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Assessment of training programme on the knowledge level of beekeeping farmers under ICAR-farmer FIRST programme in mid hills of Uttarakhand

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Abstract

The present study aims to assess the impact of training programme on the change in knowledge level of beekeepers of mid hills of Uttarakhand. ICAR funded Farmer FIRST programme operated by GBPUA&T, Pantnagar is supporting the honey production and processing as an enterprise to double the farmers' income through enhancing their livelihood opportunities. The Jeoli village of Nainital district was selected under Farmer FIRST programme to be promoted as 'Honey village'. A training programme on "Honey processing and honey wax plate making" was organized in the village to impart the knowledge of beekeepers of the village. It was found that majority of the trainees were middle aged (78.33%), male (63.33%), married (70.00%) and had education upto middle school (41.67%). The before and after weighted mean scores of different component of training programme also exhibit a change in the knowledge level of beekeepers. Maximum change in knowledge is observed in the knowledge of economic use of honey bee wax, where before the training mean score was 1.38 which increased to 2.95 after the training programme. It was also found out that majority of the trainees fall under the category of having low level of knowledge (65.00%) before attending the training but after attending the training 81.67 percent of the beekeepers fall under the category of having high level of knowledge. There is a visibly clear shift of trainees from having low level of knowledge to acquiring high level of knowledge after attending the training programme.

Keywords: Honey processing, honey wax plate preparation, honey bee management, honey products, farmer FIRST programme

Introduction

The Indian agriculture sector faces several challenges due to low soil productivity, changing climatic conditions, decreasing water table, onset of different insect, pest or diseases *etc.* The farmers are now inclining towards other agricultural allied sectors to sustain their farming and earn more profit. Among these beekeeping is traditional practice which the farmers are practicing for so many decades. Beekeeping offers an immense potential for providing employment to Indian rural masses especially to the unemployed youth. Beekeeping as an enterprise requires low investment and demands high skills in rearing, managing the bee hives and processing the honey products. It does not bring any pressure on agricultural land rather it increases the yield of various cross pollinated crops. Honeybee pollination is essential for crops such as mustard, sunflower, oilseeds, pulses *etc.* It also raises yield and increases the production of cross-pollinated crops such as cabbages, cauliflower, carrots *etc.* The distinctive feature of beekeeping is the small capital investment required as compared to other industries. Furthermore, beekeeping does not need raw material in usual sense as nature provides the same in the form of nectar and pollen (Sharma and Dhaliwal, 2014) [5]. The farmers now understand the economic profit that beekeeping is providing to them as an enterprise due to its demand on local, national and international markets. Farmers Income Committee (DFI) Report 2018 observes that human interface in breeding, rearing and managing of bees is an agro-based activity that can be undertaken to supplement the income of farmers. During the last few years, adoption of beekeeping as an enterprise increased substantially due to various government initiatives and increase in awareness among the people about the benefits of beekeeping. During 2017-18, Khadi & Village Industries Commission (KVIC), under the Ministry of MSME launched Honey Mission programme to promote Bee Keeping activities and provide self-sustaining employment opportunities among farmers, adivasies and unemployed youth in rural India, especially in economically backward and remote areas (Ministry of Micro, Small & Medium Enterprises, 2021) [3].

Further the Ministry of Agriculture and Farmers Welfare, Government of India, launched a centrally funded scheme "National Beekeeping and Honey Mission (NBHM)" during 2019-20. It has been started for the overall promotion and development of scientific beekeeping and to achieve the goal of "Sweet Revolution". The state government of Uttarakhand had announced to set up 'madhugram' in every district to promote apiculture in the state. Intending to promote self-employment in the hilly regions of the state, Uttarakhand has started an initiative to give 80 percent subsidy for beekeeping and honey rearing in boxes to locals. As a result of these initiatives by the government, farmers are now inclining towards adopting beekeeping as an enterprise to increase their income. A large number of small and marginal farmers in remote villages of the Kumaun region of Uttarakhand, have taken up beekeeping on a commercial scale. Most of these farmers have started honey venture with very limited information about rearing and maintaining bee hives and harvesting and processing of the honey products. Uttarakhand has three species of Apis viz. *A. dorsatadorsata*, *A. ceranaindica*, and *A. florea* and one species *Trigona* (*T. irridipennis*). To start any activity, complete knowledge about its all aspects is utmost important. In this regard, training is major catalytic force for augmenting human productively in all spheres of development (Singh & Singh, 2019) [6]. Under Farmers FIRST Project "Enhancing Livelihood Opportunities of Farming Communities in Mid-hills Region of Uttarakhand" operated by Department of Agricultural Communication, G.B.P.U.A&T, Pantnagar, Uttarakhand, the village "Jeoli" of Bhimtal block, Nainital district was selected to be promoted as a "Honey village". The main objective of the project is empowering the farmers economically by providing improved technologies and viable livelihood opportunities suitable to their conditions which led to increasing the farmer's income. The farmers of the village were mainly vegetable producers along with growing some cereal crops. Along with this, the farmers of the Jeoli village were already engaged in beekeeping on small scale. Initially the farmers were involved only in production and harvesting of the raw honey and they get low prices for the raw honey they produced. As an intervention under the Farmer FIRST Programme, honey processing unit and honey wax plate making unit were established in the village. The beekeepers of the village utilize these units to process their raw honey and its by-products. The Farmers planning for commercial honey bee farming should consider taking apiculture training.

Methodology

Under ICAR funded Farmer FIRST project, one day training programme on "Honey processing and honey wax plate making" to enhance the knowledge of beekeepers of the Jeoli village, was organized. The one day training was attended by 60 farmers of the village who were already engaged in the beekeeping enterprise or were willing to take it as an income generating venture. The training was divided into four sessions.

Session I: It was a discussion session with farmers during which their knowledge level on honey processing and honey wax plate making was discussed in detail with them.

Session II: It was an interaction session with subject matter specialists regarding honey processing. The trainees also asked their questions related to the subject matter.

Session III: It was also an interaction session with subject matter specialists regarding honey wax plate making. The doubts of the trainees were also cleared by the subject matter specialists.

Session IV: It was feedback session in which the feedback of trainees regarding their overall experience of the training programme and knowledge gain were collected in detail.

Findings of the study: In this section, the data related to various aspects of the training programme was collected and presented in different tables along with some observations made during the training programme.

1. Personal characteristics of trainees: The data regarding the personal characteristics such as age, gender, marital status and education of the trainees of the training programme was collected. From the table 1 it can be observed that majority of the trainees were middle aged (78.33%), male (63.33%), married (70.00%) and had education upto middle school (41.67%). There were 13.33 percent young trainees, 36.67 percent female among the trainees and 16.67 percent unmarried trainees. Minimum number of trainees were old (8.33%), widowed (13.33%) and had graduation degree (5.00%). The results of the personal characteristics of the trainees are in line with the findings of Rana and Ansari (2017) [4] and Arya *et al.* (2023) [1]

Table 1: Personal characteristics of trainees

(n =60)

S. No.	Characteristics	Categories	Trainees	
			f	%
1.	Age	Young (<30 years)	8	13.33
		Middle age (30-50 years)	47	78.33
		Old (>50 years)	5	8.33
2.	Gender	Male	38	63.33
		Female	22	36.67
3.	Marital status	Unmarried	10	16.67
		Married	42	70.00
		Widowed	8	13.33
		Divorced	0	0.00
4.	Education	Illiterate	8	13.33
		Upto primary	7	11.67
		Middle school	25	41.67
		High school	11	18.33
		Intermediate	6	10.00
		Graduation	3	5.00
	Post graduation and above	0	0.00	

F = Frequency, % = Percentage

2. Reasons of participation in training programme on beekeeping

The trainees were asked to provide the reason for attending the one day training on honey processing and wax plate

making. All of the trainees attended the training for adopting the honey processing technique and to understand the honey wax plate preparation.

Table 2: Reasons of participation in training programme on beekeeping

(n =60)			
Sl. No	Reasons	f	%
1.	To understand the basics of beekeeping	47	78.33
2.	To know about the scientific method of honey processing	56	93.33
3.	To adopt the honey processing technique	60	100.00
4.	To clear doubts about honey processing	39	65.00
5.	To gain knowledge about honey quality management	53	88.33
6.	To understand the economics of honey production and processing	58	96.67
7.	To understand the honey wax plate preparation	60	100.00
8.	To learn the operation of different equipments used in honey processing	57	95.00

Multiple responses were allowed

F = Frequency,

% = Percentage

It can be inferred from Table 2 that majority of the trainees indicated that the other reasons of attending the training programme were to understand the economics of honey production and processing (96.67%), to learn the operation of different equipments used in honey processing (95.00%), to know about the scientific method of honey processing (93.33%), to gain knowledge about honey quality management (88.33%), to understand the basics of beekeeping (78.33%) and to clear doubts about honey processing (65%).

The beekeepers of the village showed a lot of interest in the training programme. Most of the beekeepers had multiple reasons to attend the training programme. They appreciated the efforts of the Farmer FIRST team to involve the beekeepers in processing of honey and honey wax. The beekeepers had limited understanding of the post harvest processing of the honey products but the training programme

helped them to understand the process completely.

3. Knowledge level of trainees with respect to various components of honey processing and wax plate making before training:

Before the training programme, data regarding knowledge level of trainees was collected to compare with the knowledge level after training. It is clear from Table 3 that majority of the trainees had no knowledge about bee wax plate preparation at home (65.00%), economic use of honey bee wax (65.00%), knowledge about different species of honey bees (63.33%), knowledge about the technique to operate the machines for bee wax plate preparation (61.67%), honeybee box management (51.67%) and understanding about the operation of different equipments used during honey processing (45%).

Table 3: Knowledge level of trainees with respect to various components of honey processing and wax plate making before training

(n =60)								
S. No.	Components	Complete knowledge		Partial knowledge		No knowledge		Weighted mean score
		f	%	f	%	f	%	
1.	Basic information about beekeeping	28	46.67	22	36.67	10	16.67	2.30
2.	Knowledge about different species of honey bees	4	6.67	18	30.00	38	63.33	1.43
3.	Honeybee box management	12	20.00	17	28.33	31	51.67	1.68
4.	Hygiene management in honeybee colony	8	13.33	36	60.00	16	26.67	1.87
5.	Seasonal management of honeybees	28	46.67	23	38.33	9	15.00	2.32
6.	Insect pest management in honeybee colonies	22	36.67	31	51.67	7	11.67	2.25
7.	Disease management in honeybee colonies	17	28.33	37	61.67	6	10.00	2.18
8.	Honey harvesting process	21	35.00	30	50.00	9	15.00	2.20
9.	Temperature management during honey processing	13	21.67	42	70.00	5	8.33	2.13
10.	Equipment requirement for honey processing	11	18.33	39	65.00	10	16.67	2.02
11.	Honey extraction process	19	31.67	29	48.33	12	20.00	2.12
12.	Honey filtration process	20	33.33	27	45.00	13	21.67	2.12
13.	Moisture reduction technique	15	25.00	28	46.67	17	28.33	1.97
14.	Honey quality management	18	30.00	33	55.00	9	15.00	2.15
15.	Bee wax plate preparation at home	6	10.00	15	25.00	39	65.00	1.68
16.	Post harvest management of honey and its by products	22	36.67	33	55.00	5	8.33	2.28
17.	Understanding about the operation of different equipments used during honey processing	14	23.33	19	31.67	27	45.00	1.78
18.	Knowledge about the technique to operate the machines for bee wax plate preparation	3	5.00	20	33.33	37	61.67	1.43
19.	Economic aspect of beekeeping	16	26.67	30	50.00	14	23.33	2.03
20.	Economic use of honey bee wax	2	3.33	19	31.67	39	65.00	1.38

Whereas majority of the trainees had partial knowledge about temperature management during honey processing (70.00%), equipment requirement for honey processing (65.00%), disease management (61.67%), hygiene management in honeybee colony (60.00%), Honey quality management (55.00%), post harvest management of honey and its by products (55.00%), insect pest management (51.67%), honey harvesting process (50.00%), Economic aspect of beekeeping (50.00%), honey extraction process (48.33%), moisture reduction technique (46.67%) and honey filtration process (45.00%). It can be observed from the table 3 that 46.67 percent of trainees had complete knowledge in both areas of basic information about beekeeping and seasonal management of honeybees due to their previous experience and exposure with different experts of government and non-government organizations while they were starting beekeeping as a new enterprise. It can also be inferred from Table 3 that before the training programme, the weighted mean score of knowledge level was maximum for seasonal management of honeybees (2.32) followed by basic information about beekeeping (2.30), post harvest management of honey and its by products (2.28), insect pest management in honeybee colonies (2.25) and was lowest for economic use of honey bee wax (1.38).

4. Knowledge level of trainees with respect to various components of honey processing and wax plate making after attending the training:

In table 4 it can be clearly

observed that after attending the training all trainees had full knowledge about basic information about beekeeping, hygiene management in honeybee colony, insect pest management, disease management, temperature management during honey processing, honey extraction process, honey quality management and understanding about the operation of different equipments used during honey processing. While most of the trainees had seasonal management of honeybees (98.33%), knowledge about the technique to operate the machines for bee wax plate preparation (98.33%), honeybee box management (96.67%), economic aspect of beekeeping (96.67%), honey harvesting process (95.00%), honey filtration process (95.00%), economic use of honey bee wax (95.00%), bee wax plate preparation at home (93.33%), equipment requirement for honey processing (93.33%), knowledge about different species of honey bees (91.67%) and post harvest management of honey and its by products (91.67%) and moisture reduction technique (90.00%). The Table 4 also depicts that the weighted mean score values of various components of honey processing and wax plate making. It can be inferred from the table that the knowledge level of the trainees was maximum (3.00) for the hygiene management, insect pest and disease management in honeybee colonies, temperature management during honey processing, honey extraction process, honey quality management and understanding about the operation of different equipments used during honey processing.

Table 4: Knowledge level of trainees with respect to various components of honey processing and wax plate making after attending the training

(n =60)

S. No.	Components	Complete knowledge		Partial knowledge		No knowledge		Weighted mean Iscore
		f	%	f	%	f	%	
1.	Basic information about beekeeping	60	100.00	0	0.00	0	0.00	2.97
2.	Knowledge about different species of honey bees	55	91.67	5	8.33	0	0.00	2.92
3.	Honeybee box management	58	96.67	2	3.33	0	0.00	2.97
4.	Hygiene management in honeybee colony	60	100.00	0	0.00	0	0.00	3.00
5.	Seasonal management of honeybees	59	98.33	1	1.67	0	0.00	2.98
6.	Insect pest management in honeybee colonies	60	100.00	0	0.00	0	0.00	3.00
7.	Disease management in honeybee colonies	60	100.00	0	0.00	0	0.00	3.00
8.	Honey harvesting process	57	95.00	3	5.00	0	0.00	2.95
9.	Temperature management during honey processing	60	100.00	0	0.00	0	0.00	3.00
10.	Equipment requirement for honey processing	56	93.33	4	6.67	0	0.00	2.93
11.	Honey extraction process	60	100.00	0	0.00	0	0.00	3.00
12.	Honey filtration process	57	95.00	3	5.00	0	0.00	2.95
13.	Moisture reduction technique	54	90.00	6	10.00	0	0.00	2.90
14.	Honey quality management	60	100.00	0	0.00	0	0.00	3.00
15.	Bee wax plate preparation at home	56	93.33	4	6.67	0	0.00	2.93
16.	Post harvest management of honey and its by products	55	91.67	5	8.33	0	0.00	2.92
17.	Understanding about the operation of different equipments used during honey processing	60	100.00	0	0.00	0	0.00	3.00
18.	Knowledge about the technique to operate the machines for bee wax plate preparation	59	98.33	1	1.67	0	0.00	2.98
19.	Economic aspect of beekeeping	58	96.67	2	3.33	0	0.00	2.97
20.	Economic use of honey bee wax	57	95.00	3	5.00	0	0.00	2.95

By comparing table 3 and table 4 which represent the information regarding knowledge level of trainees before and after the training programme respectively it can be said that there is a shift of knowledge gain among the trainees from having partial or no knowledge to acquiring complete knowledge about honey processing and bee wax plate preparation after attending the training programmes. The detail information regarding the various aspects of honey

processing and honey wax plate making were discussed during the various sessions of the training programme. The beekeepers expressed that they have more clarity about different procedures to maintain and improve the quality of honey and wax plates as now they understand more about handling of the equipments, temperature and moisture level management during the processing of honey and raw wax.

Table 5: Change in knowledge level of trainees before and after attending the training programme

(n =60)

S.No.	Components	Weighted Mean Score	
		Before training	After training
1.	Basic information about beekeeping	2.30	2.97
2.	Knowledge about different species of honey bees	1.43	2.92
3.	Honeybee box management	1.68	2.97
4.	Hygiene management in honeybee colony	1.87	3.00
5.	Seasonal management of honeybees	2.32	2.98
6.	Insect pest management in honeybee colonies	2.25	3.00
7.	Disease management in honeybee colonies	2.18	3.00
8.	Honey harvesting process	2.20	2.95
9.	Temperature management during honey processing	2.13	3.00
10.	Equipment requirement for honey processing	2.02	2.93
11.	Honey extraction process	2.12	3.00
12.	Honey filtration process	2.12	2.95
13.	Moisture reduction technique	1.97	2.90
14.	Honey quality management	2.15	3.00
15.	Bee wax plate preparation at home	1.68	2.93
16.	Post harvest management of honey and its by products	2.28	2.92
17.	Understanding about the operation of different equipments used during honey processing	1.78	3.00
18.	Knowledge about the technique to operate the machines for bee wax plate preparation	1.43	2.98
19.	Economic aspect of beekeeping	2.03	2.97
20.	Economic use of honey bee wax	1.38	2.95

The Table 5 clearly depicts a significant change in the weighted mean score of knowledge level of trainees before and after the training programme. It can be observed from the table that the mean score values of knowledge level of the trainees on some topics such as hygiene management in honeybee colony, insect pest management, disease management, temperature management during honey processing, honey extraction process, honey quality management and understanding about the operation of different equipments used during honey processing have reached the maximum possible score of 3. Hence the trainees acquired full knowledge about the mentioned topics after attending the training programmes. Additionally in case of most of the topics there is a positive change in the mean score values of knowledge level of trainees from before the training programme and to after the training programme. Maximum

change in knowledge is observed in the knowledge of economic use of honey bee wax, where before the training mean score was 1.38 which increased to 2.95 after the training programme.

5. Distribution of trainees based on their knowledge level before and after the training programme: It can be inferred from table 6 that majority of the trainees fall under the category of having low level of knowledge (65.00%) followed by medium level (28.33%) and high level of knowledge (6.67%) before attending the training programme. Whereas after attending the one day training programme on honey processing and bee wax plate preparation it was observed that majority of the trainees had high level of knowledge (81.67%) followed by medium level (18.33%) and none of the trainees had low level of knowledge.

Table 6: Distribution of trainees based on their knowledge level before and after training programme

(n =60)

S. No.	Category	Before training		After training	
		f	%	f	%
1.	Low	39	65.00	0	0
2.	Medium	17	28.33	11	18.33
3.	High	4	6.67	49	81.67

After closely observing the tables 6, it can be concluded that there is a significance shift of trainees from having low level of knowledge to obtaining high level of knowledge in understanding the honeybee management and basics of different activities conducted during honey processing and bee wax plate preparation. The beekeepers tend to sell the raw honey and wax to middle men at low prices due to their lack of knowledge of the post harvest processing of honey raw products which in turn lower their overall profit from the enterprise. The beekeepers expressed to understand the whole concept of post harvest processing of honey and its by-products in a more simple and clear way. The bee farmers also cleared their various doubts about the whole process during various training sessions. The training programme resulted in making the beekeepers more knowledgeable and

confident about the processing of honey and its by-products.

6. Overall assessment of training programme: After completion of the training programme organized by Farmer FIRST programme, GBPUA&T, Pantnagar, the trainees were asked to provide feedback regarding different aspects of the training programme. It can be inferred from table 7 that Majority of the trainees expressed that the training method was highly suitable for them (85.00%), the subject matter was fully covered by the training programme (81.67%), the training programme had high utility for their enterprise (76.67%), the training programme was excellent (75.00%) and they were highly satisfied with the training programme (73.34%).

Table 7: Overall Assessment of training programme

(n =60)				
S. No.	Variables	Category	f	%
1.	Utility of training	High	46	76.67
		Medium	10	16.67
		Low	4	6.67
2.	Coverage of subject matter	Fully covered	49	81.67
		Moderately covered	11	18.33
		Poorly covered	0	0.00
3.	Suitability of training method	Highly suitable	51	85.00
		Moderately suitable	9	15.00
		Slightly suitable	0	0.00
4.	Excellence of training	Excellent	45	75.00
		Very good	9	15.00
		Good	6	10.00
5.	Level of satisfaction	Highly satisfied	44	73.34
		Moderately satisfied	16	26.66
		Least satisfied	0	0.00

F = Frequency, % = Percentage

The beekeepers considered the whole training programme excellent and were highly satisfied with the training programme as it provided complete information about the honey processing and wax plate making. The bee farmers also expressed to have a new level of clarity of the whole concept and were much more confident in pursuing the post harvest processing of raw honey and raw wax. The training programme was highly suitable to the bee farmers as the whole was delivered in local language using simpler terms of complex technical words.

Conclusion

Beekeeping as an enterprise demands a lot of skill sets from rearing and managing the bee colonies to harvesting and processing honey and its by-products. There is need for regular training and capacity building of the bee farmers so that they can acquire more skills in beekeeping practices and earn more profit. The present study can be concluded as a positive impact of training on the knowledge level of trainees. As expressed by the trainees, the one day training programme resulted in tremendous change in their knowledge level on honey processing and honey wax plate making. The training programme provided complete knowledge about the concept of the post harvest processing of honey and its by-products to the bee farmers. The bee farmers expressed to be confident to opt for post harvest processing of their produce by utilizing the processing plants installed by the Farmer FIRST programme at their village. The training programme ignited the desire to produce high quality honey and its by-products among the beekeepers by controlling various physical aspects of post harvest processing of honey and honey wax. The beekeepers also expressed to have a pleasant experience after attending the training programme. The training programme definitely going to benefit the beekeepers in the future as they can produce good quality honey and honey wax plates which in turn increase their overall profit from the enterprise. The study supports future endeavours of regular training on different aspects of beekeeping enterprise. It provides encouragement and confidence to the project staff to organize more trainings and interaction sessions with the beekeeping farmers.

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