

Barriers to Successful Beekeeping: Insights from the ~~Jammu~~ Region Jammu and Kashmir Regions

Abstract

This study focussed on the constraints faced by the beekeepers of the Jammu region of Jammu and Kashmir, evaluating constraints perceived by the beekeepers identified from Krishi Vigyan Kendras (KVKs) who have been involved in beekeeping ~~from-for the~~ last five years at least and the beekeepers taken were eight in number. Henry ~~Garrett-Garrett's~~ ranking and Chi-square test were used for ~~analysing-analyzing~~ the data. Findings indicate that production constraints are primarily due to ~~the~~ disease of honey bees (74.80), death of ~~the~~ colony (66.40), and heavy rainfall (63.40). Marketing constraints include ~~the~~ fluctuating price of raw honey (71.40), ~~unorganised-unorganized~~ and unregulated markets (62.40), and lack of government concern or support for ~~the~~ marketing of honey (54.40). Economic constraints feature ~~the~~ huge cost of investment is ranked first with ~~an~~ average score ~~of~~ 54.00, followed by no insurance with ~~an~~ average score ~~of~~ (53.00) and lack of credit supply for costly implements used in processing, packaging and quality testing (52.00). Chi-square tests ~~reveal-revealed~~ that certain constraints such as, death of colony (9.39), pesticide poisoning(10.58), lack of government concern and support for marketing of honey(5.73), lack of proper storage containers and facilities(6.95) and Cumbersome procedure for registration as a firm for sale of honey in retail(4.26), lack of credit supply for costly implements used in processing, packaging, and quality testing(4.43) and financial problems(3.64) are significant and are dependent of geographical differences. By addressing all these constraints through targeted interventions by the government could significantly enhance the viability of beekeeping.

Keywords: KVKs, constraints, ~~henry garrett~~Henry Garrett ranking, colony, raw honey, significant.

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 ~~means-is~~ a scientific insect breeding process capable of producing honey and wax (Kumar and Sharma, 2014; Vasukidevi *et al.*, 2021). Apiculture as a venture is relatively acceptable by people of all ages, ~~gender-genders~~, religion and class. It is comparatively cheap compared to other ~~income-generatingincome-generating~~ activities. Beekeeping includes the collection and taking care of bees, pollination of field crops by bees, the study of bee ~~product-products~~ and the breeding of ~~bee-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 ~~that-who~~ export honey and beeswax (Islam *et al.*, 2016;

Agboola *et al.*, 2021). 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 involved in promoting and developing beekeeping. On the National Bee Board, there are presently about 13,000 beekeepers registered and employs-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-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 per-centpercent 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 (2023) reported that beekeeping or apiculture has been one of the age-oldage-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-Department of agricultureAgriculture, is imparting technical skills among the farmers. Jammu and Kashmir government has launched a Rs 46.65 erores 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 per-centpercent (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 been-increased from 2.30 thousand metric tonnes in 2020-21 to 3.14 thousand metric tonnes in 2023-24 (Report of India stat, 2024).

Material and Methods Used

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 selected only those farmers who were doing beekeeping agro-enterprise from minimum last five years and thereby only eight progressive farmers were selected-chosen out of ten farmers in the list by employing the proportional method of sampling.

Data collection:

The primary data were collected through a well-structured and pre-tested schedule by personally visiting the places of selected progressive farmers trained under KVK Jammu, KVK Samba and KVK Kathua, as the farmers doing beekeeping enterprise, contained in the list were from these KVKs only and were under this agro-enterprise, from at least last five years. Secondary data

was collected from various official sites, annual reports, state digest, research articles, newspapers etc. Collected data were tabulated and analysed using suitable statistical tools.

Method of analysing the data:

Suitable statistical methods and tools given below were used for ~~analysing-analyzing~~ the collected data ~~under-in~~ this study. The collected data were ~~analysed-analyzed~~ through Henry Garrett's Ranking technique to find out the frequency distribution of the problems so that we can find out ~~that~~ which constraint is mostly faced by the farmers and ranking of the constraints ~~were-was~~ done accordingly. As per this method, the farmers were asked to assign ~~the-a~~ rank for each category of the constraints proposed to them (Kumar *et. al.*, 2021). The ~~per-cent~~percent position for each rank was calculated with the help of the following formula:

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

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 (2024) 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. To calculate the p-value, the chi-square test is used in statistics. The different values of p ~~indicates-indicate~~ the different hypothesis ~~interpretation~~interpretations, are given below:

H_0 : This implies that there is no significant difference between the observed and expected frequencies, which means the observed and expected frequencies are independent.

If, $P \leq 0.05$; then, hypothesis (H_0) ~~is~~ rejected, this shows that the constraints among the selected districts are showing dependence ~~among-on~~ each other.

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

H_1 : This implies that there is no significant difference of constraints among the districts taken under study.

The formula for chi-square can be written as;

Commented [i1]: Climate change

Commented [i2]: Are there studies that confirm the following:
The number of honey bee colonies per unit of cultivated area in what is called the pastoral load
The breed of bees raised and the experiences of beekeepers in combating diseases and pests that attack honey bee colonies

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

Or,

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

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 categories to be compared (Districts)

C is the number of constraints to be taken

df is the degree of freedom

Results and Discussion

Production Constraints:

Table 1 depicts that the most influential constraints which are affecting the production process of the beekeeping are 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) in Jammu district of Jammu region. For the Samba district, diseases of honey bees with average ~~garrett~~-Garrett score 81.00 (Rank I), death of colony with average score of 69.00 (Rank II) followed by heavy rainfall with an average score of 62.00 (Rank III) are the most severe constraints which have been faced by the beekeepers. For the Kathua district, heavy rainfall (81.00), adulteration (69.00) and diseases of honey bees (66.40) were ranked as I, II and III respectively. On an overall basis, we have found that with diseases of honey bees with garrett score 74.80 (Rank I), death of

Particulars	Jammu		Samba		Kathua		Overall	
	Average Score	Rank	Average Score	Rank	Average Score	Rank	Average Score	Rank
Lack of proper adoption of technological knowledge and skilled man labour.	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	62.00	III	74.80	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	44.00	VI	66.40	II
Heavy rainfall.	56.00	IV	62.00	III	81.00	I	63.40	III
Inability in the part of beekeepers for moving their colonies to other	41.00	VI	47.00	VI	50.00	V	46.20	VI

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

places.								
Pesticide Poisoning.	28.00	VII	49.50	V	55.00	IV	53.20	V
Adulteration.	55.00	V	50.00	IV	69.00	II	55.80	IV

colony with garrett score 66.40 (Rank II) and heavy rainfall with average score 63.40 (Rank III) are most persistent problems existed in the study area. Others problems are 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.

Marketing Constraints

Table 2 revealed that the major marketing problems are fluctuating price of raw honey with garrett score 78.00 (Rank I), followed by ~~unorganised-unorganized~~ and unregulated markets with an average score 61.50 (Rank II) and unavailability of a quality testing lab with an average score 53.50 (Rank III). In Samba district, fluctuating price of raw honey, lack of government concern and support for marketing of honey and ~~unorganised-unorganized~~ and unregulated markets with an average score of 72.00, 67.50 and 61.50 are ranked as rank I, rank II and rank III respectively. Unavailability of quality testing lab (78.00), unorganised and unregulated markets (66.00) and fluctuating price of raw honey (57.00) have been ranked as rank I, rank II and rank III respectively for Kathua district. On an overall basis, the unfixed price of raw honey is ranked higher with an average score of 71.94 followed by ~~unorganised-unorganized~~ and unregulated markets (Rank II) and lack of government concern and support for the marketing of honey (Rank III).

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

Particulars	Jammu		Samba		Kathua		Overall	
	Average score	Rank	Average score	Rank	Average score	Rank	Average score	Rank
Fluctuating price of raw honey	78.00	I	72.00	I	57.00	III	71.40	I
Lack of government concern and support for marketing of honey	43.50	IV	67.50	II	50.00	IV	54.40	III
Unorganised and unregulated markets	61.50	II	61.50	III	66.00	II	62.40	II
Lack of proper storage containers and facilities	34.00	VII	42.00	V	21.00	VII	34.60	VI
Lack of information about honey market	43.00	V	46.50	IV	43.00	V	44.40	V

Cumbersome procedure for registration as a firm for sale of honey in retail	35.50	VI	21.00	VII	34.00	VI	29.40	VII
Unavailability of Quality testing lab	53.50	III	38.50	VI	78.00	I	52.40	IV

Economic Constraints

Table 3. depicts economic problems are faced by the beekeepers, out of which three major problems are high cost on investment with garrett score 67.50, higher labour cost with garrett score 62.50 and lack of credit supply for costly implements used in processing, packaging and quality testing with

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

Particulars	Jammu		Samba		Kathua		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	55.00	III	75.00	I	60.00	II	52.00	III
Financial problems	25.00	V	37.50	V	25.00	V	30.00	V
High cost on investment	67.50	I	42.50	III	50.00	III	54.00	I
No insurance	40.00	IV	55.00	II	75.00	I	53.00	II
Higher labour cost	62.50	II	40.00	IV	40.00	IV	49.00	IV

garrett score 55.00 are ranked as I, II and III respectively in case of Jammu district of Jammu region. Same pattern of ranking is shown in samba district with lack of credit supply for costly implements used in processing, packaging and quality testing having garrett score 65.20 followed by no insurance (55.00) and high cost on investment (42.50). For Kathua district, no insurance is ranked first with average score 75.00, followed by lack of credit supply for costly implements used in processing, packaging and quality testing with average score (60.00) and high cost on investment (50.00) are ranked as II and III respectively. When talking about the overall farms, High cost on investment is ranked first with average score 54.00, followed by no insurance with average score (53.00) and lack of credit supply for costly implements used in processing, packaging and quality testing (52.00) are being ranked as rank I, rank II and rank III respectively.

Test of significance

From the results of table 4., it has been shown that among the production constraints, only death of colony and pesticide poisoning are showing significance with their chi square value and depicting dependence of constraints among the selected districts. In case of marketing constraints,

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

	Chi-square Chi-square value
Production Constraints	
Lack of proper adoption of technological knowledge and skilled man labour labor	2.90
Shortage of beehives and forage	2.98
Diseases of honey bees	2.69
Lack of beehive equipment and materials in the local market	17.16
Death of colony	9.39*
Heavy rainfall	5.53
Inability in the part of beekeepers for moving to move their colonies to other places	1.07
Pesticide poisoning	10.58*
Adulteration	3.45
Marketing Constraints	
Fluctuating price of raw honey	3.42
Lack of government concern and support for marketing of honey	5.73*
Unorganised and unregulated markets	0.22
Lack of proper storage containers and facilities	6.95*
Lack of information about honey market	0.19
Cumbersome procedure for registration as a firm for sale of honey in retail	4.26*
Unavailability of quality testing lab	14.55
Economic Constraints	
Lack of credit supply for costly implements used in processing, packaging and quality testing	4.43*
Financial problems	3.64*
High cost on investment	6.23
No insurance	10.94
Higher labour cost	7.20

*significance at 0.05 % level

lack of government concern and support for marketing of honey(5.73), lack of proper storage containers and facilities(6.95) and cumbersome procedure for registration as a firm for sale of honey in retail (4.26) are showing significance with significant chi square values, thus exhibiting dependency of constraints among the districts. In case of economic problems, lack of credit supply for costly implements used in processing, packaging and quality testing (4.43) and financial problems (3.64) are found to be dependent among the three districts of Jammu region.

Conclusion:

This study is all about the problems faced by the beekeepers of Jammu region during ~~the~~ production and marketing. The constraints are being ~~analysed~~-analyzed through ~~the~~-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 fluctuating price of raw honey, unorganised and unregulated markets, lack of government concern and support for marketing of honey etc. during ~~the~~ marketing of honey. ~~Therefore, favourable-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. Thus, a proper recommended dose of insecticides can reduce damage of colonies by killing the pests, proper regulated markets should be present, so that they could easily sell their honey at fixed rates, and availability of equipment's equipments is also very important for the easy-going process of beekeeping, as the beekeepers would not be worried about the high costs of equipment's purchased from other states due to high transportation cost. Proper honey testing labs should be available for testing the quality of honey. So, all these factors should be considered and proper managing decisions should be taken by the government the government should take proper managing decisions to tackle all these prevalent problems, 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.

Commented [13]: These are recommendations to be submitted to a government agency and not in the form of a manuscript paper.

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