“BEE” - THE CHANGE

: A dipstick study on scope of beekeeping



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Best Practices: *Shakuntala Sutradhar*

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Executive Summary

Apiculture has been increasingly explored as a supplementary livelihood option in rural Assam because of its low investment requirement and its potential to generate seasonal or supplementary income. This dipstick study assesses the current status of beekeeping in Kushdhuwa block, Goalpara district, drawing on the experience of existing beekeepers and the willingness of non-beekeepers to adopt apiculture, and examines the surrounding market ecosystem and scope for expansion.

The study covered 20 respondents through a structured survey, along with separate Focus Group Discussions (FGDs) with non-beekeepers and new beneficiaries who had received bee boxes and orientation. Interviews with local market vendors and shopkeepers were used to assess honey demand and market scope.

A central finding of the analysis is that the livelihood outcome of apiculture is best understood as a chain rather than a single input-output relationship:

Bee Boxes → Active Colonies →Honey Production → Value Addition →Household Income

The distribution of bee boxes alone does not translate into income; the critical bottleneck lies at the second link of this chain is colony survival and activity, with an estimated 40-50% of distributed boxes not holding active colonies at any given time. This reframing shifts the emphasis of scale-up recommendations away from simply increasing the number of boxes distributed, toward a phased pathway of colony stabilization, productivity enhancement, box expansion, and finally branding and market linkage.

Existing beekeepers perceive apiculture as a seasonal activity integrated with agriculture, constrained in scale and affected by colony loss and pest pressure, including from wild bees originating in nearby forest patches. Non-beekeepers show high awareness supported by nearby forest cover and inherited traditional knowledge and considerable willingness to adopt apiculture as a low-time, low-investment supplementary activity, but hesitation persists on account of fear of stings, limited technical knowledge, uncertainty about colony maintenance, and the absence of initial handholding support.

The market assessment finds consistent demand for local/organic honey, concentrated in village-level and weekly-market transactions (such as at Damra and Dudhnoi), but supply remains limited, informal, and largely unbranded. Shopkeepers and vendors indicated willingness to procure honey at scale if quality and consistency could be assured.

Overall, the study confirms that apiculture holds potential as a supplementary livelihood activity, but realizing this potential depends less on the volume of boxes distributed and more on strengthening colony management, building sustained (rather than one-time) technical capacity, addressing ecological and environmental risk factors and developing collective, group-based market linkages. Scaling toward a minimum of 4-5 active boxes per beneficiary, combined with monthly extraction cycles and technical handholding, is recommended provided colony stabilization measures are put in place first.

1.Introduction

Apiculture is being explored as a potential livelihood intervention due to its low land requirement, relatively low investment, and its ability to supplement existing income sources. In Kushdhuwa block of Goalpara district, the livelihood profile of respondents indicates strong dependence on farm activities, with a majority of households engaged in agriculture, followed by smaller proportions in labour, livestock, small business, and salaried work. This reflects a context of limited and seasonal income sources where diversified, supplementary livelihood options are valuable.

Study findings indicate that apiculture is currently practiced as a seasonal and supplementary livelihood, with all respondents identifying it as an additional rather than primary income source. While the activity is known and has been adopted to some extent, there remains a lack of clarity on how effectively beekeepers are managing colonies and what constraints they face. Equally, understanding the perception and willingness of non-beekeepers and new beneficiaries is critical to assessing future adoption and preparedness.

In this context, the study was conducted to understand: (1) the current status of apiculture; (2) the practical experience of existing beekeepers; and (3) the willingness and preparedness of non-beekeepers to adopt the activity.

2. Objectives

- To assess the current engagement in apiculture among beneficiaries
- To understand the learning and skill application from training
- To document the best practices followed by successful beekeepers
- To identify key challenges and constraints
- To explore the future plans, scalability and sustainability of the activity
- To suggest way forward and support required

3. Methodology

The study used a mixed-method approach, combining qualitative and quantitative methods to understand the current status and adoption potential of apiculture.

3.1 Study Area

The study was conducted in Kushdhuwa village, Goalpara district of Assam. The location was selected for the presence of both practising beekeepers and non-beekeepers, allowing a comparative understanding of practices and adoption potential.

3.2 Sample Size and Respondent Categories

A total of 20 respondents who received bee boxes in 2023-24 were covered through the household survey, selected using a purposive approach to ensure representation of both existing beekeepers and non-beekeepers. Separately, FGDs were held with 13 non-beekeepers and 15 new beneficiaries (2024-25) and informal interactions were carried out with local traders and retailers.

3.3 Methodology Matrix

The table below sets out which respondent group each data-collection method covered, and the specific evidence purpose it served. This is intended to make explicit which findings in the sections that follow are respondent-reported perceptions versus vendor/market-level observations and at what sample size

Method	Respondent Group	Sample Size	Purpose / Evidence Type
Structured household survey	Existing beekeepers (received bee box 2023-24)	20	Quantitative: practices, production, income, constraints
Focus Group Discussion	Non-beekeepers	13	Qualitative: awareness, perception, willingness to adopt
Focus Group Discussion	New beneficiaries (2024-25)	15	Qualitative: early-stage experience, training uptake
Informal interviews	Local vendors, shopkeepers, market stakeholders	7	Market demand, pricing, procurement willingness

Note: The beneficiary survey (n=20) is the primary quantitative base for all cost-benefit and production figures cited in this report. Given the small sample size and the dipstick nature of the study, findings should be read as indicative rather than statistically representative: see Section 17, Limitations of the Study.

4. Findings from the Field

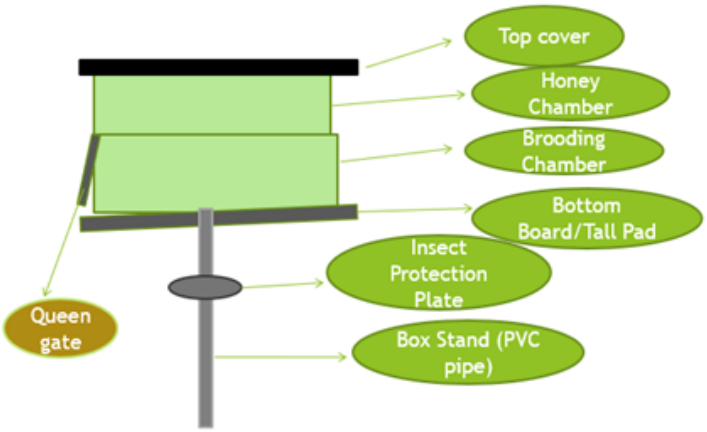
4.1 Apiary Structure and Bee Species Profile



Apis cerana is the dominant bee species reared by all respondents in the study area, indicating a uniform beekeeping system among existing beekeepers. Under managed conditions, Apis cerana colonies can develop 10-15 comb frames with an estimated population of 20,000-25,000 bees per hive, and can potentially produce 12-15 kg of honey annually.

Apis cerana is widely preferred in Assam because it is well adapted to the local climatic and ecological conditions of the region. The species can tolerate high rainfall, humidity and fluctuating seasonal conditions better than many other bee species. The species is also less aggressive in nature, making it suitable for rural households and beginner beekeepers. In addition, Apis cerana can efficiently utilize diverse local floral resources available in forests, agricultural fields and homestead plantations. Its ability to survive and forage under local environmental conditions makes it more reliable and suitable for beekeeping in Assam compared to other bee species (Rahman & Rahman, 2014; Singh, 1962).

The study covered 20 existing beekeepers, all engaged in apiculture for more than one year, mostly maintaining small-scale, homestead-based apiaries. The majority fall in the 2-box category (10 respondents), closely followed by the 1-box category (9 respondents); only one respondent maintained 5 boxes indicating that apiculture in the study area remains at a small and semi-commercial scale.





The hives used by the respondents are mainly wooden removable-frame hives which provide proper bee space between frames and other hive parts for easy colony management and honey extraction. Common hive types used include ISA A-type. The basic components of the hive include hive boxes, bottom boards, foundation sheets, removable frames for brood rearing and honey production, queen gates made of metal, wood, or plastic, and protective covers. The use of removable-frame hives supports easier hive inspection, honey harvesting, and colony management compared to traditional fixed-comb systems.

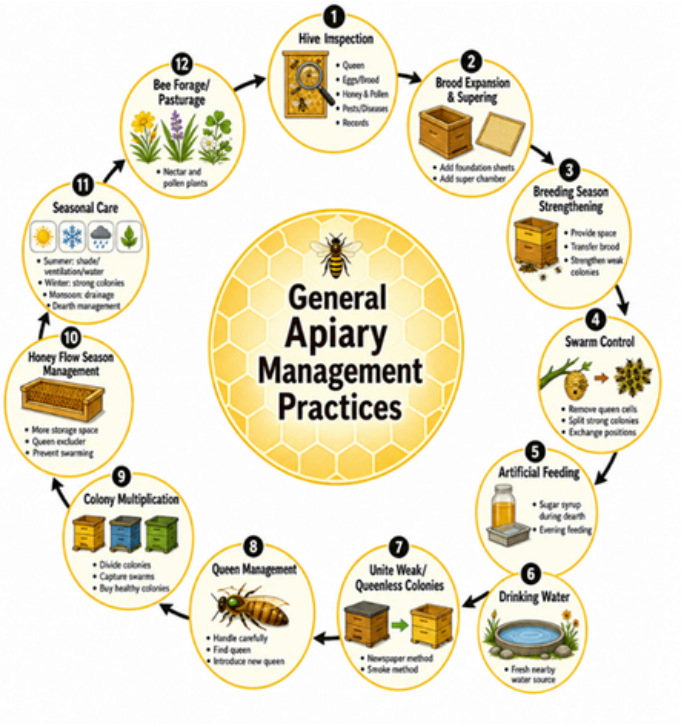
4.2 Colony Status: Active vs. Inactive Boxes

The number of bee boxes alone does not reflect the actual production potential of an enterprise. What matters more is the number of active colonies occupying those boxes. Field observations suggest that around 40-50% of the distributed bee boxes were not occupied by active colonies at the time of the study, this was mainly due to the colony absconding, colony loss and the difficulty of obtaining new colonies from nearby forest areas once a colony was lost.

Field Finding	Interpretation	Programme Implication
9 of 20 respondents operate at 1 box; 10 at 2 boxes; only 1 at 5 boxes.	Beekeeping remains a small, homestead-scale supplementary activity rather than an enterprise.	Scale-up plans must budget for colony replacement support, not only additional boxes.
40-50% of boxes estimated inactive at any point in time.	Colony loss, rather than box availability, is the binding constraint on production.	Prioritize colony stabilization before expanding box numbers (see Section 6).
Colony loss linked to limited flowering resources, pest pressure, and weather exposure.	Productivity is ecologically, not just technically, constrained.	Integrate forage planning and seasonal protection into technical support (see Sections 9-10, 12).

4.3 Management Practices and Technical Capacity

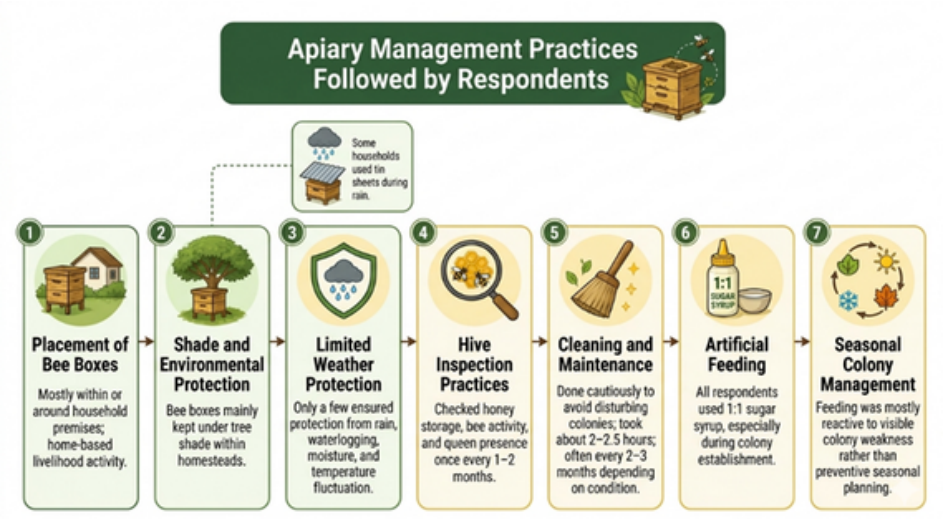
Apiary management observed among respondents includes **regular hive inspection** to assess colony health, brood condition, food storage and pests; **brood expansion and supering** as colonies grow; **feeding and brood strengthening** during the breeding period; **maintenance of forage** access; **seasonal protection** against weather extremes; **swarm control and supplementary feeding** during floral dearth; provision of **clean drinking water** near hives; uniting weak or queenless colonies; **queen monitoring**; **colony multiplication** through splitting; and **honey-flow season management** during peak flowering.



Overall, management practices in the study area remain basic and semi-managed, with limited adoption of scientific beekeeping techniques. Most respondents place bee boxes under tree shade within the homestead, supporting protection from heat, and some households use tin-sheet covering during rainfall, though moisture, drainage and ventilation management remain limited.

Observed Practice vs. Scientific Benchmark

Observed Practice	Scientific Benchmark	Gap	Programme Implication
35% inspect monthly; 35% inspect rarely; 15% weekly; 10% once in 15 days.	Hives should ideally be inspected at least twice a week.	Inspection frequency is far below recommended standard for 70% of respondents.	Introduce a simple, low-burden inspection routine and checklist (Section 4.4).
Inspection mainly checks honey storage (85%) and queen presence (65%).	Inspection should also assess brood condition, colony strength, and pest/disease status.	Pest/disease checked by only 35%; brood condition by 15%; colony strength by 5%.	Train on a full colony-health checklist, not only harvest-readiness indicators.
Feeding is reactive - triggered by visible colony weakening.	Feeding should follow a planned seasonal calendar, especially during nectar dearth.	No planned/preventive feeding calendar in use.	Introduce a seasonal feeding calendar aligned to local flowering cycles.
Colony multiplication mainly via purchase/receipt of new colonies.	Colony multiplication via planned splitting and brood transfer.	Limited use of scientific colony-multiplication methods.	Build splitting and queen-management skills to reduce dependence on colony purchase.



4.4 Hive Inspection Protocol and Colony-Health Checklist

To improve colony management a simple hive inspection checklist can help beneficiaries monitor the health and productivity of their colonies more effectively. Since field visits and inspections are already carried out every 2-3 months and typically around 2-2.5 hours, incorporating a few basic observations during each visit would not require significant additional effort.

The checklist should include:

- Queen presence and egg-laying pattern
- Brood pattern and condition (healthy vs. patchy brood)
- Honey and pollen storage levels
- Signs of pest or disease infestation (wax moth, mites, foulbrood)
- Colony strength / comb occupancy
- Physical condition of hive (moisture, ventilation, structural damage)
- Records of feeding, harvesting and any interventions

Maintaining a simple record card at the household or Community-Level Federation (CLF) level can help track condition of colonies over time. Such records would enable beneficiaries and programme staff to identify colony losses early, monitor the number of active colonies and provide timely technical support whenever required.

4.5 Equipment Availability



Bee veil



Hand Gloves



Unplugging Knife



Honey extractor

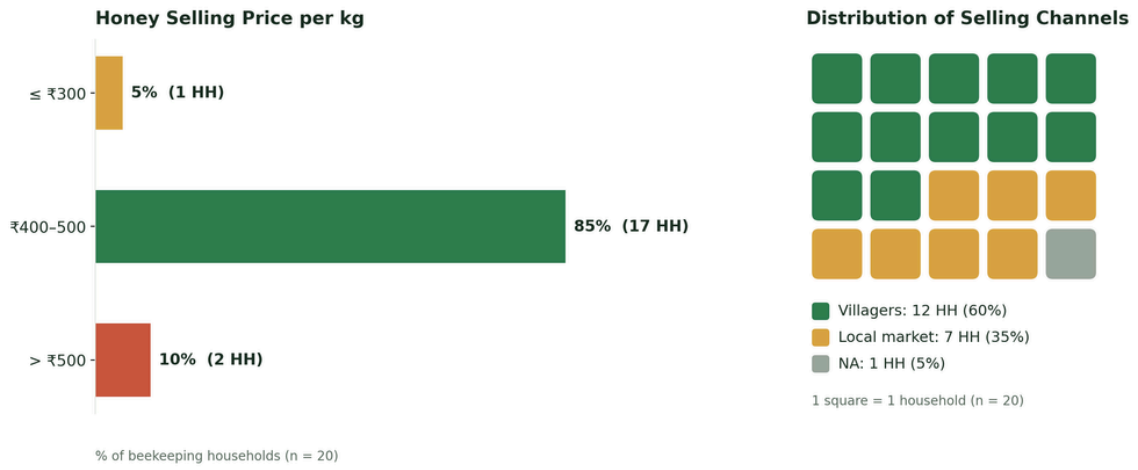


Swarm Bag

About 40 percent of respondents reported having honey extractors while 25 percent possessed protective gear such as bee veils. The use of smokers is however very low with only 10 percent of respondents reported usage of smokers during hive handling. Tools like bee veil, unplugging knife, honey extractor, gloves and other essentials are provided at the institution level, where beneficiaries access them on a revolving basis whenever required, particularly during honey harvesting periods. In terms of packaging materials, respondents reported minimal investment requirements, primarily limited to the purchase of small containers of around 250 gm capacity used for storage as well as local sale of honey.

4.6 Market Practices and Income Generation

Most respondents (95 percent) sell honey in filtered form, while a small number sell it raw, and none are involved in packaging or branding. Selling is primarily done through local channels, with 60 percent selling directly to villagers and 35 percent in nearby markets. Honey sales are primarily conducted through local channels. Around 60 percent of respondents sell directly to villagers, while 35 percent sell in nearby local markets. No respondents reported selling through SHGs, fairs, institutional channels, or online platforms. This indicates limited market diversification and absence of collective marketing systems. In terms of price realization, the majority of respondents (85 percent) reported selling honey within the price range of Rs. 500 per kg.



Graph 4: Showing the average honey price and market distribution channels

5. Livelihood Framing and Scale-Up Strategy

A key finding to this study is that simply increasing the number of the bee boxes is unlikely to improve household income unless the existing colonies remain healthy and productivity. The livelihood pathway should therefore be viewed as:

Bee Boxes → Active Colonies →Honey Production → Value Addition →Income

Distributing additional boxes without addressing colony survival (Section 4.2) risks repeating the current pattern, where 40-50% of boxes remain inactive. A phased approach is therefore recommended over a one-step box expansion:

Phase	Focus	Key Actions
Phase 1: Colony Stabilization	Ensure existing boxes hold active, healthy colonies	Field-level follow-up visits; colony-health checklist (Section 4.4); pest and colony-loss response support
Phase 2: Productivity Enhancement	Improve yield per active colony	Scientific hive inspection, seasonal feeding calendar, forage planning, queen management training
Phase 3: Box Expansion	Increase functional boxes per household (target 4-5)	Gradual expansion only after Phase 1-2 practices are established; access to healthy colonies for multiplication
Phase 4: Branding and Market Linkage	Improve price realization and market access	Standard packaging and labeling, collective aggregation through SHG/VO/CLF, direct-to-consumer channels

5.1 Enterprise expansion under different market scenarios

: Consideration of three and five boxes model

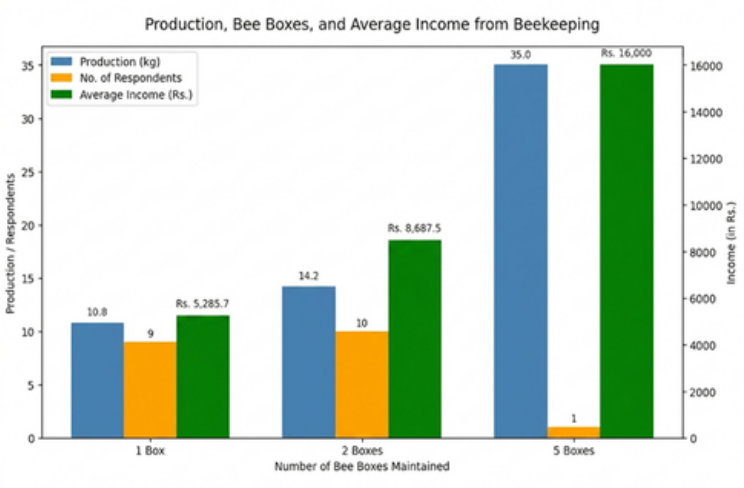
The cost-benefit analysis in Section 8 shows that under the existing individual-ownership costing model, a minimum of 5 boxes is typically needed to achieve a stable, positive net benefit once full equipment costs are counted (break-even is reached around 3 boxes on a scalability-only basis). However, where beekeepers can sell directly to consumers with basic packaging and branding rather than through informal local channels, positive returns become achievable with as few as 3 boxes because the higher realized price (up to Rs. 800/kg direct-to-consumer versus Rs. 400-500/kg through informal channels) compensates for the smaller volume. This finding suggests that programme planning should focus not only on increasing the number of bee boxes but also on helping beneficiaries access better markets to earn higher returns.

6. Income, Bee Box and Production Relationship

Production patterns across respondents are seasonal, with all households identifying winter months (November to March) as the main production period, and a few also reporting additional peaks linked to specific flowering cycles. Most respondents are maintaining only 1-2 bee boxes which also matches with the majority of households producing around 11-15 kg of honey and earning between Rs. 5,000-Rs. 10,000 annually from apiculture. This shows that households with more active bee boxes are generally able to produce more honey and earn better income.

Among the respondents maintaining 1 bee box, the average honey production is around 10.8 kg, generating an average income of approximately Rs. 4812.5. This category includes 9 respondents, showing that small-scale beekeeping is the most common practice among households. Respondents maintaining 2 bee boxes show a slight increase in production to around 14.2 kg with the average income increasing to about Rs. 8687.5.

Households maintaining only 1 bee box are mostly linked with lower production and lower income categories. Since production depends on colony strength, flowering availability, and seasonal conditions, households with fewer bee boxes are more affected when colonies become weak or inactive. This reduces both production and income.



Graph 5: Showing the Income, Bee box and Production Relationship

The respondent maintaining 5 bee boxes records an average production of around 35 kg and an average income of nearly Rs. 16000. However, the production level is comparatively lower than the expected threefold increase despite having more bee boxes.

This is mainly due to untimely extraction of honey, temporary inactivity of some bee boxes during certain production cycles and fluctuations in colony strength across seasons. These factors reduce the overall honey yield even when the number of bee boxes is higher. Nevertheless, the findings indicate that apiculture has the potential to generate better returns when the activity is expanded and colonies remain active.

7. Investment and Cost Structure

The investment pattern shows that apiculture is largely a low-cost activity for the respondents. About 55% of the beekeepers used their own money to start the activity. Key resources like bee boxes are provided individually, while honey extraction machines and protective gear are available at the Cluster Level Forum (CLF) level and shared among beekeepers as needed. Around 45% of respondents began beekeeping without direct financial investment, reflecting its accessibility and ease of entry. Regular expenses are minimal and mainly limited to feeding the bees. A few respondents also reported spending on protective gear. The overall annual expenditure remains very low, typically between Rs. 300-Rs. 500, mostly spent on sugar for feeding, highlighting that apiculture can be maintained with minimal recurring costs.

8. Cost-Benefit and Scalability Analysis

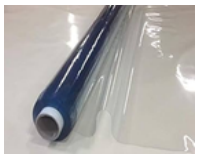
Note: The calculations below are based on a one-box, one-year cycle unless otherwise stated.

8.1 Fixed Cost of Beekeeping Setup

Particulars	Rate (Rs.)
 Bee veil	250
 Honey extractor machine	3,500
 Unplugged knife	160
Total Fixed Cost	**3,910**

8.2 Variable and Operational Cost

Particulars	Rate (Rs.)
 Bee Box	1,900
 Single-Legged stand	784
 Queen excluder	200
Sugar Feeding	250
 Shed (Tin Cost)	100
 Containers (250 gm)	20
Transportation	0
 150 gm Glass Bottle	12
 250 gm Glass Bottle	22

Particulars	Rate (Rs.)
 500 gm Glass Bottle	616
 Transparent Plastic Lid wrap	200
Vinyl Labelling (A3	60
Total cost	**4,110**

8.3 Packaging-Cost Scenario

The cost of packaging can vary depending on how and where the honey is sold. To provide a clearer picture, three common packaging options have been considered for the beneficiaries. Each option has its own packaging cost and expected selling price which allows beneficiaries to choose the most suitable approach based on the target market.

Packaging Scenario	Approx. Packaging Cost (11 kg output)	Expected Selling Price	Suited Market Channel
Loose / local container (unbranded)	~Rs. 220 (250 gm containers only)	Rs. 400-500/kg	Direct village sale to neighbours/known buyers
250 gm retail pack (glass bottle, no branding)	~Rs. 484 (22 x 250 gm bottles)	Rs. 500-600/kg equivalent	Local weekly markets (Damra, Dudhnoi)
500 gm branded bottle (label + lid wrap)	~Rs. 876 (glass bottle + lid wrap + labelling)	Up to Rs. 800/kg direct-to-consumer	Direct-to-consumer, group/CLF-branded sale

Packaging costs above are indicative, computed from Table 8.2unit rates against an average 11 kg annual output per box; actual costs will vary by scale and negotiated bottle prices.

8.4 Individual vs. Shared (CLF) Asset Ownership

The cost benefit analysis is presented under two ownership models: individually owned assets and equipment shared at the Community-Level Federation (CLF) level. This provides a clearer picture of the investment required under each ownership model.

Cost Item	Ownership Model	Note
Bee box, stand, queen excluder	Individual	Purchased/owned per beneficiary; scales with number of boxes
Honey extractor, bee veil, unplugging knife (Fixed Cost, Table 8.1)	Shared - CLF/institutional level	Accessed on a revolving basis; not a recurring cost to the individual beneficiary
Sugar feeding, shed maintenance, containers	Individual (recurring)	Ongoing annual running cost borne by the beneficiary
Packaging (bottles, labels, lid wrap)	Individual, scenario-dependent	See Section 8.3 for scenario-wise cost

The distinction between individually owned and shared assets helps in understanding the actual investment required from beneficiaries. While certain items such as bee boxes and feeding materials are directly purchased and managed by the beneficiary and equipment like honey extractors and protective gear can be shared through the CLF. As a result, the cost of establishing and operating an apiculture enterprise can vary depending on the ownership model.

8.5 Overall Cost-Benefit Analysis (1 Bee Box, Full Cost Basis)

Particulars	Details
Production	11 kg
Selling rate	Rs. 500 per kg
Gross income	Rs. 5,500
Total cost (Fixed + Variable)	Rs. 8,020
Net benefit	- Rs. 2,520
Cost-Benefit Ratio (CBR)	0.69 : 1

The overall cost benefit ratio (CBR) of beekeeping for 1 bee box comes to 0.69:1. This means that for every Re.1 invested in the activity the return generated is around Re. 0.69. The analysis shows that the overall income from a single bee box is lower than the total investment made in the bee box is lower than the total investment made in the beginning.This is mainly because the initial setup cost is quite high.

This is mainly because the initial setup cost is quite high. Materials such as honey extractor, bee veil and other protective equipment require a large one-time investment at the start of the activity. The net benefit therefore comes to Rs. 2520, indicating that the full establishment cost is not recovered from the income generated by only 1 bee box. However, the most of the expenses included under the fixed cost are durable assets that can be used for an average of 8-10 years. These items do not need to be purchased repeatedly every year[1].

Further, the variable cost calculation includes packaging expenses based on the use of 500 gm glass bottles where the bottle requirement has been calculated considering an average production of 11 kg honey. This reflects the operational and marketing-related expenditure involved in preparing the honey for sale.

8.6 Beneficiary-Level Recurring Cost-Benefit Analysis

Particulars	Amount (Rs.)
Sugar feeding	250
Shed maintenance	100
Containers (250 gm)	880
Total recurring cost	1,230
Gross income (11 kg @ Rs.500)	5,500
Net benefit	4,270
Beneficiary-level CBR	4.47 : 1

When only the beneficiary's yearly running expenses are considered, the activity appears much more profitable. The recurring expenses mainly include sugar feeding, small shed maintenance, and containers, which together come to only Rs. 1230. Against this expense, the estimated income from honey is Rs. 5500, leaving a net benefit of Rs. 4270. The beneficiary-level CBR therefore becomes 4.47:1, meaning that for every Re. 1 spent on yearly maintenance, the beneficiary earns around Rs. 4.47 in return. This clearly shows that once the basic setup and equipment are available, the regular maintenance cost of beekeeping remains low and the activity can provide good supplementary income. However, the recurring cost calculation includes packaging expenses for 250 gm containers, where the bottle requirement has been estimated considering an average honey production of 11 kg. This reflects the operational expenditure involved in packaging and marketing the honey at the beneficiary level.[1]

[1] Considering only the 500gm glass bottles

[2] 20*44(bottles)*11 kg (avg honey)

8.7 Scalability Analysis

No. of Boxes	Production (kg)	Income (Rs.)	Fixed Cost (Rs.)	Variable Cost (Rs.)	Total Cost (Rs.)	Net Benefit (Rs.)	Scalability CBR
1 box	11	5,500	3,910	4,110	8,020	-2,520	0.69 : 1
2 boxes	22	11,000	3,910	8,220	12,130	-1,130	0.91 : 1
3 boxes	33	16,500	3,910	12,330	16,240	260	1.02 : 1
4 boxes	44	22,000	3,910	16,440	20,350	1,650	1.08 : 1
5 boxes	55	27,500	3,910	20,550	24,460	3,040	1.12 : 1

Break-even (CBR just above 1:1) is achieved at around 3 boxes on the full-cost basis, improving to 1.12:1 at 5 boxes. As discussed in Section 5.1, this threshold falls to around 3 boxes if beneficiaries can access direct-to-consumer pricing through basic packaging and branding.

In the scalability calculation, the variable cost includes major operational and expansion-related components such as bee boxes, stands, honey extractor, sugar feeding, packaging materials and other recurring expenses. As additional bee boxes are introduced, certain costs such as bee boxes and stands increase proportionately because they are required separately for each colony. However, some equipment and resources can still be utilized efficiently across multiple units, which helps improve the overall economic viability of the enterprise.

Overall, scaling up the number of bee boxes helps distribute the establishment cost more effectively while increasing honey production and income generation. Tools like honey extractor machine, bee veil and unplugging knife are treated as common or shared assets that can be used for multiple bee boxes and therefore do not need to be purchased repeatedly for every additional box.

If provided the benefits,

No. of bee boxes	Production (kg)	Income (in Rs.)	Beneficiary variable cost (in Rs.)	Net benefit (in Rs.)	Scalability CBR
1 box	11	5500	1230	4270	4.47 : 1
2 boxes	22	11000	2460	8540	4.47 : 1
3 boxes	33	16500	3690	12810	4.47 : 1
4 boxes	44	22000	4920	17080	4.47 : 1

Therefore, the scalability ratios:

Scalability CBR: 22000/4920 = 4.47:1

This analysis shows that as the number of bee boxes are increased the income from bee keeping also increases steadily, while the recurring maintenance cost remains comparatively low. For example, increasing from 1 bee box to 4 bee boxes raises the estimated income from Rs.5500 to Rs. 22,000. At the same time the recurring beneficiary cost increases only from Rs. 1230 to Rs. 4920. The scalability ratio remains at 4.47:1, showing that the activity continues to remain financially beneficial even when expanded. However, in terms of the labour time invested in activities such as hive cleaning and honey extraction generally require around 2 - 2.5 hours and are carried out once in every two to three months. If hired labour is considered, the average labour cost would be Rs.350 annually per household depending on local wage rates.

8.8 Five-Year Profitability (Beneficiary Recurring Basis)

From the second year onward, major fixed assets (extractor, unplugging knife, bee veil average usable life ~5 years) are already available, so only recurring operational and packaging costs (sugar feeding, labelling, lid wrap, bottles) are incurred annually. This substantially improves multi-year profitability:

No. of Boxes	Year 1 Net Benefit	Year 1 CBR	Year 2+ Net Benefit (annual)	Year 2+ CBR	5-Year Cumulative Benefit
1 box	-2,520	0.69 : 1	4,374	4.88 : 1	14,976
2 boxes	-1,130	0.91 : 1	8,748	4.88 : 1	33,862
3 boxes	260	1.02 : 1	13,122	4.88 : 1	52,748
4 boxes	1,650	1.08 : 1	17,496	4.88 : 1	71,634
5 boxes	3,040	1.12 : 1	21,870	4.88 : 1	90,520

9. Capacity Building and Handholding Support

All respondents had received some form of apiculture training, but the depth and consistency of that training vary considerably across technical areas. The findings below are organized into training received, resulting gaps, expressed demand, and a proposed forward plan.

9.1 Training Received

Training Area	% of Respondents Trained
Feeding practices (sugar syrup)	100%
Honey extraction and post-harvest handling	85%
Basic orientation (bee species, hive structure, box placement)	75%
Hive management / installation and field demonstration	55%
Colony care	50%
Pest and disease management	10%
Seasonal colony management	5%

9.2 Gaps

Training exposure is heavily concentrated in feeding and harvesting, while the technical areas most linked to colony survival pest and disease management and seasonal colony management show the lowest coverage (10% and 5% respectively). This directly explains the colony-inactivity pattern documented in Section 4.2 is that while beneficiaries have gained knowledge in feeding and honey harvesting, additional training on preventing and managing colony losses could help improve colony survival and ensure more consistent honey production.

9.3 Demand

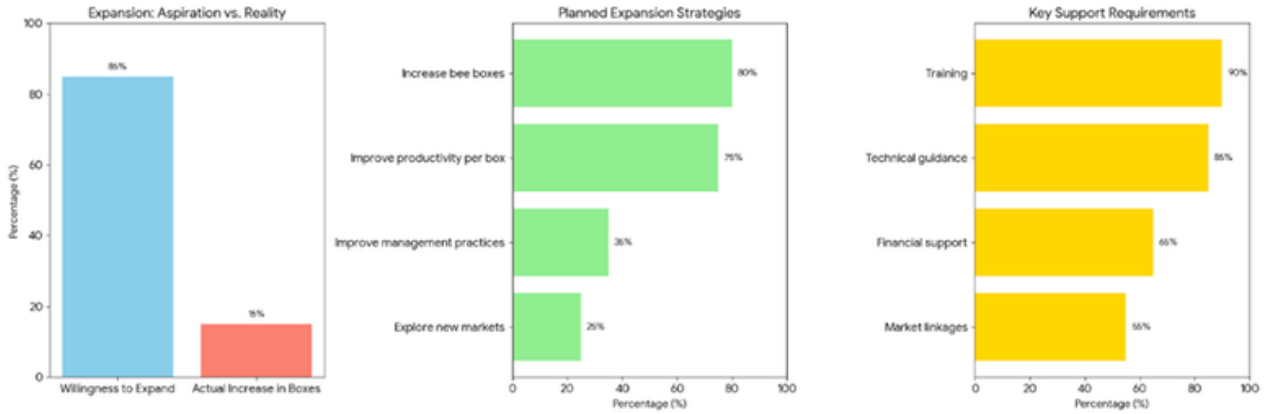
Training Need Expressed	% of Respondents
Advanced colony management (brood development, colony strengthening, scientific inspection)	85%
Seasonal management and colony care (monsoon, dearth periods)	80%
Pest and disease management	70%
Market linkage, packaging, branding and honey marketing	50%

9.4 Future Plan: Ongoing, Field-Based Support

The gap between training received and training needed indicates that one-time orientation training is insufficient. A shift toward continuous, practical, field-based support is recommended, structured around:

- Refresher training cycles aligned to the seasonal calendar (pre-monsoon, dearth period, honey-flow season) rather than a single upfront session.
- Scheduled field visits / colony-health camps timed to coincide with high-risk periods (colony establishment, monsoon, nectar dearth).
- A community-based “Bee Mitra” (peer resource person) model, identifying experienced beekeepers such as Shakuntala Sutradhar (see Best Practice, Annexure) to provide first-line peer technical support and mentor new beneficiaries, reducing dependence on external technical staff for routine issues.

10. Expansion Intent and Support Needs



Graph 4: Intent of Expansion and support required[1]

A large majority (85%) of respondents expressed willingness to expand their apiculture activity, while 15% have already increased their numbers of hives. Planned expansion is both quantitative and qualitative: 80% aim to increase the number of bee boxes and 75% seek to improve productivity per box. Support needs identified include training (90%), technical guidance (85%), financial assistance (65%), and market linkages (55%). Consistent with Section 5, this expansion intent should be sequenced behind colony stabilization and productivity gains, rather than acted on as an immediate box-count increase.

[1] Graph 3 & Graph 4 designed using Google Gemini

10.1 Awareness, Perception and Willingness among Non-Beekeepers



The findings from non-beekeepers indicate that awareness of apiculture exists within the community, primarily through observation of existing practitioners. Most respondents are familiar with the presence of beekeeping in the village, including wild bee hives and honey extraction practices. However, their understanding is largely limited to these visible aspects, with less clarity on technical practices such as colony management, seasonal care, and maintenance requirements.

In terms of livelihood perception, agriculture and plantation continue to be viewed as the primary and more reliable sources of income among non-beekeepers. Apiculture, in comparison, is perceived as a supplementary activity rather than a primary livelihood. Apiculture is generally seen as a supplementary activity, supported by its compatibility with existing livelihoods and seasonal nature of production. Despite this, there is clear interest among non-beekeepers in starting apiculture. The interest is driven by its perceived advantages, including low land requirements, the potential to generate additional income, and the flexibility to manage the activity alongside other livelihood activities. Respondents also highlighted that apiculture can be practiced within the household space without interfering with agricultural work, making it an accessible and adaptable option for rural households.

11. Ecological and Environmental Risks

Several risk factors that across climate, colony-loss and market sections are in practice, interlinked drivers of the same underlying problem colony loss and are consolidated here as a single risk area for programme attention.

Climate and Weather

- Heavy rainfall or prolonged dry weather restricts foraging, lowering honey collection and weakening colonies.
- Excessive summer heat reduces daytime colony activity; colonies may weaken or migrate toward nearby forest areas.
- During continuous rainfall, bees remain inside the hive and consume stored honey rather than foraging, reducing yield and weakening the colony over time.
- Colonies are heavily dependent on the rubber-plantation flowering season as the primary nectar source; honey collection and colony activity are notably stronger during this period.

Habitat, Forage and Human Pressure

- Limited availability of flowering plants within the homestead environment outside the rubber and mango flowering windows constrains forage year-round.
- Excessive use of chemicals and pesticides in nearby plantations affects bee health and honey quality.
- Traditional honey-hunting practices (use of smoke, fire, dhuna) together with deforestation damage natural bee habitats and wild colonies.

Pests, Disease and Wild Bee Pressure

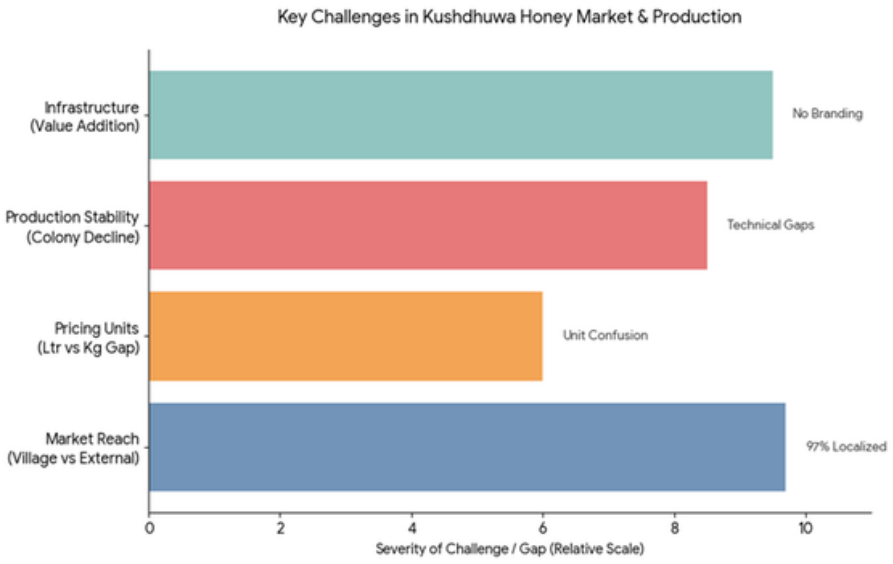
- Attacks by wild bees from nearby forest areas are a recurring challenge for managed colonies.

- Pest and disease management is the least-trained technical area (10% of respondents; Section 9.1), leaving colonies vulnerable to wax moth, mites and other threats that go unidentified until losses occur.

The colony losses observed in section 4.2 highlights the need for greater attention to pest and disease management, habitat conservation and seasonal colony care. Integrating these topics into future training and technical support could help improve colony survival and productivity. In addition beneficiaries reported that the presence of bee colonies contributed to better pollination, resulting in improved flowering, fruiting and seed formation in nearby crops, vegetables and fruit plants.

12. Market Ecosystem and Institutional Roles

12.1 Current Market Scope



The market for honey in Kushdhuwa block is primarily localised and informal with most transactions taking place through direct and small-scale channels rather than structured market systems. The honey is predominantly sold in filtered form with all respondents reporting basic filtering before sale. However, practices such as pacakging, branding and labeling are not commonly adopted ad honey is typically sold in simple containers without standarization.

In terms of sale all beekeepers reported selling honey directly within the village primarily to neighbours, local households and known buyers like the teachers, employees from the nearby offices who are aware of the honey production in the area. Only a smaller proportion(3%) of respondents also access local markets where honey is sold in limited quantities. Pricing of honey is relatively uniform across respondents with most selling at around Rs. 500 per kilogram, while a few reported selling at Rs. 600 per kilogram. It was also observed that some beneficiaries are not fully aware of the appropriate unit for selling honey, with a few selling it in terms of litres instead of kilograms. This practice may lead to potential loss, as honey is more accurately measured and priced by weight rather than volume. The control over pricing appears to be influenced by local demand, buyer negotiation and familiarity along with the demand of organic honey locally.

However, there is no presence of formal aggregators or organized collection systems within the village. There are also no established linkages with institutional buyers, cooperatives or larger market platforms. In some cases, small shopkeepers from the village act as informal intermediaries but their role is limited and not consistent across all respondents

12.2 Apiculture Value Chain

The current market discussion is elevated here into a full value-chain view to make explicit where SHG/VO/CLF institutions can add the most value beyond the household level:

Inputs → Production → Processing → Aggregation → Markets → Household Income

Value Chain Stage	Current Status	Institutional Role (SHG / VO / CLF)
Inputs	Bee boxes individually owned; extractor, veil, knife shared at CLF level on revolving basis	Manage shared-asset pool, revolving access schedule, and colony-replacement support
Production	Basic, semi-managed practices; 40-50% boxes inactive	Organize peer "Bee Mitra" support and colony-health record-keeping
Processing	Basic filtering only; minimal use of by-products (beeswax)	Facilitate shared/common extraction and filtering infrastructure; beeswax collection for secondary products
Aggregation	None- honey sold individually in small quantities	Aggregate volumes across member households for consistent supply
Markets	Informal, hyper-local, unbranded; no institutional buyer linkage	Standardize pricing, negotiate with weekly-market and institutional buyers, support common branding/labelling
Household Income	Supplementary, seasonal, Rs. 5,000-16,000/year depending on box count	Track member-level income data to inform further scale-up decisions

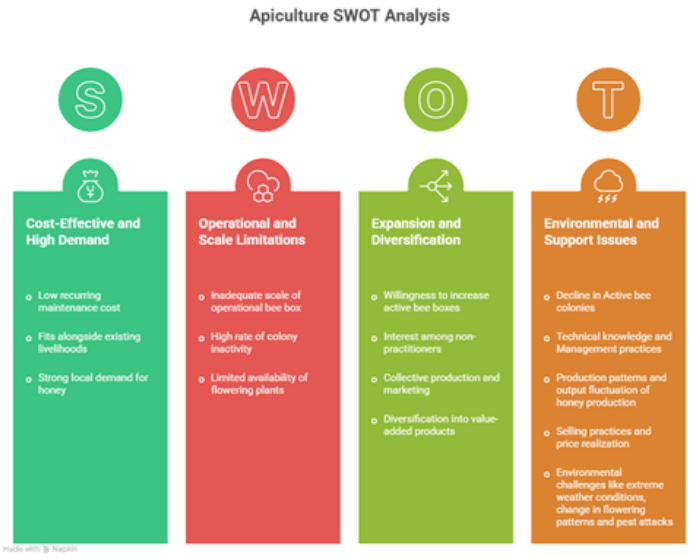
12.3 Enterprise Models: Individual, Collective and Group-Based

Model	Description	Suited For	Key Constraint
Individual	Household sells honey directly to villagers/local market on its own	Households at 1-3 boxes, early-stage adoption	Limited volume, price-taking, no bargaining power
Collective (aggregation)	SHG/VO pools honey from multiple households for joint sale at improved price	Households at 2-4 boxes wanting better price without individual branding investment	Requires basic quality standardization across members
Group-based enterprise (CLF-anchored)	CLF-branded, packaged product with shared processing/extraction infrastructure and institutional buyer linkage	Clusters with several stabilized, active beekeepers ready to move toward Phase 4 (Section 5)	Requires sustained volume, consistent quality, and market development investment

Positioning apiculture as a group-supported livelihood model rather than a purely individual household activity allows SHGs, VOs and CLFs to absorb the aggregation, quality-control, shared-asset and buyer-linkage functions that individual households are currently unable to perform on their own.

13. SWOT Analysis: Field-Based, with Contradictions

The field situation presents a mix of enabling factors and structural constraints, often existing simultaneously.[1]



Strengths: One of the major strengths of the activity is its **low recurring maintenance cost**. Most respondents reported spending only basic requirements making the activity affordable even for small and marginal households. Since beekeeping **does not require large landholding** and can be managed within the homestead area, it f**its alongside existing livelihoods activities**. Another important strength is the strong local demand for honey.

Weaknesses: Despite these inherent strengths, apiculture remains constrained by multiple operational limitations. Productivity levels are low with most households producing an average of 11 kg of honey annually, reflecting limited efficiency. A significant concern is the high rate of **colony inactivity** with approximately 40-50% of bee boxes non-functional, directly reducing output. Respondents shared that one of the key reasons behind this is the **limited availability of flowering plants** within the homestead environment. Bee colonies depend heavily on seasonal flowering from rubber plantations and mango flowers while other local flowering resources remain inadequate throughout the year. As a result, colonies often struggle to find sufficient nectar and pollen during non-flowering periods affecting colony strength and survival. The **scale of operation also remains inadequate** as the majority of households manage only 1-2 bee boxes which falls below the minimum threshold required for economic viability. These factors collectively result in low and inconsistent income, reinforcing the activity's status as supplementary rather than primary.

[1] Note: Designed using Napkin.ai

Opportunities: Field findings suggest considerable potential for expansion and system strengthening. Many existing beekeepers expressed **willingness to increase** the number of active bee boxes if proper technical support and colony availability can be ensured. The scalability analysis also supports this possibility, as income rises steadily when the number of active boxes increases, while the recurring maintenance cost remains relatively low. Many existing beekeepers expressed willingness to increase the number of active bee boxes if proper technical support and colony availability can be ensured. The scalability analysis also supports this possibility, as income rises steadily when the number of active boxes increases, while the recurring maintenance cost remains relatively low. There is also observable **interest among non-practitioners**, suggesting scope for wider adoption. Another important opportunity lies in **collective production and marketing**. At present, honey is sold individually in small quantities, limiting market reach and bargaining power. Organizing beekeepers into groups for aggregation and collective sale can help create larger marketable volumes and improve price realization.

Furthermore, the study also indicates untapped potential for **diversification into value-added products** and collective enterprise development. Respondents shared that beeswax generated during honey extraction is currently either minimally utilized or discarded, despite having local market value. Field interactions suggest that beeswax can be sold at approximately Rs. 200 per kg and may also be used for preparing secondary products such as candles and other small household items. In addition, there is scope for improving income through collective marketing systems at the group level.

Threats:

A. **Decline in Active Bee Colonies** is one of the major issues observed was the decline in active bee colonies at household level. Although many beneficiaries still possess bee boxes, not all boxes currently contain active colonies. Respondents also mentioned that **excessive use of chemicals and pesticides in nearby plantations** affects bee health and honey quality. **Traditional honey hunting practices** using smoke, fire and dhuna, along with **deforestation and destruction of trees,** were reported to damage natural bee habitats and colonies. Climate-related factors such as **irregular rainfall, excessive heat, storms, and changing flowering patterns** further affect colony strength and honey production. Once colonies are lost, most households face difficulty in replacing them because of the cost and dependence on sourcing colonies from nearby forest areas. As a result, many bee boxes remain unused for long periods.

B. **Technical Knowledge and Day-to-Day Management** practices are mostly basic and inconsistent. Hive inspections are generally done one in every one-two month and depend more on observation and experience rather than systematic monitoring. Technical knowledge related to colony strengthening, identifying pest or disease attacks, queen management and seasonal care remain limited among beneficiaries.

C. **Production Patterns and Output Fluctuation** of honey production is not consistent across households or seasons. Most respondents reported harvesting only once or twice during peak flowering periods, with little to no production in the rest of the year. Output varies significantly depending on colony survival and environmental conditions and many households' experience irregular or reduced yields over time.

D. **Market Access and Scale of Operations** continue to operate at a very small scale, with most households maintaining only one or two bee boxes. There is currently **no system of collective aggregation, cooperative marketing or bulk selling.** Beneficiaries usually sell honey individually within nearby villages or local markets. Due to the limited scale of production, households are unable to access larger buyers or organized market channels. This keeps the activity confined to a localized and supplementary level rather than developing into a larger income-generating enterprise.

E. **Selling Practices and Price Realization** of honey is generally stored and sold in locally available bottles or containers without standard packaging, branding, or proper labeling. Some respondents **use approximate measurements instead of standardized weighing methods** which often leads to inconsistency in pricing and quantity sold. Prices are mostly determined through local relationships and buyer negotiation rather than market-based pricing systems. This affects the overall value realization and limits opportunities for better market positioning.

F. **Environmental and Practical Challenges**, respondents frequently mentioned challenges such as **wild bee disturbance, pest attacks, extreme weather conditions, and changing flowering patterns**. Environmental factors such as pesticide use, deforestation, and climate variability further affect bee activity, colony survival, and honey flow, making stable production difficult to maintain.

14. Key Themes Emerging from the Study



The findings bring out several interconnected themes that define the current status and future potential of apiculture based on both survey findings and field-level interactions. The main theme that emerges is that apiculture is currently positioned as a supplementary livelihood activity rather than a primary income source. The income generated from honey production as reflected in the survey remains limited and seasonal and most households continue to rely on agriculture and plantation as their main livelihood. This positioning is further reinforced by the observed variability in production and the presence of households with no active colonies, which limits the reliability of apiculture as a standalone income source. Another key theme relates to the critical need for continuous training and handholding support. While all respondents have received some level of training, the findings clearly indicate that this has not translated into sustained technical capacity. Gaps in colony management, pest control, seasonal care and hive maintenance continue to affect productivity and colony survival. This highlights that one-time training is insufficient, and there is a need for ongoing, practical, and field-based support systems.

The study also shows that uncertainty plays a role in whether people continue or start apiculture. Issues like loss of bee colonies, attacks by wild bees, weather conditions, and changes in production make the activity less predictable. Seeing these experiences among existing beekeepers also influences how non-beekeepers think about taking up apiculture.

However, the theme of market clarity and limitations emerges as an important factor. While demand for honey is present and consistent the market system is informal and localized. At the same time gaps in basic market knowledge such as appropriate units of sale indicate the need for strengthening market awareness alongside production.

15. Recommendations

Recommendations are organized to follow the phased growth strategy introduced in Section 5, colony stabilization, productivity enhancement, box expansion, and branding/market linkage rather than treating box expansion as the first step.

Phase 1: Colony Stabilization

There is a need to first stabilize and strengthen existing beekeeping practices. A section of respondents currently have no active colonies despite initial adoption, indicating that priority should be given to improving colony survival and management rather than immediate expansion. Regular field-level support and follow-up visits can help in addressing issues such as colony loss, pest attacks, and improper handling practices.

Phase 2: Capacity Building and Productivity Enhancement

Shift from one-time training toward continuous, hands-on training in colony management, hive inspection, seasonal care and pest and disease control using demonstration-based and on-site learning (Section 9.4).

Encourage regular inspection routines using the colony-health checklist (Section 4.4) to improve productivity and reduce colony loss.

Develop a community-based “Bee Mitra” network of experienced peer beekeepers to extend routine technical support between formal training cycles.

Phase 3: Gradual Box Expansion

Once colony stabilization and basic management practices are in place gradually increase active bee boxes toward at least 4-5 functional boxes per household, consistent with the scalability analysis in Section 8.7-8.8.

Phase 4: Value Addition, Branding and Market Linkage

Encourage collective rather than individual honey sale, using SHG/VO/CLF-based aggregation to build volume, ensure regular supply, and improve bargaining power (Section 12).

Provide training on standardized packaging, labelling, correct weighing (by weight, not volume) and branding under a common village or group identity to improve consumer trust and price realization.

Support direct-to-consumer selling where feasible, which the analysis in Section 5.1 shows can make even 3-box households economically viable.

Build awareness and basic training on beeswax and other by-products for candle-making and related secondary products, as an additional income stream.

Organize exposure visits and demonstration-based learning, drawing on successful local practitioners such as Shakuntala Sutradhar (Annexure), to build confidence and encourage adoption of improved practices.

17. Conclusion

The overall analysis of apiculture in the study area shows that while the activity is well introduced and respondents have gained basic exposure through at least one production cycle, its potential remains underutilized. Initial access to inputs has enabled households to adopt beekeeping; however, a clear gap exists between asset ownership and actual productivity, primarily due to challenges in sustaining bee colonies over time. At the practice level, beekeeping continues to operate in a basic and semi-managed form. Limited adoption of scientific practices such as regular hive inspection, forage management, and monitoring of colony health indicators affects the long-term viability of colonies and consistency of production. Income outcomes reflect these constraints, with apiculture contributing only a small and supplementary share to household earnings. The seasonal nature of production, combined with environmental and management-related factors, leads to irregular output and reinforces the perception of apiculture as a secondary livelihood option rather than a primary income source. At the market level, the ecosystem remains highly localized, with direct sales, minimal value addition, and limited linkage to broader markets. While local demand provides a stable base, the absence of aggregation, branding, and structured market access restricts opportunities for scale and improved price realization.

Overall, the findings suggest that apiculture holds clear potential as a livelihood activity, but its growth is currently constrained by gaps in technical capacity, colony management, and market integration. Strengthening these areas through a more structured and integrated support system will be essential to enable a shift from small-scale, supplementary practice to a more stable and income-generating enterprise.



Shankuntala Sutradhar

Village: Kamarpara, GP Kushdhuwa
Primary Livelihood: Agriculture and Livestock
Apiculture Initiation: 2024-2025

Shakuntala Sutradhar represents a strong example of how timely training, practical exposure, and individual motivation can transform apiculture into a productive supplementary livelihood. She began beekeeping in 2024-25 after receiving bee boxes under the revolving fund support from SeSTA. Starting with two units- two modern bee boxes and one traditional hive, she integrated apiculture within her homestead placing the boxes under tree shade to ensure a suitable environment for the colonies.

In the initial phase, her practices were basic and largely trial-based. She faced challenges in proper hive placement, colony protection during rains, and technical aspects such as honey extraction without damaging the hive. Early losses due to water entering the hive and lack of protective covering highlighted gaps in her understanding of scientific management practices. However, with structured training on feeding, hive management, pest control and honey extraction, Shakuntala quickly adapted and improved her practices. She began maintaining regular hive inspections every 15-20 days, ensured cleanliness of the bee box, and adopted proper placement techniques by covering the hive to prevent rainwater damage. Feeding practices were optimized with limited use of sugar syrup (only during initial days), allowing



colonies to thrive on natural forage available in the surrounding environment.

A key turning point in her journey was her ability to translate learning into practice. Not only did she improve her own productivity but she also emerged as a local support resource for other beekeepers. She actively assists peers in honey extraction and shares technical guidance, strengthening knowledge transfer within the community. Shakuntala also demonstrated strong market orientation. She aggregates honey by purchasing from other beekeepers at Rs. 500 per kg and sells it at Rs. 600 per kg through local markets and nearby shops. This small but effective value addition model has helped her increase income while also supporting market access for others. In the 2024-25 season, she produced approximately 15 kg of honey, with an average yield of 2.5 kg per box and earned around Rs. 8,000. Her annual investment remained minimal around Rs. 300 for sugar feeding reflecting efficient cost management.

Looking ahead, Shakuntala has expressed a clear interest in expanding her apiculture activity beyond the current scale particularly through additional support under the revolving fund. Her journey highlights that with the right combination of training, practical application, and peer learning, small-scale beekeeping can evolve into a more reliable and community-driven livelihood activity. Her transition from a beginner facing colony loss to a confident practitioner and local guide underscores the potential of apiculture when supported with practical training and market linkage opportunities.

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