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Impact of ARYA bee keeping training socio economic status and entrepreneurship of rural youth

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Abstract

This study evaluates the impact of the ARYA beekeeping training program on the socio-economic status and entrepreneurial aspirations of rural youth in Jhalawar. Over a two-year period, the training engaged 110 participants, with evaluations highlighting significant improvements in their understanding of beekeeping. The training program saw an increase in participation from 45 individuals in 2020 to 65 in 2022. The majority of participants were young adults (65.46%), with a higher proportion of males (48.19%) and a range of educational backgrounds and occupations.

High satisfaction rates were reported, particularly with practical training (92.73%) and exposure visits to apiaries (95.45%). Participants valued honey production (89.09%) and acknowledged the critical role of beekeeping in pollination. Economic analysis showed substantial gains, with small-scale apiaries achieving a Benefit-Cost ratio of 2.27, medium-scale apiaries 2.08, and large-scale apiaries 2.27, reflecting strong profitability. Overall, the ARYA beekeeping training program successfully enhances rural youth engagement in beekeeping, fostering entrepreneurship and contributing positively to agricultural productivity.

Keywords: Beekeeping, entrepreneurship, honey bee, rural youth, training

Introduction

India is a vast country where more than 80 percent of the population lives in rural areas, with the economy largely dependent on agriculture for livelihood (Lal *et al.*, 2012) ^[7]. Beekeeping exhibits great potential to uplift the economy of Indian farmers, especially in the context of depleting natural resources and decreasing profitability in traditional agriculture (Singh *et al.*, 2010) ^[16]. Beekeepers manage bees to collect honey and beeswax, pollinate crops, and produce bees for sale (Qaiser *et al.*, 2013) ^[12]. Honey bees can significantly enhance agricultural productivity, increasing yields by 30-80 percent through cross-pollination (Singh, 2000; Monga & Manocha, 2011) ^[15, 8]. One of the distinctive features of beekeeping is the relatively small capital investment required compared to other industries, and it utilizes natural resources like nectar and pollen (Sharma & Dhaliwal, 2014) ^[13]. Beekeeping plays a crucial role in pollination and the production of honey and wax, with the benefits of pollination outweighing those of byproducts (Lal *et al.*, 2012) ^[7]. However, the future of bees and pollination services is threatened by changes in land use, pesticide applications, agricultural monocultures, and the spread of non-native species and pathogens, all of which are exacerbated by climate change (Settele *et al.*, 2016) ^[14]. Safeguarding and sustainably managing pollination services are essential to meet food security challenges in the face of climate unpredictability and a changing world.

Krishi Vigyan Kendras (KVKs) were introduced by the

Indian Council of Agricultural Research to improve the socio-economic conditions of farmers by enhancing farm productivity, income, and employment through the application of agricultural innovations generated at research stations (Dubey *et al.*, 2008; Barjesh & Ajay, 2012) ^[3, 1]. Agriculture need to be made more profitable to create interest and confidence among rural youth and retain them in agriculture. Rural youth are migrating to urban areas in search of jobs and on the other hand, small holdings are on the rise which poses challenge to food security for increasing population. A comprehensive model for the development of rural youth, particularly agricultural youth, was developed by ICAR to ensure food security of the country and initiated a programme on "Attracting and Retaining of Youth in Agriculture (ARYA)".

Materials and Methods

The study was conducted in Jhalawar district, selecting trainees based on their interest in beekeeping. A total of 110 respondents attended the long-duration training program, with data collected from these on-campus participants. Each training programme concluded with an evaluation test.

Data on age, sex, caste, education level, occupation etc., were collected and presented as numbers and percentages. To assess the impact of the training, pre and post-training evaluations were conducted. Participants were asked about their reasons for attending the training, such as their interest in conserving local bees, concerns about reduced

pollination, or aspirations to adopt beekeeping as entrepreneurs. Data on various aspects of the training's impact were collected, evaluated, and tabulated. Interested young farmers were also provided with honey bee colonies, handling tools, and equipment free of cost, sponsored by the Attracting and Retaining Youth in Agriculture (ARYA) programme, to promote entrepreneurship among rural youth (Singh *et al.*, 2010; Bhupender & Singh, 2019) ^[16, 2]. This training aims to attract Jhalawar's youth towards agriculture. To address these issues, KVK Jhalawar organized beekeeping training programs for rural youth to enhance their socio-economic status.

Results

The results of the beekeeping trainings conducted at KVK, Jhalawar are presented in Tables 1 to 6. Table 1 shows that KVK Jhalawar organized three on-campus beekeeping trainings over two years. In 2020, one training was conducted with 45 participants. In 2022, the number of trainings increased to two, with 65 participants attending. This increase in training activities from 2020 to 2022 reflects growing engagement in beekeeping, with 45 participants in 2020 and 65 in 2022. These findings align with studies by Lal *et al.* (2012) ^[7], Verma *et al.* (2018) ^[18], and Bhupender and Singh (2019) ^[2].

Table 2 provides a detailed demographic profile of the trainees. The majority were young adults aged 18-25 years (65.46%), with a higher proportion of males (48.19%) compared to females (17.27%). In terms of caste, 35.45% of trainees belonged to the General category, followed by Scheduled Tribes (28.18%) and Scheduled Castes (20.00%). Educationally, 51.81% of the trainees had completed senior secondary education, while 31.82% were graduates. The most common occupation was farming (44.55%), while students, retirees, and unemployed individuals accounted for 34.55%. These results are consistent with earlier works by Mujini *et al.* (2012) ^[9] and Lal *et al.* (2012) ^[7], revealing that rural youth are taking a keen interest in beekeeping as an entrepreneurial venture. The active participation of literate youth is promising for the promotion and adoption of beekeeping as a vocation.

Table 3 shows that participants expressed high levels of satisfaction with the training programs. The practical aspects of the training were particularly well-received, with 92.73% of participants expressing satisfaction. The exposure visit to an apiary was rated highly as well, with 95.45% satisfaction. Additionally, 78.18% were satisfied with the theoretical part of the training, and 89.09% appreciated the need-based nature of the program. The training content was rated as "Very Good" by 82.72% of participants, while 91.81% rated the overall experience as "Excellent." These results support previous findings by Nair *et al.* (2019) ^[10] and Patel *et al.* (2022) ^[11], which also

highlight the importance of hands-on experience and real-world exposure in successful training programs.

The perceived benefits of adopting beekeeping, as reported by the trainees, are shown in Table 4. Most participants (89.09%) considered honey production to be the most significant benefit, followed by the role of bees in pollination (8.18%). A smaller percentage (2.73%) recognized the importance of other bee products. These perceptions highlight both the economic value of honey production and the ecological benefits of beekeeping. The trainees' views are consistent with existing literature, which underscores the critical role of bees in agricultural productivity and ecosystem services (Goulson *et al.*, 2018; Klein *et al.*, 2020) ^[4].

The economic analysis indicates a positive trend in the performance of apiary units, as shown in Table 5. Small-scale apiaries demonstrated a significant increase in honey production, reaching 30.12 kg per colony, and benefitted from a higher sale price of ₹130.25 per kg. This resulted in increased gross and net returns, with the Benefit-Cost (B-C) ratio improving to 2.27, signifying enhanced profitability compared to the previous period (Smith, 2018) ^[17]. Despite a reduction in the number of beekeepers to five, medium-scale apiaries achieved improved financial outcomes due to a rise in the sale price to ₹132.50 per kg. Gross returns totaled ₹438,750, with net returns increasing to ₹227,550. Although the B-C ratio of 2.08 indicates a slight decline in relative profitability, it remains favorable, suggesting the enterprise is still a sound investment (Johnson & Brown, 2020) ^[5]. Large-scale apiaries saw growth in both the number of beekeepers and honey production. While operational costs increased, the significant gross returns and net returns of ₹523,500 highlight the sector's robust performance. The B-C ratio of 2.27 reflects effective economic management and strong profitability (Williams, 2019) ^[19].

Discussion

The results of the training programs on beekeeping at KVK Jhalawar clearly show that these programs have generated interest and participation amongst the rural youth in the area. Infact, over the years, there is a gradual increase in the number of training and participants due to an increase in awareness regarding beekeeping as a potential economic opportunity for enhancement of productivity in agriculture. What is important and probably a good omen for the future of beekeeping, most of the respondents can be classified as young, educated, and entrepreneurial. The high level of satisfaction with the practical training sessions points to the importance attached to gaining practical experience. In addition, the understanding of the trainees about honey production and the benefits accruing from pollination falls within the wider research on the contribution of beekeeping to sustainable agriculture and ecosystem health.

Table 1: Beekeeping trainings conducted during different years.

Year	Number of on campus trainings	Number of participants
2020	1	45
2022	2	65
Total	3	110

Table 2: Response of the trainees on the basis of age, caste, education, and occupation

Sr. No.	Particular	Male	Female	Total (M+F)
		Percentage (No.)	Percentage (No.)	Percentage (No.)
1.	Age			
	Young(18-25 years)	48.19 (53)	17.27 (19)	65.46 (72)
	Middle Age (26-35 years)	28.18 (31)	6.37 (7)	34.55 (38)
2.	Caste			
	Schedule Cast	16.37 (18)	3.63 (4)	20.00 (22)
	Schedule tribe	20.00 (22)	8.18 (9)	28.18 (31)
	OBC	10.91 (12)	5.46 (6)	16.37 (18)
	General	29.11 (32)	6.64 (7)	35.45 (39)
3.	Education			
	Illiterate	7.27 (8)	2.73 (3)	10.00(11)
	Up to senior secondary	33.63 (37)	18.18 (20)	51.81 (57)
	Graduate	29.10 (32)	2.72 (3)	31.82 (35)
	Post Graduate	6.36 (7)	-	6.36 (7)
4.	Occupation			
	Government Service	3.64 (4)	0.91 (1)	4.55(5)
	Farmers	44.55 (49)	-	44.55 (49)
	Housewives	-	17.27 (19)	17.27 (19)
	Others (Students, retiree, unemployed)	28.18 (31)	6.37 (7)	34.55 (38)

Table 3: Impact of on-campus Beekeeping trainings

Sr. No.	Aspect of training	Most satisfied (percent) (No.)	Satisfied (percent) (No.)	Not Satisfied (percent) (No.)
1.	Need Based training	89.09 (98)	10.91 (12)	-
2.	Theoretical part of training	78.18 (86)	21.82 (24)	-
3.	Practical part of training	92.73 (102)	7.27 (8)	-
4.	Exposure visit to apiary	95.45 (105)	4.55 (5)	-
5.	Training content	Excellent 10.92 (12)	Very Good 82.72 (91)	Good 6.36 (7)
6.	Rating of training	Excellent 91.81 (101)	Very Good 6.37 (7)	Good 1.82(2)

Table 4: Perception of trainees regarding importance of adopting beekeeping entrepreneur

Sr. No.	Particular	Perception percent (No.)
1.	Importance of honey bees in Pollination	8.18 (9)
2.	Honey production	89.09 (98)
3.	Bee products	2.73 (3)

Table 5: Three-Year Average Cost and Net Returns for Apiary Units

Sub-category	No. of Beekeepers	Avg. Honey Production (kg/colony)	Avg. Sale Price (₹/kg)	Gross Returns (₹)	Cost (₹)	Net Returns (₹)	B-C Ratio
Small Scale	10	30.12	130.25	187,740	82,640	105,100	2.27
Medium Scale	5	29.50	132.50	438,750	211,200	227,550	2.08
Large Scale	4	31.00	128.00	936,000	412,500	523,500	2.27
Total	19	29.78	131.11	1,562,490	706,340	856,150	2.21

Conclusion

The beekeeping training at KVK Jhalawar from 2020 to 2022 successfully boosted rural youth interest and participation. The increase in training sessions and positive demographic trends indicate growing entrepreneurial interest in beekeeping. High satisfaction with practical training and the recognition of honey production and pollination benefits highlight the program's effectiveness. Economic analysis shows strong performance across all apiary scales, with favorable Benefit-Cost ratios, confirming the financial viability of beekeeping. Expanding and evaluating these programs will enhance their impact further.

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