



Barriers to Successful Beekeeping: Insights from the Jammu Region of Jammu and Kashmir, India

Goldy Bhagat ^{a++*}, Anil Bhat ^{a#}, Jyoti Kachroo ^{a#},
Rakesh Sharma ^{b#}, L. K. Sharma ^{b#} and Manish Sharma ^{c#}

^a Division of Agricultural Economics and ABM, SKUAST-Jammu, India.

^b Division of Agricultural Extension Education, SKUAST-Jammu, India.

^c Division of Statistics and Computer Science, SKUAST-Jammu, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: <https://doi.org/10.9734/acri/2024/v24i9883>

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/123436>

Original Research Article

Received: 11/07/2024

Accepted: 16/09/2024

Published: 18/09/2024

ABSTRACT

This study focused on the constraints faced by the beekeepers of Jammu region of Jammu and Kashmir, evaluating constraints perceived by the beekeepers identified from Krishi Vigyan Kendras (KVKs) who have been involved in beekeeping for the last five years at least and the list contained eight beekeepers. By using the sampling method with replacement, the sample size of eight beekeepers were interviewed two times and comparison made for three time periods or years viz; 2019-20, 2021-22 and 2023-24, which made the ultimate sample size of twenty four (24) beekeepers. For analyzing the data collected for three time periods, Henry Garrett's ranking and

⁺⁺ Ph.D. Scholar;

[#] Professor;

^{*}Corresponding author: Email: goldy3139@gmail.com;

Cite as: Bhagat, Goldy, Anil Bhat, Jyoti Kachroo, Rakesh Sharma, L. K. Sharma, and Manish Sharma. 2024. "Barriers to Successful Beekeeping: Insights from the Jammu Region of Jammu and Kashmir, India". *Archives of Current Research International* 24 (9):194-200. <https://doi.org/10.9734/acri/2024/v24i9883>.

Chi-square test were used. Findings indicated that major production constraints were the disease of honey bees (78.60), death of the colony (70.00), and heavy rainfall (61.00). Marketing constraints included the fluctuating price of raw honey (69.20), unorganized and unregulated markets (63.20) and lack of government concern or support for the marketing of honey (55.80). Economic constraints featured the huge cost of investment is ranked first with an average score of 71.00, followed by no insurance facilities for the beehives with an average score of 53.67 and lack of credit supply for costly implements used in processing, packaging and quality testing (50.67). Chi-square test revealed that only two constraints under production problems such as, the lack of beehive equipments and materials in the local market (14.77) and pesticide poisoning (7.88) were significant and were showing dependency over the years. By addressing all these constraints through targeted interventions could significantly enhance the viability of beekeeping.

Keywords: KVKs; constraints; henry garrett's ranking; colony; raw honey; significant.

1. INTRODUCTION

Apiculture is the cultivation and care of honeybees to extract honey from them. The management of the honey bee colonies or hives is beekeeping (or apiculture). The honey-bee which is a social species lives in big settlements of up to 100,000 individuals. An apiarist or beekeeper keeps bees for the collection of sweet honey and beeswax, or for pollination of crops. A bee garden is known as a beehive or "bee yard." Beekeeping is a scientific insect breeding process capable of producing honey and wax [1,2]. Apiculture as a venture is relatively acceptable by people of all ages, genders, religion and class. It is comparatively cheap compared to other income-generating activities. Beekeeping includes the collection and taking care of bees, pollination of field crops by bees, the study of bee products and the breeding of bees for honey production either in a small or large scale. Beekeeping for honey production is a profitable agricultural enterprise nowadays in all parts of the world. It is an important foreign exchange earner for those who export honey and beeswax [3,4]. Around 1.8 million tonnes of honey were produced worldwide in 2021. The largest producer is China with an annual production of 486,000 tonnes. It was followed by Turkey (96,300 tonnes) and Iran (77,200 tonnes) according to the Food and Agriculture Organisation. India is one of the top nations exporting honey worldwide. India's organic honey has made its way to markets in the United States, United Kingdom, Japan, France, Italy, Spain, and other countries. About 74,413 million tonnes of honey worth Rs. 1221.17 crores was exported by India in 2021-22. The US, Saudi Arabia, Canada, Bangladesh, and Qatar are some of the main export markets. The National Bee Board (NBB) in India is actively engaged in promotion and development of beekeeping. On the National Bee Board, there are presently

about 13,000 beekeepers registered and employ more than 3 lakh, rural people. Khadi and Village Industries Commission (KVIC) took the task of further development of the beekeeping industry to uplift the financial status of people living in extremely interior rural areas by introducing and popularizing scientific beekeeping. The State Khadi & Village Industries Boards (KVIB) and Non-Government Organizations (Beekeeping NGOs) registered with KVIC and KVIB are taking part in beekeeping programs in the country. According to the reports of the International Market Analysis Research and Consulting Group (IMARC Group), the Indian apiculture market size reached 25,760.90 million rupees in 2023 and expects the market to reach 63,474.60 million rupees by 2032, exhibiting a growth rate (CAGR) of 10.2 percent during 2024-2032. Growing demand for honey and other bee products, the increasing awareness of the health benefits of honey, and the surging need for organic food products represent some of the key factors driving the market. Rising Kashmir newspaper [5] reported that beekeeping or apiculture has been one of the age-old traditions in Jammu and Kashmir, which is now turning into a lucrative business with governments' progressive policies and initiatives. The J&K UT administration, through its Krishi Vigyan Kendras (KVKs) and Department of Agriculture, is imparting technical skills among the farmers. Jammu and Kashmir government has launched a Rs 46.65 crore 'Promotion of Beekeeping' project to increase the annual honey production to 66100 quintal in the UT and the population of bees will be enhanced by 333.00 percent (1,43,000). The total honey production in India in the year 2023-24 was 146.30 thousand metric tonnes and for Jammu and Kashmir UT, production has increased from 2.30 thousand metric tonnes in 2020-21 to 3.14 thousand metric tonnes in 2023-24 (Report of India stat, 2024).

2. MATERIALS AND METHODS

Locale of the study: The study was conducted in the Jammu region of Jammu and Kashmir UT. Firstly, a list of progressive farmers was procured from the Krishi Vigyan Kendras (KVKs) of the Jammu region and purposively selected only those farmers who were doing beekeeping agro-enterprise from minimum last five years.

Sampling procedure: By using the sampling method with replacement, the responses of the beekeepers were taken three times i.e. for the period 2019-20, 2021-22 and 2023-24 and this made a total of twenty four (24) beekeepers, as list procured from the KVKs, contained only eight beekeepers.

Data collection: The primary data were collected through a well-structured and pre-tested schedule by personally interviewing the progressive farmers trained under KVKs of Jammu region. Secondary data were collected from various official websites, annual reports, statistical digest of J&K, research articles, newspapers etc. Collected data were further tabulated and analyzed by using suitable statistical tools.

Method of analysing the data: Suitable statistical methods and tools given below were used for analyzing the collected data in this study. The collected data were analyzed through Henry Garrett's Ranking technique to find out the frequency distribution of the problems so that we can find out which constraint is mostly faced by the farmers and ranking of the constraints was done accordingly. As per this method, the farmers were asked to assign a rank for each category of the constraints proposed to them [6]. The percent position for each rank was calculated with the help of the following formula:

$$\text{Percent Position} = \frac{R_{ij} - 0.5}{N_j} \times 100$$

Where,

R_{ij} = Rank given for the i^{th} factor by the j^{th} respondent, N_j = Number of factor ranked by the j^{th} respondent.

Thereafter, the Chi-Square test was used to test the independence of the constraints among selected districts. Biswal [7] defined that the chi-squared test (χ^2) is utilized to examine discrepancies between the data distributions that are observed and those that are expected. It is also known as Pearson's chi-squared test as it

was developed in 1900 by Karl Pearson for the analysis of categorical data and distribution. P stands for probability here [8]. To calculate the p-value, the chi-square test is used in statistics. The different values of p indicate the different hypothesis interpretations, are given below:

H_0 : states that the observed constraints over the years are independent to each other.

If, $P > .05$; H_0 : Hypothesis Accepted,

H_1 : This implies that there is no significant difference of constraints over the years and are showing dependence on each other

If, $P \leq 0.05$; then, hypothesis (H_0) rejected

The formula for chi-square can be written as;

$$\chi^2 = \sum \frac{(\text{Observed value} - \text{Expected value})^2}{\text{Expected value}}$$

Or,

$$\sum \frac{(O_i - E_i)^2}{E_i} \sim \chi^2 (R-1) \text{ df}$$

Where,

O_i is the observed value of average score of each constraint

E_i is the expected value of average score of each constraint

R is the number of periods (years) considered

df is the degree of freedom

3. RESULTS AND DISCUSSION

Production constraints: Table 1 depicted that the most influential constraints which were affecting the production process of the beekeeping were death of the colony with an average score of 78.00 (Rank I), followed by diseases of honey bees with a mean score of 75.00 (Rank II) and lack of beehive equipment and materials in the local market with average score 72.00 (Rank III) for the year 2019-20. For the period 2021-22, diseases of honey bees with an average Garrett score of 81.00 (Rank I), followed by death of colony with an average score of 69.00 (Rank II) and the heavy rainfall with an average score of 62.00 (Rank III), were the most severe constraints which have been faced by the beekeepers. During the time period of 2023-24, diseases of honey bees (81.00), heavy rainfall (69.00) and death of colony (62.00) were ranked as I, II and III respectively. On an

overall basis, we have found that the diseases of honey bees with an average Garrett score of 78.60 (Rank I) followed by the death of colony with an average Garrett score of 70.00 (Rank II) and the heavy rainfall with an average score of 61.00 (Rank III) were the most persistent

problems faced by the beekeepers [9]. Others problems were also having significant impact on production such as adulteration, inability in the part of beekeepers for moving their colonies to other places and pesticide poisoning [10].

Table 1. Production constraints perceived by the beekeepers under study area

Particulars	2019-20		2021-22		2023-24		Overall	
	Average Score	Rank	Average Score	Rank	Average Score	Rank	Average Score	Rank
Lack of proper adoption of technological knowledge and skilled human labor.	25.50	VIII	19.00	IX	31.00	VIII	23.80	IX
Shortage of beehives and forage.	25.00	IX	31.00	VIII	19.00	IX	26.20	VIII
Diseases of honey bees.	75.00	II	81.00	I	81.00	I	78.60	I
Lack of beehive equipment and materials in the local market	72.00	III	38.00	VII	38.00	VII	39.20	VII
Death of colony.	78.00	I	69.00	II	62.00	III	70.00	II
Heavy rainfall.	56.00	IV	62.00	III	69.00	II	61.00	III
Inability in the part of beekeepers to move their colonies to other places.	41.00	VI	47.00	VI	44.00	VI	45.00	VI
Pesticide Poisoning.	28.00	VII	49.50	V	50.00	V	52.20	V
Adulteration.	55.00	V	50.00	IV	55.00	IV	53.00	IV

Table 2. Marketing constraints perceived by the beekeepers under study area

Particulars	2019-20		2021-22		2023-24		Overall	
	Average score	Rank	Average score	Rank	Average score	Rank	Average score	Rank
Fluctuating price of raw honey	67.20	I	71.40	I	69.00	I	69.20	I
Lack of government concern and support for the marketing of honey	54.40	III	54.40	III	58.60	III	55.80	III
Unorganized and unregulated markets	66.40	II	62.40	II	60.60	II	63.20	II
Lack of proper storage containers and facilities	28.80	VI	34.60	VII	31.40	VII	39.20	VI
Lack of information about honey market	47.20	V	44.40	IV	48.60	IV	42.93	V
Cumbersome procedure for registration as a firm for sale of honey in retail	35.20	VII	29.40	VI	32.40	VI	32.33	VII
Unavailability of Quality testing lab	49.60	IV	52.40	V	48.40	V	46.33	IV

Table 3. Economic Constraints perceived by the beekeepers under study area

Particulars	2019-20		2021-22		2023-24		Overall	
	Average score	Rank	Average score	Rank	Average score	Rank	Average score	Rank
Lack of credit supply for costly implements used in processing, packaging and quality testing	51.00	III	55.00	II	46.00	IV	50.67	III
Financial problems	30.00	V	30.00	V	35.00	V	31.67	V
High cost on investment	67.00	I	52.00	IV	54.00	III	71.00	I
No insurance facilities for the beehives	53.00	II	53.00	III	65.00	I	53.67	II
Higher labor cost	49.00	IV	60.00	I	60.00	II	43.00	IV

Table 4. Test of independence for the constraints faced by beekeepers under study

Production Constraints	Chi-square value
Lack of proper adoption of technological knowledge and skilled human labor	2.81
Shortage of beehives and forage	2.97
Diseases of honey bees	0.46
Lack of beehive equipment and materials in the local market	14.77*
Death of colony	1.61
Heavy rainfall	1.54
Inability in the part of beekeepers to move their colonies to other places	0.54
Pesticide poisoning	7.88*
Adulteration	0.24
Marketing Constraints	
Fluctuating price of raw honey	0.13
Lack of government concern and support for the marketing of honey	0.21
Unorganized and unregulated markets	0.30
Lack of proper storage containers and facilities	0.53
Lack of information about honey market	0.20
Cumbersome procedure for registration as a firm for sale of honey in retail	0.52
Non-availability of quality testing lab	0.17
Economic Constraints	
Lack of credit supply for costly implements used in processing, packaging and quality testing	1.21
Financial problems	0.29
High cost on investment	2.67
No insurance facilities for the beehives	1.10
Higher labor cost	1.21

*significance at 0.05 % level

Marketing constraints: Table 2 revealed that the major marketing problems were the fluctuating price of raw honey with Garrett score 67.20 (Rank I), followed by unorganized and unregulated markets with an average score of 66.40 (Rank II) and lack of government support and concern for the marketing of honey with an average score of 54.40 (Rank III) during the time period of 2019-20. For the year 2021-22, the fluctuating price of raw honey, unorganized and unregulated markets and lack of government concern and support for the marketing of honey with an average score of 72.00, 67.50 and 61.50 were ranked as rank I, rank II and rank III respectively. The fluctuating price of raw honey (69.00), unorganised and unregulated markets

(60.60) and lack of government support and concern for the marketing of honey (58.60) were ranked as rank I, rank II and rank III, respectively for the period 2023-24. On an overall basis, also these three constraints such as fluctuating price of raw honey, unorganized and unregulated markets and lack of government support and concern for the marketing of honey with their average score of 69.20, 63.20 and 55.80 were placed at first three ranks respectively. So, it was found that these three major marketing problems perceived by the beekeepers were same over the years. Some other constraints like unavailability of honey testing labs, lack of information about honey market etc. were also perceived [11].

Economic constraints: Table 3. depicted the economic problems which have been faced by the beekeepers and three major problems were the high cost on investment with an average Garrett score of 67.00, followed by no insurance facilities for the beehives (53.00) and lack of credit supply for costly implements used in processing, packaging and quality testing (51.00) were ranked as I, II and III respectively, during 2019-20. The Higher labor cost, lack of credit supply for costly implements used in processing, packaging and quality testing and no insurance facilities for the beehives with their respective average Garrett score of 60.00, 55.00 and 53 were ranked as I, II and III during the year 2021-22. When talked about the period 2023-24, the no insurance facilities for the beehives was ranked first with an average score of 65.00, followed by the higher labor cost (60.00) and the lack of credit supply for costly implements used in processing, packaging and quality testing with an average score of (54.00) and were ranked as II and III, respectively. On an overall basis, the high cost on investment (71.00), no insurance facilities for the beehives (53.67) and lack of credit supply for costly implements used in processing, packaging and quality testing (50.67), were the major problems and were ranked as rank I, rank II and rank III, respectively, [12,13].

Test of significance: From the results of Table 4., it has been shown that among the production constraints, only the lack of beehive equipment and materials in the local market (14.77) and the pesticide poisoning (7.88) were showing significance with significant their chi-square values and depicting their dependency over the years. All other constraints were independent and non-significant [14,15].

4. CONCLUSION

This study is all about the problems faced by the beekeepers of Jammu region during production and marketing. The constraints are being analyzed through statistical tools. Various constraints like the disease of the colony, death of the colony, heavy rainfall, adulteration, etc. are the major constraints faced during production and the fluctuating price of raw honey, unorganized and unregulated markets, lack of government concern and support for the marketing of honey, unavailability of honey testing labs, lack of information about honey market etc. were the major problems faced by the beekeepers during the marketing process of

honey. Thus, favorable modifications should be done in order to bring out the proper development of this agro-enterprise such as proper disease management strategies by finding out the causes of diseases occurrence especially, an ectoparasite mite named Varroa destructor cause a huge damage to the bee colonies of *Apis Mellifera* species of honeybee. Thus, a proper recommended dose of insecticides can reduce the damage of the colonies by killing the pests. Also, the regularised markets should be present at the regional level, so that the beekeepers can easily sell their honey at fixed rates. The availability of equipments is also an issue of concern to be resolved for an easygoing process of beekeeping, as the beekeepers are used to be worried about the high costs of equipments purchased from other states and thereby the cost of equipments increased due to their high transportation costs. This, in turn, increases the cost of rearing the beecolonies by beekeepers. Proper honey testing labs should also be available for testing the quality of honey, which, in turn, will help the beekeepers to market their honey at higher prices. So, all these factors should be considered and the proper managing decisions to tackle all these prevalent problems should be taken, which will in turn, encourage other farmers to take up this agro-enterprise and secure their sustenance by easily making money and profits out of this agro-enterprise.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

I, Goldy Bhagat, hereby declare that no generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

ACKNOWLEDGEMENT

This study is basically an outcome of the doctoral work of Goldy Bhagat, with support from the Indian Council of Social Science Research (ICSSR), New Delhi. The author(s) extend their gratitude to ICSSR for its invaluable financial backing.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Kumar Y, Sharma SK. Scientific beekeeping for apiculture development.

- Proceedings of the workshop on Promotion of Honey beekeeping in Haryana. 2014; 113-122.
Available:<https://www.hkcp.org.in/>
2. Vasukidevi R, Ashok K, Kalaiarasi V, Babu B. Apiculture status in India: An overview. Intern. J. Zool. Invest. 2021;7(2):557-561. Available:<https://doi.org/10.33745/ijzi.2021.v07i02.034>.
 3. Islam MR, Chhay L, Milan MM, Nasry NB. The financial analysis of apiculture profitability in Bangladesh. Asian J. Agric.Exten. Econ. Soc. 2016;9(2):1-8. DOI: 10.9734/AJAEES/2016/22985.
 4. Agboola IS, George-Onaho JA, Ete JA, Ayandokun A. Contribution of apiculture in social and economic development of Nigeria. J. Appl. Sci. Environ. Manage. 2021;25(9):1559-1562. DOI:10.4314/jasem.v25i9.2.
 5. Anonymous. 1,43,000 new bee colonies to be set up enhancing honey production to 66100 quintal in J&K. Rising Kashmir newspaper, online desk; 2023, March 9. Available:<http://www.risingkashmir.in/>
 6. Kumar S, Sharma S, Kumar S. Constraints analysis under different farming systems in the hills of Himachal Pradesh. Frontiers in Crop Improvement. 2021;9:3747-3752. Print ISSN: 2393-8234 Online ISSN: 2454-6011. Available:<http://www.asthafoundation.in/>
 7. Biswal A. What is a chi-square test? Formula, examples & application. Data Science & Business Analytics, Simplilearn Solutions; 2024. Available:<https://www.simplilearn.com/>
 8. Abrol DP. Beekeeping for sustainable economic development of India: Challenges and opportunities. J Indian Inst Sci. 2023;103:997–1017. Available:<https://doi.org/10.1007/s41745-023-00374-9>.
 9. Anonymous. Indian Apiculture Market Report by Product Type (Honey, Beeswax), Application (Direct Consumption, Food and Beverages, Pharmaceuticals, Cosmetics, and Others), and Region 2024-2032, Market research report of IMARC Group; 2023. Available:<https://www.researchandmarkets.com/>
 10. Anonymous; 2024. DOI:www.indiastat.com/data/agriculture/apiculture-beekeeping/ Statistics and Growth Figures Year-wise of india.
 11. Mushtaq R, Singh H. Role of bee colonies in honey production for sustainable livelihood in Anantnag District of Kashmir Valley, J & K. Sustainability, Agri, Food and Environmental Research, (ISSN: 0719-3726). 2023;11(X). Available:<http://dx.doi.org/10.7770/safer-V11N1-art2390>.
 12. Olagunju OE, Ariyo OC, Olagunju OS, Alabi OF. Contribution of agroforestry practices to rural household food security status in chikun local government area of Kaduna state. Conference paper, “Proceedings of the 8th Biennial Conference of the Forests & Forest Products Society, Held at the Forestry Research Institute of Nigeria, Ibadan, Nigeria”; 2022, August 14th - 20th. Available:<https://www.researchgate.net/>
 13. Rana R, Singhal R. Chi-square test and its application in hypothesis testing. J Pract Cardiovasc Sci. 2015;1:69-71. DOI: 10.4103/2395-5414.157577.
 14. Dash SR, Mishra PJ, Bar N, Biswas KK, Pani RR. Constraints analysis in adoption of vegetable production technologies in Malkangiri District, Odisha. Journal of Research in Humanities and Social Science. 2022;10(5):45-53. Available:<http://www.questjournals.com/>
 15. Satish S. Sweet revolution-honey mission; 2024. Available:<https://www.clearias.com/>

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/123436>