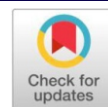


Original Research Article

Open Access

Determinants of beekeeping adoption among farmers in Haryana**Subhash Chander^{1*}, Bas Kaur¹, Rashmi Tyagi¹, Rati Mukteshwar², Sujata Rani³ and Ruby Garg⁴**¹Department of Sociology, CCS HAU, Hisar, Haryana, India²Department of Agricultural Extension Education, CCS HAU, Hisar, Haryana, India³Department of English, Indira Gandhi National Open University, New Delhi, India⁴Department of Entomology, CCS HAU, Hisar, Haryana, India**ABSTRACT**

Beekeeping serves as a vital supplementary livelihood for farmers, contributing to both economic gains and agricultural sustainability. This study examines the adoption of beekeeping practices among farmers in Haryana, identifying the factors influencing their engagement and challenges faced in the process. Data were collected through structured interviews with farmers across selected districts, focusing on variables. The findings revealed that majority of farmers (56.67%) prefer alternative occupations over beekeeping, citing limited family support (23.33%), socio-cultural constraints (13.33%) and lack of land and resources (58.66%) as key barriers. Additionally, financial challenges, including insufficient funds (65.33%) and lack of loan facilities (42.00%), hinder adoption. The majority of farmers (94.67%) cited low initial investment as a major motivator, followed by low labour requirements (92.66%) and minimal technical demands (89.33%). The study emphasizes the need for enhanced policy support, capacity-building initiatives and improved market connectivity to boost the adoption and sustainability of beekeeping. In this regard, the main challenges are securing comprehensive and reliable data on beekeeping practices and adoption rates among farmers in Haryana. These insights aim to guide stakeholders in promoting beekeeping as a viable and sustainable livelihood option in Haryana.

Keywords: Adoption of beekeeping, Practices, Equipment, Marketing, Sustainable, Reasons for adoption and Socio-economic factors affecting

INTRODUCTION

Beekeeping has emerged as a significant supplementary agricultural practice, offering economic benefits and contributing to ecological sustainability. In India, the "Sweet Revolution" initiative underscores the importance of beekeeping in enhancing rural incomes and promoting sustainable agriculture. Haryana, with its diverse agro-climatic conditions and rich agricultural heritage, presents a compelling case for examining the adoption of beekeeping among farmers. This study aims to assess the sociological factors influencing beekeeping adoption in Haryana, focusing on socioeconomic status, education, gender roles and institutional support.

Recent data indicates that Haryana is among the top honey-producing states in India, yielding approximately 4,500 metric tons annually, with over 5,000 active farmers [1]. Despite this, the overall adoption rate of beekeeping as an enterprise remains relatively low, with studies reporting an adoption rate of 19.8% over four years [2]. This discrepancy suggests the presence of underlying sociological factors that influence the decision to adopt beekeeping practices.

Education and awareness are critical determinants in the adoption process. A study assessing beekeeping knowledge among farmers in Haryana found that while most farmers possessed moderate to high knowledge of various aspects of

beekeeping, a significant portion (77.39%) were unaware of the role of bees in pollination and 60.15% had limited knowledge of honey's importance [3]. This gap in knowledge underscores the need for targeted educational interventions to enhance awareness and technical know-how. Gender dynamics also influence beekeeping adoption. Although traditionally male-dominated, beekeeping offers opportunities for women's participation due to its flexible nature. However, societal norms and limited access to resources often restrict women's involvement.

Institutional support, including training programs and extension services, significantly impacts adoption rates. The Haryana government has initiated efforts to promote beekeeping, yet challenges persist in reaching marginalized communities. A study in Panchkula district highlighted constraints such as inadequate training and lack of access to quality bee colonies as major impediments to adoption. The majority of respondents (86.7%) listed attack of honeybee pests and diseases as a major constraint wherein the colonies are destroyed during heavy infestations and it becomes difficult for them to replenish the colonies and to bring the number of bee colonies back to the level where the activity is economically viable. The problem of frequent migration and the associated problems of taking care of family responsibilities during periods of absence due to shortage of bee forage was felt more by respondents having nuclear and small and medium-sized families [4].

Beekeeping holds great promise to improve the livelihoods of Indian farmers, especially in Haryana, where knowledge levels of beekeepers are moderate to high. Ecological and economic benefits associated with this enterprise include crop

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productivity enhancement, income diversification and employment opportunities. The age factor, education level and social participation are all important determinants of knowledge acquisition, suggesting that targeted training programs and awareness campaigns should be part of the efforts. However, with all these benefits, problems such as limited resources and technical know-how remain. Beekeeping represents a sustainable, low-investment enterprise that can play a significant role in rural economic development and environmental sustainability [5].

In conclusion, while beekeeping holds substantial potential for augmenting rural livelihoods in Haryana, its adoption is influenced by a complex interplay of socioeconomic factors, educational awareness, gender roles and institutional support. A comprehensive sociological assessment is imperative to identify and address the barriers hindering widespread adoption. Such insights can inform policymakers and extension educators in designing targeted interventions to promote beekeeping as a sustainable and inclusive agricultural practice.

MATERIAL AND METHODS

The current research was carried out in the meticulously selected Kaithal, Kurukshetra and Karnal districts of Haryana state of India in 2023. The districts were chosen on purpose because of their abundant and varied beekeeping, which is perfect for scientific bee rearing. From Kaithal district, fifty respondents were selected at random from the villages namely Machheredi, Kharkara, Riwad, Kakeri, Salempur, Bata and Deohra whereas from Kurukshetra district fifty respondents were selected randomly from the villages namely Charuni Jattan, Ghararsi, Barna, Jhandheri, Thanesar and Shahbad and Karnal district fifty respondents were selected randomly from the villages namely Budheri, Santri, Khera, Seir, Gheer and Choura. Thus, 150 farmers constituted the respondents to the study by simple random sampling technique.

A well-structured interview schedule especially for the study and direct observation techniques helped get primary data. The government, sectors and gram panchayats' official records provided secondary data. The dependent variable, adoption of the respondents regarding beekeeping, was employed using the approach outlined [6]. With the use of the proper statistical tools, the researcher coded, tabulated, analyzed and interpreted the data as per objectives of the study. To make the inference in the study, descriptive statistical tools and techniques including frequency and percentage have been used. To determine several specific goals, the field data acquired in the end were observed and analysed. Scores of 3, 2 and 1 were assigned to Fully adopted, moderately adopted and not adopted respectively. Adoption quotients were calculated from raw scores to gauge the overall adoption level. Thus, after computing the individual adoption quotient scores, the respondents were categorized into three groups. Scores of 5, 4, 3, 2 and 1 were assigned to

strongly agree, agree, neutral, disagree and strongly disagree regarding factors adversely affecting adoption of beekeeping, respectively. The relationship between two categorical variables of such independent variables and adoption level was checked by implementing a non-parametric test of chi-square value, coefficient of contingency and degree of freedom estimation to conclude.

RESULTS AND DISCUSSION

The findings of the present study, titled "Determinants of beekeeping adoption among farmers in Haryana" are presented and analysed in the following sections.

ADOPTION OF BEEKEEPING

Table 1 presents insights into the adoption of beekeeping in Haryana, influenced by social, economic and environmental factors. The overall mean adoption score for beekeeping among farmers in the study area was 2.19. Regarding adoption rates, more than half of the farmers (54.67%) fully adopted beekeeping as their primary source of income and regularly manage beehives according to extension guidelines (48.67%). Approximately 39.33% of farmers did not engage in migratory beekeeping based on seasonal floral availability. In terms of technology and equipment adoption, majority of respondents (56.00%) fully adopted artificial queen rearing techniques to enhance colony productivity. About 33.33% of farmers moderately adopted modern beekeeping equipment such as hive tools and protective gear. Economic and marketing adoption, A significant portion of farmers (46.67%) fully utilized government subsidies and financial schemes to support beekeeping. Approximately 45.33% of farmers engaged in the sale of honey and bee products through local or organized markets.

For sustainable and eco-friendly practices, the overall mean score for adoption was 2.25. More than half of the farmers (56.67%) fully adopted practices such as maintaining biodiversity and planting pollinator-friendly trees near apiaries. Around 48.67% educated fellow farmers on the benefits of beekeeping for agriculture and pollination. Approximately 46.00% of farmers did not ensure access to pesticide-free floral resources near bees. Moreover, the study highlights the importance of social networks and peer influence in adoption, as noted by [7], who found that farmers are more likely to adopt practices when they observe positive outcomes from peers. The socio-economic variables influencing beekeeping adoption, such as age, education and landholding size, are consistent with the findings of previous studies. Younger and more educated farmers tend to adopt beekeeping more readily, as they are more open to innovation and modern farming techniques. Larger landowners, as expected, are more likely to invest in beekeeping due to their greater access to resources.

Table 1: Adoption of beekeeping among farmers of Haryana (n=150)

| Statements for Beekeeping Adoption | Fully adopted | Moderately adopted | Not adopted | Mean score |
|---|---------------|--------------------|-------------|------------|
| Adoption of Beekeeping Practices | | | | |
| Beekeeping as primary source of income | 82 (54.67) | 52 (34.67) | 16 (10.66) | 2.44* |
| Manage beehives regularly as per extension guidelines | 73 (48.67) | 47 (31.33) | 30 (20.00) | 2.29* |
| Recommended hive placement and maintenance techniques follow | 64 (42.67) | 46 (30.67) | 40 (26.66) | 2.16 |
| Regular inspection of beehives to prevent pests and diseases | 62 (41.33) | 43 (28.67) | 45 (30.00) | 2.11 |
| Practice of migrant beekeeping based on availability of seasonal floral | 52 (34.67) | 39 (26.00) | 59 (39.33) | 1.95 |

| Overall mean score 2.19 | | | | |
|---|------------|------------|------------|-------|
| Adoption of Beekeeping Technology & Equipment | | | | |
| Use of modern beekeeping equipment such as hive tools and protective gear | 74 (49.34) | 50 (33.33) | 26 (17.33) | 2.32* |
| Scientific method for honey extraction and processing | 56 (37.34) | 44 (29.33) | 50 (33.33) | 2.04 |
| Use of artificial queen rearing techniques to improve colony productivity | 84 (56.00) | 55 (36.67) | 11 (7.33) | 2.49* |
| Recommended practices for controlling honeybee pests and diseases | 75 (50.00) | 49 (32.67) | 26 (17.33) | 2.33* |
| Use of advanced hive designs (Langstroth, top-bar hives) for better productivity | 62 (41.33) | 42 (28.00) | 46 (30.67) | 2.11 |
| Overall mean score 2.26 | | | | |
| Economic & Marketing Adoption | | | | |
| Sell of honey and bee products through local or organized markets | 68 (45.33) | 54 (36.00) | 28 (18.67) | 2.27* |
| Value-added processing techniques for honey and wax production | 62 (41.33) | 51 (34.00) | 37 (24.67) | 2.17 |
| Participation in cooperative societies or Farmers' Producer Organizations for honey marketing | 66 (44.00) | 38 (25.33) | 46 (30.67) | 2.13 |
| Utilization government subsidies and financial schemes to support beekeeping | 70 (46.67) | 41 (27.33) | 39 (26.00) | 2.21* |
| Diversification in beekeeping enterprise by selling pollen, royal jelly or propolis | 64 (42.67) | 45 (30.00) | 41 (27.33) | 2.15 |
| Overall mean score 2.19 | | | | |
| Adoption of Sustainable & Eco-Friendly Beekeeping | | | | |
| Adherence to organic beekeeping practices without using synthetic chemicals | 71 (47.33) | 30 (20.00) | 49 (32.67) | 2.15 |
| Ensuring access to pesticide-free floral resources near bees | 43 (28.67) | 38 (25.33) | 69 (46.00) | 1.83 |
| Maintaining biodiversity and plant pollinator-friendly trees near apiary | 85 (56.67) | 53 (35.33) | 12 (8.00) | 2.49* |
| Adoption of sustainable methods for colony splitting and queen rearing | 74 (49.33) | 66 (44.00) | 10 (6.67) | 2.43* |
| Education to fellow farmers on benefits of beekeeping for agriculture and pollination | 73 (48.67) | 57 (38.00) | 20 (13.33) | 2.35* |
| Overall mean score 2.25 | | | | |

Figures in parentheses denote percentage
Responses were multiple

ADOPTION OF BEEKEEPING AMONG FARMERS

The data presented in Figure 1 revealed that the largest proportion of farmers (45.34%) exhibited a moderate level of adoption of beekeeping practices. Additionally, 31.33% of the farmers demonstrated a high level of adoption, while 23.33% showed a low level of adoption.

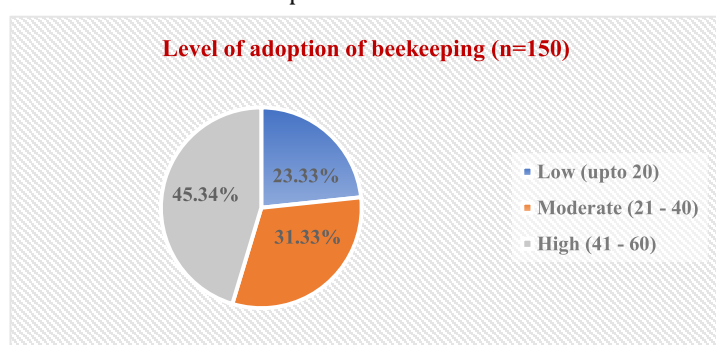


Fig.1: Level of adoption of beekeeping in Haryana (n=150)

Factors adversely affecting adoption of beekeeping

Table 2 presents a sociological analysis of the factors influencing the adoption of beekeeping, as perceived by the respondents. These factors are categorized into social, physical, economic and technical dimensions. The data revealed that a majority of farmers (56.67%) had fully adopted occupations other than beekeeping. Additionally, 23.33% of the respondents strongly reported a lack of family support for pursuing beekeeping and 13.33% cited socio-cultural restrictions as barriers. The high mean score of 3.23 indicates that social factors play a significant role in shaping beekeeping decisions. Issues such as family support and prevailing societal norms appear to strongly influence individuals' willingness to adopt beekeeping. Social acceptance plays a significant role in the adoption process, with

high scores for family support and social acceptance, which aligns with [8], who found that education and societal support are critical for beekeeping adoption. This suggests that beekeeping aligns well with the societal values in Haryana, where family involvement and community support remain integral to farming practices.

With regard to physical factors, the analysis showed that nearly 58.66% of farmers did not adopt beekeeping due to a lack of land and other physical resources. Although physical constraints are important - reflected in a mean score of 3.09 - they seem slightly less influential compared to social factors. Among physical barriers, scarcity of resources and fear of bees were particularly noteworthy. Field observations further revealed that economic factors were a major hindrance to beekeeping adoption. Approximately 65.33% of farmers reported being adversely affected by economic challenges, with 48.00% citing a lack of initial capital to start a beekeeping enterprise and 42.00% indicating the unavailability of loan facilities. The highest mean score of 3.72 underscores that economic factors are perceived as the most significant barrier to adoption. Marketing difficulties and financial limitations emerged as critical concerns. On the economic front, access to financial resources like loans and subsidies (mean score 2.27) and the lack of competition in local markets (2.21) positively impact adoption. This mirrors the findings of [9], who pointed out the effectiveness of government subsidies in encouraging beekeeping. The availability of natural spaces for beehives (2.49) and the presence of harmful pesticides (2.43) are significant factors affecting beekeeping. Regarding technical factors, 43.33% of farmers stated that they did not prefer beekeeping due to limited access to quality equipment. The moderate mean score of 3.31 suggests that while technical barriers are acknowledged, they are perceived as less restrictive than social and economic factors.

Table 2: Factors adversely affecting adoption of beekeeping by farmers (n=150)

| Factors | Level of factors affecting adoption of beekeeping | | | | | Mean Score |
|--------------------------------------|---|------------|------------|------------|-------------------|------------|
| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | |
| Social factors | | | | | | |
| Priority to other activities | 85 (56.67) | 25 (16.67) | 19 (12.66) | 12 (8.00) | 9 (6.00) | 4.10* |
| Lack of family support | 35(23.33) | 31 (20.67) | 40 (26.67) | 28 (18.67) | 16 (10.66) | 3.27* |
| Socio-culture restriction | 20 (13.33) | 29 (19.33) | 25 (16.67) | 42 (28.00) | 34 (22.67) | 2.73 |
| Not interested in beekeeping | 18 (12.00) | 23 (15.33) | 52 (34.67) | 31 (20.67) | 26 (17.33) | 2.84 |
| Overall Mean score 3.23 | | | | | | |
| Physical factor | | | | | | |
| Lack of land and resources | 88 (58.67) | 21 (14.00) | 20 (13.33) | 11 (7.33) | 10 (6.67) | 4.11* |
| Fear from bees | 23 (15.33) | 25 (16.67) | 31 (20.67) | 38 (25.33) | 33 (22.00) | 2.78 |
| Labour-intensive activity | 21 (14.00) | 28 (18.67) | 35 (23.33) | 36 (24.00) | 30 (20.00) | 2.83 |
| Allergy from bee sting | 18 (12.00) | 26 (17.33) | 28 (18.67) | 42 (28.00) | 36 (24.00) | 2.65 |
| Overall Mean score 3.09 | | | | | | |
| Economic factors | | | | | | |
| Marketing problem | 98 (65.33) | 24 (16.00) | 14 (9.33) | 8 (5.34) | 6 (4.00) | 4.33* |
| Lack of money to start business | 72 (48.00) | 27 (18.00) | 21 (14.00) | 18 (12.00) | 12 (8.00) | 3.86* |
| Lack of loan facilities | 63 (42.00) | 32 (21.33) | 25 (16.67) | 14 (9.33) | 16 (10.67) | 3.75* |
| Less income than expenditure | 15 (10.00) | 42 (28.00) | 45 (30.00) | 16 (10.67) | 32 (21.33) | 2.95 |
| Overall Mean score 3.72 | | | | | | |
| Technical factors | | | | | | |
| Limited access to quality equipment | 65 (43.33) | 28 (18.67) | 17 (11.33) | 29 (19.34) | 11 (7.33) | 3.71* |
| Lack of skilled labour | 42 (28.00) | 31 (20.67) | 38 (25.33) | 20 (13.33) | 19 (12.67) | 3.38* |
| More technical than other activities | 35 (23.33) | 27 (18.00) | 34 (22.67) | 34 (22.67) | 20 (13.33) | 3.15 |
| Lack of complete knowledge | 30 (20.00) | 25 (16.66) | 37 (24.67) | 31 (20.67) | 27 (18.00) | 3.00 |
| Overall Mean score 3.31 | | | | | | |

Figures in parentheses denote percentage
Responses were multiple

Socio-economic variables and level of adoption of beekeeping across districts

Table 3 presents the analysis of the association between various socio-economic variables and the level of adoption of beekeeping across different districts in Haryana. The analysis was conducted using the Chi-square test and the coefficient of contingency. The findings revealed that age was highly significantly associated with the adoption of beekeeping. This suggests that younger and middle-aged individuals are more inclined to adopt innovative practices compared to older age groups. Similarly, education emerged as a significant factor, indicating that higher levels of education enhance knowledge, skills and the willingness to adopt beekeeping practices. It was also found that landholding size had a strong positive association with adoption. Landowners were more likely to

invest in beekeeping, likely due to greater access to financial and physical resources. Additionally, family size played a role, as larger families could contribute more labour, making beekeeping a more viable livelihood option. Other socio-economic variables such as social participation, exposure to mass media and overall socio-economic status were also found to be highly significantly associated with the adoption of beekeeping. These variables may contribute to greater awareness, motivation and access to extension services and information. This agrees with [10], who found that access to resources, including land and education, significantly impacts the adoption of beekeeping. The study also highlights that economic barriers are the most significant inhibitors of adoption, as reflected in the high mean score for marketing issues (4.33) and lack of financial support (3.75). In contrast, variables such as caste, subsidiary occupation, type of family and annual family income were not found to have a significant association with the adoption of beekeeping.

Table 3: Association between socio-economic variables and adoption of beekeeping in different districts of Haryana

| Socio-economic variables | Chi-Square value (χ^2) | Coefficient of contingency (C) | Degree of freedom |
|--------------------------|-------------------------------|--------------------------------|-------------------|
| Age | 21.788** | 0.356 | 4 |
| Caste | 3.249 | 0.146 | 4 |
| Education | 16.095* | 0.311 | 6 |
| Subsidiary occupation | 9.944 | 0.249 | 8 |
| Land holdings | 13.141* | 0.284 | 6 |
| Type of family | 1.467 | 0.098 | 2 |
| Size of family | 10.358* | 0.254 | 4 |
| Annual family income | 8.247 | 0.228 | 6 |
| Social participation | 20.950** | 0.350 | 4 |
| Mass media exposure | 15.279** | 0.304 | 4 |
| Socio-economic status | 14.467** | 0.297 | 4 |

*Significant at 5% level

**Highly significant at 1% level

Reasons for adoption of beekeeping

Beekeeping has gained increasing popularity as an occupation in Haryana, driven by a combination of environmental, economic and social factors. Field data presented in Table 4 revealed that an overwhelming majority of farmers (94.67%) adopted beekeeping due to its low initial investment requirements. This was followed by its less labour-intensive nature (92.66%) and the perception of it being a less technically demanding activity (89.33%). A smaller proportion of respondents cited additional reasons for adoption, including the lack of land requirement (9.33%) and the continuation of a family occupation (8.66%). It was also found that adoption rate was moderate, with active participation and an increase in managed beehives being the most widely adopted activities. These results align with previous research, such as [11], beekeeping offers a range of economic opportunities for rural development, including income generation, job creation, market development and value chain integration.

Table 4: Reasons for adoption of beekeeping in different districts of Haryana (n=150)

| Reasons for adoption | Districts of Haryana | | | Total |
|---------------------------------|----------------------|------------------|-------------|-------------|
| | Kaithal (50) | Kurukshetra (50) | Karnal (50) | |
| Low initial investment | 48 (96.00) | 48 (96.00) | 46 (92.00) | 142 (94.67) |
| Less labour intensive | 48 (96.00) | 47 (94.00) | 44 (88.00) | 139 (92.66) |
| Less technical activity | 46 (92.00) | 45 (90.00) | 43 (86.00) | 134 (89.33) |
| Higher return than expenditure | 44 (88.00) | 43 (86.00) | 42 (84.00) | 129 (86.00) |
| Self-employment | 29 (58.00) | 24 (48.00) | 23 (46.00) | 76 (50.66) |
| Increase in production of crops | 25 (50.00) | 23 (46.00) | 22 (44.00) | 70 (46.66) |
| Additional source of income | 21 (42.00) | 20 (40.00) | 17 (34.00) | 58 (38.66) |
| No requirement of land | 7 (14.00) | 4 (8.00) | 3 (6.00) | 14 (9.33) |
| Taken over of family occupation | 6 (12.00) | 4 (8.00) | 3 (6.00) | 13 (8.66) |
| Amateurishly | 5 (10.00) | 3 (6.00) | 2 (4.00) | 10 (6.66) |
| Any others | 4 (8.00) | 2 (4.00) | 2 (4.00) | 8 (5.33) |

Figures in parentheses denote percentage
Responses were multiple

CONCLUSION

The adoption of beekeeping among farmers in Haryana is influenced by a complex interplay of social, economic and environmental factors. While low initial investment and minimal technical requirements encourage participation, financial constraints, limited institutional support and socio-cultural barriers hinder widespread adoption. The study highlights that farmers show greater inclination towards beekeeping, but lack of training, resources and organized market structures restrict their engagement. Additionally, environmental concerns such as pesticide exposure and inadequate floral resources present further challenges. Strengthening extension services, improving financial accessibility and fostering community-based knowledge-sharing initiatives can enhance adoption rates. Addressing these socio-economic and structural limitations is essential for integrating beekeeping into sustainable rural livelihoods. Policies aimed at market expansion, technical training and environmental protection will play a crucial role in promoting beekeeping as a viable and inclusive agricultural enterprise in Haryana. It is also suggested that government should provide targeted training programs, easy access to financial aid and subsidies for beekeeping equipment to encourage adoption. Improving access to local honey markets and establishing fair pricing mechanisms initiatives can enhance the economic sustainability of beekeeping.

By harnessing the economic potential of beekeeping, rural communities can improve their livelihoods, reduce poverty and achieve sustainable development goals. However, realizing these benefits requires supportive policies, investments in training and infrastructure and concerted efforts to address challenges such as access to markets, technical knowledge and climate change adaptation. The farmers' concerns about the lack of infrastructure, including access to quality bee colonies and storage facilities, suggest that better infrastructure and market linkages are necessary to support the growth of beekeeping in the region. A researcher highlighted the positive environmental benefits of beekeeping, including enhanced pollination and increased crop yields. However, the presence of pesticides near beekeeping areas poses a challenge, which is consistent with the environmental concerns outlined in the study by other researchers emphasizing the need for awareness and better agricultural practices to mitigate these risks [12].

Future scope of the Study

This study explores the socio-economic, institutional and environmental factors influencing the adoption of beekeeping among farmers in Haryana. It examines how variables such as landholding size, education level, access to extension services and awareness about ecological benefits affect decision-making. The research covers both adopters and non-adopters across diverse agro-climatic zones to offer a comparative perspective. It aims to identify key enablers and barriers in the diffusion of beekeeping practices. The findings are intended to inform policy interventions and promote sustainable livelihood diversification in rural Haryana.

Conflict Interests

The authors declare no conflict of interest regarding the publication of this article. The research was conducted independently, without any financial or personal relationships that could inappropriately influence the findings. No funding agency or external organization influenced the design, data collection, analysis, or interpretation of the results. All views expressed are solely those of the authors.

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