



# Technology Adoption in Apiculture and Socio-Psychological Determinants of Apipreneurs Influencing Adoption

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## ABSTRACT

The research paper emphasizes on exploration of the apipreneurs based on their level of adoption of the selected scientific apiculture technology developed by Kerala Agricultural University. The study was conducted during 2019-2020 at College of Agriculture, Vellayani. The location of the study was Pathanamthitta, Idukki and Kottayam districts of Kerala where apiculture was predominant. Seventy-five apipreneurs were randomly selected and ex post facto research design was followed for the study. The study revealed that seven out of eighteen selected apiculture practices of Kerala Agricultural University had an adoption per cent greater than 90. The results also indicated that majority of the respondents had medium extent of adoption followed by high category and low adoption category. The socioeconomic attributes like 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 five per cent level of significance to the extent of adoption of the apipreneurs.

**Key Words:** Apiculture, Beekeepers, Correlation, Honey, Technologies.

## INTRODUCTION

Agripreneurial opportunities have an increasing potential due to globalization and a densely interweaved global marketing system. Agripreneurship also enables the monitoring of migration of youths from villages to urbanized spaces and ensure betterment of livelihood of the farmers by providing alternative income source. Apiculture becomes one such enterprise which has the ample potential to enhance the income and employment opportunities for the farmers especially the landless and farmers with medium and small landholdings.

Scientific beekeeping in India can be traced to the end of nineteenth century. India positively fosters various species of bees being well known for providing crop specific pollination. States that are hunted out for honey production includes states

of Kerala and Tamil Nadu that account for nearly 42 per cent of the national production (Sivaram, 2012). According to Srikumar (2015) with the state also being the lead producer of rubber in the country fosters the suitable source of feed to the bees. But during the recent years the production of natural rubber in Kerala has collapsed by more than 15 per cent due to the non-remunerative 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. Singh and Singh (2006) and Agrawal (2014) emphasize the importance to delineate the reasons, which hinders optimum production of quality honey. Therefore, to enhance the productivity of apiculture, it is vital

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to adopt improved beekeeping technologies. Gidey and Mekonen (2010) and Monga and Manocha (2011) stressed the need for adoption studies for the effective popularization of apiculture in the farming communities which will help in determining the type of extension strategy/package to be adopted. It was also concluded that with an aid in the form of small interventions from the technical experts as well as the Government, the honey production has great scope to catch the export market leading to better earning and improved livelihood (Das *et al*, 2011). The study was undertaken to assess the extent of adoption by the apipreneurs on the scientific agriculture technology developed by Kerala Agricultural University (KAU) and also to determine the socio psychological and economic characteristics that influence the extent of the adoption.

## MATERIALS AND METHODS

Marginal and small apipreneurs from three districts of South Kerala *viz.*, Pathanamthitta, Idukki and Kottayam were selected. The selection was done based as these districts possess maximum beekeepers and have maximum area under rubber growing tracts in South Kerala (GoK, 2016).

The apipreneurs were selected randomly from Pathanamthitta Idukki and Kottayam districts in 30, 30 and 15 number respectively, thus constituting 75 respondents for the study. A pretested well-structured interview schedule was prepared and administered to the selected respondents. Ex-post facto research design was used for the purpose of study.

Eighteen recommended practices were used for the measurement of adoption. 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 was assigned making the maximum total that can be obtained by the respondent for a practice as five. 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:

$$\text{Adoption Quotient (AQ)} = \frac{\sum_{i=1}^n \frac{e_i}{p_i}}{N} \times 100$$

Where, AQ = Adoption quotient

$e_i$  = Extent of adoption of each practice

$p_i$  = 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. The respondents were categorized as innovators, early adopter, early majority, late majority and laggards and were compared with the standard Rogers curve. Also, the correlation coefficient between adoption and the socio-psychological characteristics of apipreneurs were estimated using JMP software.

## RESULTS AND DISCUSSION

### Overall adoption of selected apiculture practices of KAU

The data (Table 1) 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

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**Table 1. Distribution of apipreneurs based on the overall adoption of selected apiculture practices of KAU.**

Sr. No	Adoption practice	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Overall (N=75)	
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
1	Spacing of hives	11	36.00	13	43.33	11	73.33	35	46.4
2	Use of Newtons beehive	29	96.66	30	100.00	15	100.00	74	98.66
3	Colour of beehive	27	88.66	29	97.33	12	78.66	68	90.13
4	No. of frames in each chamber	21	68.66	18	61.33	13	88.00	52	69.33
5	Foraging plants grown	22	72.00	24	78.66	14	93.34	59	78.93
6	Use of ant pan/ oil band	29	96.66	30	100.00	15	100.00	74	98.66
7	Honey harvesting season	30	100.00	29	96.66	15	100.00	74	98.66
8	Inspection of hives	26	85.33	26	86.00	13	89.31	65	86.40
9	Harvest from sealed frames	16	53.33	16	52.00	9	57.33	40	53.60
10	Proportion of artificial feed	30	99.33	29	97.33	15	100.00	74	98.66
11	Division of colonies	30	100.00	26	88.00	15	100.00	71	95.20
12	Once a week harvest	29	96.00	28	93.33	14	94.66	71	94.66
13	Movement of hives	8	25.33	8	25.33	4	25.33	19	25.33
14	Control of diseases Turmeric feed	24	81.33	23	78.00	13	89.33	61	81.60
15	Disease control	5	16.00	10	32.00	5	30.66	19	25.33
16	Value addition	15	50.66	13	42.66	10	65.33	38	50.4
17	Temperature for processing of honey	27	90.00	16	54.66	13	86.66	56	75.20
18	Agmark grading	4	12.66	2	8.00	2	12.00	8	10.68
	Mean		70.47		68.59		76.88		71.00

grading of honey according to AGMARK (10.68 %).

District wise analysis of the results revealed that the mean value of adoption of selected practices of apipreneurs belonging to 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. The higher mean values for adoption score among the apipreneurs in Kottayam district

**Table 2. Distribution of apipreneurs based on the extent of adoption of scientific apiculture practices of KAU.**

Sr. No	Category	Class limits	Pathanamthitta (n=30)		Idukki (n=30)		Kottayam (n=15)		Total (N=75)	
			Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
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

could be due the relatively high knowledge level and more training received by the apipreneurs, which influenced the adoption rate. A higher adoption rate was also determined by the experience of the apipreneur in beekeeping and their interaction with the institutions or peers associated with beekeeping.

**Distribution of apipreneurs based on the extent of adoption**

The mean adoption quotient of the apipreneurs was 71.0 per cent with standard deviation of 11.76 and scores ranging from 44 to 87. Based on the mean and standard deviation values apipreneurs were characterized into low, medium and high categories of adoption. Majority of the apipreneurs exhibited medium level of adoption *i.e.*, 64 per cent followed by high level (18.67%) and remaining in the low level of adoption (17.34 %). The results obtained are in conformity with the study conducted by Singh *et al* (2010). 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 (71%) was oriented towards the higher side.

**Categorization of apipreneurs into adopter categories**

Based on the mean and standard deviation of the scores obtained by the apipreneurs, they were categorized into the different adopter categories

as explained by Rogers (1982) and the results are represented in Table 3.

The result (Table 3) revealed that maximum of the respondents belong to the late majority category (47 %) followed by early majority (20 %), early adopters (17 %), laggards (16 %) and with no respondents in the innovators category. The highest percentage of apipreneurs (47%) belongs to the late majority category of adopters, as apipreneurs in this category are always cautious before committing to a technology. On comparing the results with that of Rogers standard curve that explains adopter category, it was evident that the percentage of apipreneurs who belong to early majority (20%) are lesser than the value (34%) ascribed in standard Rogers curve, whereas the percentage of early adopters (17%) was higher than that of Rogers value (13.5%).

Early majority is a group of thoughtful people according to Rogers (1982). The reasons pinpointing to the fact of the apipreneurs being considerate and 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 makes 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

**Table 3. Overall adopter categorization of the apipreneurs.**

Category	Frequency	Percentage adoption (Study value)	Percentage adoption (Std 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.)			

himself considered this category as social leaders. The service of early adopters to act 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%), which draws attention 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, the resistance to any change by laggards as a result of their satisfaction from their existing venture in terms of returns from the enterprise and from the available lot of technologies. For this reason, it will be very difficult for field level extensionists to transform them with any ordinary programme and the results are in conformity with the findings of Jacob (2013). However, use of on farm trials, extensive interventions from the extension agents taking into consideration the characteristics of laggards and promoting programmes to interact 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 and this could be due to the fact that beekeeping has been an age-old enterprise and there has been a lack of availability of a standardised scientific technology for remunerative bee keeping. However, governmental linkages with private start-ups 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. 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. However, it was also essential to compare the relationship of personal and social characteristics with level of adoption of apipreneurs. The results of the correlation coefficient between adoption and the socio-psychological characteristics of apipreneurs were estimated and presented in Table 4.

The data (Table 4) represent 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. 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

**Table 4. Level of adoption of apipreneurs of selected apiculture technology of KAU and relation with the independent variables.**

Sr. No	Independent variable	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

area, apipreneurs tend to place more hives and also availability of additional plots on lease allows the apipreneurs to extend the enterprise. This 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 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).

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 asserted that all the nine variables mentioned above have direct influence on the adoption of apiculture technology among the apipreneurs.

### CONCLUSION

Majority of the respondents had medium extent of adoption followed by high level and low extent of adoption. Out of the fifteen variables, nine personal

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socio-economic characteristics were found to have a significant relationship with the adoption level of the farmers. The study suggests that the practices which were not adopted by the farmers should be given due attention by extension agencies, so that the existing level of adoption of such practices can be increased. Beekeeping was an age-old enterprise and already there was availability of a standardised scientific technology for remunerative bee keeping. 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.

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