E-ISSN: 2618-0618
P-ISSN: 2618-060X

NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; SP-9(1): 14-16
Received: 17-10-2025
Accepted: 22-11-2025

Dr. Nawal Kishor Singh
Krishi Vigyan Kendra, ICAR-VPKAS Almora, Bageshwar, Uttarakhand, India

Dr. Raj Kumar
Krishi Vigyan Kendra, ICAR-VPKAS Almora, Bageshwar, Uttarakhand, India

Dr. Kamal Kumar Pande
Krishi Vigyan Kendra, ICAR-VPKAS, Almora, Uttarkashi, Uttarakhand, India

Harish Chandra Joshi
Krishi Vigyan Kendra, ICAR-VPKAS Almora, Bageshwar, Uttarakhand, India

Neeraj Joshi
Krishi Vigyan Kendra, ICAR-VPKAS Almora, Bageshwar, Uttarakhand, India

Dr. Amit Kumar
Krishi Vigyan Kendra, ICAR-VPKAS Almora, Bageshwar, Uttarakhand, India

Corresponding Author:
Dr. Nawal Kishor Singh
Krishi Vigyan Kendra, ICAR-VPKAS Almora, Bageshwar, Uttarakhand, India

Empowering rural youth through horticulture based integrated farming: A case study of commercial IFS from the Kumaon Hills of Uttarakhand

Nawal Kishor Singh, Raj Kumar, Kamal Kumar Pande, Harish Chandra Joshi, Neeraj Joshi and Amit Kumar

DOI: https://www.doi.org/10.33545/2618060X.2026.v9.i1Sa.4585

Abstract
Agriculture in the hills of Uttarakhand is critically constrained and repressed by fragmented farms, dependency on rains, wild animal menace and high input costs, driving distress migration among rural youth for employment. This case study assesses the economic viability and sustainability of a Horticulture-based Integrated Farming System (IFS) in Village Palaribagar, District Bageshwar. The study focuses on the transition of a 3-acre traditional fragmented farm into a diversified commercial enterprise led by a rural youth, with aids of technical interventions from Krishi Vigyan Kendra (KVK), Bageshwar. The present model integrated high income generating components including orchards (Apple, Kiwi, Stone fruits), off-season vegetables, apiculture (*Apis cerana indica*), fisheries, and dairy, thus utilizing a "waste-to-wealth" approach of nutrient cycling and maximising the net income. Economic analysis over a seven-year period (2018-2024) shows a significant trajectory of growth. The adoption of IFS model has resulted in income increase by four times, from ₹1.15 lakh in 2018 to ₹5.20 lakh in 2024, and improvement in Benefit-Cost (B:C) ratio from 1.33 to 2.46, indicating efficacy in resource utilization. The study demonstrates and supports the fact that that IFS cause income stability and is climate resilient, therefore, serve as replicable model for rural youth and fortify hill economy.

Keywords: Integrated Farming System (IFS), hill agriculture, rural livelihood, youth entrepreneurship, Uttarakhand, B:C Ratio

Introduction
Agriculture is the backbone of local economy of Uttarakhand, with about 75% of population directly relying of agriculture for sustenance and livelihood. However, farming in the hills still practiced at a subsistence level (Rana *et al*., 2019) [5]. As mentioned by Singh *et al*. (2025) [9], severe constraints being faced by Himalayan agriculture, to say a few, fragmented land holdings, heavy dependency on rains, and biotic stress of pest and diseases, further magnified by crop destruction by wild animals These challenges only give negative assurance of low income and increasing instances of farmland being left fallow. Further aggravating the issue, research by Mittal *et al*. (2008) [3] and Salgotra (2017) [7] indicates that nearly 70% of landholdings are marginal, which results in high input costs and family income low enough, just to meet daily needs. This economic distress, along with the drudgery of traditional farming and heightened human-wildlife conflict-specifically the menace of wild boars and monkeys-has powered up a massive out-migration of youth to the urban plains (Sati, 2023; Mamgain & Reddy, 2017) [2, 8]. Consequently, the region is witnessing an agriculture recession and land abandonment (Prabhakar and Gulafshanaj, 2025) [4] and fields are degrading to wastelands in no time,
These factors have collectively caused a decline in interest, among the younger generation, towards agriculture, causing necessity more than ever for sustainable practices in agriculture like Integrated Farming Systems (IFS), to reverse this trend. Previous researches affirms that IFS addresses the critical limitation of small farm sizes by maximizing productivity per unit area through the vertical integration of enterprises—such as horticulture, livestock, and apiculture, instead of solely relying on just land expansion (Ansari *et al*., 2014) [1]. As mentioned by Yadav

et al. (2024) [10], IFS guarantees for structured and planned resource recycling, promote economic sustainability, and promise regular employment generation, which are essential requirements for the sustainable livelihood of small and marginal farmers. Ultimately, this comprehensive and all-inclusive approach not only secure year-round income but also generates steady employment, and thereby directly countering the drivers of distress migration in the Himalayan region (Roy & Kharga, 2022) [6].

This paper presents the success story of Mr. Mohan Singh Karayat, a 31-year-old farmer who, despite limited educational qualifications and low-wage employment in private no agriculture industry, successfully transformed his family farm into a high-value enterprise.

Materials and Methods

Study Area and Profile

The study is done on a 3-acre farm located in Village Palaribagar, Block Bageshwar, District Bageshwar, Uttarakhand. The farmer, Mr. Mohan Singh Karayat, returned to his paternal land in December 2024 after migrating to nearby semi-urban areas for private employment for four years (2021-2024). This farm of 3 acre supports his household comprising of five members.

Technical Interventions

The technical know-how and basic input help was provided by the Krishi Vigyan Kendra (KVK) Bageshwar (ICAR-VPKAS), after assessing the farmer's aptitude and willingness to undertake the venture, and thereby provided comprehensive training in scientific agriculture. Key interventions included, Capacity Building training in orchard management, apiculture, vermicomposting, and nursery management, Input Support by providing high-yielding variety (HYV) seeds for crops (wheat, paddy, finger millet) and vegetables (tomato, cabbage, broccoli) to reduce initial risk. Time to time Exposure Visits at KVK and on farm tours to lands of peer progressive farmers to observe commercial-scale operations.

IFS Model Components

The farm was converted into a horticulture-based IFS model comprising the following components:

- **Traditional cereal and pulse crops:** Paddy, Finger Millet, Soybean, Wheat, Horsegram, Lentil etc
- **Horticulture (Orchard and vegetable):** Plantation of temperate fruits (Apple, Kiwi, Peach, Plum, Apricot, persimmon) and adoption of protected cultivation of off-season vegetables (capsicum, tomato, cauliflower and broccoli)
- **Apiculture:** set up and maintenance of 12 boxes of *Apis cerana indica* at various locations in farms
- **Fisheries:** Two water collecting ponds with dimension (10 x 5 x 1.5 m^3) stocked with Grass Carp, Common Carp, and Silver Carp and azolla
- **Livestock & Composting:** Cows integrated with vermicompost units to recycle farm waste and utilizing the compost in vegetables and orchards.

Results and Discussion

The economic performance of the horticulture-based IFS model was evaluated over a seven-year period (2018-2024). The year-wise analysis of gross income, expenditure, net income, and benefit-cost (B:C) ratio is presented in Table 1.

Table 1: Year-wise Economic Performance and Interventions of the Horti-based IFS Model (2018-2024)

Year	Gross Income (₹)	Expenditure (₹)	Net Income (₹)	B:C Ratio	Major Interventions & Farm Status
2018	4,60,000	3,45,000	1,15,000	1.33	Conventional mixed farming; conventional apiary management.
2019	5,20,000	3,85,000	1,35,000	1.35	Farming with High Yielding Varieties (HYV); plantation of peach, plum and Malta; expansion of apiary units.
2020	5,80,000	4,20,000	1,60,000	1.38	Plantation of Kiwi; vegetable production with hybrid seeds; commercial nursery sale of vegetable plants; basic maintenance of horticultural crops.
2021	6,45,000	3,75,000	2,70,000	1.72	Plantation of Apple and persimmon trees in orchard; introduction of fisheries with Azolla feed; nursery raising in polytunnels.
2022	7,15,000	3,30,000	3,85,000	2.17	Commencement of fruit harvest; yield enhancement via bee pollination; vegetable sale and crop production with advanced HYV seeds; regular maintenance of established units.
2023	7,85,000	3,45,000	4,40,000	2.28	Commercial sale of fruits, vegetables, and nursery stock; utilization of Farm Yard Manure (FYM) in farm crops; regular maintenance of established units.
2024	8,75,000	3,55,000	5,20,000	2.46	Establishment of market linkages for produce supply; sustained sale of fruits, vegetables, and nursery stock; nutrient cycling via FYM; regular maintenance of established units.

Figure 1: Trends in Farm Profitability (2018-2024)

The graph illustrates the simultaneous rise in Net Income (₹) and Benefit-Cost (B:C) Ratio over the seven-year period. Following the adoption of the Integrated Farming System (IFS), Net Income grew from ₹1.15 lakh to ₹5.20 lakh, while the B:C Ratio improved from 1.33 to 2.46, indicating enhanced economic efficiency.

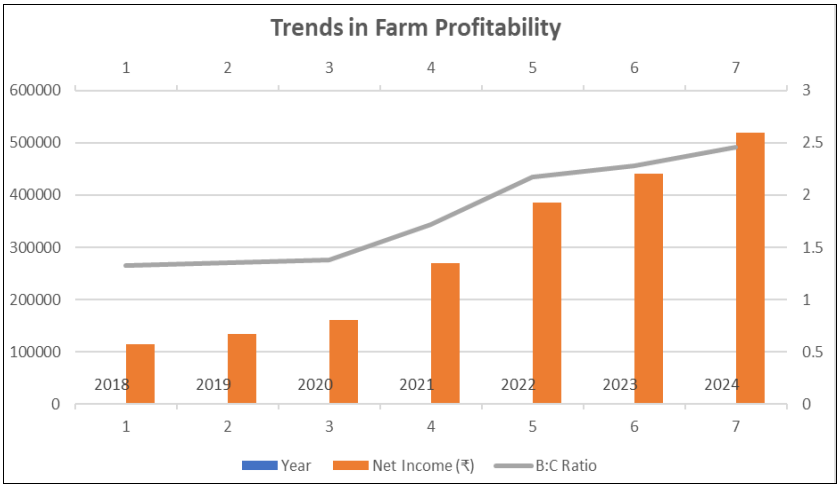

Fig 1: Trends in Farm Profitability (2018-2024)

Profitability Trends

The data reveals an upward growth in farm income following the adoption of scientific interventions. In the initial year (2018), under conventional mixed farming, the net income was recorded at ₹1,15,000 with a B:C ratio of 1.33. The shift to a commercial IFS model and year wise upgradations in enterprises, initiated a gradual increase in gross returns.

A noticeable leap income was observed from 2021 and onwards, where net profit rose sharply to ₹2,70,000 (B:C ratio 1.72). This rise correlates with the diversification of the farm ecosystem, like introduction of fisheries and protected nursery cultivation. By 2024, the net income reached ₹5,20,000, an increase of around 4 times, and peak in B:C ration to 2.46, indicating highly efficient resource utilization and profitability.

Factors that contributed to this enhanced economic efficiency

- **Diversification and Risk Mitigation:** The integration of multiple components such as orchards, off-season vegetables, and fisheries ensured a stable income throughout the year, reducing the risk associated with monoculture. Even during the COVID-19 pandemic (2020), despite higher input and transportation costs, the farm-maintained profitability (Net Income: ₹1,60,000).
- **Resource Recycling:** The decline in expenditure in later years (e.g., 2022-2024) can be attributed to internal input generation like cow dung and crop waste for vermicomposting, thus reducing external chemical fertilizer dependency. Along with it, utilizing *Azolla* as fish feed further optimized input costs.
- **Complementary Effects:** The maintenance of *Apis cerana indica* (12 boxes) provided dual benefits: direct revenue from sale of honey and an estimated 10-20% increase in crop and fruit yields due to enhanced pollination.
- **Market Linkages and Sustainability**: The sustained growth in 2023 and 2024 highlights the importance of market stability. The establishment of firm market linkages by providing the produce on time (seedlings, vegetables and fruits) to the buyers and thus gaining their trust, solidified the farm's financial footing

Conclusion

The case study of Mr. Mohan Singh Karayat, validates that Horticulture-based IFS can be a sustainable solution for the fragile ecosystem of the Hill Himalayas. The transition from subsistence farming to a diversified commercial model resulted in a four-fold increase in net income (₹1.15 lakh to ₹5.20 lakh) and a significant rise in the Benefit-Cost ratio to 2.46 over six years. Most importantly, this model addresses the socio-economic crisis of youth migration by proving that scientific agriculture can provide economic stability with security to livelihood, along with restoring the ecological health of the region

References

1. Ansari MA, Prakash N, Baishya LK, Punitha P, Sharma PK, *et al*. Integrated farming system: An ideal approach for developing more economically and environmentally sustainable farming systems for the Eastern Himalayan Region. Indian J Agric Sci. 2014;84:356-62.
2. Mamgain RP, Reddy DN. Out-migration from the hill region of Uttarakhand: Magnitude, challenges, and policy options. In: Rural Labour Mobility in Times of Structural Transformation. 2017. p. 209-235. doi:10.1007/978-981-10-5628-4_10
3. Mittal S, Tripathi G, Sethi D. Development strategy for the hill districts of Uttarakhand. ICRIER Working Paper No. 217; 2008.
4. Prabhakar A, Gulafshanaj. The silent fields: Unravelling migration-driven transformations in agricultural landscapes in Uttarakhand. Int J Manage Dev Stud. 2025;14(11):01-16. doi:10.53983/ijmds.v14n11.001
5. Rana K, Kameswari VLV, Chaudhary S, Kumar D. Livelihood opportunities through agriculture and allied field in the mid-hills of Uttarakhand. J Pharmacogn Phytochem. 2019;SP5:81-86.
6. Roy R, Kharga BD. Integrated farming system: A boon in hill farming system. Indian Farming. 2022;72(1):23-26.
7. Salgotra AK. Problems and agriculture land holding pattern among BPL households in hill rural areas: A study of Pauri District of Uttarakhand. Int J Human Soc Sci Stud. 2017;4(1):103-109.
8. Sati VP, Kumar S. Declining agriculture in Garhwal Himalaya: Major drivers and implications. Cogent Soc Sci. 2023;9(1).
9. Singh NK, Kumar R, Pande KK, Joshi HC, Joshi N, Kumar A. Livelihood enhancement through diversification: Transitioning from standalone poultry farming to integrated farming systems. Int J Agric Ext Soc Dev. 2025;8(12):162-165.
10. Yadav V, Deshmukh JP, Paslawar AN, Morwal BS. Integrated farming system for resource recycling, sustainability, and employment generation among the small and marginal farmers in Vidarbha region of Maharashtra. Int J Res Agron. 2024;7(11):28-32.