed as "potential entrepreneurs". The results of the study also showed that higher the need for achievement in an individual higher will be the levels of entrepreneurial potential as an indication of their capacity and desire to engage in entrepreneurial activities.

Esakkimuthu (2015) defined entrepreneurial potential of the beekeepers as the extent to which an individual is capable of becoming an entrepreneur. It was also stated in the study that entrepreneurial potential and motivation had a direct causal effect on entrepreneurial behavior. Entrepreneurial potential being a composite attribute, it was studied in terms of five major dimensions which comprised of innovativeness, economic motivation, need for achievement, risk taking ability and self-confidence. The study conducted on the entrepreneurial potential of beekeepers of Kanyakumari district showed that that majority of the beekeepers *i.e.* 84.51 per cent of had high level of overall entrepreneurial potential and the remaining 15.49 per cent of the beekeepers had medium level of overall entrepreneurial potential. Entrepreneurial potential was determined as the

sum of all the five components and scores on these components ranged from medium to high for all beekeepers.

Almasdi (2018) in his study on assessing the entrepreneurial index of vegetables farmers who applied specialized and diversified farming systems in Kabupaten Agam reported the following findings. He opined that farmers who had applied a specialization system exhibited higher entrepreneurial potential than the farmers who implemented the diversification systems in vegetable crops. The entrepreneurial spirit of vegetable farmers was said to be reinforced with the application of specialization cultivation system.

2.3. Knowledge of farmers about the selected apiculture technology.

Knowledge can be defined as the understanding of the various different scientific practices of beekeeping as stated in the recommended package of practices.

Pande *et al.* (2003) in the study conducted to identify the impact that short duration training programmes organized by KVK Badgaon in Rajasthan had on the respondents, it was concluded by the researcher that all the respondents prior to attending training programmes displayed low knowledge level. However post training programmes 25.66 per cent respondents exhibited an average knowledge level.

Chittaranjan *et al*. (2006) reported that 47.00 per cent of the farmers manifested medium knowledge level. While 38.00 per cent respondents had exhibited high knowledge level and 15.00 per cent had low knowledge level with regard to the recommended practices of scientific beekeeping.

Singh *et al*. (2010) identified the extent of gain in the knowledge level of the respondents with respect to various beekeeping practices, prior and post to attending the training session. From the study results of pre-training mean knowledge score ranged

between 0.1 as in case of breeding of honey bees and 4.3 in case of management of boxes. On analyzing the mean knowledge score of the respondents after attending the trainings, the results obtained depicted that the scores ranged between 3.8 and 23.20. Interpretation of the t-values of difference of the mean knowledge score of all the practices of beekeeping obtained from the pre and post training was found to be significant ($p<0.05$).

Kumar (2013) revealed that 50.00 per cent beekeepers had low level of knowledge, followed by 25.71 per cent and 23.80 per cent of beekeepers had high and medium level of knowledge respectively. Mean knowledge score obtained in the study was 56.37 and it was concluded that greater proportion of the beekeepers exhibited low level of knowledge.

According to Basheer (2016) in her study on technology utilization of bitter gourd in Thiruvananthapuram district concluded that substantial proportion of the farmers displayed medium level of knowledge (58.59%) on scientific production practices of bitter gourd , 21.11 per cent of them showed low knowledge level and spare 20.00 percent in the high knowledge level.

Mehra *et al.* (2018) opined that greater proportion of the respondents about 98.00 per cent belonged to high level of knowledge category, while 2.00 per cent respondents exhibited moderate level of knowledge.

Phukan *et al.* (2018) suggested that the mean score of knowledge level of respondents obtained were 21.38. 58.75 per cent of the respondents belonged to medium category of knowledge level on selected technology practices of rice production. The remaining 23.75 per cent and 17.50 per cent of respondents had high and low category of knowledge respectively.

Poudel *et al.* (2018) in their study related to assessing the knowledge level of beekeepers on pesticide application during beekeeping enumerated that 76.60 per cent and 16.66 per cent of the respondents claimed that the bee population was declining and there

was a reduction in honey bee production respectively which was predominantly due to the application of the pesticide on the agricultural field for the crop production while 6.80 per cent of them reported that they had no any idea regarding the pesticide application

4.4. Level of adoption of selected apiculture technology of KAU

Rogers (2003) defined adoption as a decision to make full use of an innovation as the best course of action available.

The adoption process is said to be influenced by interrelated series of various factors such as personal, social, cultural and institutional factors which also includes the five stages of adoption *i.e.* awareness, interest, evaluation, trial and adoption. Development, dissemination and application at the farm level of novel and old chemical, biological, and mechanical techniques which forms an integral part of farm capital and inputs also affects the adoption of any technology. Training, education, advice and information which lies the foundation to the farmers knowledge is also reckoned to influence the adoption of technology. (OECD, 2001)

Bhusal and Thapa (2005) stated in the study that larger percentage (82.40 per cent) from the mobilized group practiced beekeeping enterprise of which 80.60 per cent of them followed improved methods with an adoption index of 77.44 per cent. Incase of non-mobilized group only 56.00 per cent adopted beekeeping enterprise and 68.40 per cent followed improved beekeeping practices with an adoption index of only 58.73 per cent. There existed significant linear relationship between number of honey bee colonies, extent of improved technology adoption, and honey yield and farm income from beekeeping.

Sathiadas *et al.* (2003) in a study conducted on adoption level of scientific dairy farming practices by IVLP farmers in the coastal agro ecosystem of Kerala, it was reported that there existed a significant positive association between their adoption of the recommended dairy farming practices and risk orientation of the farmers.

Thippeswamy (2007) reported significant positive relationship between adoption behaviour of plant protection measures in coconut cultivation and entrepreneurial behaviour of the coconut growers.

Kumar *et al.* (2013) reported that the most widely adopted management practices among the respondents were giving of sugar feed, uniting of boxes, method of feeding, migration of boxes, multiplication of boxes and winter packing. Low adoption rates were observed in case of methods *viz.*, rearing of queen bee and control of insect pests.

Bunde and Kibet (2016) revealed that the level of adoption of modern bee keeping in Baringo County was low *i.e.* 35.11 per cent and the factors that influenced the adoption of modern bee keeping technology were found to be gender, age, family size and education level of the household head.

Esakkimuthu (2015) on analyzing the extent of adoption of scientific beekeeping technologies by beekeepers the results showed that majority (72.77 per cent) of the beekeepers had a high level of adoption of scientific beekeeping technologies, 27.33 per cent of the beekeepers had medium level of adoption and none of respondents exhibited low level of adoption.

Kumari *et al.* (2015) in their study which analyzed the influence of training on the extent of adoption of beekeeping among the rural women in seven villages of Samastipur district in Bihar revealed that 88.00 per cent of trained women had practiced beekeeping. It also pinpointed the significant impact of trainings on influencing the rural women to adopt beekeeping.

Oladmeji and Damisa (2017) revealed that generally, the traditional bee farms had low levels of usage of improved techniques and practices. In the traditional unit the usage of Kenya top bar and Langroth bar as well as provision of water in form of either bore wells or dug wells were found to be low *i.e.* at 45.00 per cent and 58.00 per cent respectively. Further results reveal that the modern bee farmers did use Kenya top bar or Lang troth, assorted bait materials (63.00 per cent), supplement feed (59.00 per cent),

control pests and disease (78.00 per cent). Furthermore, modern bee farmers made use of experimental.

The farmers' diversification into beekeeping and thereby adoption of beekeeping technologies was suggested to be driven by the perceptions that existed among the farmers like higher income generation potential of hive products (59.00%), after seeing other farmers keeping bees (51.00%). The information and support received from government departments (50.00%) and non-government organizations also triggered the adoption of beekeeping as an enterprise among the farmers. (Amulen e*t al.* 2017)

Singh *et al.* (2010) enumerated that 60.00 per cent of farmers displayed moderate adoption level, while 28.00 per cent exhibited low level of adoption and remaining 12.00 per cent of them showed high adoption. The findings of the study pinpointed that there was a scope enhancement in the extent of adoption of improved production practices of mango to ensure higher fruit production

Jerin and Somasundaram (2018) opined that greater proportion of the respondents projected medium level of adoption (67.70 per cent), 17.30 per cent of respondents had high level of adoption and 16.00 per cent of the respondents exhibited low level of adoption on recommended rubber cultivation practices.

2.5. Perceived usefulness and effectiveness of selected apiculture technology of KAU

Basheer (2016) found out that the perceived effectiveness of practices like cue lure trap and weeding and raking at the time of fertilizer application was high where 76.67 per cent of farmers had reported it be 'very effective'. 82.00 percent of them reported that the cue lure trap and 78.00 per cent of respondents for weeding and raking at the time of fertilizer application agreed on these technologies to be 'very useful'. Technology assessment revealed that 65.55 per cent of farmers belonged to medium adoption category,

followed by 17.78 per cent who belonged to low adoption level and 16.67 per cent belonged to high adoption level.

In a study conducted by Tasneem (2016) the perceived effectiveness was found to be high for intercropping with cucumber and amaranthus (56.67 per cent) and irrigation (53.33 per cent).

Aparna (2017) in her study mentioned that majority of farmer respondents *i.e.* 97.78 per cent each reported that use of botanicals and cultivation of crop mixtures were the practices that was found to be effective for them. With regard to the extent of perceived usefulness of the technology 97.78 per cent suggested that cultivating crop mixtures followed by use of botanicals (69.8%) was useful.

2.6. Training needs in apiculture as perceived by the farmers and the experts.

Poonia and Dhaka (2011) in a study conducted inorder to identify the training needs of vegetable growers in Bundi district, reported that the farmers required training programmes related to the post-harvest management of vegetables. Also respondents had medium level of training need intensity with regard to production and marketing aspects of vegetable cultivation.

Singh *et al.* (2011) in a study undertaken to assess the training needs of beekeepers it was found that training needs such related to protection of bee pests, diseases and other hazards to be the ones which obtained highest value followed by the business of bees, bee-hive products and their extraction, processing, and medicinal values and essential operations.

Srivastava *et al.* (2012) reported that the training need was perceived to be the highest in scientific method of planting (56.70 per cent). Balanced use of fertilizer (53.80

per cent) was the second to top the list. With regard to the major areas of plant protection, management and control of late blight followed by management of brown rot were the areas were farmers felt the urgent need for trainings. The training need for post-harvest handling were found to be higher for proper storage of potato (46.30 per cent) while grading & sorting of potatoes the training need index was found to be low (15.42 per cent).

Kumar (2013) based on the training needs expressed by the beekeepers involved in the study of Jammu region, the important areas in which beekeepers felt the need for trainings were delineated in the following order *i.e.* rearing of queen bee, honey testing, control of insect pests and method of wax production It was determined based on the calculated training need indices and the indices obtained for the above mentioned was high. The least perceived training needs of the respondents were feeding, uniting of boxes and giving sugar feeding methods.

2.7. Constraints experienced by the farmers with suggestions for refinement.

Monga and Manocha (2011) reported that honey bee pests and diseases, shortage of bee forage necessitating migration to areas where bee forage was available, credit facility and the losses due to pests and diseases, management of bee colonies in extreme weather conditions, lack of cooperatives and institutional support for marketing, lack of motivation, lack of skilled manpower and training institutions pesticide poisoning and lack of subsidiary occupation as in other developing countries were mentioned as the major constraints by the respondents.

Esakkimuthu (2015) reported that lack of expertise about disease management technologies, lack of specific government schemes for beekeepers, absence of a minimum support price, unorganized market and absence of storage facilities at reasonable price were the major constraints faced by beekeepers.

Kumari *et al.* (2015) in the study categorized that constraints faced by the beekeepers into four categories mainly socio - personal, economic, technological and communicational constraints. Lack of information on consumer awareness and motivation, lack of finance, lack of proper training programme and inadequate access to training programme were the major constraints for beekeeping entrepreneurship development.

Gupta *et al.* (2015) reported that the major constraint among the beekeepers which has resulted in decline number of bee colonies was the increasing number of mobile towers in and around the growing area. The radiation emitted from mobile towers were said to distract the bees which thereby resulted in extinction of the bee species.

Shibru *et al.* (2016) identified major constraints of honeybee as insufficient number of visit to apiary and lack of proper bee management skills (51.11 per cent), understanding regarding bee enemies (14.33 per cent), drought and wild burning (13.1 per cent), absconding and migration of bee colony (12.30 per cent), poison plant in the area (4.90 per cent) and spraying of chemical (4.30 per cent).

Sumit *et al*. (2018) found out that lack of awareness about social, environmental, physical, economic and technological constraints in production were major constraints delineated in production and marketing of honey. Also, higher expenditure on transportation, low selling price of honey and delay in payment were also major constraints faced by the beekeepers.

Essayah *et al.* (2019) reported that the major constraints faced by the Tripoli community were honeybee diseases, droughts, absconding of colonies, poor societal awareness, pesticide poisoning, lack of bee colonies, lack of training, and lack of initial capital to start up beekeeping.

Methodology

3.

METHODOLOGY

Research methodology can be defined as the path through which researchers has to conduct the research. It enlists the path through which the researchers formulate the problem. Thereby develop the objectives and present their result from the data obtained during the study period. It also enables the readers to analyze the appropriateness of the study (Sileyew, 2019)

The research methodology in accordance with the objectives of the study is presented under the following section heads.

3.1 Research design

3.2 Locale of study

3.3 Selections of respondents

3.4 Operationalization and measurement of independent variables

3.5 Entrepreneurial potential of apipreneurs

3.5 Knowledge of farmers about the selected apiculture technology.

3.6 Level of adoption of selected apiculture technology of KAU

3.7 Perceived usefulness and effectiveness of selected apiculture technology of KAU

3.8 Training needs assessment of apipreneurs

3.9 Constraints faced by the apipreneurs

3.10 Techniques employed in data collection

3.11 Statistical tool used for data analysis

3.1 Research Design

In the study ex post facto research design was employed for analyzing the entrepreneurial potential, the extent of knowledge and adoption of improved apiculture technologies. Also the research design was used to identify the constraints faced in apiculture and ascertain their training needs. Ex post facto research design was used as the researcher has no direct control over the independent variables because they are inherent. The investigator also has no direct control over the independent variables which has already occurred and then their effects become obvious (Ray and Mondal, 2011).

3.2 Locale of the study

The present study was conducted mainly focusing the Southern districts of Kerala. Three districts were selected purposively (Kottayam, Pathanamthitta and Idukki). Marginal and small scale apipreneurs of South Kerala *viz.*, Kottayam, Pathanamthitta and Idukki were purposively selected as these districts possess maximum beekeepers community. As the major source of food for honey bees are obtained from rubber, three districts of South Kerala with maximum area under rubber cultivation were considered. Pathanamthitta tops the list followed by Idukki and Kottayam as per the Agricultural Statistics report of 2014-15 (GoK, 2015). It was also identified that Idukki district was earmarked as the Honey hotspot of the state with over a thousand beekeepers in the district.

3.3 Selection of respondents

Two categories of respondents were selected for the study namely beekeepers and the experts in the field of apiculture

a) Beekeepers: A minimum of thirty each of marginal and small scale apipreneurs were selected randomly from Pathanamthitta and Idukki district and fifteen from Kottayam district in consultation with honey bee research and training centres of the respective districts of Kerala. The disproportionate sampling occurred as the study was conducted during the Covid pandemic situation. Hence a total of 75 beekeepers were selected for the study.

b) Experts in the field of apiculture: Five experts from each district associated with apiculture who rendered research, development and extension were selected. Hence the total sample size for the study was 90.

KERALA MAP

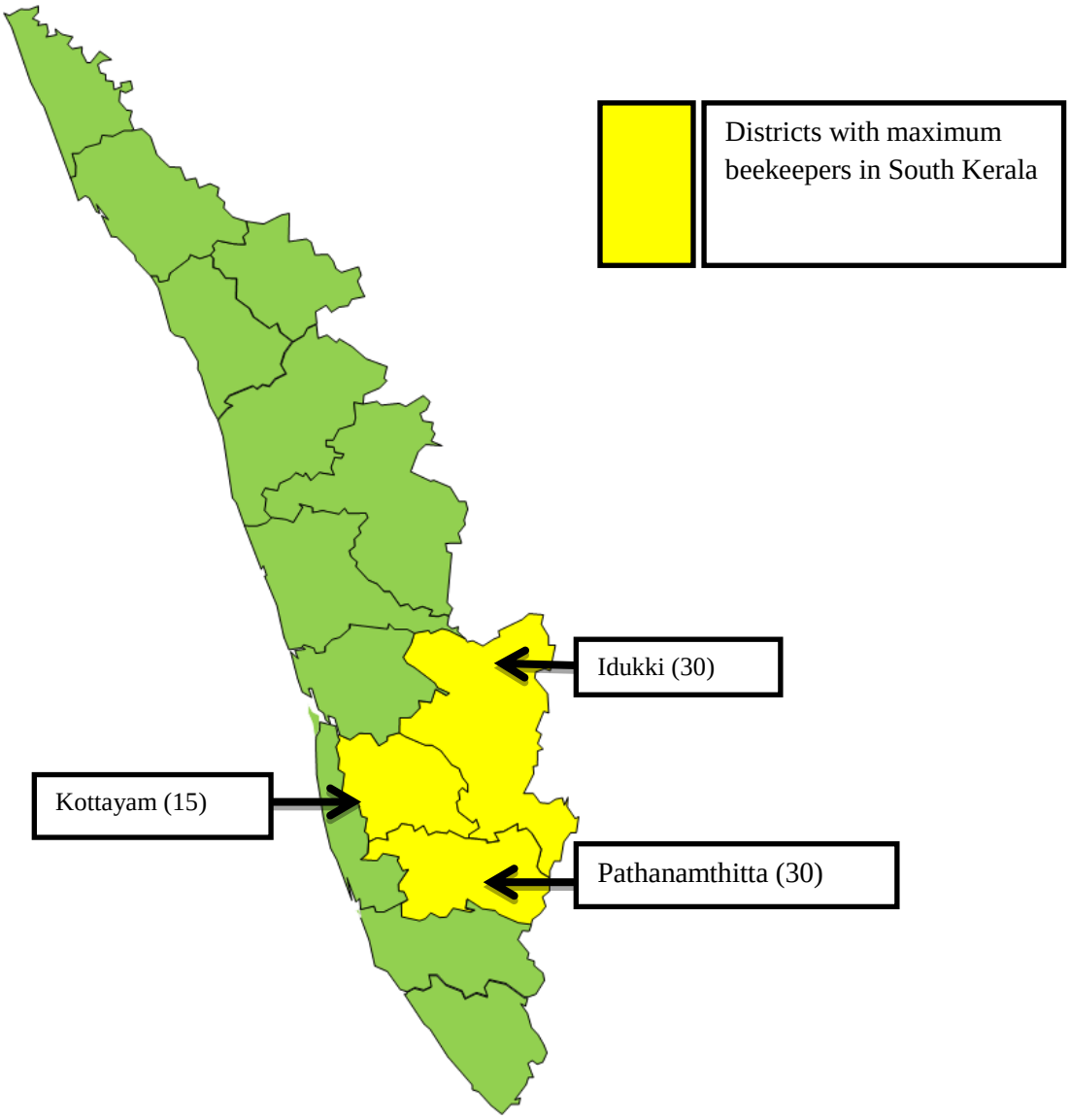


Fig.1 : Location Map of the study

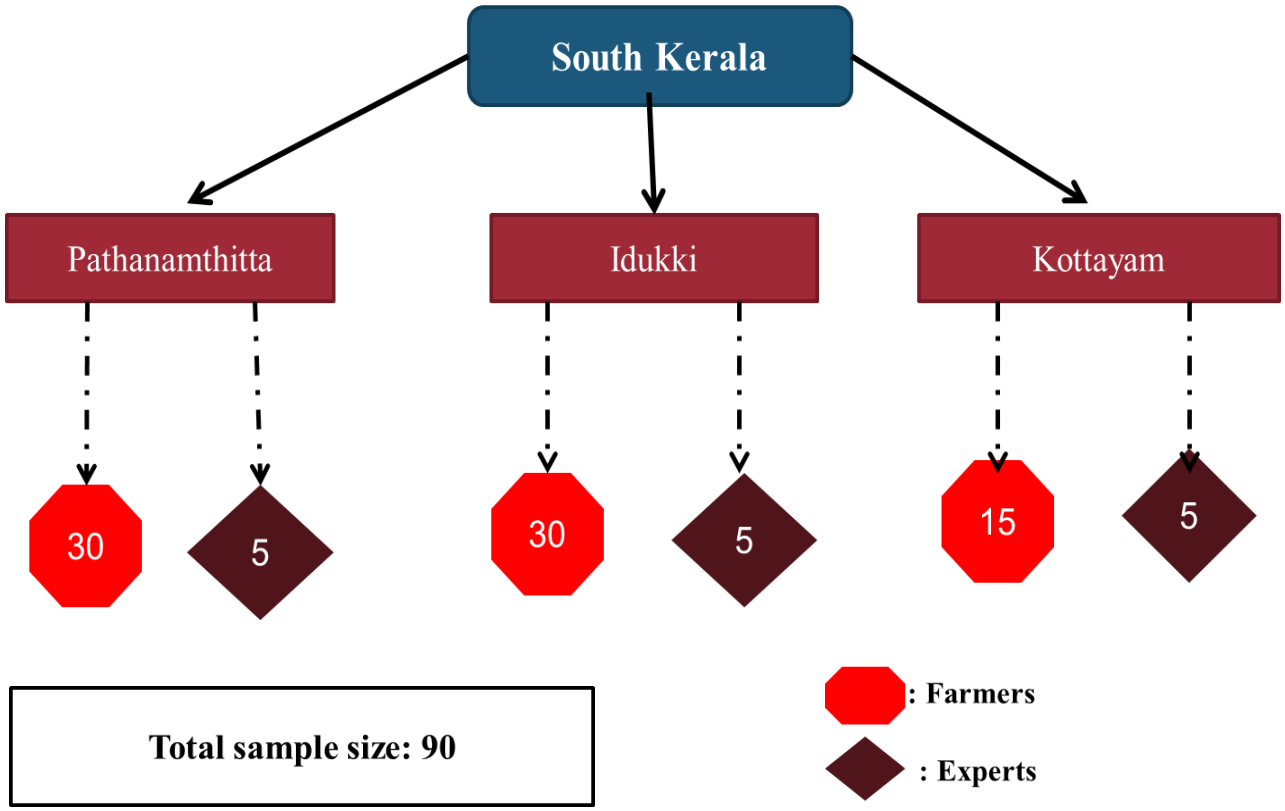


Fig.2: Representation of selection of respondents

3.4 Operationalization and measurement of the independent variables

As per the objectives, review of literature, discussion with experts and observations made by the researcher, the following independent variables were considered for the study which has relationship with the dependent variable. Thirty four independent variables were selected based on various literatures which were then given for judges rating to extension experts. It was given in the form of a questionnaire to collect responses from the judges on a five point continuum with response pattern "most relevant", "more relevant", "relevant", "less relevant", and "least relevant" with scores 5,4,3,2, and 1 respectively.

The copies of questionnaire were sent to thirty four judges via post and mail. Twenty three of the judges responded. The score obtained from the judges were added for the variable individually. The variables with high scores were selected as the independent variables for the study as represented in Appendix I.

Table 1: Independent variables and measurement procedures

Sl.No	Independent Variable	Measurement
1.	Age	Actual chronological age
2.	Education	Thomas (2004)
3.	Family Size	No. of family members at the time of interview
4.	Total land holding	Land area owned and leased by apipreneur
5.	Institutional interventions	Arbitrary scale developed for the study
6.	Market Intelligence	Scoring procedure will be developed for the study
7.	Training attended	Number of training attended by the apipreneur
8.	Yield per box	Arbitrary scale developed by the researcher
9.	Experience in Beekeeping	Jacob (2015)
10.	Risk propensity	Silveira *et al.* (2014)
11.	Credit orientation	Kumar (2007)
12.	Employment generation	Arbitrary scale developed by the researcher
13.	Creativity	Standard Creative Intelligence Test
14.	Optimism	Bernoster *et al*. (2018)
15.	Knowledge	Teacher made test developed for the study

3.4.1 Age

Age is defined as the number of years which is completed by the apipreneur at the time of investigation.

The variable was measured by directly asking the respondents the total number of years completed by the apipreneur at the time of investigation.

The apipreneurs were grouped into different categories based on the mean value and standard deviation and expressed in terms of frequency and percentage.

3.4.2 Education

Education is operationally defined as the academic qualification obtained by the apipreneur through formal and informal methods that help the person to understand information and interpret it as educational status of the apipreneur.

The scoring procedure developed by Thomas (2004) with necessary modifications was used for the study. A score of one was assigned to every consecutive level of education completed by the respondent.

The apipreneurs were then categorized into different categories on the basis of their education level and expressed in terms of frequency and percentage.

Category	**Number of apipreneurs**	
	F	**%**
Upto 10^{th}		
Upto 12th		
Graduation		
Higher education		

3.4.3 Family size

Family size is operationally defined as the number of family members in each apipreneur's household.

Family size was measured in numbers. The respondents were grouped into categories based on the mean value obtained and expressed in terms of frequency and percentage.

Sl. No	Family Size	Frequency
1.	Up to mean value	
2.	Greater than mean value	

3.4.4. Total Land holding

Total land holding is operationally defined as the extent of land the apipreneur possess and cultivate (own as well as leased land area) is termed as total land holding.

The variable was measured by directly asking the respondents based on which scoring was done. Based on the mean and standard deviation, the categorization was done into low, medium and high.

The apipreneurs was expressed in terms of frequency and percentage into different categories on the basis of the total land holding they owned. Categorization was also done to identify the frequency of apipreneurs who carried out beekeeping in their own and in leased land.

Category	Number of apipreneurs	
	F	%
Low (Mean - S.D.)		
Medium (Mean)		
High (Mean + S.D.)		

3.4.5. Institutional interventions

Institutional interventions are operationally defined as to the support that is received by the enterprise from formal and non-formal institutions in terms of finance, training, technology and information.

It was an arbitrary scale developed by the researcher. The variable was measured where for every type of trainings received a score of one was assigned and the institutions from which such interventions are given were also given a score of one.

Formal sources/ Informal sources	**Duration of training**			
	One day	**Two day**	**Three day**	**6 months**

The respondents were then grouped and expressed in terms of frequency and percentage.

3.4.6 Market intelligence

Market intelligence is operationally defined as the market related information received by the apipreneur and its extent of usefulness is measured by this variable.

An arbitrary scale was developed for the study comprising of five statements reflecting market intelligence of the apipreneur. The scoring ranged from 1 to 12.

Sl.no	**Statements**	**Responses**		
1.	Do you have a picture about the present prices of honey and its products in the market?	Yes	No	
2.	**If yes**, how regularly do you update yourselves?	Always	Sometime	Rarely

3.	What all are the sources of market information?	Newspaper/Online sources/Television/Organizations Peer groups Others:	
4.	Market intelligence has enabled to bring about value addition in the products obtained from apiculture.	Yes	No
5.	Market intelligence has enabled the fetching of higher prices.	Yes	No

The scores obtained by the apipreneurs were considered as the market intelligence score. Based on the mean and standard deviation, the respondents were categorized into low, medium and high and expressed as frequency and percentage.

3.4.7 Number of Trainings

Number of trainings is operationally defined as the number of trainings undergone by the apipreneur in various activities related to production aspects of apiculture by different agricultural institutions.

The respondents were categorized based on the mean value and expressed in terms of frequency and percentage.

3.4.8 Yield per colony

Yield per colony is operationally defined as the amount of honey obtained by the apipreneur from a bee box or a colony per year.

The respondents were categorized based on the mean value and expressed in terms of frequency and percentage.

3.4.9 Experience in beekeeping

Experience in beekeeping is operationally defined as the number of years in beekeeping.

Scale developed by Jacob (2015) with slight modifications as per the need of the study was used. The score assigned represents the number of years the apipreneur has been practicing apiculture. The following was the categorization followed for the apipreneurs.

Category	F	%
Less than 10 years		
10-20 years		
Greater than 20 years		

3.4.10 Risk propensity

Risk propensity refers to the behaviours of an individual in situations that involve some potential danger or harm but also provide an opportunity to obtain some benefits.

It was measured using a scale developed by da Silveira *et al. (*2014) with slight modifications. The scale comprised of four statements of which two were positive and two were negative. It was measured on a five-point continuum *i.e.* strongly agree, agree, undecided, disagree, and strongly disagree. A score of 5, 4, 3, 2 and 1 was given for positive statements, and scoring was reversed for negative statements. The scores were added to measure the risk propensity of the respondents.

Sl.No	**Statements**	**SA**	**A**	**UD**	**DA**	**SDA**
1.	I trust my intuitions and experience inorder to understand the best time for selling honey and its by products					
2.	I still believe that I can make maximum profit even if the enterprise is risky					

3.	Apiculture is not a risky business					
4.	Future marketing is not a way to tackle risk that is associated with the enterprise					

Based on the mean and standard deviation, the apipreneurs were categorized into low medium and high and then expressed in frequency and percentage.

3.4.11 Credit orientation

Credit orientation is operationally defined as orientation of the apipreneur to avail and utilize credit for the production. It was measured using a scale developed by Kumar (2007). It consisted of five statements. The maximum score a respondent could get was 17 and minimum was 5. The statements were as follows:

a) Do you think a beekeeper like you should borrow for beekeeping? **Yes/No**

b) According to you how difficult is it to secure credit for beekeeping?

Very difficult/Difficult/Easy/Very easy

c) How is a beekeeper treated when he goes to secure credit for beekeeping?

Very badly/badly/Fairly/ Very fairly

d) There is nothing wrong in taking credit from institutional sources for investing in apiculture? **SA / A / D / DA**

e) Have you used credit for beekeeping? **Yes / No**

The categorization of the apipreneurs was done on the basis of the mean and standard deviation obtained and then expressed in terms of frequency and percentage.

3.4.12. Employment generation

Employment generation is operationally defined as number of persons employed by the apipreneur.

An arbitrary scale is developed where the score assigned represents the number of years the apipreneur has been practicing apiculture. The variable was measured based on the number of employees who are engaged in the various aspects of the enterprise, which includes production, protection, harvesting and post-harvest and number of family as well as hired labour used.

Total No. of employees working under the enterprise:

Growth season	Scarce season	Harvest season	Family labour	Hired labour	Total

3.4.13. Creativity:

Creativity is operationally defined as the ability of the apipreneurs to generate or identify new ideas or alternatives that may be effective in solving problems in apiculture.

Creativity was measured using Standard creative intelligence test. A list of 14 terminologies were presented to the apipreneurs as adjectives which referred to their personal traits (creative traits *vs*. non creative traits. The respondents were free to choose the adjectives that they felt closely related to their personality from the list given below. A score of 0.25 score was given for every adjective that was deemed to be a creative trait and score of -0.25 for every non creative trait. Then the cumulative score was calculated.

Creative traits	Non creative traits
Inventive	Responsible
Enthusiastic	Dependable
Determined	Practical
Informal	Understanding
Self confidence	Polite
Independence	Rational
Daring	
Persistence	
Versatile	

The apipreneurs were then grouped into low and high category with mean value as the check.

3.4.14 Optimism

Optimism is operationally defined as the mental attitude of the apipreneur reflecting a belief or a hope that the outcome of specific endeavor or outcomes in general, will be positive, favorable, and desirable.

The variable was measured using Life Orientation Test-Revised (LOT-R) scale developed by Bernoster *et al.* (2018) with slight modifications. It comprised of five statements which were rated on five point continuum from strongly agree, agree, undecided, disagree to strongly disagree. A score of 5, 4, 3, 2 and 1 was given for positive statements, and scoring was reversed for negative statements. The score ranges from 1 to 25.

Sl.No	Statements	SA	A	UD	DA	SDA
1.	I usually expect the best even at times of uncertainty					
2.	I rarely count on the good things that happened to me					
3.	I hardly expect the things to happen the way I want it to.					
4.	I stay calm and relaxed even in unexpected situations					
5.	It is always important that I always stay busy with work					

The categorization of the apipreneurs into low, medium and high was done on the basis of the mean and standard deviation obtained and then expressed in terms of frequency and percentage.

3.5. Entrepreneurial potential of apipreneurs

In the study, entrepreneurial potential was operationally defined as the individuals' readiness to engage in entrepreneurship activities. Hence we can summarize that the entrepreneurial potential is the summative result of the expression of several entrepreneurs' individual characteristics.

The scale developed by Santos *et al*. (2011) with necessary modifications done as per the need of the study was used for measurement of entrepreneurial potential of apipreneur. In the scale developed, entrepreneurial motivations, management competencies, psychological competencies and social competencies were the four major domains that determine the entrepreneurial potential of an individual. The scale consisted of 25 statements. Response of the apipreneur was collected on a five point continuum *viz.*, strongly agree, agree, undecided, disagree and strongly disagree with the corresponding scores of 5, 4, 3, 2, and 1, respectively in case of positive statements and the reverse in the case of negative statements. Entrepreneurial potential of the respondent can be obtained by summing score of responses to all the 25 statements. The maximum possible score is 125 and minimum is 25. Based on their score, entrepreneurial potential of apipreneur can be divided into three categories *viz.*, high, medium and low.

3.5.1. Entrepreneurial motivation

Entrepreneurial motivation can be operationally defined as a process which activates and can motivate an individual to accomplish his entrepreneurial goals.

a) Need for achievement:

It can be operationally defined as the desire of the beekeeper to attain excellence and sense of personal accomplishment.

b) Need for power:

Need for power can be operationally defined as the desire within an apipreneur to hold control and authority over another person and thereby influence and change their decision in accordance with his own needs or desires.

c) Need for independence:

Operationally defined as the desire of an apipreneur to not subject to another's authority and become the authority of the enterprise.

d) Need for wealth:

It can be defined as the desire of the apipreneur to pursue entrepreneurial opportunities so as to generate economic growth for oneself.

3.5.2 Management competencies

Management competencies operationally defined as the ability of an individual to manage the four main components of the business *i.e.* the entrepreneur, business strategy, business resources and human resources. The following are the dimensions that enable analysis of the management competency of the individual *i.e.*

a) Leadership ability

Leadership ability can be operationally defined as the ability to influence others, to manage resources strategically in order to emphasize both opportunity-seeking and advantage-seeking behaviors

b) Resource mobilization capacity:

It is operationally defined as ability of the apipreneur to secure new and additional resources for the enterprise. It also involves better usage of the existing resources.

3.5.3. Psychological competencies

Psychological competencies are operationally defined as the wide group of skills and attributes which characterize entrepreneurial behavior of the apipreneur

a) Innovation decision delay

It is operationally defined as a psychological phenomenon in which, the apipreneur delay the decisions rather than deciding on and preparing for risky scenarios ahead of time. It can be measured using the following three sub dimensions *i.e.* techno-optimism, perceived technical capacity and perceived risk.

- ***Techno-optimism****:* Techno-optimism is a "belief in human technological abilities to solve problems of unsustainability while minimizing or denying the need for large-scale social, economic and political transformation.
- ***Perceived technical capacity*****:** Perceived capacity, defined as the "extent to which people feel prepared to endure changes and take necessary steps to cope with them.
- ***Perceived risk:*** Risk perception is the subjective judgement that people make about the characteristics and severity of a risk.

3.5.4 Social competencies

Social competencies are operationally defined as the apipreneurs ability to interact effectively with others.

a) Network development capacity:

It is operationally defined as the ability of an apipreneur to develop a network between apipreneur and other individuals who can provide resources for business implementation and development

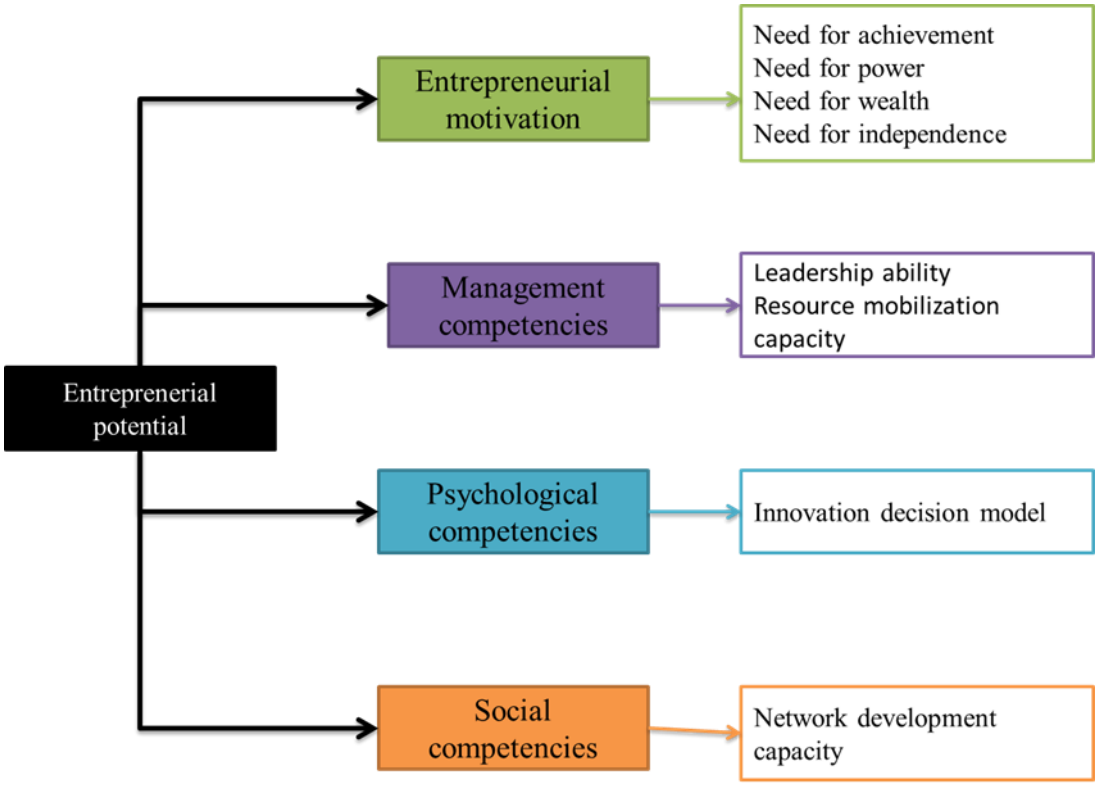


Fig.3: Dimensions of Entrepreneurial potential

3.6. Knowledge of farmers about the selected apiculture technology.

Refers to the extent of knowledge possessed by the apipreneurs on the recommended practices.

In order to determine the extent of knowledge of the beekeepers, a teacher made knowledge test was used (Interview Schedule – Appendix II). Major practices as per the recommendation of KAU, scientific beekeeping practices were included in the knowledge test to understand the existing knowledge of the respondent about apiculture and its practices. Scores of 'one' and 'zero' were given to the correct and wrong answers respectively. Hence the maximum score that could be obtained apipreneur was 15 and minimum score was 0.

The summation of the scores obtained on correct answers given by the individual represented his level of knowledge on the scientific apiculture practices of KAU. The mean score and standard deviation of the knowledge level were computed and the apipreneurs were categorized into low, medium and high level of knowledge with mean value kept as the check.

3.7. Level of adoption of selected apiculture technology of KAU

In the study, adoption level refers to the adoption of recommended cultivation practices of coconut by the farmers. Eighteen recommended practices were used for the measurement of adoption (Interview schedule – Appendix II). Every practice was rated in a score out of five for which minimum of one is given if the respondent is aware and simultaneously with every stage of adoption *i.e.* interest, evaluation, trial and adoption a score of one will be assigned making the maximum total to be obtained by the respondent for the practice is 5.

In the study the stages of adoption was operationalized as the following. The respondent is said to be in the awareness stage if the apipreneur came to know about the practice, if he/she probed more on the practice then he was said to be in the interest stage. Following which if the respondent is probing and discussing, he is considered to be in the evaluation stage and then trying the practice makes him in the trail stage. Finally if the respondent takes up the practice on a continuous basis he is said to be in the adoption stage.

Based on the cumulated scores, rate of adoption of individual practices were calculated and the overall adoption quotient of apipreneurs were also calculated using the formula mentioned below

The adoption quotient was calculated by using the formula:

$$\text{Adoption Quotient} = \frac{\sum_{I=1}^{n} \frac{e_i}{p_i}}{N} \times 100$$

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

The respondents were also categorized into low, medium and high level of adoption based on the mean value and standard deviation of the adoption quotient and expressed in terms of frequency and percentage. Categorization of the apipreneurs into innovators, early adopter, early majority, late majority and laggards based on the standard Rogers curve was also done.

3.8. Perceived usefulness and effectiveness of selected apiculture technology of KAU

Perceived usefulness and the effectiveness of the selected apiculture technology were categorized into very useful, useful, not useful and very effective, effective and not effective. The scoring pattern assigned was 3, 2 and 1 for very useful/very effective, useful/effective and not useful/not effective respectively. Hence the perceived usefulness and effectiveness was then expressed in terms of frequency and percentage.

3.9. Training needs in apiculture as perceived by the farmers and experts.

The practices selected to analyze the trainings needs of beekeepers were considered based on study done by Kumar (2013) and modified based on the suggestions obtained on discussion with subject matter specialist and experts associated in the field of apiculture. Training needs of beekeeping comprised of 15 items. The training needs were then categorized into most needed, needed and least needed and scored as 3, 2 and 1 respectively. The training needs were then computed based on the Average Choice Score method.

3.10. Constraints experienced by the farmers

The constraints were measured based on the ten statements developed by Esakkimuthu (2015) and was modified on consultation with the subject matter specialists. The constraints were scored on 3 point continuum as very important, important and least important marked with a score of 3, 2 and 1 respectively. The results obtained were then analyzed and on the basis of the weighted mean the constraints were ranked from one to ten with one being the highest rank and ten the lowest rank.

3.11. Techniques employed in data collection

A well-structured interview schedule was used for purpose of data collection. The schedule was pretested with 10 respondents selected outside the sample area and based on the interaction with the respondents necessary modifications were made accordingly. (Appendix II)

3.12. Statistical tool used for data analysis

3.12.1 Frequency and percentage analysis

For simple comparison and classification of the respondents, the selected variables were subjected to and interpreted using frequency and percentage analysis, wherever it was found necessary. First frequency was calculated and the percentage was obtained by multiplying it with 100 and then further dividing it with total number of respondents.

3.12.2 Mean and Standard Deviation

Mean (M) of the data and standard deviation (SD) of the data was found out to classify respondents in to low, medium and high. Values less than M-SD was categorized as low and values falling under M±SD was categorized as medium. Values greater than M+SD was categorized as high.

3.12.3 Standard Error

Standard error was used to measure the statistical correctness of an approximate in the standard deviation results.

3.12.4 Correlation Analysis

The relationship between the dependent variables and independent variables were found out using correlation analysis.

3.12.5. Principal Component Analysis

Principal component analysis was performed inorder to identify the components that contributed to the entrepreneurial potential of the apipreneurs.

3.13. HYPOTHESES:

The following were the hypotheses formulated inorder to fulfill the objectives of the study

H0: The entrepreneurial potential of the apipreneurs were found to be low

H0: The apipreneurs exhibit very low knowledge level with regard to the selected apiculture technology of KAU

H0: The extent of adoption of selected KAU practices of apiculture was found to be low

H0: There is no significant relationship between the extent of adoption and the independent variables

H0: The selected apiculture practices of KAU are not perceived useful and effective by the apipreneurs

Results and Discussions

4.

RESULTS AND DISCUSSIONS

The salient findings of the study undertaken are presented and discussed under the following subheads:

4.1. Personal and social characteristics of apipreneurs.

4.2. Knowledge of farmers about the selected apiculture technology.

4.3. Entrepreneurial potential of apipreneurs.

4.4. Level of adoption of selected apiculture technology of KAU

4.5. Perceived usefulness and effectiveness of selected apiculture technology of KAU

4.6. Training needs in apiculture as perceived by the farmers and the experts.

4.7. Constraints experienced by the farmers with suggestions for refinement.

4.8. Farmers practices

4.1. Personal and social characteristics of the apipreneurs

Personal and social characteristics of the apipreneurs enable better understanding on their socio economic and psychological background. Results based on the respondent's personal and social characteristics that were selected through Judges Rating are presented below:

4.1.1. Age

Age is defined as the number of years which is completed by the apipreneur at the time of investigation. The result on the distribution of the apipreneurs on the basis of their age is given in Table 2.

Table 2: Distribution of apipreneurs based on age

Category (years)	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
< 47	4	13.33	4	13.33	1	6.67	9	12
47-58	10	33.33	8	26.67	10	66.67	28	37.33
59-68	12	40	12	40	2	13.33	26	34.66
> 69	4	13.33	6	20	2	13.33	12	16
Total	30	100	30	100	15	100	75	100
	Max- 70 Min- 38		Max- 85 Min- 31		Max- 70 Min- 40		Mean- 58.15 S.D.- 10.78 S.E.- 1.245 Max- 85 Min- 31	

From Table 2. it is clearly evident that more than 50 per cent of the total apipreneurs belong to age above 59 *i.e.* the old age category. This was followed by middle age and the young age with a percentage of 37.33 and 12.00 per cent respectively.

With regard to distribution of apipreneurs within each district, two districts namely Pathanamthitta and Idukki had more than 50.00 per cent apipreneurs that belonged to the

old age category, while in case of Kottayam more than 60.00 per cent of the apipreneurs belong to the middle age category. This greater percentage of respondents who belonged to middle age category in Kottayam unlike apipreneurs who belonged to old age category from the other districts of study is an indication of how the fellow professional apipreneurs within the district, can have an influence on the peer group to establish successful apiculture enterprise.

Hence it can be concluded that majority of the apipreneurs belong to the old age category which can be highlighted as a key characteristics of Kerala farmers who largely belong to the middle age to old age category. The low per cent of youth among apipreneurs in the study shows the extent of aversion of the young generation into apiculture due to lack of proper knowledge of beekeeping, the fear of defensive bee behaviour, lack of attractive marketing platforms and lack of necessary financial aid. Thus extension efforts need to focus to promote self-employment among youth in rural areas. The results are in line with the findings of Jacob (2015) and Amulen *et al*. (2015).

4.1.2. Education

Education is operationally defined as the academic qualification obtained by the apipreneur through formal methods that help the person to understand information and interpret the educational status of the apipreneur. The distribution of apipreneurs based on their level of education is presented in Table 3.

Table 3: Distribution of apipreneurs based on the education

Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
Upto 10th	11	36.67	17	56.67	3	6.67	31	41.33
Upto 12th	6	20	5	26.67	4	26.67	15	20
Graduation	12	40	6	20	8	53.33	26	34.67

Higher education	1	3.33	2	6.67	0	0	3	4
Total	30	100	30	100	15	100	75	100
	Mean-12.267 Max- 17 Min- 9		Mean- 11.134 Max- 17 Min- 5		Mean- 13 Max- 15 Min- 10		Mean-11.96 S.D.-2.54 S.E- 0.29 Max- 17 Min- 5	

On analysis of Table 3, it can be observed that all of the apipreneurs are literate with educational qualifications ranging from high school to post-graduation. More than 50 per cent of the apipreneurs have completed education up to higher secondary.

District wise analysis shows a variation in the category to which the apipreneurs belong. In Pathanamthitta and Kottayam districts, majority of the apipreneurs possessed educational qualification up to graduation. While over 50 per cent in Idukki have respondents who have studied up to 10^{th} grade. Kottayam is said to be the second most literate district (GoK, 2011) which is a clear indication as to why majority of apipreneurs have education qualification with and above higher secondary.

Hence it can be inferred that education level of the apipreneurs play a vital role in persuading the apipreneurs to take up technologies and beekeeping being an enterprise that is gaining pace, educated farmers can ensure higher rate of adoption of recent technologies and the proper management practices. Similar results were revealed in a study conducted by Masuku (2013) and Abejew and Zeleke (2017)

4.1.3. Family Size

Family size is operationally defined as the number of family members in each apipreneur's household. The distribution of the apipreneurs based on the family size is represented in Table 4.

Table 4: Distribution of apipreneurs based on the family size

Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
≤4	20	66.67	16	53.33	7	46.67	43	57.33
>4	10	33.33	14	46.67	8	53.37	32	42.66
Total	30	100	30	100	15	100	75	100
	Mean- 3.97 Max- 6 Min- 3		Mean- 4.567 Max- 10 Min- 2		Mean- 4.73 Max- 7 Min- 2		Mean- 4.36 S.D.- 1.457 S.E.- 0.17 Max- 10 Min- 2	

From Table 4, we can conclude that 57.33 per cent of the apipreneurs have a family size ranging from 2-4 members and remaining 42.66 per cent had family size greater than 4 members.

District wise analysis shows that majority of apipreneurs in Pathanamthitta and Idukki districts have a family size falling in the range between 2 and 4 unlike in Kottayam where majority of apipreneurs had family size with family members greater than 4.

From the above table it can be inferred that there is a shift in the family structure indicating transit from joint family to nuclear system in Kerala. However irrespective of the family size, the family members involvement in beekeeping practices was evident during the study. The following results were in line with that of findings of Sathyanarayan *et al.* (2010) and Jacob (2015).

4.1.4. Total Land Holding

Total land holding is operationally defined as the extent of land the apipreneur possess and cultivate (own as well as leased land area). The distribution of the apipreneurs based on the total land holding possessed is represented below in Table 5. The categorisation was based on the mean and standard deviation.

Table 5**:** Distribution of apipreneurs based on the total land holding

Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
Low	6	20.00	3	10.00	1	6.67	10	13.33
Medium	20	66.67	25	83.33	11	73.33	56	74.66
High	4	13.33	2	6.67	3	10.00	9	12.00
Total	30	100	30	100	15	100	75	100
	Mean- 1.694 Max- 4.5 Min- 0.4		Mean- 1.54 Max- 5 Min- 0.21		Mean- 2.05 Max- 4 Min- 0.5		Mean- 1.702 S.D.- 1.06 S.E.-0.12 Max- 5 Min- 0.21	

It is evident from Table 5 that majority of the apipreneurs *i.e.* about 75.00 per cent of the apipreneurs possess medium land area (ranging from 0.64 acre to 2.76 acre), followed by apipreneurs who possess land less than 0.64 acre (13.33 per cent) and apipreneurs who had land area greater than 2.76 acres (12.00 per cent).

District wise analysis revealed that majority of the apipreneurs (66.67 per cent) in Pathanamthitta possess land area ranging from 0.64 acre to 2.76 acre followed by apipreneurs owning land less than 0.64 acre and remaining 13.33 with land holding greater than 2.76 acre. The similar trends were observed in Idukki as well as in Kottayam districts. The mean total area possessed by apipreneurs was 1.702 acre and the table clearly illustrates that apipreneurs from Kottayam district possessed more mean land area (2.05

acre) for farming compared to that of farmers from Pathanamthitta (1.694 acre) and Idukki (1.54 acre) districts respectively.

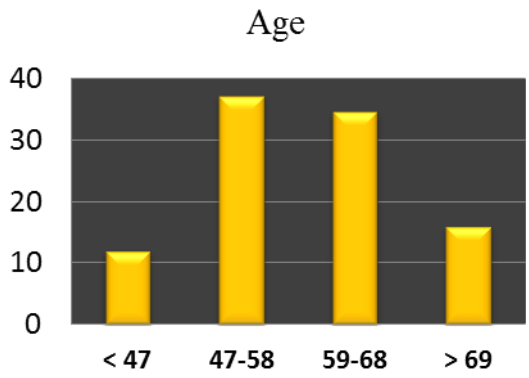
The mean land area possessed by apipreneurs of Kottayam district was high and this could be due to the predominance of rubber based farming systems. Also, as evident from Table 15 where the number of boxes maintained by apipreneurs for bee keeping was more than that was owned by apipreneurs of Pathanamthitta and Idukki districts respectively.

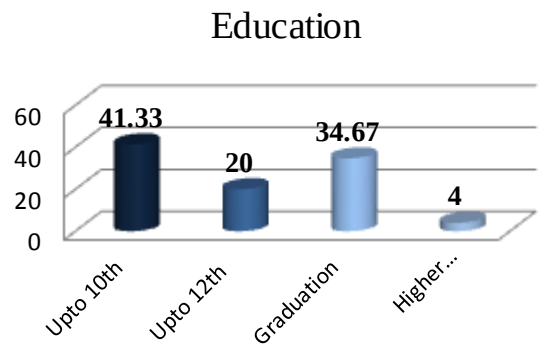
Table .6: Distribution of apipreneurs based on own and leased land

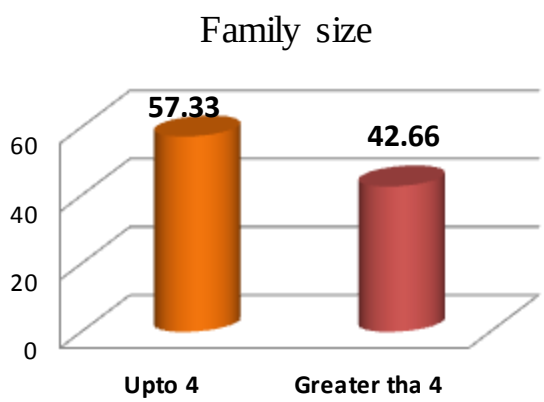
Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
Own plot	19	63.33	24	80.00	6	40.00	49	65.33
Leased plot	11	36.67	6	20.00	9	60.00	26	34.67
Total	30	100	30	100	15	100	75	100

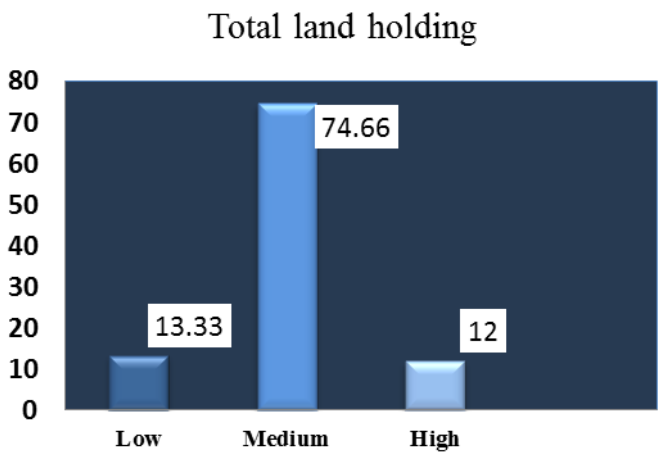
On analysing Table 6 it is evident that majority of the apipreneurs *i.e.* 65.33 per cent possess their own land while 34.67 per cent placed their boxes in other farmers or plots of their acquaintances. Majority of the farmers in Idukki and Pathanamthitta districts placed their beehives in their own plots. While in case of Kottayam district the scenario shows a contrast where the majority of the apipreneurs had large number of boxes in possession for apiculture, which forced them to place boxes on others plot as well. It shows their entrepreneurial orientation compared to that of apipreneurs of Pathanamthitta and Idukki districts.

From the Table 5 and Table 6 it can be inferred that majority of the apipreneurs can be categorized into small farmers. Even though the land holdings are smaller, beekeeping is one such enterprise which is being practised by the landless farmer thus making it an enterprise that can be taken up by farmers irrespective of the total land holding that they possess. From the results it can be concluded that governmental organisations and extension efforts should be taken up in order to enhance the economic status of the









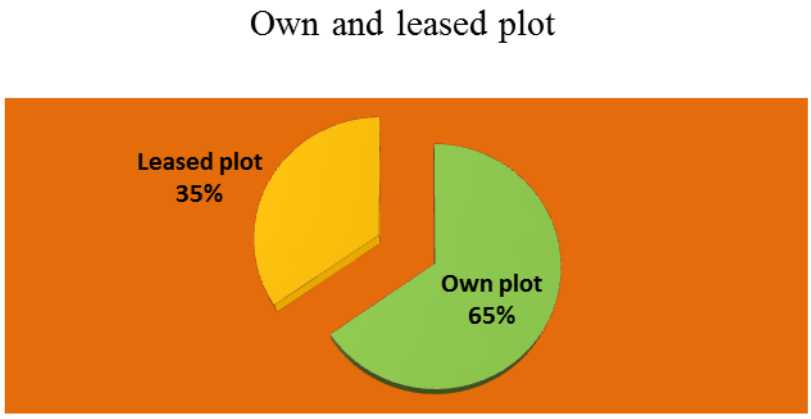


Fig.4: Profile characteristics of apipreneurs

apipreneurs and also promote apipreneurs to expand their enterprise as apiculture is one such enterprise that can be taken up irrespective of the size of the land holding. They should also bring in more landless and marginal farmers to take up apiculture as a main profession or subsidiary occupation with the agriculture, which inturn can create opportunities to attract more youth into bee keeping business.

4.1.5 Institutional interventions

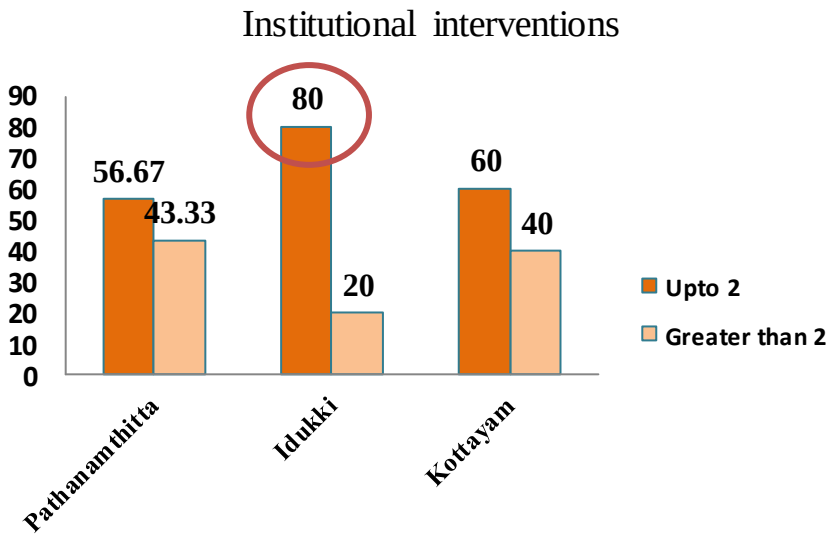
Institutional intervention is operationally defined as the support received by the apipreneur from formal and non-formal institutions in terms of finance, training, information and technology. Distribution of the apipreneurs based on institutional interventions is presented in Table 7.

Table 7: Distribution of apipreneurs based on the institutional interventions obtained

Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
≤2	19	63.33	24	80.00	9	60.00	52	69.33
>2	11	36.67	6	20.00	6	40.00	23	30.67
Total	30	100	30	100	15	100	75	100

On analysis of Table 7, it is clearly evident that around 70.00 per cent of the apipreneurs have attended trainings provided by upto two institutions while the remaining 30.00 per cent of the apipreneurs have attended trainings provided by more than two institutions.

Similar trend was observed while delineating the district wise information as that obtained above. From the table it is clearly evident that only 20.00 per cent of the apipreneurs in Idukki district have attended trainings greater than four. The reason could be due to the lack of institutional mechanisms for apipreneurs to get actively engaged and connected with the institutions associated with beekeeping. An attempt was also made to



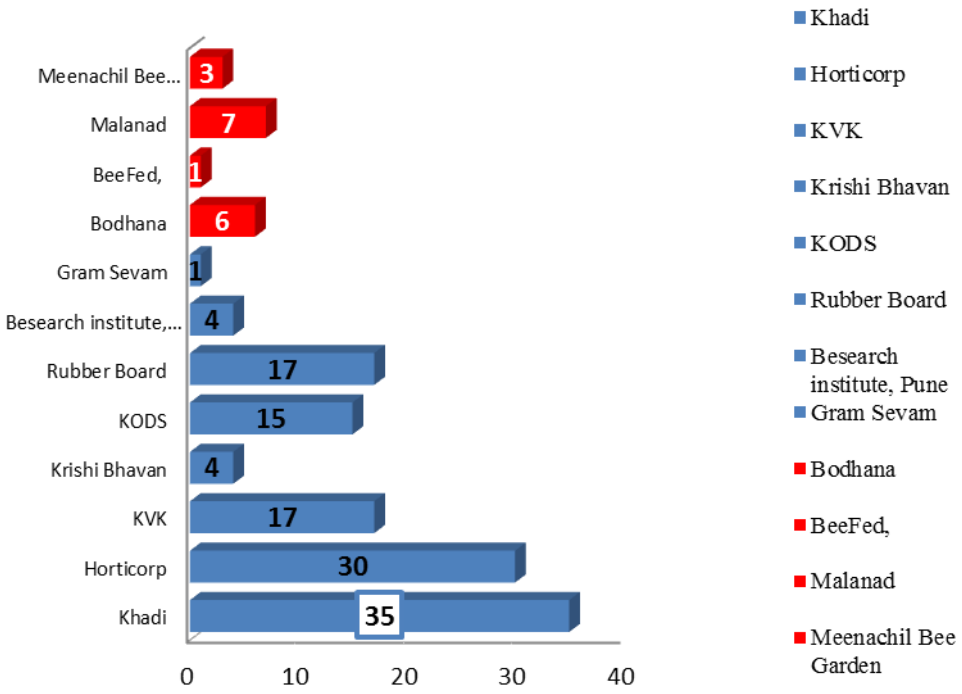


Fig.4: Profile characteristics of apipreneurs

delineate the list of institutions that were involved in rendering services to the apipreneurs and the result of the same is presented in Table 8.

Table.8: List of institutions providing services to the apipreneurs.

Organizations	Total	Percentage
KVIC	35	46.67
Horticorp	30	40.00
KVK	17	22.67
Krishi Bhavan	4	5.34
KODS	15	20.00
Rubber Board	17	22.67
Besearch institute, Pune	4	5.34
Gram Sevam	1	1.34
Bodhana	6	8.00
BeeFed,	1	1.34
Malanad	7	9.34
Meenachil Bee Garden	3	4.00

From the above Table 8, it can be concluded that KVIC (46.66 per cent) followed by Horticorp (40.00 per cent) in collaboration with Kerala Agricultural University were the organizations that are extensively involved in providing majority of the interventions to the apipreneurs in the form of trainings, provision of bee boxes and other subsidies. There are non-formal organizations set up within each district which also cater as a bridge between the apipreneurs and governmental organizations to carry out interventions. Few of such organizations are Travancore Beekeepers Society in Pathanamthitta, Kerala Organic Development Society (KODS) in Idukki and Malanad Cooperative Society in Kottayam district. Apart from this, professional apipreneur centre namely Meenachil Bee Garden, BeeFed and Highrange bee unit also provide training and services to the apipreneurs.

From the above details, we can infer that majority of the apipreneurs had obtained trainings provided by atleast upto two organizations. Hence it becomes the allegiance of the governmental organizations, non-governmental organizations professional beekeepers and extension officials to bring in more apipreneurs to actively participate in apiculture

related services and programme in order to promote apiculture as an enterprise within the state. More apipreneurs can be encouraged by promoting the skill upgradation of the trainees from beekeeping experts or bee breeders as a part of the follow up of the training.

4.1.6. Market Intelligence

Market intelligence is operationally defined as the market related information received by the apipreneurs and the extent of usefulness of these information are measured by this variable. The distribution of apipreneurs on the basis of the market intelligence is given below in Table.9. The categorisation was based on the mean and standard deviation.

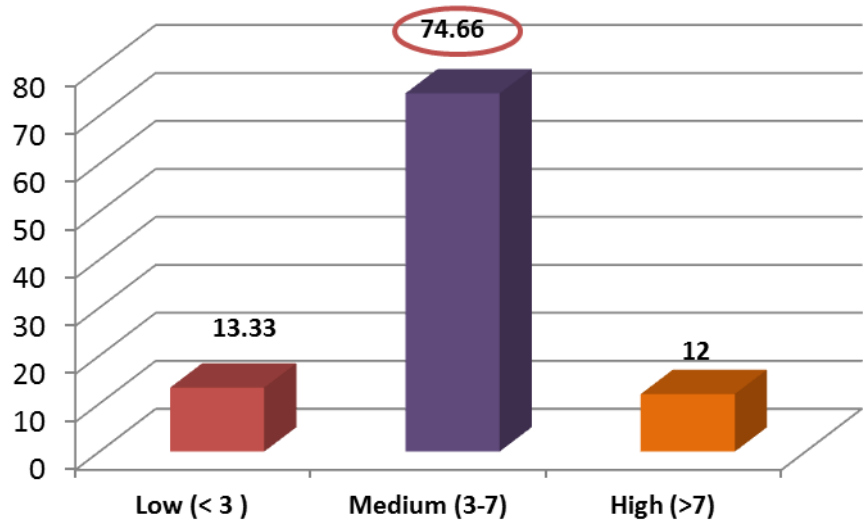
Table.9: Distribution of apipreneurs based on market intelligence

Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
Low	1	3.33	7	23.33	2	13.33	10	13.33
Medium	26	86.67	22	73.33	8	53.33	56	74.66
High	3	10	1	3.34	5	33.34	9	12
Total	30	100	30	100	15	100	75	100
	Mean- 5.34 Max- 8 Min- 2		Mean- 4.70 Max- 8 Min- 1		Mean- 5.80 Max- 8 Min- 1		Mean-5.17 S.D.- 2.01 S.E.- 0.23 Max- 8 Min- 1	

Table 9 gives the details regarding the market intelligence of the apipreneurs, from which it can be inferred that majority of the apipreneurs had medium level of market intelligence followed by low level and then high of market intelligence with a percentage of 74.66, 13.33 and 12.00 respectively.

District wise analysis revealed similar results as that obtained from overall apipreneurs analysis with maximum apipreneurs belonging to medium level of market

Market Intelligence



Overall and district wise mean value of market intelligence

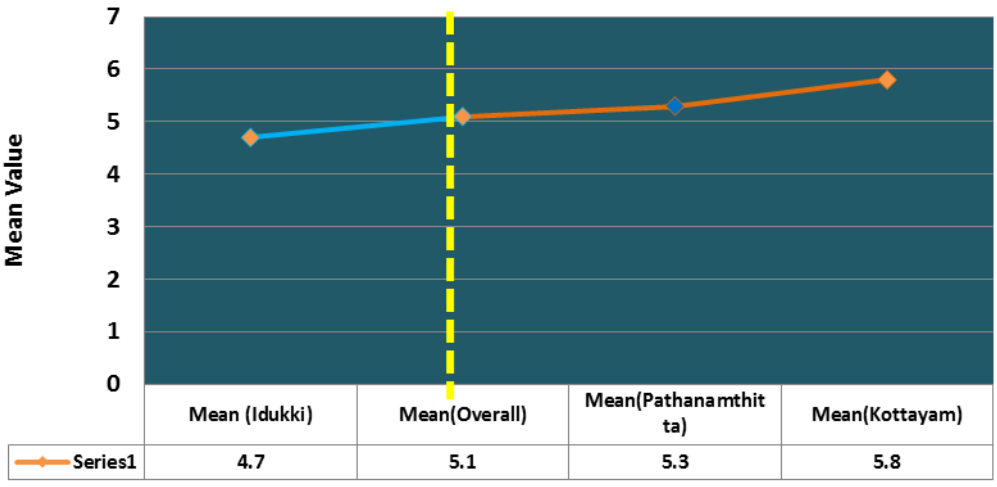


Fig.4: Profile characteristics of apipreneurs

intelligence in all the three districts. However, on comparison of the total mean value with that of the mean value of all three districts it was evident that the mean value of Idukki district (4.7) was lower than that of the overall mean while that of Pathanamthitta (5.34) and Kottayam (5.8) districts was higher than the overall mean value. The reason for Pathanamthitta and Kottayam districts exhibiting higher values could be the influence of beekeepers societies and the close knit association of the members within the organization. It was also observed that majority of the apipreneurs received information from the organizations (e.g. Travancore Beekeepers Society in Pathanamthitta and Malanad Cooperative Society in Kottayam) and also from peer members with regard to apiculture.

Hence it can be inferred that apipreneurs have medium level of market intelligence. The information related to market is mainly brought to the apipreneurs either through the organizations or peers while information made available through newspaper and television sources was found to be minimum. Hence efforts from government front, need to be initiated in order to bring apiculture, its benefits, scheme related information on a public scale in order to ensure timely availability of right information and also to create public awareness with regard to apiculture, its importance and opportunities among the masses.

4.1.7. Number of trainings

Number of trainings is operationally defined as the day wise or duration based number of trainings that is undergone by the apipreneur on various activities of apiculture by different agricultural institutions. The distribution on the duration of the trainings and the number of trainings attended is presented below in Table 10.

Table 10: Distribution of apipreneurs based on the number and types of training attended

Category	Pathanamthitta (n=30)		Idukki (n= 30)		Kottayam (n=15)		Total* (N=75)	
	F	%	F	%	F	%	F	%
One day	24	80.00	23	76.66	13	86.67	60	80.00
Two day	23	76.66	20	66.67	13	86.67	56	74.66

Three day	24	80.00	19	63.33	14	93.33	57	76.00
Six month	18	60.00	8	26.67	10	66.67	36	48.00

* multiple responses

It is evident from Table 10 that majority (80.00 per cent) of the respondents attended one day training closely followed by 76.00 per cent who attended three day training and 74.66 per cent two day training. District wise analysis of distribution of apipreneurs revealed the same trend and that in Pathanamthitta district around 80.00 per cent of the apipreneurs attended both one day and three day training followed by two day training (76.66 %) and six month (60.00%). Similar trends were also seen in Kottayam district while in case of Idukki district the number of apipreneurs attending the 6 month long training was less than 30 per cent indicating lack of time in apipreneurs within Idukki district due to involvement in other farming enterprises. However more than 50 per cent of the apipreneurs in Pathanamthitta and Kottayam districts have attended training sessions of all durations. This shows the interest level of the apipreneurs to participate in the training sessions and thereby gain the necessary knowledge and skill upgradation regarding beekeeping.

Hence, from Table 10 it can be inferred that majority of the apipreneurs are interested in attending training sessions. This can be taken as a positive sign for governmental organizations and non-governmental organizations to carry out trainings related to apiculture. The table also shows the preference of beekeepers to the type and duration of the trainings. Based on this information, organizations associated with development of beekeeping can work on developing suitable training sessions which will ensure active participation by the apipreneurs. The results obtained in the study are in conformity with the findings of Esakkimuthu (2015)

4.1.8. Yield per colony

Yield per colony is operationally defined as the amount of honey obtained by the apipreneur from a bee box or a colony. The distribution of apipreneurs based on the yield per colony obtained is represented in Table 11.

Table.11. Distribution of apipreneurs based on the yield per colony obtained

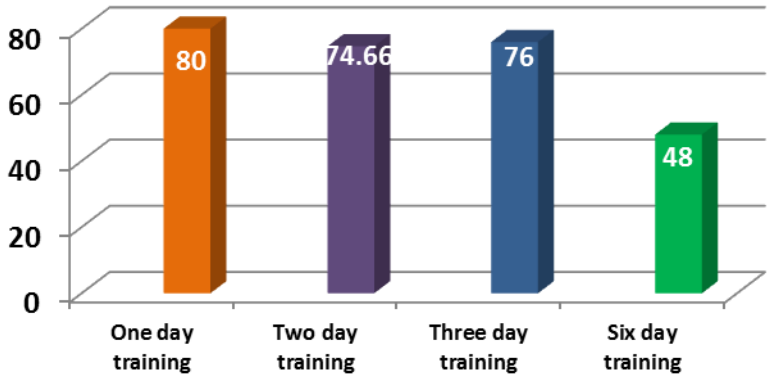
Yield per box per year	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
≤6.5 kg/ box	16	53.33	21	70.00	7	46.67	44	58.66
> 6.5 kg/ box	14	46.67	9	30.00	8	53.33	31	41.33
Total	30	100	30	100	15	100	75	100
	Mean- 6.60		Mean- 6.05		Mean- 7.16		Mean- 6.5	

On analysis of Table 11, majority of the apipreneurs (58.66 per cent) obtain an average yield of up to 6.5 kg per colony. The remaining 41.33 per cent of the apipreneurs obtain yield greater than 6.5 kg per colony.

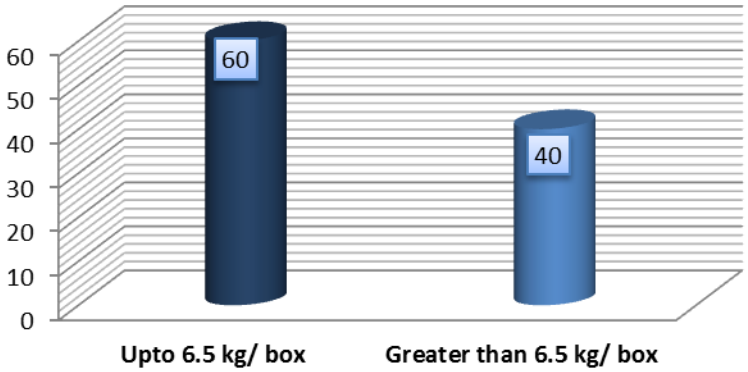
A district wise analysis revealed that more than 50 per cent of the respondents from districts of Pathanamthitta and Idukki obtained yield per colony upto 6.5 kg, while the trend changes in Kottayam district with majority of the respondents having obtained more than 6.5 kg honey per colony. On comparing the overall mean with the mean obtained in the three districts of study, the mean yield per colony obtained in Kottayam district (7.16) and Pathanamthitta district (6.60) was higher than the overall mean (6.5) yield per colony. The increase in productivity of honey in Kottayam and Pathanamthitta could be due to the fact that beekeeping is a practice that was extensively carried out in these regions from a very long time, which therefore makes the apipreneurs experienced and enough to tackle the unfavourable situations. The additional scientific knowledge and trainings that resulted in skill upgradation also could have resulted in the availability of satisfactory yield per colony.

From perusal of the Table 11, it can be inferred that majority of the apipreneurs obtained an average yield of upto 6.5 kg per colony. According to the data from the Horticulture Mission the average yield to be obtained is around 6-8 kg per colony for the state of Kerala. As per the respondents the major reasons which resulted in reduction of the yield was pinpointed to the occurrence of floods in the previous two years, untimely

Trainings attended (duration)



Yield per colony



Mean Values - Yield per colony

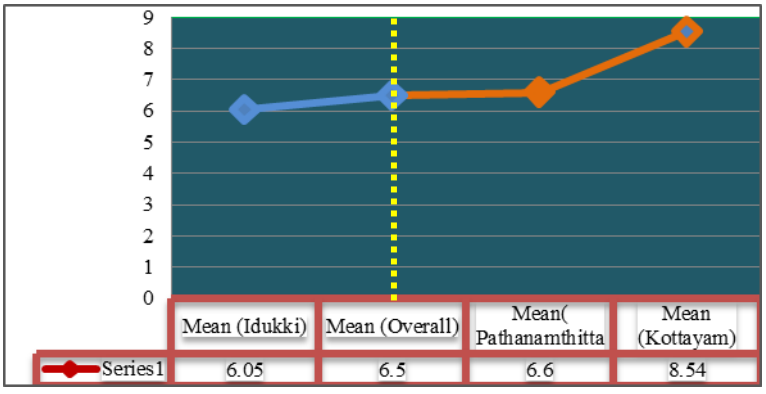


Fig.4: Profile characteristics of apipreneurs

swarming of the colony and pest infestation. Since majority of the apipreneurs still obtained honey at the rate less than or equal to 6.5 kg per colony, it does become necessary to delineate the reasons which affect the production of higher amount of honey. Also training and knowledge with regard to enhancing the productivity should be carried by the organizations associated with apiculture development.

4.1.9. Experience in beekeeping

Experience in beekeeping is operationally defined as the number of years the apipreneur has invested in beekeeping. The distribution of apipreneurs based on the experience of the respondents in bee keeping is represented in Table 12.

Table 12: Distribution of apipreneurs based on the experience in beekeeping (years)

Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
< 10 years	13	43.33	17	56.67	9	60.00	39	52.00
10 to 20	13	43.33	9	30.00	3	20.00	25	33.33
> 20 years	4	13.33	4	13.34	3	20.00	11	14.67
Total	30	100	30	100	15	100	75	100
	Mean- 13.31 Max- 30 Min- 1		Mean- 11.8 Max- 55 Min- 3		Mean- 22.87 Max- 40 Min- 1		Mean- 14.35 S.D.- 12.2 S.E.- 1.41 Max- 55 Min- 1	

From Table 12, it is evident that around 52 per cent of the apipreneurs have experience in beekeeping for a period of less than 10 years followed by apipreneurs *i.e.* 33.33 per cent who possess experience ranging from 10 to 20 years and remaining 14.67 per cent have experience greater than 20 years.

District wise tabulation shows that majority of the apipreneurs had beekeeping less than 10 years. In case of Pathanamthitta district equal proportion of apipreneurs (43.33 per

cent each) belonged to the category having less than 10 years of experience and with experience between 10 to 20 years.

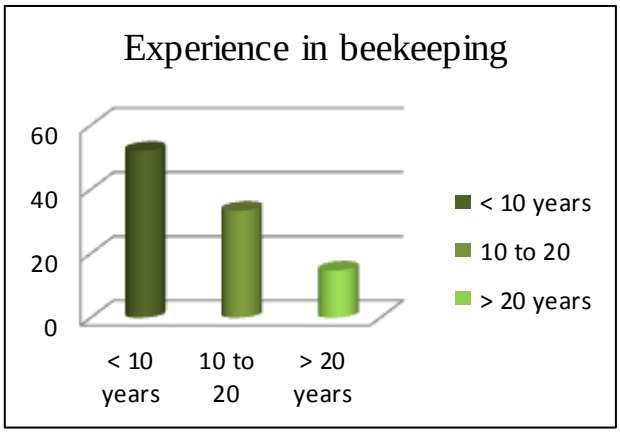
Hence, it can be inferred that the apipreneurs had a favourably good experience in bee keeping as the overall average experience was 14.35 years as evident from the Table 11. Also, conclusions can be made that the majority of the apipreneurs (85%) had an experience in beekeeping upto twenty years. Beekeeping, being an enterprise where years of experience becomes a key factor for successful apipreneurship, their knowledge regarding to bees and their behaviour is linked to their experience. Experience always helps in improving the skills of the apipreneur to tackle adverse environmental conditions.

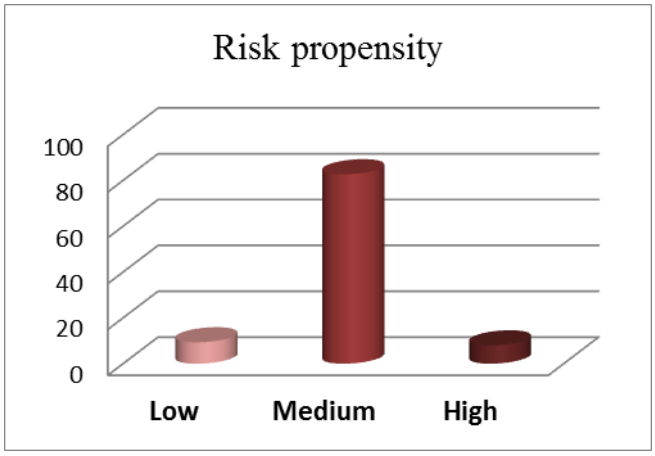
4.1.10. Risk propensity

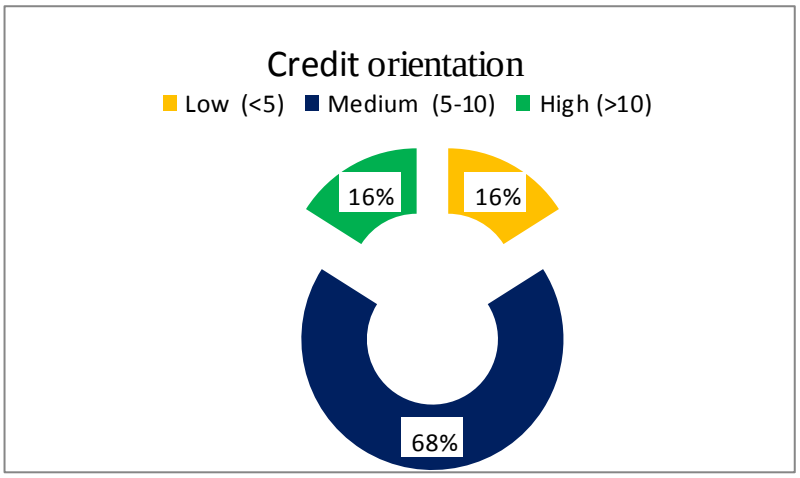
Risk propensity is defined as the behaviour exhibited by an apipreneurs in situations which involve some potential danger or harm but also provide an opportunity to obtain some benefits. The distribution of apipreneurs based on the risk propensity behaviour is depicted in Table 13. The categorisation was based on the mean and standard deviation.

Table 13: Distribution of apipreneurs based on risk propensity

Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
Low (<12)	2	6.67	3	10	2	13.33	7	9.33
Medium (12-16)	24	80	26	86.67	12	80	62	82.67
High (>16)	4	13.33	1	3.33	1	6.67	6	8
Total	30	100	30	100	15	100	75	100
	Mean- 14.07 Max- 19 Min-12		Mean-14.03 Max- 19 Min- 11		Mean- 13.74 Max- 17 Min-10		Mean-13.99 S.D.- 2.04 S.E.- 0.23 Max- 19 Min- 9	







Overall and district wise mean value (Credit orientation)

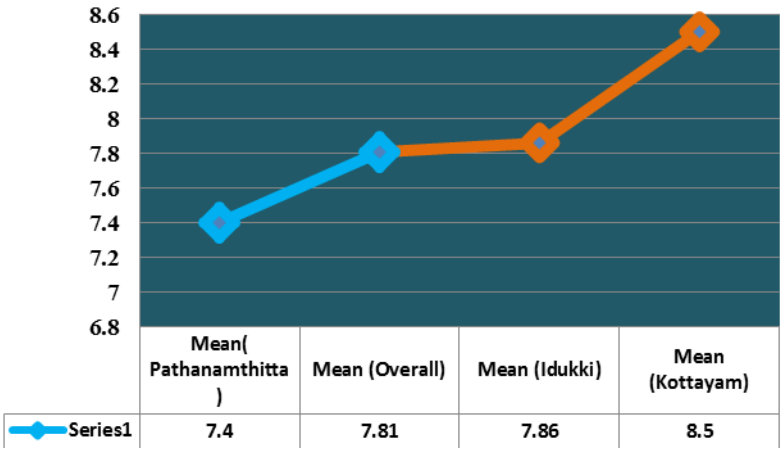


Fig.4: Profile characteristics of apipreneurs

Table 13 clearly showed that majority of the apipreneurs (82.67 %) belonged to medium level of risk propensity followed by low level (9.33 %) and high level of risk propensity (8.00 %). A similar trend was exhibited in all the three districts of study.

From the Table 13 it can be inferred that the apipreneurs show medium level of risk propensity behaviour and the results was in line with the findings of Chaurasiya *et al.* (2015). Since the apipreneurs fall under medium category there is an ample scope for the respondents to take up new technological interventions with regard to beekeeping. It is evident that successful apipreneurs have been taking up value addition on an extensive level and also setting up processing units themselves which is also being appreciated and looked upon by the fellow apipreneurs. Hence it can be concluded that apipreneurs are open to take up technological upgradation. This positive orientation of risk propensity behaviour opens door for governmental organizations to start up new developmental programmes related to scientific beekeeping.

4.1.11. Credit orientation

Credit orientation is operationally defined as orientation of the apipreneur to avail and utilize credit for the production purpose. The distribution of apipreneurs on the basis of their credit orientation is presented in Table.14.

Table.14: Distribution of apipreneurs based on their credit orientation

Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
Low (<5)	7	23.3	5	16.67	0	0	12	16
Medium (5-10)	17	56.6	20	66.67	14	93.3	51	68
High (>10)	6	20	5	16.67	1	6.67	12	16
Total	30	100	30	100	15	100	75	100
	Mean-7.4 Max- 12 Min- 3		Mean- 7.8 Max- 12 Min- 2		Mean- 8.5 Max- 14 Min- 5		Mean- 7.8 S.D.- 2.69 S.E.-0.312 Max- 14 Min- 2	

It can be summarised from Table 14 that around 68.00 per cent of the apipreneurs had medium level of credit orientation followed by 16.00 per cent apipreneurs each with low level and high level of credit orientation respectively. The result supports the findings of study conducted by Esakkimuthu (2015) where 80.00 per cent of beekeepers possessed medium level of credit orientation.

District wise distribution also reflected the result depicted in Table 14 where majority of the apipreneurs in Kottayam had medium level of credit orientation *i.e.* 93.30 per cent. However majority of the apipreneurs have not taken credit to establish this venture. Lack of proper credit facilities in financial institutions deters the apipreneurs from approaching institutions even if they had the urge to expand their enterprise.

From the results obtained from Table 14, it can be inferred that the majority of the apipreneurs have medium level of credit orientation. Hence it becomes very important for the governmental organizations to come up with tailor made governmental policies and credit facilities for the beekeeping community thereby encouraging the apipreneurs to expand their enterprise and earn better profit.

4.1.12 Employment generation

Employment generation is operationally defined as number of persons employed by the apipreneur. Tabular representation and classification on the basis of labour which include both family and hired labour that is utilized by the apipreneur is depicted below in Table 15.

Table no.15: Employment generation by the apipreneurs

Category	Pathanamthitta (n=30)				Idukki (n=30)				Kottayam (n=15)				Total (N=75)	
	Family	Hired	Total	%	Family	Hired	Total	%	Family	Hired	Total	%	Total	%
Growth season	98	6	104	6.98	54	1	55	5.7	35	38	73	4.01	232	5.44
Scarce season	700	175	875	58.69	528	48	576	59.8	483	569	1052	57.8	2503	58.56
Harvest season	404	108	512	34.33	294	38	332	34.47	244	451	695	38.19	1539	36
Total Man days	1170	321	1491	100	876	87	963	100	762	1058	1820	100	4274	100
Total Boxes	2607				1061				5902*				9570	
Per box labour	1.74				1.1				3.07				2.2	

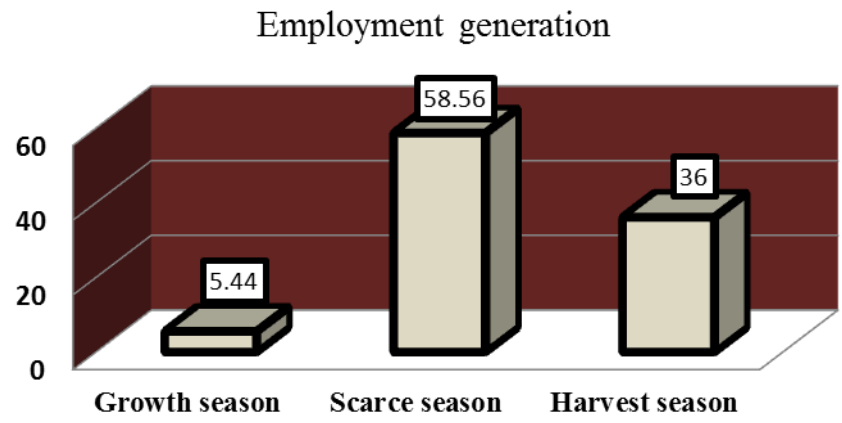
From Table 15, it is clear that apipreneurs of Kottayam district consumes the maximum number of man days which is 42.50 per cent followed by Pathanamthitta and Idukki districts with 34.88 and 22.50 per cent respectively. It can also be observed that 65.00 per cent of the total man-days comprises of family labour while the remaining 35.00 per cent opted for hired labour especially where beekeeping greatly dependent on the number of boxes managed by the apipreneurs.

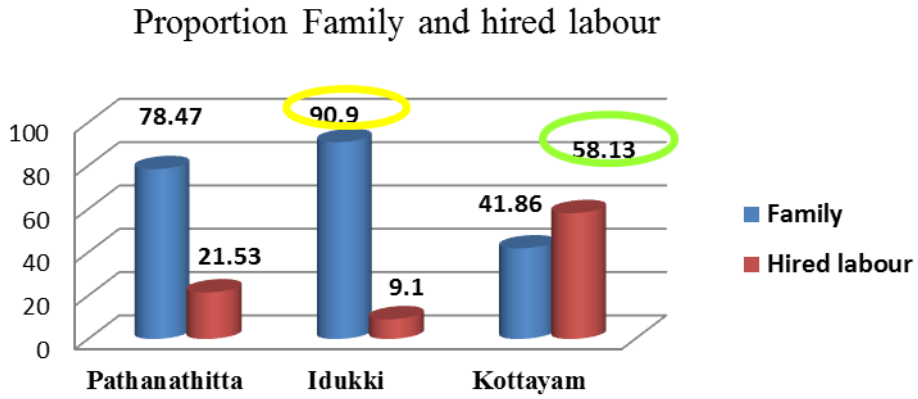
District wise tabulations show that greater proportion of family labour was utilised in Pathanamthitta and Idukki districts while reverse trend was seen in Kottayam. It was because the district comprises of apipreneurs who own a large number of bee boxes and its management requires large number of labour.

Analysing the season wise requirement of labour from Table 15, it is clear that majority of the labour is required during the scarce season (58.56 per cent) followed by harvest season (36 per cent). In case of Pathanamthitta and Idukki districts, majority of the labour utilised during the three seasons *i.e.* growth, scarce and harvest seasons, mainly comprised of family members. While in case of Kottayam, more hired labour was utilised compared to that of the family labour due to the possession of large number of boxes.

The majority of labour requirement during scarce period was due to the weekly feeding of the bees for over 4 months. However majority of the apipreneurs opted for family labour during the scarce period. But in case of apipreneurs who consider apiculture on a commercial place their hives in different locations which demands need to hire labours other than family labour. The harvest season, which comprises of around 8- 9 weeks of honey harvesting and post-harvest processing becomes the season which requires the most number of hired labour.

District wise categorization based on the number of labours required per box, was calculated on the basis of total number of boxes and the total man days required and on analysis of Table 15 it can be concluded that the per box labour is highest in Kottayam.





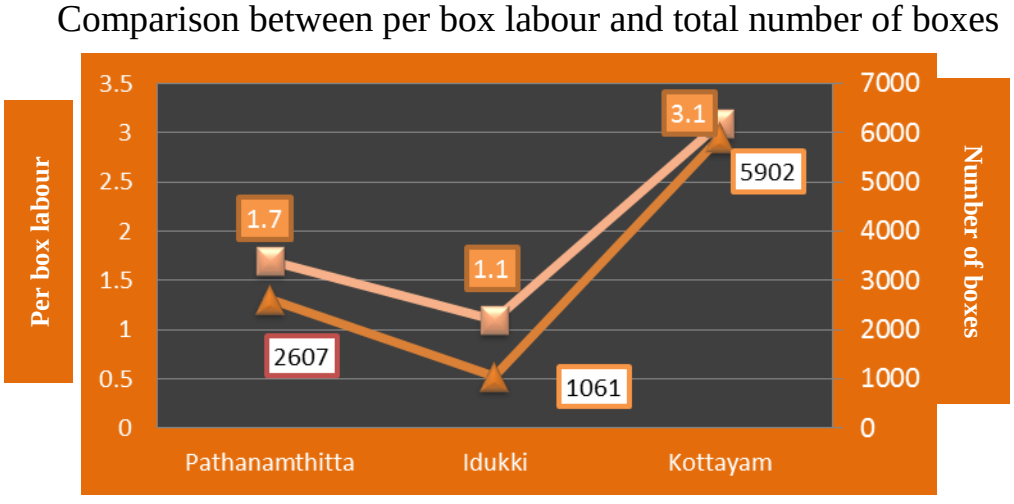


Fig.4: Profile characteristics of apipreneurs

district which was around 3 followed by Pathanamthitta which was around 2 and 1 in case of Idukki district. The extent of commercialization of the enterprise clearly determines the number of labour that will be invested per box. Hence greater the number of boxes maintained by an apipreneur, higher is the labour requirement per box. Hike in number of boxes in Kottayam district was due to the fact that some apipreneurs have number of boxes ranging from 1000 to 3000 and a very few apipeneurs with more than 3000 boxes.

The conclusion that can be drawn on analysing the above results is that apiculture is one such enterprise which can be limited to involvement of just the family labour but if done on a large scale it also creates ample employment opportunities during the active as well as lean seasons. Hence increase in production of honey and other by-products will ensure greater profit which will motivate the apipreneurs to expand their business thereby generating employment opportunities within family and for labour outside as well. One major reason for greater proportion of apipreneurs turning into beekeeping was due to the experience obtained during their childhood with regard to beekeeping which played a key role for them to take up apiculture as an enterprise. Hence it can also be concluded that family involvement in beekeeping creates awareness within the younger generation which promotes them to have a positive attitude to take up apiculture in near future. Also apiculture is an enterprise that has the capability to generate employment opportunities in every phase from growth season through multiplication of colonies to value addition of honey products.

4.1.13 Creativity

Creativity is operationally defined as the ability of the apipreneurs to generate or identify new ideas or alternatives that may be effective in solving problems in apiculture. Table 16 depicts the distribution of apipreneurs on the basis of their creativity. The categorization of the apipreneurs was done based on the mean score.

Table.16: Distribution of apipreneurs based on creativity.

Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
Low (≤Mean)	16	53.33	17	56.67	7	46.67	40	53.33

High (> Mean)	14	46.67	13	43.33	8	53.33	35	46.37
Total	30	100	30	100	15	100	75	100
Mean								0.4

From perusal of Table 16, it is observed that more than half of the apipreneurs had low level of creativity (53.33 per cent) while around 46.37 per cent of apipreneurs have high level of creativity, with mean value as the check.

District wise analysis shows that around 53.33 per cent of apipreneurs in Pathanamthitta district had lower level of creativity and 46.67 per cent of apipreneurs had higher level of creativity. Similar trend was observed in Idukki district as well. However in Kottayam district it was observed that majority of the apipreneurs (53.33 per cent) belonged to the category of high level of creativity.

Hence, we can draw the conclusion that majority of the apipreneurs belong to low level of creativity however the percentage is just above half. It was also observed that apipreneurs who had adequate experience, could manage the apiculture enterprise on farm that in turn yielded well from the enterprise. Apipreneurs were well aware of the knowledge and skills involved in beekeeping and were more oriented to trying innovative practices in beekeeping and this can be substantiated with almost or close to half the respondents belonging to high level of creativity. In case of the apipreneurs who belonged to low category of creativity, might evolve gradually and positively in their creativity level with years of experience, influence from successful apipreneurs and training in beekeeping.

4.1.14 Optimism

Optimism is operationally defined as the mental attitude of an apipreneur reflecting a belief or a hope or outcomes in general, which will be positive, favourable, and desirable. Distribution of apipreneurs based on their level of optimism is represented in Table 17. The categorisation was based on the mean and standard deviation.

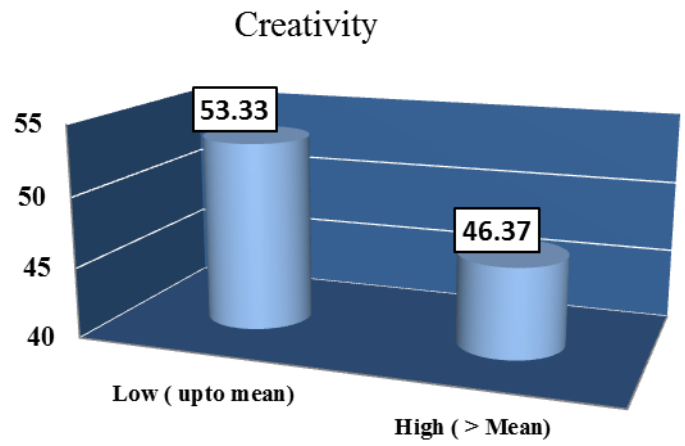
Table 17: Distribution of apipreneurs based on the level of optimism

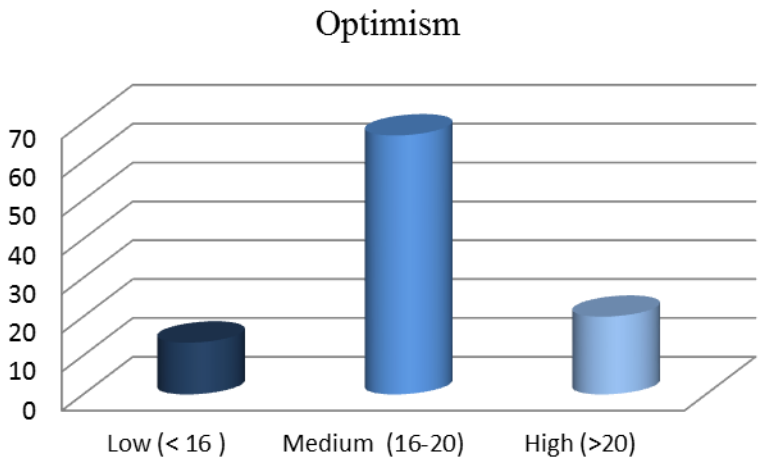
Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
Low (< 16)	6	20	4	13.34	0	0	10	13.34
Medium(16-20)	18	60	21	70	11	73.34	50	66.67
High (>20)	6	20	5	16.67	4	26.67	15	20
Total	30	100	30	100	15	100	75	100
	Mean-18.33 Max- 22 Min- 15		Mean- 18.23 Max- 23 Min- 13		Mean- 19.4 Max- 23 Min- 16		Mean- 18.50 S.D.- 2.28 S.E.- 0.263 Max- 23 Min- 13	

On analysis of Table 17, it is evident that majority of apipreneurs *i.e.* 66.67 per cent of them have medium level of optimism with obtaining scores ranging from 16 to 20. Followed by it was those apipreneurs who belonged to the category of higher level of optimism (20.00 per cent) and low level of optimism (13.34 per cent). District wise analysis illustrates similar trends.

The mean score obtained by apipreneurs for level of optimism was 18.50 and the table clearly illustrates that apipreneurs from Kottayam district possessed a mean score of 19.4 compared to that of apipreneurs from Pathanamthitta (18.23) and Idukki (18.33) districts respectively

The knowledge level and years of experience in beekeeping of the apipreneurs plays a pivotal role in determining the optimism of apipreneur towards apiculture. The highlight is that, in every district, established and successful apipreneurs keep in touch with the other apipreneurs and act as a source of information through peers and organizations. The extent of success achieved by the successful apipreneurs influences the other apipreneurs to have a positive outlook towards maximising profit from their beekeeping. In case of apipreneurs from Kottayam, this could be the reason that none of





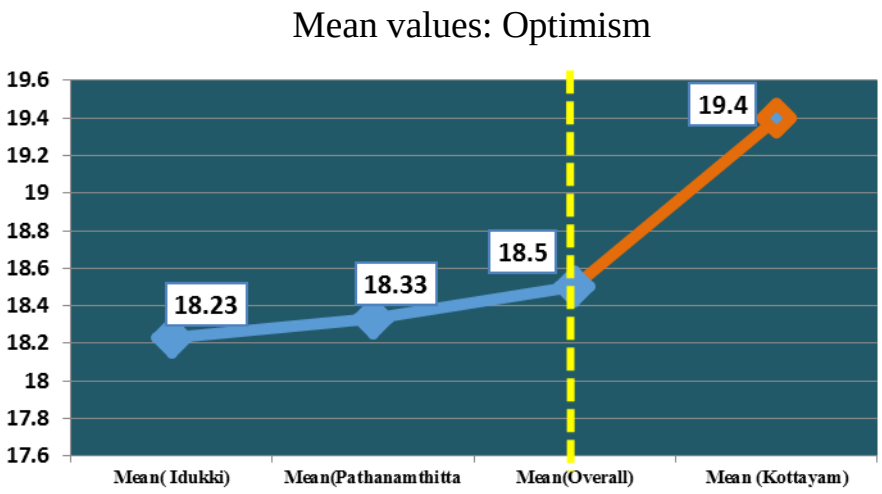


Fig.4: Profile characteristics of apipreneurs

the apipreneurs belonged to the category of low level of optimism. Optimism is an important quality for any farmer to take up an enterprise like apiculture. Every enterprise comes with a certain amount of risk, yet to have that belief to succeed in a venture is very important.

4.2. Knowledge of farmers about selected apiculture technology of KAU.

Knowledge level of the apipreneurs refers to the extent of knowledge possessed by the apipreneurs on the recommended practices. The distribution of the apipreneurs on the basis of the respondent's knowledge level is given in Table 18. Based on the mean and standard deviation of knowledge level, categorization of the apipreneurs was done.

Table 18: Distribution of apipreneurs based on their knowledge level.

Category	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
	F	%	F	%	F	%	F	%
Low (< 8)	2	6.67	4	13.34	0	0	6	8
Medium (8-13)	23	76.67	22	73.34	11	73.34	56	74.67
High(>13)	5	16.67	4	13.34	4	26.67	13	17.34
Total	30	100	30	100	30	100	75	100
	Mean- 12.2 Max- 15 Min- 7		Mean -10.34 Max- 14 Min- 6		Mean- 10.53 Max- 15 Min- 9		Mean-10.78 S.D.- 2.42 S.E.- 0.28 Max- 15 Min- 6	

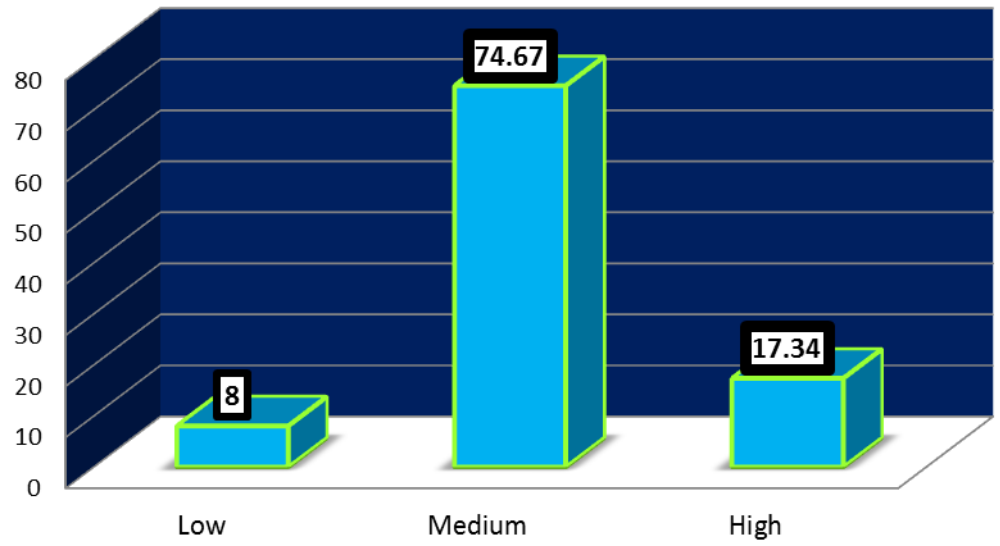
On the analysis of Table 18, it is apparent that majority (74.67%) of the apipreneurs possessed medium level of knowledge on selected apiculture technology of KAU followed by high level (17.34 %) and low level of knowledge (8.00 %). A district wise comparison also showed similar trends. The medium level of knowledge level is an indicator that there is lack of complete awareness of the selected KAU technology.

The overall mean score for the knowledge level in apipreneurs as mentioned in Table 18 revealed that the apipreneurs knowledge on the selected KAU practices was high (10.78) which was skewed towards the maximum attainable score 15. The maximum and minimum attainable score that could be attained by a respondent was 15 and 0 respectively. While comparing the mean knowledge score of apipreneurs from the different districts of the study, apipreneurs from Pathanamthitta topped with a mean knowledge score of 12.2, followed by apipreneurs of Kottayam (10.53) and Idukki (10.43) respectively. However, it's heartening to observe that the mean knowledge level of apipreneurs of all the districts was above 10 and the individual highest was 15 and the lowest was 6.

It was also good to observe that there were no respondents in the category of low knowledge level in case of the apipreneurs of Kottayam district. The reason behind it could be the influence of traditional knowledge on beekeeping and the long years of experience that an apipreneur of Kottayam possessed. This can also be due to the influence of established beekeeping professionals who also provide trainings to the peer groups which ensure complete transfer of scientific apiculture among the beekeepers.

Hence, it can be concluded that majority (92.00 %) of the apipreneurs possess medium to high level of knowledge with regard to selected apiculture technology. Beekeeping being a traditional subsidiary occupation, majority of beekeepers was aware of both the traditional and scientific beekeeping techniques through training imparted by different organisation as there were no farmers who did not attend any training. Along with that intervention by governmental and non-governmental organizations in the form of service support has also aided in enhancing the scientific knowledge of the apipreneurs which brings majority of the apipreneurs under the medium to high knowledge level. However, the data revealed that there are scopes for furthering the efforts from governmental organizations in rendering more extension services, which in turn can ensure enhancement of the knowledge level of the apipreneurs.

Fig.5 :Knowledge level



4.3. Entrepreneurial potential of apipreneurs

Entrepreneurial potential is operationally defined as the individuals' readiness to engage in entrepreneurship archetypal activities. The Table 19 represents the distribution of apipreneurs based on their entrepreneurial potential. The categorisation of the apipreneurs was done based on the mean and standard deviation.

Table.19: Distribution of apipreneurs based on the entrepreneurial potential

Category	Class Limits	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=30)		Total (N=75)	
		F	%	F	%	F	%	F	%
Low	< 89	4	13.33	8	26.67	0	0	12	16
Medium	89-107	23	76.67	20	66.67	9	60	52	69.33
High	> 107	3	10	2	6.67	6	40	11	14.67
Total		30	100	30	100	15	100	75	100
		Mean- 96.97 Max- 114 Min- 83		Mean- 94.63 Max -111 Min- 79		Mean-105.93 Max- 118 Min- 91		Mean- 97.82 S.D.-8.88 S.E.-1.02 Max- 118 Min- 79	

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From perusal of Table 19, it can be deduced that majority (69.33 per cent) of the apipreneurs belong to the category of medium level of entrepreneurial potential followed by 16.00 per cent in low level and 14.67 per cent in the high level entrepreneurial potential. The mean value obtained from the overall apipreneurs was 97.82 with scores ranging from 79 to 118.

District wise analysis revealed that majority of the apipreneurs (76.67 per cent) in Pathanamthitta district belonged to medium category. Similar trend was observed in Idukki and Kottayam districts with 66.67 per cent and 60.00 per cent respectively. But with regard to Kottayam district it was observed that around 40.00 per cent of the apipreneurs belonged to the high category of entrepreneurial potential.

On comparing the mean value of entrepreneurial potential score of apipreneurs in all the three districts with their overall mean value, it was observed that Pathanamthitta (96.66) and Idukki (94.63) district had mean value less than the overall mean while Kottayam district had mean value (105.33) greater than the overall mean

value (97.82).The spike in the mean value of entrepreneurial potential of apipreneurs in Kottayam district was a clear indication that apiculture was an enterprise that was considered as a profitable venture. The predominant reasons why it was considered profitable could be due to different factors like the availability of the source of food (rubber), conducive environmental conditions, and easy availability of input resources with minimal initial cost of investment and assured remunerations from the products. With the backdrop of many successful apipreneurs within the district who have commercialized the beekeeping enterprise, it has become a source of motivation for fellow peer apipreneurs to consider beekeeping as an enterprise to be pursued as a means of livelihood.

From the above analysis, it can be inferred that majority of the apipreneurs have medium level of entrepreneurial potential. Interventions with necessary financial support along with recent scientific technologies in apiculture can enhance the capabilities of apipreneurs to take up apiculture on an entrepreneurial level, especially with regard to honey and value addition. Based on the scale developed by Santos *et al.* (2011), it was opined that entrepreneurial potential could be assessed based on four main components namely entrepreneurial motivation, management competencies, psychological competencies and social competencies. Following the categorization of the apipreneurs, it was decided to identify the dimensions that influenced the entrepreneurial potential of an apipreneur for which principal component analysis was done. The results obtained is interpreted below and presented in Table 20 & Table 21

Table 20: Cumulative variance obtained through Principal Component Analysis

Component	Initial Eigen values		
	Total	% of variance	Cumulative %
Principal Component 1	2.217	55.4	55.4
Principal Component 2	0.877	21.9	77.3
Principal Component 3	0.593	14.8	92.1
Principal Component 4	0.313	7.9	100

Table 20 represents the variability obtained from principal component analysis done on the dimensions of entrepreneurial potential. From the analysis it is evident that component 1 exhibited maximum variability of 55.4 per cent. Followed by component

2 which was responsible for 21.90 per cent variability. Hence component 1 and 2 on summation presented a cumulative variance of 77.30 per cent and the same is illustrated through a scree plot (Fig.6)

Fig.6. Scree plot diagram obtained from Principal Component Analysis

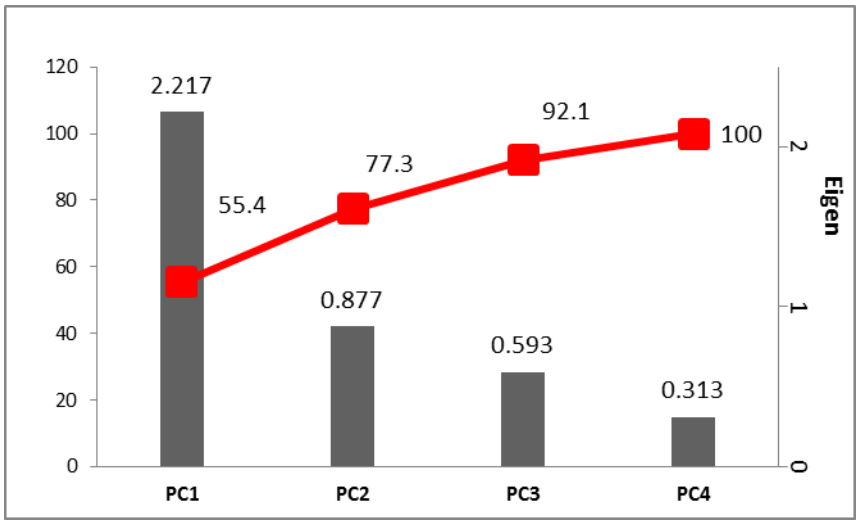
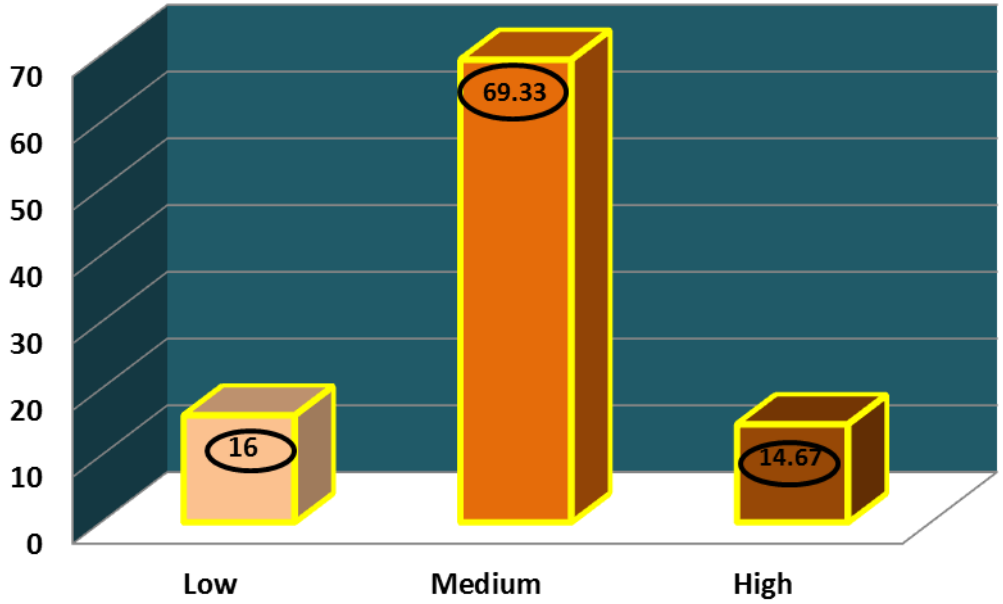
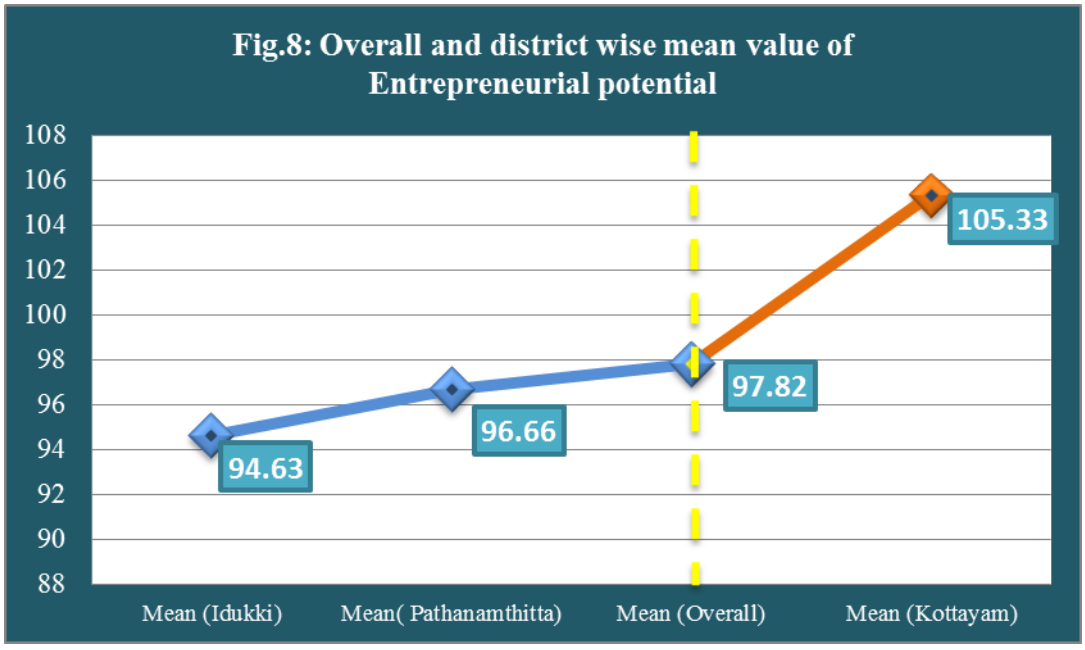


Table.21: Loadings (Eigenvectors) of Correlation Matrix

Dimensions of Entrepreneurial Potential	PC1	PC2
PC1: Entrepreneurial Motivation	**0.594**	-0.092
PC2: Managerial competencies	**0.553**	0.030
PC3: Psychological competencies	0.452	-0.578
PC4: Social competencies	0.370	**0.810**

Fig.7: Entrepreneurial potential of apipreneurs





However the Eigen value obtained through Principal Component Analysis confirms the fact that three dimensions out of four influences the entrepreneurial potential of the apipreneurs and the results are depicted in Table 21. From the first component (PC1) it is evident that both entrepreneurial motivation and managerial competencies was the most important dimension contributing to entrepreneurial potential with Eigen values of 0.594 and 0.553 respectively. And from component 2 (PC2) represented in Table 21 Social competencies is said to influence the entrepreneurial potential with an Eigen value 0.810.

Entrepreneurial motivation was determined using sub components like need for achievement, need for power, need for wealth and need for independence in an individual. This study was in agreement to the findings of Chaurasiya *et al.* (2015), who opined that entrepreneurs should have the highest level of achievement and also have the urge to improve his own socio economic status in a society. The nature of the sub components of entrepreneurial motivation could be a major trigger for an individual to create an enterprise enabling him to take up the sole responsibility of the risk and uncertainty associated with the enterprise in the pursuit to derive profit. Entrepreneurs also exhibited an aversion to being an employee and rather preferred being the employer indicating the high need of independence among the entrepreneurs (Deepthi, 2016).

Managerial competencies mainly comprised of sub components like leadership ability and resource mobilization capacity of the apipreneur. The ability of an individual to direct and inspire the people working under him is considered as a valuable trait of an entrepreneur that is an intrinsic component of managerial competency. Also the ability to mobilize the resources at minimum cost of production at the right time exhibits the strong decision making ability of the entrepreneur. The managerial capability of an individual greatly determines the success rate of an enterprise and this was well overt in case of successful apipreneurs. Similar findings were also reported by Pooja *et al.* (2014).

The study confirms the influence of social competencies on entrepreneurial potential and this could be due to the fact that social competencies that are driven by reputation and networking ability of the apipreneur, which are intangible assets that are

said to significantly influence the rate of market access as reported by Adler and Kwon (2000). Major advantage of an entrepreneur's social networking capabilities is that it influences the ability to identify and acquire external resources. It also enhances ability of the apipreneurs to promote additional product development, production and promotion. Entrepreneurs' connection with stakeholders involved in their supply chains enables the easy access to resources and also ensure sale of the produce on a wider masses (Urban and Shree, 2012).

Hence to summarize, it can be concluded that entrepreneurial motivation was the most important dimension contributing to the entrepreneurial potential exhibiting variance of 55.4 per cent. However based on the Eigen values entrepreneurial motivation, management competencies and social competencies together were the dimensions that greatly influenced the entrepreneurial potential of the apipreneur.

4.4 Level of adoption of selected apiculture technology of KAU

4.4.1 Overall adoption of selected apiculture practices of KAU

The distribution of apipreneurs based on the overall adoption of selected apiculture practices of KAU is represented in Table 22.

Table 22: Distribution of apipreneurs based on the overall adoption of selected apiculture practices of KAU.

Sl.No	Adoption practices	Pathanamthitta (n=30)	Idukki (n=30)	Kottayam (n=15)	Overall (N=75)
		%	%	%	%
1	Spacing of hives	36.00	43.33	73.33	46.4
2	Use of Newtons beehive	96.66	100.00	100.00	98.66
3	Colour of beehive	88.66	97.33	78.66	90.13
4	No. of frames in each chamber:	68.66	61.33	88.00	69.33
5	Foraging plants grown	72.00	78.66	93.34	78.93
6	Use of ant pan/ oil band to get rid of ants.	96.66	100.00	100.00	98.66
7	Honey harvesting season	100.00	96.66	100.00	98.66
8	Inspection of hives: Every week	85.33	86.00	89.31	86.40
9	Harvest from sealed frames	53.33	52.00	57.33	53.60

10	Proportion of artificial feed 1:1	99.33	97.33	100.00	98.66
11	Division of colonies	100.00	88.00	100.00	95.20
12	Once a week harvest	96.00	93.33	94.66	94.66
13	Movement of hives to coconut growing area	25.33	25.33	25.33	25.33
14	Control diseases: Turmeric feed	81.33	78.00	89.33	81.60
15	Disease control :mixture of basil and garlic	16.00	32.00	30.66	25.33
16	Value addition and byproducts	50.66	42.66	65.33	50.4
17	Temperature for processing of honey	90.00	54.66	86.66	75.20
18	Agmark grading	12.66	8.00	12.00	10.68
	Mean	70.47	68.59	76.88	71.00

Table 22 indicates that seven out of eighteen selected apiculture practices had an adoption per cent greater than 90 *viz*., the use of Newtons beehive (98.66%), colour used for the beehive (90.13%), using of ant pan/oil band against ant attack (98.66%), honey harvesting season (98.66%), number of division of colonies (95.20 %), proportion of the artificial feed used (98.66%), and once a week harvest (94.66%). However four practices had an overall adoption percentage less than 50 per cent which are mentioned in the decreasing order of percentage namely spacing of hives (46.4 %), movement of hives during coconut grooves during the scarce period (25.33%), disease control: mixture of basil and garlic (25.33%) and grading of honey according to AGMARK (10.68 %).

Considering the district wise analysis, it can be observed that the mean value of adoption of selected practices of Kottayam district was 76.88 per cent that exhibited higher value followed by Pathanamthitta and Idukki district with mean value of 70.47 per cent and 68.59 per cent respectively. In case of Kottayam district 100 per cent adoption was observed for four practices viz., honey harvesting season, proportion of artificial feed 1:1 division of colonies , and use of ant pan/ oil band to get rid of ants. But in case of Pathanamthitta and Idukki districts 100 per cent adoption was observed for two practices, namely honey harvesting season, division of colonies and use of Newtons beehive, use of ant pan/ oil band to get rid of ants respectively . The higher mean values for adoption score among the apipreneurs in Kottayam district is a clear indication of the relatively high knowledge level and more trainings received by the

apipreneurs that would have influenced the adoption rate. In addition, higher adoption rates are also determined by the experience of the apipreneur in beekeeping and their interaction with the institutions or peers associated with beekeeping.

4.4.2. Distribution of apipreneurs based on the extent of adoption

It was also important to categorize the apipreneurs based on the adoption quotient and the distribution of apipreneurs based on the extent of adoption is represented in Table. 23. The mean adoption quotient and standard deviation was obtained to categorise apipreneurs into the following category.

Table.23: Distribution of apipreneurs based on the extent of adoption of scientific apiculture practices of KAU

Sl.No	Category	Class limits	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
			F	%	F	%	F	%	F	%
1	Low	<59.2	5	16.67	5	16.67	3	20	13	17.34
2	Medium	59.2-83	21	70.00	16	53.34	11	73.34	48	64.00
3	High	>83	4	13.34	9	30	1	6.67	14	18.67
Total			30	100	30	100	15	100	75	100
			Mean- 71.00 SD- 11.76 Max-87 Min-44							

On analysis of Table 23, it can be concluded that the mean adoption quotient of the apipreneurs was 71.00 per cent with standard deviation of 11.76 and scores ranging from 44 to 87. Based on the mean and standard deviation the apipreneurs were categorized into low, medium and high. It was evident that majority of the apipreneurs exhibited medium level of adoption *i.e.* 64.00 per cent followed by high level (18.67 per cent) and remaining in the low level of adoption (17.34 per cent).

District wise analysis also showed similar distribution pattern. Distribution of the apipreneurs in medium category is an indicator that with the necessary governmental support and extension services, there is an ample scope of enhancing the overall extent of adoption of the selected apiculture practices, even though the mean adoption quotient was oriented towards the higher side.

Fig.9: Overall extent of adoption of practices by apipreneurs

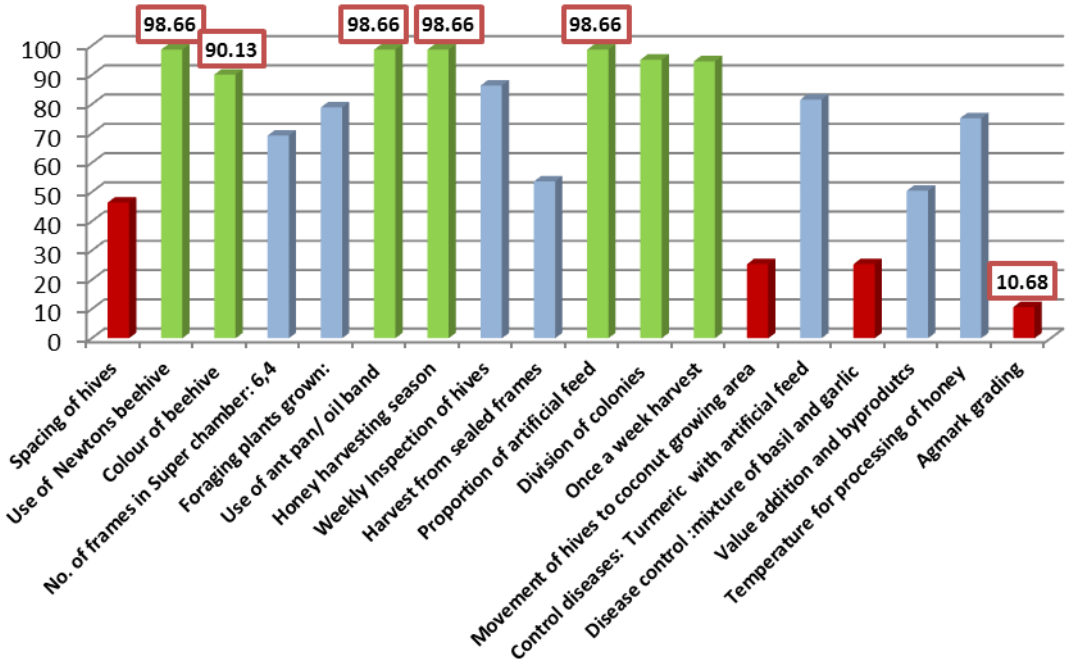


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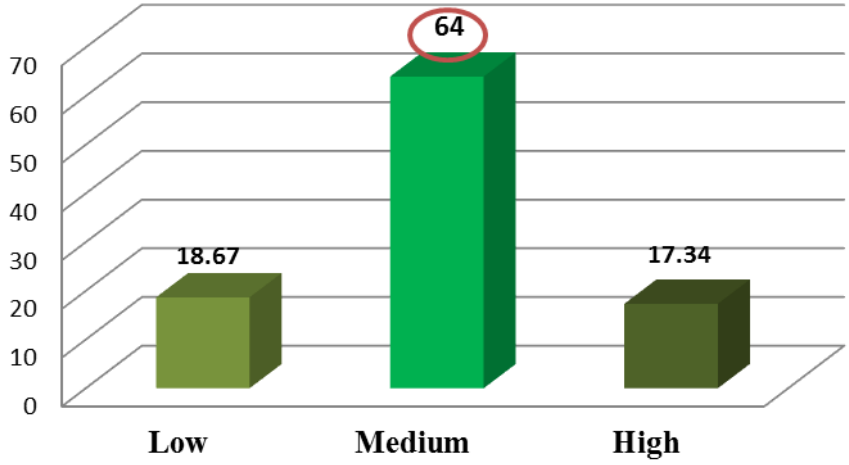
Fig.10: Distribution of apipreneurs based on Adoption Quotient



4.4.3. Categorization of apipreneurs into adopter categories

Based on the mean and standard deviation of the scores obtained by the apipreneurs an attempt was made to categorize the apipreneurs into the different adopter categories as explained by Rogers (1982). The different categories are innovators, early adopters, early majority, late majority and laggards. The Table 24 shows the distribution of apipreneurs based on the adopter categorization.

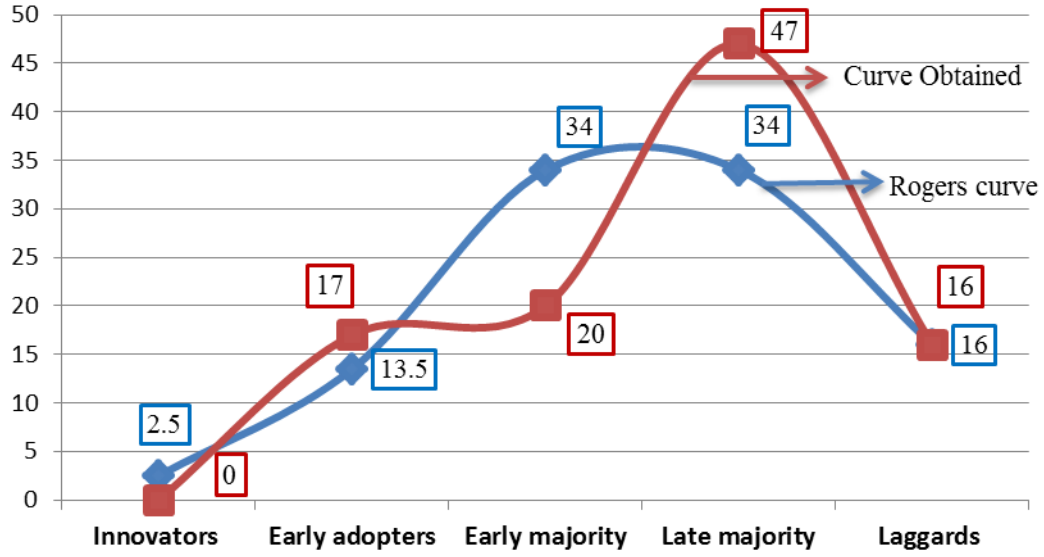
Table 24: Overall adopter categorization of the apipreneurs

Category	Frequency	Percentage	Percentage(Rogers)
Innovators	0	0	2.50
Early adopters	13	17.00	13.50
Early Majority	15	20.00	34.00
Late Majority	35	47.00	34.00
Laggards	12	16.00	16.00
Classification based on Mean and Standard deviation (Mean-2SD, Mean-S.D., Mean, Mean+ S.D.)			

The result from Fig. 11 reveals that maximum of the respondents belong to the late majority category (47.00 per cent) followed by early majority (20.00 per cent), early adopters (17.00 per cent), laggards (16.00 per cent) and with no respondents in the innovators category.

Table 24 depicts that highest percentage of apipreneurs (47.00%) belongs to the late majority category of adopters, as these category are always cautious before committing to a technology. These are category of respondents who require continuous hand holdings and if organised effort through public extension can be made available there is all possibility to reduce the percentage of apipreneurs falling under this category of late majority.

Fig.11: Graphical representation of adopter categories of the apipreneur *vs* Rogers's standard curve.



Followed by the late majority, it can be found that early majority (20.00%) and early adopters (17.00%) pursue. On comparing the results with that of Rogers standard curve that explains adopter category, it is evident that the percentage of apipreneurs who belong to early majority (20.00%) are lesser than the value (34.00%) ascribed in standard Rogers curve, whereas the percentage of early adopters (17.00%) is higher than that of Rogers value (13.50%). Early majority is a group of thoughtful people according to Rogers. In this study the apipreneurs could be considerate and who are careful about accepting changes. This category of respondents may tend to be less affluent and require more education to become tech savvy. However, owing to their inherent nature of willing to take up a venture after witnessing others doing it successfully make it quite possible to change them from early majority to early adopters through technology and extension interventions.

The higher percentage of early adopters is a welcome sign and Rogers himself considered this category as social leaders who are popular in the community and are educated. The service of early adopters who acts as a key player in opinion formation should be used for the benefit of educating the early majority and late majority.

The percentage of laggards among the apipreneurs is at par with that of standard Rogers value (16.00 per cent). This could be due to the fact that the apipreneurs are practising this venture for a long period of time with a custom way technology in use, out of their past experience and intuition. Hence, it can be inferred that these apipreneurs will exhibit high resistance to change as a result of their satisfaction from their existing venture in terms of returns from the enterprise from the available lot of technologies. For this reason, it will be very difficult for field level extensioinists to transform them with any ordinary programme and the results are in conformity with the findings of Jacob (2015). However use of on farm trials, extensive interventions from the extension agents and interactions with successful apipreneurs in the state might create the necessary awareness with regard to the need of scientific technologies in apiculture among the laggard population.

There were no innovators in the adoption curve and this could be due to the fact that beekeeping was an age old enterprise and already there was availability of a standardised scientific technology for remunerative bee keeping. However governmental linkages with private startups like public private partnership system, who work for development of beekeeping products and their value added products, can open new broader platforms for the apipreneurs. And the apipreneurs with higher per cent belonging to the early adopter category itself is a positive sign that with further technological interventions and tailor made strategies focussing on this category will boost the apipreneurs to develop creative new ideas and enhance the risk taking ability of individuals in the field of apiculture.

The following conclusion can be drawn that there is a necessity to establish an effective extension advisory and service system in order to support the apipreneurs. Under the influence of a healthy support system, the frequency of apipreneurs who belong to late majority and laggards can be reduced resulting in the surge of the number of apipreneurs who belong to early majority, early adopters or innovators.

4.4.4 Level of adoption of apipreneurs of selected apiculture technology of KAU and relation with the independent variables

It was also essential to compare the relationship of personal and social characteristics with level of adoption of apipreneurs. Hence independent variables were correlated with the level of adoption and the result is depicted in Table 25.

Table 25. Correlation results between level of adoption of the apipreneurs and the independent variables.

Sl.no	Independent variables	Correlation
1	Age	-0.021
2	Education	0.138
3	Family members	0.034
4	**Total Land holding**	**0.298****
5	Yield per box	0.066
6	**Institutional interventions**	**0.259***
7	**Market Intelligence**	**0.462****
8	**Training attended**	**0.444****
9	**Experience in beekeeping**	**0.366****
10	Risk propensity	0.082
11	**Credit orientation**	**0.241***
12	Creativity	0.143
13	**Employment generation**	**0.517****
14	**Optimism**	**0.270***
15	**Knowledge**	**0.755***

**-Significant at 1 per cent level; *- Significant at 5 per cent level

Table 25. represents the result obtained from the correlation analysis of extent of adoption with the independent variables which illustrates that nine out of fifteen independent variables showed positive and significant correlation. Variables namely

Fig.12: Schematic representation of Association of Level of adoption and the independent variables

1. Age
2. Education
3. Family members
4. Total Land holding
5. Yield per box
6. Institutional interventions
7. Market Intelligence
8. Training attended
9. Experience in beekeeping
10. Risk propensity
11. Credit orientation
12. Creativity
13. Employment generation
14. Optimism
15. Knowledge

Negatively correlated

Non significant

Significant

total land holding, market intelligence, training attended, experience in beekeeping and employment generation were positively and significantly related at one per cent level of significance while institutional interventions, credit orientation, optimism and knowledge were significant at 5 per cent level of significance.

Total land holding showed a positive and significant relationship with the extent of adoption. It can be inferred that with the increase in land area, apipreneurs tend to place more hives and also availability of additional plots on lease allows the apipreneurs to extend the enterprise. The study asserted market intelligence as a factor that enabled the apipreneurs to be aware of the market prices and nature of the supply and demand of honey which was in line with the study of Bunde and Kibet (2016). Based on this an apipreneur decides whether to expand his enterprise and the expansion of an enterprise demands adoption of effective scientific technology to ensure maximum yield and higher remuneration. Experience in beekeeping and number of trainings attended provides the beekeepers with the necessary knowledge and skills which influences the adoption of a technology. Apipreneur who exhibits higher employment generation will ensure that he utilizes the work force to adopt the recent scientific methods to maximize returns from the enterprise (Sharma and Das, 2018).

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Institutional interventions also showed positive and significant correlation with level of adoption at 1 per cent level of significance. This association explains that with increase in institutional interventions the chances of an apipreneur to adopt a scientific beekeeping technology will also increase. Similarly credit orientation ensures expansion of beekeeping enterprise and with the expansion enhances the adoption of scientific beekeeping technology. Optimism can play a vital role in extent of adoption of technology as the optimistic approach influences the decision of an apipreneur to adopt a new scientific technology. Knowledge level of the apipreneur also determines the decision of an apipreneur to adopt or to reject a technology.

Hence it can be inferred that all the nine variables mentioned above have direct influence on the adoption of apiculture technology among the apipreneurs.

4.5. Perceived usefulness and effectiveness of selected apiculture technology of KAU

The selected eighteen apiculture technologies of KAU were categorized into two in order to rightly interpret the extent to which a practice was said to be useful and effective. Thirteen practices were considered for assessing the extent of usefulness as perceived by the apipreneur and the result is represented in Table 26.

Table.26: Perceived usefulness of selected apiculture technology of KAU

Sl.No	Statements	Perceived Usefulness		
		VU (%)	U (%)	NU (%)
1	Spacing of hives	2.66	56.00	41.33
2	Beehive used: Newtons beehive	13.33	74.66	12.00
3	Colour of beehive : White / Light coloured	26.33	48.00	26.66
4	Foraging plants grown:	2.66	48.00	49.33
5	Use of ant pan/ oil band to get rid of ants.	76.00	20.00	4.00
6	Suitable time for honey harvesting	29.33	14.66	56.00
7	Inspection of hives: Every week	61.33	33.33	3.33
8	Proportion of artificial feed 1:1	38.66	57.33	4.00
9	Harvesting from sealed hives	18.66	73.33	8.00
10	Honey harvest: 5-7 days	20.00	66.67	13.33
11	Scarce period: Movement of hives to coconut growing area	2.66	6.66	90.66
12	By products obtained through apiculture: Wax processing, value addition of honey	21.33	44.00	34.66
13	Grades of honey according to AGMARK	20.00	18.66	61.33

It is apparent from the Table 26 that out of the thirteen practices considered, three practices *viz*., use of ant pan/oil band to get rid of ants (76.00 per cent) and weekly inspection of the hives were found to be very useful (61.33 per cent). Practices like use of newtons beehive (74.66 per cent), harvesting from sealed hives (73.33 per cent) and harvesting from hives on weekly interval (66.67 per cent) were considered useful. Movement of the hives during the scarce period (90.6 per cent) was considered not to be useful as apipreneurs found it to be a tedious process and provision of feed during scarce period itself supplemented the food requirement of the bees. Grading of the honey as per AGMARK (61.33 per cent) was also considered not useful. The apipreneurs had opined that in the absence of a grading system in honey, they were still able to obtain markets inorder to sell their produce. Hence there is a need to educate the

apipreneurs on the importance of grading systems and production of quality produce with shear efforts from extension services and support system.

With regard to understanding the perceived effectiveness of the practices, five practices were considered and the result obtained was represented in Table 27.

Table. 27: Perceived effectiveness of selected apiculture technology of KAU

Sl.No	Statements	Perceived Effectiveness		
		VE (%)	E (%)	NE (%)
1.	No. of frames in brood chamber: **6** No. of frames in Super chamber: **4**	29.33	9.33	61.33
2.	Division of colonies is done in the growth period	20.00	26.66	53.33
3.	Control of viral diseases using turmeric along with artificial feed	80.00	5.33	14.66
4.	Control of diseases using mixture of basil and garlic mixture	13.33	14.66	72.00
5.	In processing of honey Temperature at which purification of honey is carried out: 45 ^{o} C and 63-65^{o} C	49.33	18.66	32.00

From perusal of Table 27 it is distinct that the use of turmeric along with the feed in order to control viral diseases was found to be very effective by majority of the apipreneurs (80.00 per cent) followed by the processing of honey through double boiling method at 45^{o}C and 63-65^{0}C. However practices like use of garlic or basil to control diseases and use of six and four frames in brood and super chamber respectively were found to be less effective by the 72.00 per cent and 61.33 per cent apipreneurs respectively. The use of five frames instead of four in the super chamber was found to be more effective as use of four frames had resulted in bulging of the honey comb which led to the breakage of the comb while harvesting. Usage of four frames also resulted in increase in the moisture content of the honey.

Hence it can be inferred that use of ant pan/oil band to get rid of ants was found to be very useful while movement of the hives during the scarce period perceived not useful by the apipreneurs. The use of turmeric along with the feed in order to control viral diseases was found to be very effective and use of garlic or basil to control

Fig.13: Perceived usefulness of selected apiculture technology of KAU

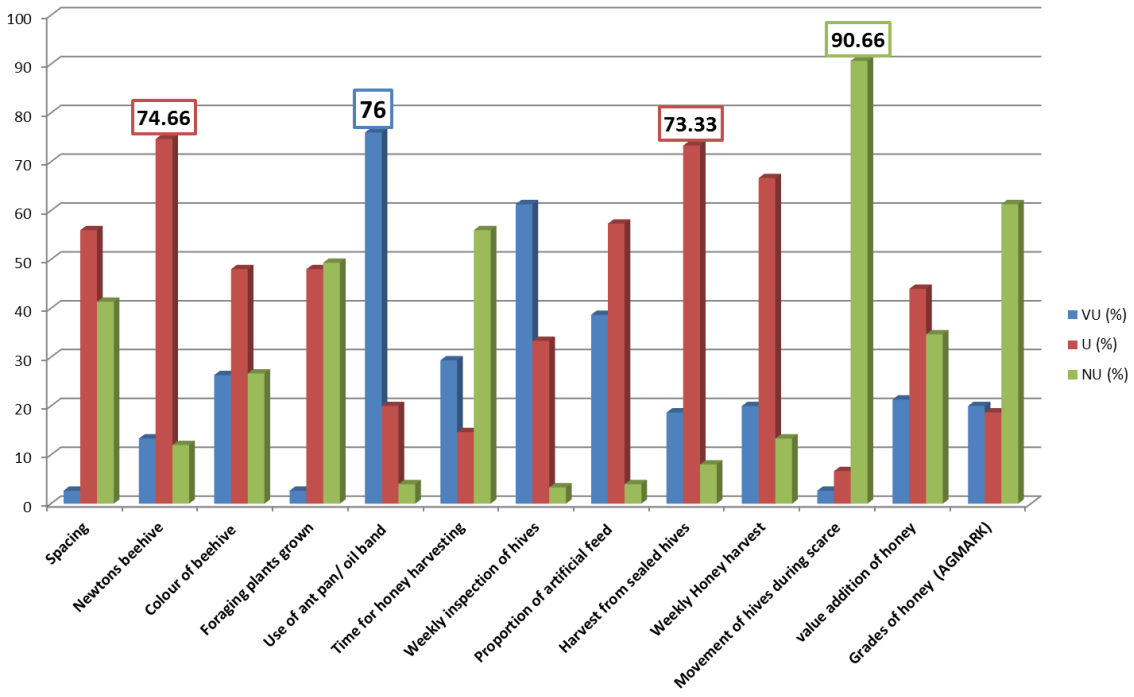
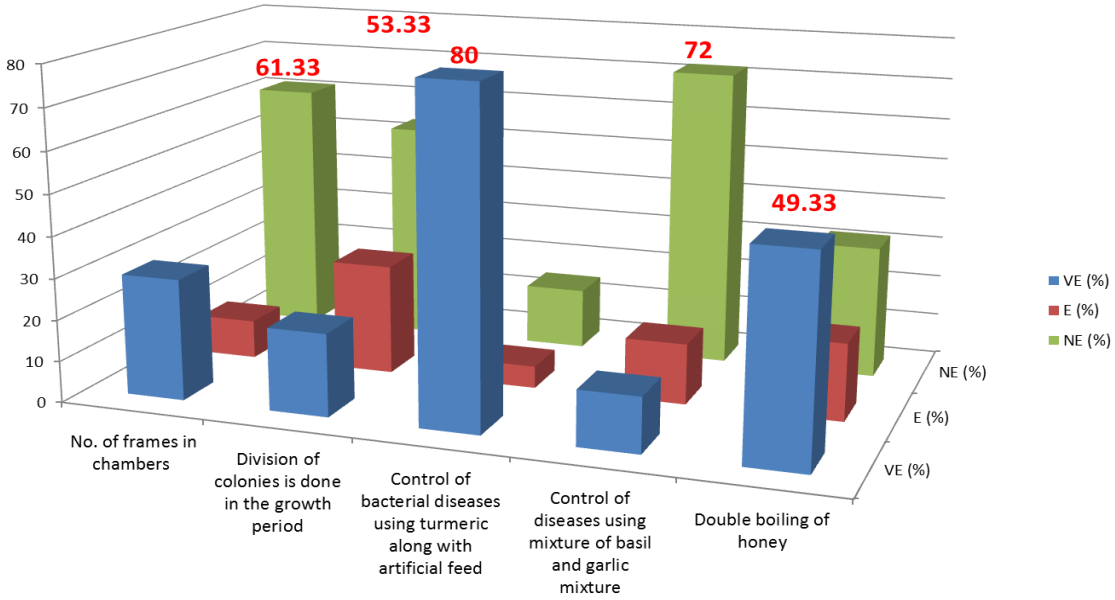


Fig.14.Perceived effectiveness selected apiculture technology of KAU



diseases to be not effective by majority of the apipreneurs. However majority of the practices developed by KAU are very well accepted among the apipreneurs which clearly indicates the extent of dominance of KAU technologies in the benefit of beekeepers. Furthermore scientific research should be carried out to delineate the limitation experienced by the apipreneurs in order to ensure the development and dissemination of effective need based technologies on apiculture.

4.6. Training needs in apiculture as perceived by the farmers and the experts.

The results with regard to the training need assessments obtained as depicted in Table 28 is provided below

Table.28.Training needs assessment as perceived by the apipreneurs and experts

Sl.No	Training need assessment	Average Choice Score	Percentage of apipreneurs		
			Most needed	Needed	Not needed
1.	Queen bee rearing	1.12	0	12.00	88.00
2.	Training on bee flora throughout the year	1.33	1.33	30.66	68 .00
3.	Migration of boxes	1.08	1.33	5.33	93.33
4.	Method of feeding	1.04	0	4.00	96.00
5.	Formula for feeding	1.09	0	12 .00	88.00
6.	Division of boxes	1.29	26.66	29.33	44 .00
7.	Division of queen bees among queen less hives	1.33	9.33	24 .00	66.66
8.	Uniting of boxes	1.45	5.33	34.66	60 .00
9.	Identification of pest and disease symptoms	2.08	24.00	44 .00	32 .00
10.	Control methods of pest and diseases	2.20	25.33	29.33	45.33
11.	Method of honey extraction and processing	2.05	34.66	38.66	26.66
12.	Honey testing	2.70	76.00	24 .00	0
13.	Value addition of honey and byproducts	2.62	66.67	29.33	4 .00

Based on the results obtained using the average choice score it is distinct from Table 28 that greater proportion of the apipreneurs felt that trainings with regard to honey testing and grading (2.70) along with value addition of honey and its by-products

(2.62) had to be undertaken by the extension agents while trainings on method of feeding, migration of boxes, formulation for feeding were found to be least required by the apipreneurs.

Hence from the Table 28, it is evident that the trainings with regard to production and protection aspects were found to be in the category of either important or least important. Trainings on skill development related to post harvest practices of honey was considered very important by majority of the apipreneurs. The knowledge and skill of the apipreneurs related to production and protection aspects were versed to an extent greater than that of information related to post-harvest and value addition technology. Hence majority of apipreneurs felt the need for training programmes related to post harvest and value addition. Similar opinion was made by the experts who were involved in providing services and support to the apipreneurs at grass root level.

From the results obtained, it can be inferred that majority of apipreneurs felt there was a need of training programmes related to post harvest and value addition of honey. Necessary training sessions emphasizing more on the post-harvest techniques and value addition of honey should be considered by the extension agents and organizations who are predominantly involved in the upliftment of the beekeeping community.

4.7. Constraints experienced by the farmers with suggestions for refinement.

4.7.1. Constraints experience by farmers (apipreneurs)

Constraints experienced by the apipreneurs were identified on consultation with experts. A list of ten constraints were provided to the apipreneurs which were classified into very important, important and least important. Based on the weighted mean obtained, the constraints were then ranked as represented in Table 29.

Table. 29 Constraints experienced by the apipreneurs

Sl.No	Constraints	Weighted mean	Rank
1.	Non availability of good quality bee box	1.26	8
2.	Non-availability of beekeeping equipment's	1.00	10
3.	Lack of financial support	2.35	3
4.	Lack of skill up gradation	1.96	5
5.	Pest infestation resulting damage to the colonies	2.11	4
6.	Lack of technical know how about disease management practices	1.81	6
7.	Lack of an organized marketing network for honey and honey products	2.49	2
8.	Lack of minimum price for honey and value added products from apiculture	2.69	1
9.	Absence of storage facilities at reasonable price	1.01	9
10.	High price fluctuations	1.36	7

From the Table 29 it is evident that the respondents ranked the constraints in the following order with lack of minimum price for honey and value added products from apiculture (2.69) being the major constraint followed by the lack of an organized marketing network for honey and honey products (2.49), lack of financial support (2.35), pest infestation resulting damage to the colonies (2.11), lack of skill up gradation (1.96), lack of technical know how about the disease management practices (1.81), non-availability of good quality bee box (1.26), high price fluctuations (1.36) and, absence of storage facilities at reasonable price (1.01) and lastly non-availability of beekeeping equipment (1.00).

Apart from the constraints mentioned in the list, few more were pointed out by the apipreneurs which included the lack of subsidy for sugar which was required for providing artificial feed to the bees. Lack of commercial processing units nearby was also said to be a major constraint faced since in the state of Kerala there are only three commercial processing units of honey whose site of establishment is comparatively for the apipreneurs in these districts which resulted in increase in the cost of processing honey. Untimely occurrence of floods resulted in a heavy loss to the beekeeping

community of Kerala. Hence lack of a proper insurance scheme to safeguard the beekeepers was also identified as a constraint that demanded attention

Hence the conclusion that can be drawn is that, lack of a minimum support price for honey and value added products, lack of credit facilities, and lack of an organized marketing network was the most highlighted constraints which were experienced by the apipreneurs. Therefore considering the enlisted constraints faced by the apipreneurs, necessary measures should be taken up by governmental organizations and extension service systems in order to ensure the upliftment of the beekeeping community in terms of their techno socio economic security.

4.7.2 Suggestions for refinement

The suggestions that were perceived by the apipreneurs and experts are enlisted in Table 30.

Table 30: Suggestions for refinement

Sl.No	Suggestions	(%)
1.	Establishment of a government based brand for beekeepers where the produces are procured at a minimum support price.	86.66
2.	Setting up of more processing units to ensure production of quality honey and by-products.	74.66
3.	Development of governmental policies specific to the beekeeping community.	70.00
4.	Credit facilities tailor made for apipreneurs should be promoted in institutional agencies.	66.67
5.	Development of organized Marketing network for sale of honey and by- products.	60.00
6.	Development of standardized apiculture technology for the state.	53.33

Table 30. indicated that greater fraction of the respondents (86.66 per cent) felt an urgent need for establishment of a government based brand for beekeepers where the produces would be procured from the apipreneurs at a minimum support price. It was followed by the setting up of more commercial processing units to ensure quality honey

products and its by-products (74.66 per cent) ; development of governmental policies specific to the beekeeping community (70.00 per cent); credit facilities tailored made available for apipreneurs in financial institutions (66.67 per cent); development of organized marketing network for sale of honey and by- products (60.00 per cent) and lastly the development of standardized apiculture technology for the state (53.33 per cent).

Hence it can be inferred that majority of the apipreneurs opined for the establishment of a government based brand for beekeepers where the produces are procured at a minimum support price. Lack of an organized marketing system should be considered as key issue and tailor made governmental and credit oriented policies need to be developed. Establishment of more commercial processing units will ensure the availability of quality honey for sales within the state and for export purpose at lower cost of production and guarantee higher remuneration to the apipreneurs.

4.8. Farmers practices

Based on the interaction with the apipreneurs the following were the general practices that was carried out by the apipreneurs

1. Storage of the frames with the comb after the extraction of honey in plastic bins to be reused in the next season.
2. Placing of PVC reducers to store water/grease which prevent attacks by ants.
3. Applying turmeric garlic paste in brood chamber to deter pest attack.
4. Mixture of banana and sugar as artificial feed.
5. Leaves of Indian Borage (Panikoorka) is also added in boiling sugar and water mixture which is then used as artificial feed for bees during scarce period.
6. Use of sweet flag in sugar solution as a source of nutrition for the bees during scarce period.

Storage of the frames with the comb after the extraction of honey in plastic bins for next season was one such farmer's practice which was popularly followed. The practice enabled reduction in duration of the comb development phase which resulted in early production of honey in the colonies.

PVC reducers were used by the apipreneurs to store water or grease which was found to be an effective measure to prevent attacks by ant. Rusting or spoilage of the stand was also reduced. Reducers could also be easily dismantled making it easy for apipreneurs to transport it from one place to another.

Supplementing of artificial feed with banana, sweetflag and Indian borage was found to provide the necessary nutrition to the honeybees and was also believed to improve the resistance of bees towards diseases.

Hence the above mentioned farmers practices also needs to be considered and validated for consideration into a standardized technology for the betterment of management of apiculture.

VALIDATION OF THE HYPOTHESES

The following were the hypotheses formulated inorder to fulfil the objectives of the study

1. The entrepreneurial potential of the apipreneurs were found to be low

2. The apipreneurs exhibit very low knowledge level with regard to the selected apiculture technology of KAU

3. The extent of adoption of selected KAU practices of apiculture was found to be low

4. There is no significant relationship between the extent of adoption and the independent variables

5. The selected apiculture practices of KAU are not perceived useful and effective by the apipreneurs

Based on the analysis and the results obtained the following can be inferred

1. The entrepreneurial potential of the apipreneurs were found to be low

From Table 19 it is evident that the significant proportion of the apipreneurs *i.e.* 69.33 per cent possessed medium level of entrepreneurial potential which clearly indicates the hypothesis mentioned is rejected.

2. The apipreneurs exhibit very low knowledge level with regard to the selected apiculture technology of KAU

The results from Table 23 clearly enumerates that a substantial proportion of the apipreneurs in the study i.e. around 92 per cent of them exhibit medium to high knowledge level with regard to the selected apiculture technology of KAU. Hence the hypothesis of the apipreneurs exhibiting low knowledge level is falsified.

3. The extent of adoption of selected KAU practices of apiculture was found to be low

It was evident from the results obtained that majority of the apipreneurs exhibited medium level to high level of adoption of the selected apiculture with a mean adoption quotient of 71.00 per cent and scores ranging from 44 to 87. .Hence the assumption on apipreneurs exhibiting low level of adoption is rejected.

4. There is no significant relationship between the level of adoption and the independent variables

Table 25 represents the result obtained from the correlation analysis of extent of adoption with the independent variables which illustrates that nine out of fifteen independent variables showed positive and significant correlation. Variables namely total land holding, market intelligence, training attended, experience in beekeeping and employment generation were positively and significantly related at one per cent level of significance while institutional interventions, credit orientation, optimism and knowledge were significant at 5 per cent level of significance. Hence there is significant relationship between the level of adoption and the independent variables. Thus the null hypothesis stated above is rejected.

5. The selected apiculture practices of KAU are not perceived useful and effective by the apipreneurs

Majority of the apipreneurs perceived most of the practices as useful and effective. However few of the practices were also considered to be not useful and ineffective. Majority of the practices developed from KAU are very well accepted among the apipreneurs which clearly indicates the extent of dominance of KAU technologies in the benefit of beekeepers. Hence the statement of the selected apiculture practices of KAU are not perceived useful and effective by the apipreneurs is falsified.

Plate 1: Field Survey

Plate 3: Equipments used for beekeeping by the apipreneurs

Bee

Bee Wax

Bee knife

Smoker

Honey extractor

Bee box

Colonies in the bee box

Plate 3: Value added products of honey and its byproducts

Processed Honey obtained from Indian as well as Stingless bee

Creams prepared using turmeric and bee wax

Value added products of honey

Summary

5.

SUMMARY

Indian economy eventhough being agriculture –commanded nation the current performance of agricultural sector in India is not upto the mark. This necessitates the need to recognize the untapped growth potential of Indian agriculture which includes development of the rural infrastructures and accelerate growth of agribusiness through promotion of value addition of the agricultural produce thereby ensure employment among the masses in rural areas. Agripreneurship is one such component can be defined as a sustainable; community oriented, directly marketed agriculture which has an inherent ability to identify opportunities at various level of agriculture and thereby adds the entrepreneurial component to an agricultural activity. Apiculture, one among the most traditional agricultural practices followed in India, has now become an enterprise with ample scope for providing self-employment as it ensures higher returns for rural and tribal families. Out of the different states in the country, Kerala and Tamil Nadu were traditionally found to be the leading states in beekeeping with Kerala being the major contributor with 70 per cent of the annual production of honey in India (Shende, 1992). In a state like Kerala, where mono crop like rubber is facing crisis in terms of price decline apiculture can ensure higher profit in lean periods. Rubber plantations can aid bee foraging and enhance the subsidiary income to the farmer augmenting profit. Hence, this study on multidimensional analysis of apipreneurship prospect is vital. The present study was undertaken with the following objectives:

- To explore the entrepreneurial potential, the extent of knowledge and the adoption of improved apiculture technologies.
- This study will also diagnose the constraints in apiculture, profile the beekeepers and ascertain their training needs.

The study was conducted during the year 2019 in the southern districts of Kerala predominantly in three districts *i.e.* Pathanamthitta, Idukki and Kottayam covering a total sample size of 90 with 75 apipreneurs and 15 experts associated with beekeeping. Entrepreneurial potential and level of adoption of KAU apiculture technology was selected as the dependent variables and the independent variables , selected based on judges rating were age, education, family members, total land holding, yield per box, institutional interventions, market intelligence, training attended, experience in beekeeping, risk propensity ,credit orientation, creativity, employment generation, optimism and knowledge level .

The data was collected from the apipreneurs using a well-structured interview schedule and through personal interview of the apipreneurs for data enumeration. On subjecting to further data statistical analysis the following were the results obtained:

The salient findings of the study were:

1. More than half of the apipreneurs (56.66 per cent) belonged to the old age category.

2. The apipreneurs were literate. Fifty nine per cent of the apipreneurs had education qualification from high school to post-graduation level.

3. Greater proportion of the apipreneurs (57.33 %) had a family size of upto 4 members.

4. Majority of the apipreneurs *i.e.* about 75 per cent of the apipreneurs possessed medium land area (ranging from 0.64 acre to 2.76 acre). 65.33 per cent of the total apipreneurs possessed their own land while 34.67 per cent placed their boxes in other farmers or plots of their acquaintances.

5. Seventy per cent of the apipreneurs had attended trainings provided by upto two institutions related to development of the beekeeping community.

6. KVIC (46.66 per cent) followed by Horticorp (40 per cent) in collaboration with Kerala Agricultural University (KAU) were the organizations that were extensively involved in providing greater proportion of the interventions to the apipreneurs in the form of trainings, provision of bee boxes and other subsidies.

7. Seventy five per cent of the total apipreneurs exhibited medium level of market intelligence.

8. Majority of the respondents *i.e.* 80.00 per cent of them had attended one day training closely followed by 76.00 per cent who attended three day training and 74.66 per cent two day training.

9. Majority of the apipreneurs (58.66 per cent) obtained an average yield of up to 6.5 kg per colony. The remaining 41.33 per cent of the apipreneurs obtained yield greater than 6.5 kg per colony.

10. Larger per cent (52.00 %) 52 of the apipreneurs had experience in beekeeping for a period of less than 10 years followed by apipreneurs *i.e*. 33.33 per cent who possessed experience ranging from 10 to 20 years and remaining 14.67 per cent have experience greater than 20 years.

11. Eighty three per cent of the apipreneurs showed medium level of risk propensity behavior.

12. Substantial proportion of the apipreneurs *i.e.* 68.00 per cent had medium level of credit orientation followed by 16.00 per cent apipreneurs each with low level and high level of credit orientation.

13. Majority of the labour was required during the scarce season (58 per cent) followed by harvest season (36 per cent).

14. Sixty five per cent of the total man-days comprised of family labour while the remaining 35.00 per cent opted for hired labour especially where requirement of labour in beekeeping was greatly dependent on the number of boxes managed by the apipreneurs.

15. The per box labour was found to be highest in Kottayam district which was accounted as 3 followed by Pathanamthitta which was around 2 and 1 in case of Idukki district.

16. More than half of the apipreneurs had low level of creativity (53.33 per cent) while around 46.37 per cent of apipreneurs had high level of creativity, with mean value as the check.

17. Greater proportion of the apipreneurs *i.e.* ninety two per cent possessed medium to high level of knowledge with regard to selected apiculture technology of KAU.

18. The mean knowledge score of apipreneurs from the different districts of study, apipreneurs from Pathanamthitta topped with a mean knowledge score of 12.2, followed by apipreneurs of Kottayam (10.53) and Idukki (10.43) respectively

19. Majority (69.33 per cent) of the apipreneurs belonged to the category of medium level of entrepreneurial potential followed by 16.00 per cent in low level and 14.67 per cent in the high level entrepreneurial potential.

20. Entrepreneurial motivation, management competencies and social competencies had exhibited high Eigen values, which made them the dimensions that greatly influence the entrepreneurial potential of the apipreneur.

21. Majority of the apipreneurs exhibited medium level of adoption *i.e.* 64 per cent followed by high level (18.67 per cent) and remaining in the low level of adoption (17.34 per cent).

22. Majority of the respondents belonged to the late majority category (47.00 per cent) followed by early majority (20.00 per cent), early adopters (17.00 per cent), laggards (16.00 per cent) and with no respondents in the innovators category.

23. Total land holding, market intelligence, training attended, experience in beekeeping and employment generation were significantly related at one per cent level of probability while institutional interventions, credit orientation, optimism and knowledge were significant at 5 per cent level of significance with the level of adoption

24. The practices like use of ant pan/oil band to get rid of ants was found to be very useful and the use of turmeric along with the feed inorder to control viral diseases was found to be very effective. While movement of the hives during the scarce period was considered not to be useful and use of garlic or basil for disease control was considered least effective by majority of the apipreneur.

25. Greater proportion of the apipreneurs felt that training with regard to honey testing and grading (2.70) along with value addition of honey and its by-products (2.62) had to be undertaken by the extension agents.

26. Lack of a minimum support price for honey and value added products, lack of credit facilities, and lack of an organized marketing network were the most highlighted constraints as perceived by the apipreneurs.

27. Majority of the apipreneurs attributed for the establishment of a government based brand for beekeepers where the produces were procured at a minimum support price as a suggestion.

From the above findings the following conclusions can be drawn in general that majority of the apipreneurs had medium level of entrepreneurial potential because of the easy availability of input resources with minimal initial cost of investment and assured remunerations from the products. Entrepreneurial motivation was the most important dimension contributing to the entrepreneurial potential. Majority of the apipreneurs exhibited medium level of adoption. The analysis of the personal and social characteristics of apipreneurs showed the factors that influenced the level of adoption of apiculture technology of KAU. The apiculture practices recommended by KAU were also considered to determine the extent of usefulness and effectiveness as perceived by the apipreneurs. The study also capacitated the identification of the training needs of beekeepers and the constraints of the apipreneur. From the results obtained it can be observed that there is considerable room for the improvement in beekeeping as a agripreneurial enterprise and for scaling up the adoption through suitable extension interventions. Tailor made strategies tare to be lined up inorder to enhance the entrepreneurial potential of the apipreneur towards taking up apiculture as an enterprise.

Suggestions for future research

1. Similar study should be carried out in other districts as well.
2. Action research with an objective to attract the younger generation in apiculture and thereby promote agripreneurship in apiculture should be taken up as a subject of future research.
3. Research regarding implementation and extent of effectiveness of the current policies developed for beekeeping community should be assessed.
4. Tailor made research and extension strategies should be developed for the beekeeping societies
5. A comparative analysis of the entrepreneurial potential of the small scale and large scale apipreneurs needs to be conducted.
6. Livelihood security provided by apiculture to the farmers should be assessed.

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Appendix

APPENDIX I
Apipreneurs profile analysis

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE
Department of Agricultural Extension
Vellayani - 695 522, Thiruvananthapuram

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Ms. Devapriya. S. Kaimal (Ad. No. 2018-11-087), the Post Graduate student in the Department of Agricultural Extension, College of Agriculture, Vellayani is undertaking a research study entitled "Multidimensional analysis of apipreneurship prospect in South Kerala" as part of her research work. Variables supposed to have close association with the study have been identified after extensive review of literature.

Considering your vast experience and knowledge on the subject, I request you to kindly spare some of your valuable time to examine the variables critically and to rate the relevancy of them with the continuum provided. Any other variables found suitable for the study may also be kindly suggested inorder to improve the quality of the study. I request your good self to kindly return the list duly filled at the earliest in the self-addressed stamped envelope enclosed with this letter.

Thanking you

Yours faithfully

(Allan Thomas)

Cont. Appendix I

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE
Department of Agricultural Extension
Vellayani, Thiruvananthapuram - 695 522

TITLE OF STUDY

"MULTIDIMENSIONAL ANALYSIS OF APIPRENEURSHIP PROSPECT IN SOUTH KERALA"

OBJECTIVES OF THE STUDY

To explore the entrepreneurial potential, the extent of knowledge and the adoption of improved apiculture technologies. This study will also diagnose the constraints in apiculture, profile the beekeepers and ascertain their training needs.

Table showing variables taken for the study

Variables are given in bold cases and their meaning is explained for its easy understanding. You may please rate the statement with a tick mark in the appropriate column against the statement with special reference to its importance to meet the objectives of the study. You are free to correct and suggest modification for the statements under each stated variable of study.

Sl. No.	Variable Operational definition	Relevancy rating (R - relevant)				
		Most R	More R	R	Less R	Least R
1.	**Age:** Refers to the number of years completed by the apipreneur in the time of investigation.					
2.	**Education:** The academic qualification obtained by the apipreneur through formal and informal education that helps that person to understand information and interpret it is the educational status of the apipreneur.					
3.	**Occupation:** Work done by a apipreneur to sustain his livelihood is termed as the occupation of that individual					
4.	**Family size:** Refers to the number of family					

	members in each apipreneur's household.					
5.	**Family type:** Refers to the type of the family to which the apipreneur belongs to.					
6.	**Annual income:** Refers to the total earnings of the apipreneur through farm entrepreneurship per year.					
7.	**Total land holding:** The extent of land the apipreneur possess and cultivate is termed as land holding.					
8.	**Institutional interventions:** Refers to the support received by apipreneur from formal and non-formal institutions in terms of finance, training, technology and information.					
9.	**Market intelligence:** The market related information received by apipreneur from the organisation and its extent of usefulness is measured by this variable.					
10.	**Market orientation:** Refers to the means or opportunity to get the inputs for apiculture as well as to sell the outputs.					
11.	**Training:** Refers to the number of trainings undergone by the apipreneur in various activities related to production aspects of apiculture by different agricultural institutions.					
12.	**Experience in beekeeping:** It was measured in terms of number of years in beekeeping.					
13.	**Yield per colony:** The average yield obtained per box /colony by the apipreneur.					
14.	**Extension participation:** Refers to participation of apipreneur in activities or programmes like meetings, seminar etc. organized by various agencies.					
15.	**Cosmopoliteness:** Refers is the tendency of the apipreneur to be in contact with outside his own social system based on the belief that all the needs of an individual cannot be satisfied within his own social system.					
16.	**Information seeking behaviour:** Refers to frequency of contact or exposure of a apipreneur to different sources for obtaining apiculture related information.					
17.	**Attitude:** Refers to the degree of positive and negative approach of the apipreneur towards the adoption of technology.					
18.	**Risk propensity:** Refers to behaviours that involve some potential danger or harm but also					

	provide an opportunity to obtain some benefit.					
19.	**Decision making ability:** It is defined as the degree to which an apipreneur justifies the selection of most effective means from the available alternatives on the basis of scientific criteria's for achieving maximum economic profit.					
20.	**Knowledge about beekeeping:** Refers to the extent of information possessed by the apipreneur on recommended practices.					
21.	**Level of satisfaction:** Refers to the degree to which the apipreneur feel satisfied with the technology.					
22.	**Problem Solving ability:** Refers to the ability of the apipreneur to identify the problem, find the solution, select the best one and apply it.					
23.	**Credit orientation:** Refers to orientation of the apipreneur to avail and utilize credit by the production.					
24.	**Creativity:** Refers to the ability of the apipreneur to generate new ideas and solve problems.					
25.	**Resource Recycling:** It is defined as the reuse of various available resources in the apipreneurs field.					
26.	**Self-reliance:** Refers to the extent to which the apipreneur relies on self for his future.					
27.	**Attitude towards self-employment:** Refers to the mental disposition of the apipreneur towards self-employment.					
28.	**Employment Generation:** Refers to the number of persons employed by an apipreneur.					
29.	**Work motivation:** Refers to the ability of the apipreneur for taking personal sacrifices and additional efforts for accomplishment of the objectives.					
30.	**Scientific orientation:** Refers to the degree to which an apipreneur is oriented to the use of scientific methods in his cultivation.					
31.	**Awareness about agripreneurial opportunities:** Refers to the extent to which the apipreneurs were familiar with various entrepreneurial opportunities					
32.	**Personal control**: Defined as the degree of control that an apipreneur exerts over the entrepreneurial activities and takes control of the farm enterprise.					

33.	**Optimism**: Refers the mental attitude of the apipreneur reflecting a belief or hope that the outcome of some specific endeavour or outcomes in general, will be positive, favourable, and desirable.					
34.	**Self-categorisation** : Refers to the process by which people form cognitive representations of themselves and others in relation to different social groups.					
35.	Suggestions					

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Cont.. Appendix I

The variables with their mean relevancy score

Sl.no	Independent Variables	Mean relevancy score
1.	**Age.**	**4.20**
2.	**Education**	**3.96**
3.	Occupation	3.40
4.	**Family size.**	**3.90**
5.	Family type.	1.95
6.	Annual income	2.10
7.	**Total land holding**	**4.15**
8.	**Institutional interventions**	**4.05**
9.	**Market intelligence**	**3.95**
10.	Market orientation	3.42
11.	**Trainings attended**	**4.10**
12.	**Experience in beekeeping**	**4.25**
13.	**Yield per colony**	**4.05**
14.	Extension participation	3.50
15.	Cosmopoliteness	3.15
16.	Information seeking behaviour	3.15
17..	Attitude.	3.50
18.	**Risk propensity**	**4.15**
19.	Decision making ability	3.25
20.	**Knowledge about beekeeping.**	**4.45**
21.	Level of satisfaction	3.42
22.	Problem Solving ability.	3.4
23.	**Credit orientation**	**4.25**
24.	**Creativity**	**3.95**
25.	Resource Recycling	3.40
26.	Self-reliance	3.25
27.	Attitude towards self-employment	2.65
28.	**Employment Generation**	**4.1**
29.	Work motivation	3.15
30.	Scientific orientation	2.70
31.	Awareness about agripreneurial opportunities	3.20
32.	Personal control	3.40
33.	**Optimism**	**3.90**
34.	Self-categorisation	3.51
	Mean	3.56

APPENDIX II

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI, THIRUVANANTHAPURAM
DEPARTMENT OF AGRICULTURAL EXTENSION

INTERVIEW SCHEDULE FOR FARMERS

Multidimensional analysis of apipreneurship prospect in South Kerala

No. Date:

Name of Block:

Name of Panchayath:

Name and address of the respondent

1. Name:
2. Age:
3. Address
4. Phone No.:
5. Number of family members
6. Total land holding: Area owned: ____ (acre) Area leased in: _____ (acre)
7. Educational status:

8. Institutional interventions

Formal sources/ Informal sources	Duration of training			
	One day training	Two day training	Three day training	6 months

9. Market Intelligence

Sl.no	Statements	Responses	
1.	Do you have a picture about the present prices of honey and its products in the market	Yes	No

2.	If yes, how regularly do you update yourselves	Always	Sometime	Rarely
3.	What all are the sources of market information?	Newspaper/Online sources/ Television/Organizations Peer groups		
4.	Market intelligence has enabled to bring about value addition in the products obtained from apiculture.	Yes	No	

10. Number of trainings attended:____

11. Experience in beekeeping : _____

12. Risk propensity

Please give your degree of agreement or disagreement about each of the following statements (SA- Strongly agree A- Agree, UD- Undecided, DA- Disagree, SDA- Strongly disagree)

Sl.No	Statements	SA	A	UD	DA	SDA
1.	I trust my intuitions and experience inorder to understand the best time for selling honey and its by products					
2.	I still believe that I can make maximum profit even if the enterprise is risky					
3.	Apiculture is not a risky business					
4.	Future marketing is not a way to tackle risk that is associated with the enterprise					

13. Credit orientation

a) Do you think a beekeeper like you should borrow for beekeeping? Yes/No

b) According to you how difficult is it to secure credit for beekeeping?
Very difficult/Difficult/Easy/Very easy

c) How is a beekeeper treated when he goes to secure credit for beekeeping?
Very badly/badly/Fairly/ Very fairly

d) There is nothing wrong in taking credit from institutional sources for investing in apiculture? SA / A / D / DA

e) Have you used credit for beekeeping? Yes / No

14. Creativity

Inventive	Enthusiastic	Determined	Informal	Self confidenc
Independent	Daring	Persistent	Versatile	
Responsible	Dependable	Practical	Understanding	Polite
Rational				

15. Employment Generation:

Total number of labour required for the enterprise:

Growth season	Scarce season	Harvest season	Family labour	Hired labour	Total

16. Optimism

Sl.No	Statements	SA	A	UD	DA	SDA
1.	I usually expect the best even at times of uncertainty					
2.	I rarely count on the good things that happened to me					
3.	I hardly expect the things to happen the way I want it to.					
4.	I stay calm and relaxed even in unexpected situations					
5.	It is always important that I always stay busy with work					

17. Entrepreneurial Potential

Sl.No	Statements	SA	A	UD	DA	SDA
1.	I want to use new technologies as and when it emerges.					
2.	Work should come first even if one cannot get proper result inorder to achieve ones goal.					
3.	I always obtain the desired result.					
4.	No matter what I have done I always want to do more and the best.					
5.	I always cherish me being an entrepreneur rather than being an					

	employee					
6.	I believe that a position in the beekeepers organization has an element of social pride					
7.	It is not good for an entrepreneur to become ambitious in life.					
8.	I believe unless an apipreneur makes maximum profit, he is not considered successful.					
9.	I try only those beekeeping practices which are likely to help me earn more money.					
10.	I prefer beekeeping over other activities as it helps me make more money					
11.	I believe that it's the role of the individual to determine their own future.					
12.	I have enough faith in my ability that is the reason for my success					
13.	One of the most important things to me is having a job where I am my own boss.					
14.	I can easily lead people who have different ideas on initiatives that I seek to achieve.					
15.	I initiate group discussions with respect to new beekeeping technologies, among other apipreneurs.					
16.	I assign work related to beekeeping among the family members.					
17.	People approach me and consider me as source of information on new beekeeping practices.					
18.	I can find the resources to implement the initiatives I have					
19.	It is easy for me to get input from nearby local markets					
20.	Setbacks in apiculture enterprise is not a big issue because human innovation will enable us to adapt to changes					

21.	I have the knowledge and technical skill to deal with any threats to the viability of my apiculture enterprise					
22.	Variation in climatic and lack of proper market condition can harm the success of the enterprise					
23.	I keep contact with people who are associated with scientific apiculture technology development.					
24.	I believe using of social networking sites enables overall development of the enterprise.					
25.	Even without being on a social media platform or online marketing sites my enterprise can still do well					

18. Knowledge level of the apipreneurs

1. Number of beehives required for 1 acre of land

   2 ☐ 3 ☐ 4 ☐ 5 ☐

2. The beehive used in Kerala for apiculture is: _____

3. Hive to hive spacing should be:

   1-2 ☐ 2-3 ☐ 3-4 ☐ No spacing ☐

4. The preferred color for beehive should be:

   White ☐ Yellow ☐ Red ☐ Brown ☐

5. Division of the colonies should be done during growth period. True/ False
6. Number of divisions that should be done in the growing period

   1 ☐ 3 ☐ 4 ☐ 5 ☐

7. What are the foraging plants that should be grown for beekeeping?

8. No. of frames in brood chamber and super chamber respectively:

   2/4 ☐ 6/4 ☐ 5/3 ☐ 8/6 ☐

9. Proportion of sugar to water while preparing artificial feed

1:2 ☐ 3:2 ☐ 2:1 ☐ 1:1 ☐

10. During scarce period hives should be shifted coconut growing tracts. True / False

11. Garlic + Basil mixture can be used to control bacterial diseases in bees. Yes / No

12. Suitable period for honey harvesting in Kerala is

Dec-Apr ☐ Jun-Sept ☐ Aug-Jan ☐ Feb-May ☐

13. Harvesting should be done _____ every week.

Once ☐ Twice ☐ Thrice ☐ None of these ☐

14. During processing, the temperatures at which double boiling of honey should be

45 / 65 ☐ 50 / 70 ☐ 65 / 75 ☐ 100 / 150 ☐

15. What are the grades of honey according to AGMARK? _____

19. Adoption and Perceived Usefulness

Sl No	Statements	Adoption						Perceived usefulness/effectiveness		
	Production Aspect	A	I	E	T	A	U			
1.	Spacing: Hive to Hive and Row to Row									
2..	Use of Newtons beehive									
3.	Colour of beehive : White / Light coloured									
4.	No. of frames in Brood chamber: 6 Super chamber: 4									
6.	Foraging plants grown									
7.	Use of ant pan/ oil band to get rid of ants.									
8.	Suitable time for honey harvesting: Dec- Apr									

9.	Inspection of hives: Every week									
10.	Harvesting from sealed frames									
11.	Proportion of artificial feed 1:1									
12.	Division of colonies is done in the growth period: 3									
13.	Honey harvest: 5-7 days interval									
14.	Scarce period: Movement of hives to coconut growing area									
	Protection Aspect									
15.	Control of viral diseases using turmeric along with artificial feed									
16.	Control of diseases using basil or garlic mixture									
	Post-Harvest and Processing									
17.	By products obtained through apiculture: Wax processing, value addition of honey									
18.	In processing of honey Temperature at which purification of honey is carried out: 45 o c and 63-65o c									
19.	Grades of honey according to AGMARK									

20. Training need assessment

Sl . No	Training parameters	Most needed	Needed	Not needed
	Production aspect			
1.	Queen bee rearing			
2.	Training on bee flora throughout the year			
3.	Migration of boxes			

4.	Method of feeding			
5.	Formula for feeding			
6.	Division of boxes			
7.	Division of queen bees among queen less hives			
8.	Uniting of boxes			
	Protection aspects			
9.	Identification of pest and disease symptoms			
10.	Control methods of pest and diseases			
	Harvest and post-harvest aspects			
11.	Method of honey extraction and processing			
12.	Honey testing			
13.	Method of wax production, propolis etc			

21. Constraints experienced by the farmers

Sl.No	Constraints	Very imp	Important	Least Imp
1.	Non availability of good quality bee box			
2.	Non-availability of beekeeping equipment's			
3.	Lack of financial support			
4.	Lack of skill up gradation			
5.	Pest infestation resulting damage to the colonies			
6.	Lack of technical know how about disease management practices			
7.	Lack of an organized marketing network for honey and honey products			
8.	Lack of minimum price for honey and value added products from apiculture			
9.	Absence of storage facilities at reasonable price			
10.	High price fluctuations			
11.	Others if any			

22. Farmers practice

_____

_____

_____

APPENDIX III

Correlation analysis between extent of adoption and independent variables

Tables of Means, Standard deviation and Standard Error

Variables	Mean	S.Deviation	S. Error
Variable 1	64.387	11.110	1.283
Variable 2	58.147	10.852	1.253
Variable 3	11.960	2.554	0.295
Variable 4	4.360	1.467	0.169
Variable 5	1.703	1.068	0.123
Variable 6	6.498	1.786	0.206
Variable 7	8.201	2.033	0.235
Variable 8	5.173	2.029	0.234
Variable 9	21.576	5.005	0.578
Variable 10	14.347	12.262	1.416
Variable 11	13.987	2.017	0.233
Variable 12	7.813	2.715	0.313
Variable 13	0.393	0.324	0.037
Variable 14	56.893	73.661	8.506
Variable 15	18.507	2.292	0.265
Variable 16	10.787	2.440	0.282

Appendix III Cont..

Variance covariance Matrix

	Variable 1	Variable 2	Variable 3	Variable 4	Variable 5	Variable 6	Variable 7	Variable 8	Variable 9	Variable 10	Variable 11	Variable 12	Variable 13	Variable 14	Variable 15	Variable 16
Variable 1	121.783	-2.537	3.856	0.554	3.482	1.295	4.777	10.280	19.829	49.226	1.805	7.179	0.508	417.681	6.778	20.203
Variable 2	-2.537	116.204	-6.661	-1.919	2.155	-3.251	-1.095	-1.372	-3.570	27.683	4.389	6.747	0.169	-54.931	-2.021	0.431
Variable 3	3.856	-6.661	6.438	-1.186	0.206	0.321	0.527	-0.273	0.780	-3.306	-0.734	-0.541	-0.028	33.582	-0.113	0.391
Variable 4	0.554	-1.919	-1.186	2.124	-0.331	-0.105	-0.436	0.604	-0.267	2.982	0.125	-0.079	-0.018	-0.362	0.378	0.223
Variable 5	3.482	2.155	0.206	-0.331	1.124	-0.096	1.028	0.291	2.346	2.560	0.340	0.377	-0.055	10.395	0.066	0.853
Variable 6	1.295	-3.251	0.321	-0.105	-0.096	3.146	3.049	0.794	6.895	1.152	-0.141	-0.413	0.041	25.127	1.201	0.588
Variable 7	4.777	-1.095	0.527	-0.436	1.028	3.049	4.077	1.085	9.241	3.712	0.199	-0.036	-0.014	35.521	1.267	1.442
Variable 8	10.280	-1.372	-0.273	0.604	0.291	0.794	1.085	4.063	6.234	8.660	0.922	1.552	0.118	66.885	1.672	1.437
Variable 9	19.829	-3.570	0.780	-0.267	2.346	6.895	9.241	6.234	24.719	16.087	1.320	1.479	0.091	137.952	4.208	4.320
Variable 10	49.226	27.683	-3.306	2.982	2.560	1.152	3.712	8.660	16.087	148.360	3.285	8.398	0.250	407.157	3.531	11.101
Variable 11	1.805	4.389	-0.734	0.125	0.340	-0.141	0.199	0.922	1.320	3.285	4.013	0.958	0.062	26.412	0.007	0.184
Variable 12	7.179	6.747	-0.541	-0.079	0.377	-0.413	-0.036	1.552	1.479	8.398	0.958	7.272	0.087	33.247	-0.012	1.173
Variable 13	0.508	0.169	-0.028	-0.018	-0.055	0.041	-0.014	0.118	0.091	0.250	0.062	0.087	0.104	7.485	0.131	0.137
Variable 14	417.681	-54.931	33.582	-0.362	10.395	25.127	35.521	66.885	137.952	407.157	26.412	33.247	7.485	5,353.616	64.894	86.911
Variable 15	6.778	-2.021	-0.113	0.378	0.066	1.201	1.267	1.672	4.208	3.531	0.007	-0.012	0.131	64.894	5.183	1.975
Variable 16	20.203	0.431	0.391	0.223	0.853	0.588	1.442	1.437	4.320	11.101	0.184	1.173	0.137	86.911	1.975	5.875

Appendix III **Correlation Matrix**

	Variable 1	**Variable 2**	**Variable 3**	**Variable 4**	**Variable 5**	**Variable 6**	**Variable 7**	**Variable 8**	**Variable 9**	**Variable 10**	**Variable 11**	**Variable 12**	**Variable 13**	**Variable 14**	**Variable 15**	**Variable 16**
Variable 1																
Variable 2	-0.021^{NS}															
Variable 3	0.138^{NS}	-0.244*														
Variable 4	0.034^{NS}	-0.122^{NS}	-0.321**													
Variable 5	0.298**	0.189^{NS}	0.077^{NS}	-0.214^{NS}												
Variable 6	0.066^{NS}	-0.170^{NS}	0.071^{NS}	-0.041^{NS}	-0.051^{NS}											
Variable 7	0.214^{NS}	-0.050^{NS}	0.103^{NS}	-0.148^{NS}	0.480**	0.851**										
Variable 8	0.462**	-0.063^{NS}	-0.053^{NS}	0.206^{NS}	0.136^{NS}	0.222^{NS}	0.267*									
Variable 9	0.361**	-0.067^{NS}	0.062^{NS}	-0.037^{NS}	0.445**	0.782**	0.920**	0.622**								
Variable 10	0.366**	0.211^{NS}	-0.107^{NS}	0.168^{NS}	0.198^{NS}	0.053^{NS}	0.151^{NS}	0.353**	0.266*							
Variable 11	0.082^{NS}	0.203^{NS}	-0.144^{NS}	0.043^{NS}	0.160^{NS}	-0.040^{NS}	0.049^{NS}	0.228*	0.133^{NS}	0.135^{NS}						
Variable 12	0.241*	0.232*	-0.079^{NS}	-0.020^{NS}	0.132^{NS}	-0.086^{NS}	-0.007^{NS}	0.286*	0.110^{NS}	0.256*	0.177^{NS}					
Variable 13	0.143^{NS}	0.049^{NS}	-0.034^{NS}	-0.039^{NS}	-0.161^{NS}	0.072^{NS}	-0.021^{NS}	0.183^{NS}	0.057^{NS}	0.064^{NS}	0.096^{NS}	0.100^{NS}				
Variable 14	0.517**	-0.070^{NS}	0.181^{NS}	-0.003^{NS}	0.134^{NS}	0.194^{NS}	0.240*	0.453**	0.379**	0.457**	0.180^{NS}	0.169^{NS}	0.318**			
Variable 15	0.270*	-0.082^{NS}	-0.020^{NS}	0.114^{NS}	0.027^{NS}	0.297**	0.276*	0.364**	0.372**	0.127^{NS}	0.001^{NS}	-0.002^{NS}	0.178^{NS}	0.390**		
Variable 16	0.755**	0.017^{NS}	0.064^{NS}	0.063^{NS}	0.332**	0.137^{NS}	0.295**	0.294**	0.358**	0.376**	0.038^{NS}	0.180^{NS}	0.176^{NS}	0.490**	0.358**	

APPENDIX IV

PRINCIPAL COMPONENT ANALYSIS OF ENTREPRENEURIAL POTENTIAL

	PC1	PC2	PC3	PC4
O1	1.930	-0.243	0.652	-0.216
O2	-1.175	0.678	-2.040	0.324
O3	-1.645	1.132	0.407	-0.866
O4	-1.654	0.164	-1.294	2.458
O5	-0.815	0.998	-0.422	0.697
O6	-0.235	-0.380	-1.192	0.510
O7	-1.369	0.143	0.833	0.038
O8	-0.590	0.092	-0.291	0.102
O9	-0.102	0.067	0.237	-1.229
O10	-0.491	1.419	-1.736	1.716
O11	-0.028	0.807	2.877	-0.361
O12	0.287	0.042	-0.325	-1.197
O13	1.227	-1.015	0.522	-1.011
O14	0.393	-1.673	-1.168	-2.539
O15	-0.610	1.007	0.440	-0.956
O16	0.539	0.901	-1.072	-0.264
O17	-1.335	0.590	1.172	-0.338
O18	0.554	1.316	-0.559	-0.043
O19	0.256	0.935	-0.738	-0.586
O20	-0.730	-0.911	2.190	0.499
O21	-0.192	-0.472	0.421	0.937
O22	-0.049	-0.401	-0.156	-0.546
O23	1.132	0.324	-0.641	0.587
O24	-0.672	1.068	-0.999	-0.786
O25	0.603	0.454	-0.321	-1.251
O26	0.494	0.830	0.595	-0.143
O27	1.250	-0.591	-0.282	0.282
O28	0.384	-0.518	0.896	-0.088
O29	-0.456	-0.406	0.581	0.018
O30	-0.030	-0.370	-0.330	-1.143
O31	-0.082	0.877	0.120	0.882
O32	-0.986	-0.837	1.032	0.653
O33	-1.201	-3.757	-2.334	-0.601
O34	-0.544	-0.385	0.634	-0.288
O35	-2.018	-1.097	0.311	-0.075
O36	0.720	-1.021	0.169	0.917
O37	-1.008	-1.099	-1.444	-1.188
O38	1.406	0.281	0.342	-0.163

O39	0.389	-0.125	0.265	1.802
O40	0.156	0.772	1.452	1.324
O41	-1.685	-0.269	0.829	0.092
O42	0.284	0.427	0.362	-0.380
O43	-0.920	-1.121	-1.497	-0.881
O44	1.027	0.876	-0.544	-1.595
O45	0.307	0.852	-0.442	0.914
O46	-0.066	-3.102	-1.153	0.653
O47	-0.064	0.908	-0.054	0.285
O48	-0.328	0.973	0.106	-0.634
O49	0.598	-1.446	-0.117	0.987
O50	-1.183	0.669	-0.722	-0.748
O51	1.513	0.290	0.115	-0.454
O52	0.089	0.440	0.643	-0.396
O53	-1.570	-0.799	1.875	0.605
O54	-1.040	-0.368	1.424	-0.030
O55	-0.022	0.037	1.502	-1.995
O56	-1.533	-0.737	1.526	-0.589
O57	0.314	-0.466	0.775	-0.991
O58	-0.385	0.102	0.571	-1.551
O59	-1.177	1.623	-1.483	-1.331
O60	-0.590	0.092	-0.291	0.102
O61	2.158	0.191	0.710	-0.576
O62	2.282	-0.330	0.439	1.009
O63	0.686	-1.468	-0.170	1.293
O64	1.170	-0.560	-1.547	1.049
O65	2.056	-1.149	-0.307	0.552
O66	-0.651	1.878	-1.116	1.324
O67	-1.012	0.450	-0.011	3.153
O68	0.410	-0.479	-0.597	0.388
O69	1.555	0.745	-0.864	0.243
O70	0.353	0.375	0.483	0.523
O71	0.569	0.008	-0.660	-0.875
O72	0.454	2.262	-1.092	-0.335
O73	0.435	-0.602	1.191	1.412
O74	0.965	-0.171	0.740	0.777
O75	1.300	0.272	0.570	0.127

APPENDIX V

Inventorization of the apipreneurs

Sl.No	Name	Address	District	No. of boxes	
				Indian bee	Stingless
1	Jacob Mathew	Kuriannoor	Pathanamthitta	100	50
2	P. A Abraham	Ranni	Pathanamthitta	50	0
3	Minu George	Adoor	Pathanamthitta	16	0
4	Binu K Shashi	Kuriyannoor	Pathanamthitta	15	40
5	N T Abraham	Kuzhikala	Pathanamthitta	7	0
6	A.C Varghese	Kozhanchery	Pathanamthitta	34	60
7	Philip	Ayroor	Pathanamthitta	35	0
8	Roy Varghese	Vellayil	Pathanamthitta	10	50
9	Mathew Mathai	Kadamanattha	Pathanamthitta	30	5
10	Shobhana Varghese	Puramattom	Pathanamthitta	20	4
11	Preethakuamri J	Kunnathumkara	Pathanamthitta	17	5
12	VargheseMathew	Perukattu	Pathanamthitta	20	17
13	Sanil P	Muttuthura	Pathanamthitta	670	400
14	M.G Chacko	Karimichara	Pathanamthitta	500	200
15	Subramanian K	Prakkanam	Pathanamthitta	14	3
16	Sunny Mathew	Adoor	Pathanamthitta	45	43
17	Thomas Abraham	Kuriyannoor	Pathanamthitta	13	0
18	P G Krishnapillai	Kulanada	Pathanamthitta	60	15
19	Raju K	Kandamtottukara	Pathanamthitta	200	25
20	Reji Joseph	Ranni,	Pathanamthitta	100	10
21	K.T Mathew	Pullanaad	Pathanamthitta	15	16
22	Sulojanan	Kollampara	Pathanamthitta	30	0
23	Sethukumar	Pandalam	Pathanamthitta	50	20
24	P J John	Kallupara	Pathanamthitta	45	35
25	Krishnapillai	Perivanaad	Pathanamthitta	200	0
26	Bijukumar	Thengamom	Pathanamthitta	33	9
27	James	Konni	Pathanamthitta	200	50
28	Oommen	Ranni	Pathanamthitta	15	0
29	John	Adoor	Pathanamthitta	11	0
30	Varghese	Ranni	Pathanamthitta	35	0
31	Purushothaman	Arikuzha	Idukki	15	0
32	Francis Jospeh	Arikuzha	Idukki	17	3
33	C.J Jose	Arikuzha,	Idukki	10	0
34	George Emmanual	Arikuzha	Idukki	4	0
35	Paul	Memadangu	Idukki	8	0
36	Jaison	Kodikulam	Idukki	25	30

37	Njujyappan	Arikuzha	Idukki	50	0
38	Job Varghese	Udumbannoor	Idukki	12	0
39	ThankachanThomas	Muthalakodam	Idukki	10	9
40	Toji Sebastian	Ezhumuttam	Idukki	100	6
41	Mathew Michael	Karimannoor	Idukki	10	7
42	Jose Thomas	Karimannor	Idukki	65	30
43	P K Vijayan	Uppukunnu	Idukki	5	3
44	Ravindran	Udumbannoor	Idukki	250	15
45	Sunil T	Udumbannoor	Idukki	20	0
46	Jose Mathew	Cheenikuzhi	Idukki	10	5
47	Kuruvilla V K(Joy)	Amayapra	Idukki	65	20
48	K Gopalakrishnan	Tattakuzhi	Idukki	8	4
49	James John	Malayinj	Idukki	15	0
50	Sasi P.P	Udumbannoor	Idukki	21	0
51	George Varghese	Amayapra	Idukki	164	27
52	Darly Mathew	Mulappuram	Idukki	10	15
53	Wilson Paulose	Mulamattom	Idukki	20	6
54	Shyam C.K	Cheenikuzhi	Idukki	16	0
55	G. Ratnamma	Udumbannoor	Idukki	15	0
56	K Ramakrishnan	Tattakuzhi	Idukki	0	12
57	K N Sajeev	Kaliyar	Idukki	10	4
58	Surendran M R	Muttam	Idukki	35	0
59	Bindhu Santhosh	Neriyamangalam	Idukki	50	3
60	Daisy Mathew	Kalayanthani	Idukki	15	0
61	Joice Joseph	Pala	Kottayam	1500	100
62	Sibi Augustine	Ponkunnam	Kottayam	2500	2500
63	George Mathew	Koruthodu	Kottayam	0	80
64	Tom Thomas	Pala	Kottayam	100	30
65	Biju Jospeh	Pala	Kottayam	1000	600
66	Thomas E.V	Mukuttuthara	Kottayam	10	5
67	Martin V	Pala	Kottayam	12	8
68	A.V George	Mattathipara	Kottayam	10	8
69	Sebastian M.C.	Kanjirammattom	Kottayam	150	300
70	Joy	Pala	Kottayam	200	200
71	Shaju Jacob	Poonjaar	Kottayam	84	103
72	Jospeh Baby	Cherakadavu	Kottayam	180	40
73	Johny Mathew	Teekoyi	Kottayam	100	100
74	Beena Tom	Pala	Kottayam	16	6
75	Sudheer	Pala	Kottayam	10	0

Abstract

MULTIDIMENSIONAL ANALYSIS OF APIPRENEURSHIP PROSPECT IN SOUTH KERALA

By

Devapriya S Kaimal

(2018-11-087)

ABSTRACT

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DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF AGRICULTURE

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ABSTRACT

The study entitled 'Multidimensional analysis of apipreneurship prospect in South Kerala' was undertaken with an objective to explore the entrepreneurial potential, the extent of knowledge and adoption of improved apiculture technologies. This study also diagnosed the constraints in apiculture, profiled the beekeepers and ascertained their training needs. The study comprised of 90 respondents *i.e.* 75 apipreneurs and 15 experts. Apipreneurs were selected randomly from the three districts namely Pathanamthitta (30), Idukki (30) and Kottayam (15). Five experts each were selected from the respective districts of study. Fifteen independent variables were selected through judge's rating. Entrepreneurial potential and extent of adoption were the dependent variables selected.

On analysis, 37.00 per cent of apipreneurs belonged to middle age (47-58), with family size upto four (57.33%) and 41.33 per cent had education upto high school. Over 52.00 per cent had experience in beekeeping less than 10 years. Majority (69.33 %) apipreneurs attended two day trainings. Majority of apipreneurs had medium level of market intelligence (74.66%), risk propensity (82.67%), optimism (66.67 %) and knowledge level (74.67) with maximum employment generation during the scarce season of beekeeping (58.56%).

The distribution of apipreneurs based on their entrepreneurial potential revealed that 16.00 per cent of them belonged to low category followed by 69.33 per cent in the medium category and remaining 14.67 per cent to high category. The mean total score of entrepreneurial potential was 97.82 with a minimum and maximum score of 79 and 118 respectively. The results of the principal component analysis revealed that entrepreneurial motivation alone contributed 55.4 per cent variation with an eigen value of 2.217 to the overall entrepreneurial potential.

The results of the adoption quotient revealed, that majority of apipreneurs *i.e.* 64.00 per cent belonged to medium category of adoption, followed by 18.67 and 17.34 per cent in low and high category of adoption. The mean adoption quotient (AQ) was 71 per cent with a maximum and minimum AQ of 96.67 and 48.89 per cent respectively. In case of the

recommended practices, seven out of eighteen practices had an overall adoption percentage greater than 90. On categorization of apipreneurs to different adopter categories as explained by Rogers (1982) majority of the apipreneurs belonged to late majority (47%).

The results of the correlation revealed that out of 15 independent variables selected for the study, 9 variables were significantly related to the dependent variable adoption. The independent variables, *viz*., total land holding, market intelligence, trainings attended, experience in beekeeping and employment generation were significant at 1% level of significance followed by institutional interventions, credit orientation, optimism and knowledge at 5% level of significance.

On analyzing perceived usefulness and effectiveness of selected apiculture technology of KAU, use of ant pan/oil band to control ants was considered to be very useful (76%) and control of viral diseases using turmeric along with artificial feed was considered very effective (80%).

Result of training need assessment pinpointed that apipreneurs felt the need of trainings related to the quality testing of honey (76%) and value addition of honey and its byproducts (66.67%). The major constraint experienced by the apipreneur was the lack of a reasonable minimum support price for honey and its byproduct (78.66%). The primary suggestion for refinement was development of governmental policies specific to the beekeeping community.

To conclude, the present study indicates, the entrepreneurial potential of an apipreneur was determined by the principal component 'entrepreneurial motivation'. Also, the intensity of total adoption of apiculture practices was significantly high (71%) among the apipreneurs and nine out of 15 independent variables showed positive and significant relationship. The presence of 47 per cent of late majority highlights, that there exists considerable room for the improvement in beekeeping and for scaling up the adoption through suitable extension interventions, even though the overall adoption per cent is relatively high.

സംഗ്രഹം

സംരംഭക സാധ്യതകൾ, അറിവിന്റെ വ്യാപ്തി, മെച്ചപ്പെട്ട തേനീച്ച കൃഷിയുടെ സാങ്കേതികവിദ്യകൾ സ്വീകരിക്കുക എന്നിവ പര്യവേക്ഷണം ചെയ്യുകയെന്ന ലക്ഷ്യത്തോടെയാണ് 'ദക്ഷിണ കേരളത്തിലെ തേനീച്ച സംഭരംഭകരുടെ സാധ്യതകളുടെ ബഹുമുഖ വിശകലനം' എന്ന പഠനം 2018-**20** കാലഘട്ടത്തിൽ നടത്തിയത്. ഈ പഠനം കൃഷിയിടത്തിലെ തടസ്സങ്ങൾ കണ്ടെത്തുകയും തേനീച്ച വളർത്തുന്നവരെ വിശദീകരിക്കുകയും അവരുടെ പരിശീലന ആവശ്യങ്ങൾ കണ്ടെത്തുകയും ചെയ്തു. പഠാനത്തിനായി 75 തേനീച്ച സംരംഭകരെയും പിന്നെ 15 വിദഗ്ധരെയും തിരഞ്ഞയെടുക്കുകയുണ്ടായി . പത്തനംതിട്ട (30), ഇടുക്കി (30), കോട്ടയം (15) എന്നീ മൂന്ന് ജില്ലകളിൽ നിന്ന് തേനീച്ച സംരംഭകരെ ക്രമരഹിതമായി തിരഞ്ഞെടുത്തു. അതത് ജില്ലകളിൽ നിന്ന് അഞ്ച് വിദഗ്ധരെ വീതം തിരഞ്ഞെടുത്തു. വിദഗ്ധരുടെ റേറ്റിംഗിലൂടെ പതിനഞ്ച് സ്വതന്ത്ര വേരിയബളുകൾ തിരഞ്ഞെടുത്തു. സംരംഭക സാധ്യതയും സാങ്കേതികവിദ്യകളുടെ സ്വീകാര്യതയും വ്യാപ്തിയും കണ്ടെത്തുക എന്നതാണ് തിരഞ്ഞെടുത്ത ആശ്രിത വേരിയബിളുകൾ.

വിശകലനത്തിൽ, 37.00 ശതമാനം തേനീച്ച വളർത്തുന്നവരിൽ മധ്യവയസ്കരാണെന്നും (47-58), കുടുംബ വലുപ്പം നാലുവരെ ആണെന്നും (57.33%), 41.33 ശതമാനം പേർക്ക് ഹൈസ്കൂൾ വരെ വിദ്യാഭ്യാസം ഉണ്ടെന്നും കണ്ടെത്തി. കൂടാതെ 52.00 ശതമാനത്തിലധികം പേർക്ക് 10 വർഷത്തിൽ താഴെ തേനീച്ചവളർത്തൽ പരിചയം ഉണ്ടായിരുന്നു. ഭൂരിപക്ഷവും (69.33%) രണ്ട് ദിവസത്തെ പരിശീലനങ്ങളിൽ പങ്കെടുത്തിരുന്നു. ഭൂരിഭാഗം തേനീച്ച സംഭരംഭകരും ഇടത്തരം മാർക്കറ്റ് ഇന്റലിജൻസ് (74.66%), റിസ്ക് പ്രൊപെൻസിറ്റി (82.67%), ശുഭാപ്തിവിശ്വാസം (66.67%), വിജ്ഞാന നില (74.67) എന്നിവ പ്രദർശിപ്പിച്ചിരുന്നു തേനീച്ചവളർത്തൽ പഠനം നടന്ന കാലഘട്ടത്തിൽ (58.56%) പരമാവധി തൊഴിലവസരങ്ങൾ സൃഷ്ടിച്ചിരുന്നു.

അവരുടെ സംരംഭക ശേഷിയുടെ പഠനത്തിന്റെ അടിസ്ഥാനത്തിൽ തേനീച്ച സംഭരംഭകരുടെ വിതരണത്തിൽ 16.00 ശതമാനം താഴ്ന്ന വിഭാഗത്തിൽ പെട്ടവരാണെന്നും 69.33 ശതമാനം ഇടത്തരം വിഭാഗത്തിലും ബാക്കി 14.67 ശതമാനം ഉയർന്ന വിഭാഗത്തിലാണെന്നും കണ്ടെത്തി. സംരംഭക ശേഷിയുടെ ശരാശരി മൊത്തം കണക്ക് 97.82 ആയിരുന്നു, ഏറ്റവും കുറഞ്ഞതും കൂടിയതുമായ കണക്ക് യഥാക്രമം 79 ഉം 118 ഉം ആണ്. പ്രധാന ഘടക വിശകലനത്തിന്റെ ഫലങ്ങൾ, സംരംഭക പ്രചോദനം മാത്രം 55.4 ശതമാനം വ്യതിയാനത്തിന് 2.217 ഈജിൻ മൂല്യമുള്ള മൊത്തത്തിലുള്ള സംരംഭക ശേഷിക്ക് സ്വാധിനിച്ചതായി കണ്ടെത്തി.

സാങ്കേതികവിദ്യകളുടെ സ്വീകാര്യത വ്യാപ്തി എന്നീ ഘടകത്തിന്റെ ഫലങ്ങളിൽ ഭൂരിഭാഗം തേനീച്ച സംരംഭകരിൽ, അതായത് 64.00 ശതമാനം ഇടത്തരം വിഭാഗത്തിൽ പെട്ടവരാണ് എന്ന് സൂചിപ്പിക്കുന്നു, തുടർന്ന് 18.67 ഉം 17.34 ശതമാനവും താഴ്ന്നതും ഉയർന്നതുമായ വിഭാഗത്തിൽ പെടുന്നു.

ശരാശരി സ്വീകാര്യത വ്യാപ്തിയുടെ അളവ് (എക്യു) 71 ശതമാനമാണ്, പരമാവധി എക്യു യഥാക്രമം 96.67 ഉം 48.89 ശതമാനവുമാണ്. ശുപാർശചെയ്ത സമ്പ്രദായങ്ങളുടെ കാര്യത്തിൽ, പതിനെട്ട് പ്രയോഗങ്ങളിൽ ഏഴ് പ്രയോഗങ്ങൾക് മൊത്തത്തിലുള്ള സ്വീകാര്യത വ്യാപ്തി ശതമാനം 90 നേക്കാൾ കൂടുതലാണ്. റോജേഴ്സ് (1982) വിശദീകരിച്ചതുപോലെ വിവിധ സ്വീകാര്യത വ്യാപ്തി വിഭാഗങ്ങളിലേക്ക് തേനീച്ച സംരംഭകാരെ തരംതിരിക്കുമ്പോൾ, ഭൂരിഭാഗം സംരംഭകരും വൈകി ഭൂരിപക്ഷത്തിൽ (47%) ഉൾപ്പെടുന്നു.

ആശ്രിത വേരിയബിളുകളും സ്വതന്ത്ര വേരിയബിളുകളും തമ്മിലുള്ള പരസ്പര ബന്ധം കണ്ടെത്താനായി കോറിലേഷൻ പഠനത്തിൽ നടത്തിയിരുന്നു. പഠനത്തിനായി തിരഞ്ഞെടുത്ത 15 സ്വതന്ത്ര വേരിയബിളുകളിൽ നിന്ന് 9 വേരിയബിളുകൾ ആശ്രിത വേരിയബിളായ സാങ്കേതികവിദ്യകളുടെ സ്വീകാര്യത വ്യാപ്തിയും തമ്മിൽ പോസിറ്റീവും സുപ്രധാനവുമായ ബന്ധം കാണിച്ചു. സ്വതന്ത്ര വേരിയബിളുകളായ മൊത്തം ഭൂമി കൈവശം വയ്ക്കൽ, മാർക്കറ്റ് ഇന്റലിജൻസ്, പങ്കെടുത്ത പരിശീലനങ്ങൾ, തേനീച്ചവളർത്തൽ അനുഭവം, തൊഴിലവസരങ്ങൾ എന്നിവ 1% പ്രാധാന്യമുള്ള തലത്തിൽ ബന്ധപ്പെട്ടിരിക്കുന്നു. തുടർന്ന് സ്ഥാപനപരമായ ഇടപെടലുകൾ, ക്രെഡിറ്റ് ഓറിയന്റേഷൻ, ശുഭാപ്തിവിശ്വാസം, അറിവ് എന്നിവ 5% പ്രാധാന്യമുള്ള തലത്തിൽ ബന്ധപ്പെട്ടിരിക്കുന്നു.

കേരള കാർഷിക സർവകലാശാലയുടെ തിരഞ്ഞെടുത്ത തേനീച്ച കൃഷിയുടെ സാങ്കേതികവിദ്യയുടെ ഉപയോഗക്ഷമതയും ഫലപ്രാപ്തിയും വിശകലനം ചെയ്യുമ്പോൾ, ഉറുമ്പുകളെ നിയന്ത്രിക്കാൻ ഉറുമ്പ് പാൻ / ഓയിൽ ബാൻഡ് ഉപയോഗിക്കുന്നത് വളരെ ഉപയോഗപ്രദമാണെന്ന് കണ്ടെത്തി (76%) കൃത്രിമ തീറ്റയ്ക്കൊപ്പം വൈറൽ രോഗങ്ങൾ നിയന്ത്രിക്കുന്നതിനായി മഞ്ഞൾ ഉപയോഗവും വളരെ ഫലപ്രദം ആണെന്ന് കണ്ടെത്തി (80 %).

തേനീച്ച സംരംഭകർക്ക് തേനിന്റെ ഗുണനിലവാരം പരിശോധിയ്ക്കുന്നതിന്റെയും (76%), തേനിന്റെയും അതിന്റെ ഉപോൽപ്പന്നങ്ങളുടെയും (66.67%)മൂല്യവർദ്ധന പ്രവർത്തനങ്ങളുമായി ബന്ധപ്പെട്ടിട്ടുള്ള പരിശീലനത്തിന്റെ ആവശ്യം ഉള്ളതായി അഭിപ്രായപ്പെട്ടു. തേനും അതിന്റെ ഉൽപ്പന്നങ്ങള്ക്കും (78.66%) ന്യായമായ ഏറ്റവും കുറഞ്ഞ പിന്തുണ വിലയുടെ അഭാവമാണ് തേനീച്ച സംരംഭാകർ പ്രധാന തടസമായി അഭിപ്രായപ്പെട്ടത്. തേനീച്ചവളർത്തൽ സമൂഹത്തിന് മാത്രമായുള്ള സർക്കാർ നയങ്ങൾ വികസിപ്പിക്കുക എന്നതായിരുന്നു പരിഷ്കരണത്തിനുള്ള പ്രാഥമിക നിർദ്ദേശം.

ഉപസംഹാരമായി, ഈ പഠനത്തിൽ സൂചിപ്പിക്കുന്നത്, ഒരു തേനീച്ച കർഷകൻറെ സംരംഭക സാധ്യത നിർണ്ണയിക്കുന്ന പ്രധാന ഘടകം 'സംരംഭക പ്രചോദനം' ആണ് എന്നതാണ്. കൂടാതെ, തേനീച്ച സംരംഭകരുടെ സമ്പ്രദായങ്ങൾ സ്വീകരിക്കുന്നതിന്റെ തീവ്രത ഗണ്യമായി ഉയർന്നു എന്നും പഠനം കണ്ടെത്തി (71%). 15 സ്വതന്ത്ര വേരിയബിളുകളിൽ ഒമ്പതും പോസിറ്റീവും സുപ്രധാനവുമായ ബന്ധം കാണിച്ചിരുന്നു. മൊത്തത്തിലുള്ള

സാങ്കേതികവിദ്യകളുടെ സ്വീകാര്യതയും വ്യാപ്തിയുടെ ശതമാനവും താരതമ്യേന ഉയർന്നതാണെങ്കിലും, തേനീച്ചവളർത്തൽ കൂടുതൽ മെച്ചപ്പെടുത്തുന്നതിനും ഉത്പാദനം വർധിപ്പിക്കുന്നതിനായും അനുയോജ്യമായ വിപുലീകരണങ്ങളുടേയും ഇടപെടലുകളിലൂടെ ഗണ്യമായ ആവശ്യമുണ്ടെന്നു കണ്ടെത്തി.