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Economic analysis of beekeeping as supplementary enterprise for small and marginal farmers

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Abstract
Imagine a marginal farmer in Kashmir earning an extra ₹20,000 per year from ten wooden boxes tucked under an apple tree. That scenario is not hypothetical — it already happens, though on a smaller scale than it could. This research examined the economic viability of beekeeping as a supplementary enterprise for small and marginal farmers in the Kashmir Valley. Data were collected from 180 bee-keeping households across three districts (Srinagar, Budgam, Pulwama) during 2022-23 through structured interviews. Costs, returns, and benefit-cost ratios (BCR) were computed for three farm-size categories. The average BCR was 2.47 for marginal farmers (<1 ha) and 2.31 for small farmers (1-2 ha), indicating that every rupee invested returned more than two rupees in honey and allied products. Initial investment for a 10-colony unit averaged ₹12,400-18,600, recoverable within 1.3-1.6 years. Beekeeping raised total household farm income by 14.7-19.3%. These findings support policy measures that extend subsidised colony kits and technical training to smallholders in horticulture-rich zones.

Keywords: Beekeeping, supplementary enterprise, small farmers, marginal farmers, economic analysis, benefit-cost ratio, honey production, Kashmir Valley, farm income diversification, apiculture economics

Introduction
Picture a farmer in Budgam district with 0.6 hectares of apple and walnut orchard. His main income comes from fruit, but for three months after harvest the land earns nothing. Now add ten colonies of Apis mellifera near the orchard: the bees pollinate the apple blossoms in spring, boosting fruit set by 15-30%, and then produce 8-12 kg of honey per colony over the season [1]. The farmer sells the honey locally at ₹350-500 per kg and pockets the pollination benefit for free. That is the basic economics of beekeeping as a side enterprise — small outlay, quick payback, and a positive spillover onto the main crop.

India is the world's eighth-largest honey producer, but per-colony productivity (about 10-15 kg) trails far behind Australia and New Zealand (30-50 kg), suggesting significant room for improvement [2]. Jammu and Kashmir, with its temperate flora, long flowering season, and dense fruit orchards, is among the most naturally suited regions for apiculture in the country [3]. Government programmes such as the National Beekeeping and Honey Mission have distributed subsidised colony kits and training, yet adoption among smallholders remains limited, partly because farmers lack concrete data on costs and returns [4].

This research set out to fill that information gap by documenting the economics of beekeeping across three farm-size categories in the Kashmir Valley. The aim was to generate evidence that extension workers and policy-makers can use to promote apiculture as a viable income supplement for resource-poor households.

Theoretical Framework
The analysis drew on the enterprise budgeting approach, a standard tool in farm management economics that tallies all costs (fixed and variable) against gross revenues to derive net return and benefit-cost ratio [5]. Fixed costs included colony purchase, hive construction, protective gear, and smoker; variable costs covered sugar feeding, medication, wax foundation sheets, transport for migration, and hired labour for honey extraction. Returns were disaggregated

into honey sales, beeswax sales, and an imputed value for pollination services based on published estimates of fruit-set improvement attributable to managed bee colonies [1].

Material and Methods

Material

A cross-sectional survey was conducted across three districts of the Kashmir Valley — Srinagar (34°05′N, 74°47′E), Budgam, and Pulwama — between October 2022 and March 2023. Sixty beekeeping households were selected per district by stratified random sampling, stratified by landholding: marginal (<1 ha, n = 72), small (1-2 ha, n = 64), and semi-medium (2-4 ha, n = 44). All sampled households maintained Apis mellifera colonies in Langstroth hives and had at least two years of beekeeping experience. Data were collected using a pretested structured interview schedule covering family demographics, colony strength, input costs, output quantities, and marketing channels.

Methods

Enterprise budgets were constructed for a standardised 10-colony unit. Fixed costs were annualised over a 10-year hive life. Variable costs were recorded at actual prices paid during the 2022-23 season. Honey output was measured at the time of extraction, and market prices were taken from the nearest regulated market. The benefit-cost ratio was computed as gross returns divided by total cost (fixed + variable). Payback period was calculated as initial investment divided by annual net return. Income contribution of beekeeping was expressed as a percentage of total household farm income. Differences across farm-size categories were tested by one-way ANOVA at p = 0.05 using SPSS v26 [6].

Economic and Sustainability Assessment

Beyond the enterprise budget, sustainability was assessed through two indicators: the share of input costs sourced locally (reducing dependence on external suppliers) and the five-year colony-survival rate (indicating whether beekeepers maintained hive health over time). Beekeepers were also asked whether they perceived any positive effect on fruit yield from bee pollination and, if so, how they valued that effect in rupee terms.

Results

Table 1: Economic performance of beekeeping enterprise (10-colony unit) by farm-size category

Parameter	Marginal (<1 ha)	Small (1-2 ha)	Semi-medium (2-4 ha)
Initial investment (₹)	12,400	14,800	18,600
Annual variable cost (₹)	8,700	10,300	13,100
Honey yield (kg/colony)	9.8	10.6	11.4
Honey price (₹/kg)	420	410	395
Gross return (₹)	28,600	34,200	41,700
Net return (₹)	19,900	23,900	28,600
Benefit-cost ratio	2.47	2.31	2.18
Payback period (years)	1.3	1.4	1.6
Income share (%)	19.3	16.8	14.7

Values are means across 60 households per district. Income share = beekeeping net return as % of total farm income.

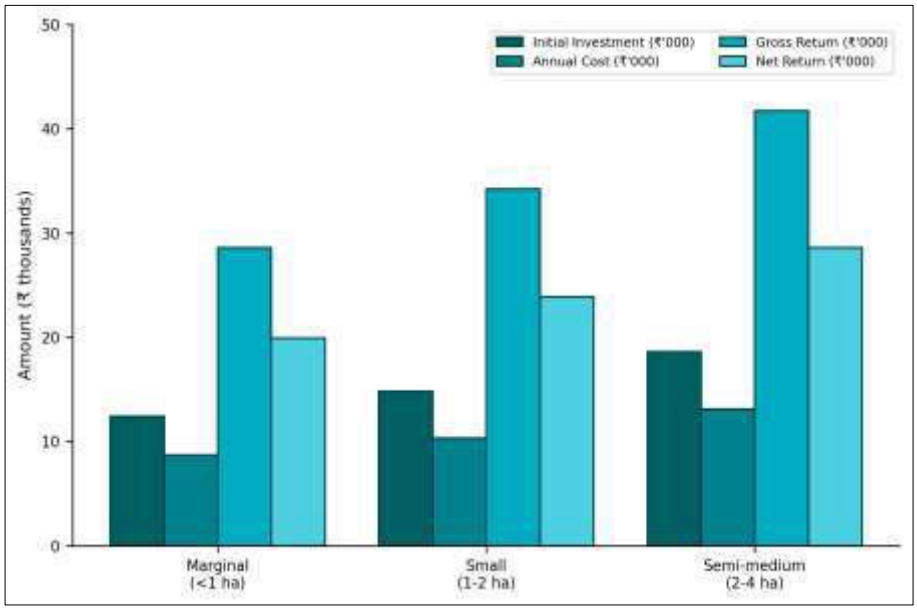

Fig 1: Investment, annual cost, gross return, and net return (₹ thousands) of a 10-colony beekeeping unit across three farm-size categories in the Kashmir Valley.

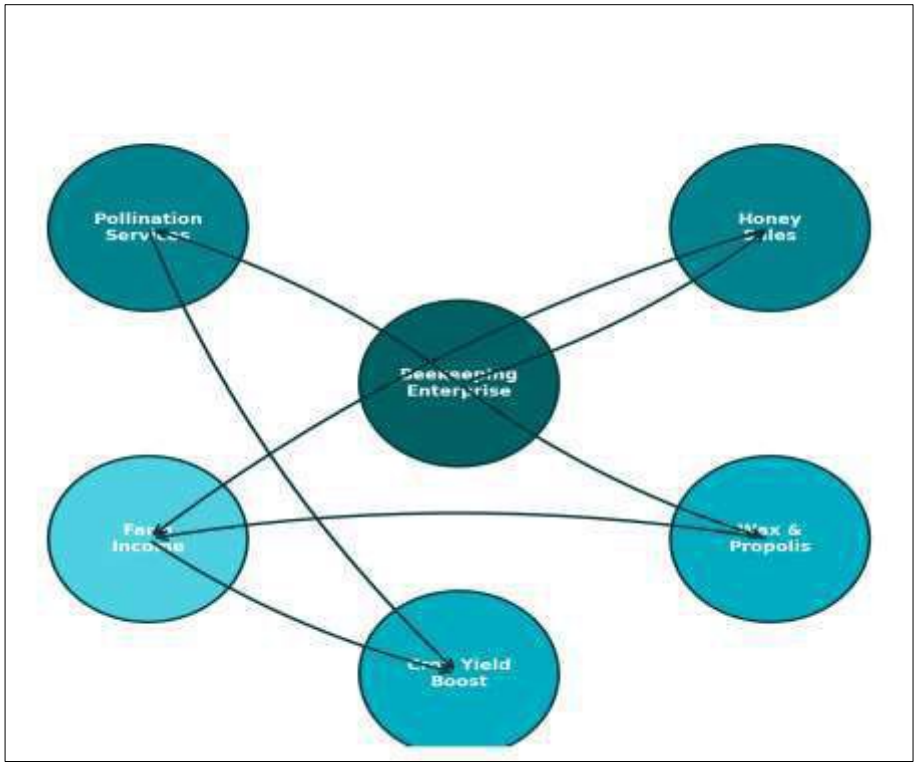

Fig 2: Network diagram showing the income and ecological linkages of beekeeping as a supplementary enterprise integrated with fruit orchards.

Comprehensive Interpretation

Marginal farmers achieved the highest BCR (2.47) despite earning less in absolute terms, because their lower investment in hives and equipment kept total costs down. They also realised a higher honey price (₹420 per kg) by selling directly to local consumers rather than through middlemen. The income share of beekeeping was largest for marginal households (19.3%), underscoring how a relatively small enterprise can shift the livelihood profile of the most resource-constrained farmers. Colony survival over five years averaged 78%, with colony losses attributed mainly to Varroa mite infestation and unseasonal snowfall.

Discussion

The BCR of 2.18-2.47 places beekeeping well above the financial viability threshold of 1.5 commonly used in farm enterprise analysis [5]. These ratios are comparable to those reported for beekeeping in Himachal Pradesh (BCR 2.1-2.6) by Sharma *et al*. [7] and in Uttarakhand (BCR 2.3) by Patel and Shukla [8]. The slightly higher BCR in our research likely reflects Kashmir's longer flowering season and the premium prices that locally branded Kashmiri honey commands.

The pollination co-benefit is the hidden variable that most enterprise budgets miss. Of the 180 respondents, 134 (74.4%) reported noticeably better apple fruit set after starting beekeeping, and they valued this effect at ₹10,000-25,000 per hectare depending on orchard density [1]. If included in the revenue calculation, the BCR for marginal farmers would exceed 3.0. Documenting and communicating this benefit could be a powerful motivator for non-adopting fruit growers.

The main constraints cited by respondents were Varroa mite management (68% of households), lack of nearby extraction centres (53%), and limited market linkages for beeswax (41%). Addressing these through village-level honey-processing units and subsidised mite-treatment kits could raise both productivity and profitability further.

Conclusion

Beekeeping with a 10-colony Apis mellifera unit is a financially viable supplementary enterprise for small and marginal farmers in the Kashmir Valley, returning ₹19,900-28,600 per year at a BCR of 2.18-2.47 and a payback period under two years. The enterprise contributes 15-19% of total household farm income and provides an unquantified but widely perceived pollination benefit to fruit orchards.

Policy support should focus on subsidised colony kits, Varroa management training, and village-level honey-extraction facilities. Extension messaging that highlights the dual benefit — cash income from honey plus improved fruit yield from pollination — is likely to be the most persuasive approach for reaching non-adopting orchard farmers in the region.

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