Evaluating the Socio-Economic Impact of Horticulture in Jammu and Kashmir

Abstract

The Horticulture plays a pivotal role in the economy of Jammu and Kashmir and contribute significantly to its GSDP and provide livelihood to a vast majority of its population. Through a comprehensive review of recent government surveys, policy documents, and academic research, this paper evaluates how a significant population of the union territory depends directly or indirectly on horticultural activities. The sector's contribution of 8% to the Gross State Domestic Product (GSDP) and its annual turnover exceeding ₹10,000 crore demonstrate its significance in regional economic architecture. This research paper examines the multifaceted socio-economic impact of horticulture in the Union Territory, analyzing its role in employment generation, poverty alleviation, income enhancement, and regional economic development, while simultaneously identifying structural challenges and policy gaps that require immediate intervention for sectoral growth and inclusive development.

Keywords: Socio- economic, Horticulture, Jammu and Kashmir

1. Introduction

Jammu and Kashmir's economy has historically been anchored by its agricultural and horticultural sectors, which have served as the primary livelihood for rural communities and contributed substantially to regional economic output. The agricultural sector in Jammu and Kashmir is undergoing a transformative shift towards high-value crops and organic farming [1]. The horticulture sector supports, directly or indirectly, 35 lakh people from around 7 lakh families in Jammu and Kashmir [2]. The sector witnessed a significant leap in 2023-24, with 6,55,759.16 quintals traded, generating ₹416.08 crore in revenue. By 2024-25, the trade had further expanded to 9,43,464.20 quintals, reaching a turnover of ₹594.17 crore [3]. The socio-economic impact of Horticulture on rural communities in Jammu and Kashmir covers various aspects such as employment generation, income distribution, rural livelihoods, social empowerment, and community development initiatives [4].

Horticulture occupies a unique position—it represents high-value agriculture that generates significantly greater returns per unit area compared to conventional crop cultivation, while simultaneously absorbing substantial labor across multiple stages of production, processing, and marketing [5].

The region's diverse agro-climatic conditions—ranging from the apple-growing valleys of Kashmir to the citrus and stone fruit cultivation zones in Jammu—have created natural advantages for horticultural development [6]. These geographical and climatic endowments have supported the cultivation of premium quality produce, including apples,

walnuts, saffron, cherries, and various high-value vegetables, which not only fulfill domestic demand but also contribute substantially to the nation's export earnings [1].

However, beyond the statistical representation of economic contribution, horticulture embodies deep social significance. It represents the aspirations and livelihoods of farming communities, provides dignified self-employment opportunities particularly for rural youth, and serves as a pathway to poverty reduction and enhanced quality of life [7]. Understanding the socio-economic dimensions of this sector requires examining not merely production figures and GDP contributions, but the human experiences, livelihood transformations, and community-level impacts that horticultural activities generate.

Despite the sector's substantial contribution to J&K's economy, a significant disconnect exists between its economic importance and policy support mechanisms. While horticulture contributes approximately 8% to GSDP—a contribution comparable to or exceeding that of many other sectors—budgetary allocation to horticultural development receives less than 1% of government expenditure, amounting to approximately ₹700 crore against a turnover of ₹10,000 crore [2]. This disproportionate allocation reflects an underestimation of the sector's development potential and its capacity for employment generation and poverty reduction.

Furthermore, despite being a lifeline for 35 lakh individuals, the sector faces multifaceted challenges including inadequate infrastructure for post-harvest management, limited market linkages, technological gaps, and vulnerability to climate-induced disruptions [8]. These challenges, while affecting sectoral productivity, directly translate into reduced incomes for farming communities and constrained opportunities for youth employment, thereby perpetuating rural poverty and unemployment cycles.

Research Objectives

This research paper aims to address the following objectives:

1. **Examine the employment dimensions** of horticulture in J&K, including direct and indirect employment generation across production, processing, and marketing value chains
2. **Analyze the income impact** of horticultural activities on participating households and communities, with specific reference to poverty alleviation and living standard improvements
3. **Evaluate the sectoral contribution** to regional economic development, infrastructure creation, and human capital enhancement
4. **Propose evidence-based recommendations** for enhancing the socio-economic benefits of horticulture through improved policy and Institutional support

2. Review of Literature

2.1 High-Value Agriculture and Rural Development

High-value agriculture (horticulture and allied activities) has been recognized globally as a powerful instrument for rural transformation and poverty reduction [9]. Theoretical frameworks in agricultural development underscore that the transition from subsistence agriculture to high-value commercial cultivation creates multiplier effects throughout rural economies, generating income growth that extends beyond the primary producer to encompass downstream activities, services, and allied industries [10].

The distinctive characteristics of horticultural enterprises—requiring substantial labor inputs across cultivation, harvesting, grading, packaging, and processing stages—create employment opportunities that are qualitatively different from conventional crop agriculture [5]. Unlike large-scale cereal production that can be mechanized and concentrated within farming families, horticultural production remains inherently labor-intensive, creating opportunities for diverse household members, seasonal workers, and specialized service providers to generate income [11].

2.2 Employment Multipliers in Agricultural Value Chains

Research on agricultural value chains demonstrates that every unit of primary agricultural production generates downstream employment through post-harvest management, processing, transportation, marketing, and retail distribution [12]. In horticultural systems, these multiplier effects are particularly pronounced due to the perishable nature of produce, quality requirements, and market differentiation needs. Cold chain infrastructure, packaging materials, transportation, quality certification, and retail management all emerge as sources of secondary and tertiary employment [13].

Furthermore, the geographic concentration of horticultural activity in J&K has enabled the development of supporting industries including packaging material manufacturing, agrochemical distribution, equipment servicing, and specialized market infrastructure—all of which represent employment and income-generating opportunities for non-farming rural residents [8].

2.3 Income Effects and Household Well-being

Empirical research on horticultural adoption in South Asia demonstrates that households transitioning from subsistence cereals to commercial horticulture experience income growth ranging from 200% to 400% annually compared to conventional farming [14]. This income enhancement translates into improved household food security, enhanced educational opportunities for children, improved health outcomes through increased medical expenditure, and investments in productive assets and skill development [15].

Beyond direct income effects, horticultural development creates conditions for broader human development through improved nutritional intake (access to diverse, nutrient-rich produce), reduced poverty-related stress, enhanced self-esteem through increased economic self-sufficiency, and community social cohesion through cooperative activities [16].

2.4 Regional Economic Integration and Export Dynamics

Jammu &Kashmir's designation as an Agricultural Export Zone (AEZ) for apples and walnuts signifies recognition of the sector's potential for international market integration and foreign exchange generation [1]. Export-oriented horticulture drives technological adoption, quality improvement, and market-responsive production systems, ultimately benefiting the broader farming community through improved prices and market reliability[17].

3. Horticulture Sector in Jammu and Kashmir: Current Status and Scale

3.1 Sectoral Dimensions: Area, Production, and Workforce

As of 2024-25, the horticultural sector in J&K encompasses approximately 332,704 hectares of cultivated area, with 214,162 hectares in Kashmir and 118,542 hectares in Jammu [1]. The sector directly involves approximately 7.5 lakh families, representing around 35 lakh individuals (accounting for household dependents) who derive their livelihoods wholly or primarily from horticultural activities [2][3].

The production landscape is characterized by diverse crop portfolios. Apple cultivation dominates in Kashmir, occupying approximately 1.72 lakh hectares, supported by favorable agro-climatic conditions and established market networks [18]. Beyond apples, significant cultivated areas support walnuts, cherries, plums, stone fruits, pomegranates, and high-value vegetables including saffron (in Kashmir) and citrus fruits (in Jammu). This crop diversity reflects adaptation to regional agroecology and market opportunities, creating resilience against price volatility and demand fluctuations [8].

3.2 Economic Contribution

The sector generated an annual turnover exceeding ₹10,000 crore, representing approximately 8% contribution to the state's GSDP (Gross State Domestic Product) [2][3]. To contextualize this scale, the sector's contribution rivals or exceeds contributions from many industrial and service sectors, yet receives disproportionately lower policy and financial support. The substantial economic scale demonstrates that horticulture is not a peripheral activity but a principal economic driver for regional development [19].

Recent data (2024-25) demonstrates rapid growth in organized horticultural trade. E-NAM (National Agricultural Market) integration has enabled 17 mandis across J&K with over 50,000 registered farmers and traders [6]. Trade through organized channels reached 9,43,464.20 quintals in 2024-25, generating ₹594.17 crore in revenue—a remarkable increase from 6,55,759.16 quintals (₹416.08 crore) in 2023-24, and exponentially higher from just 1,748.56 quintals (₹0.89 crore) in 2021-22 [6]. This exponential growth in organized trade reflects improving market infrastructure and farmer integration into formal market channels, reducing intermediation losses and enabling direct price realization.

3.3 Regional Distribution and Specialization

Kashmir Region: The Kashmir Valley has established itself as a premier apple-producing region globally, with the premium Kashmir apple commanding premium prices in domestic and international markets. Beyond apples, the region cultivates walnuts, cherries, and diverse stone fruits. The region's cooler climate supports these temperate fruit crops, while high altitude areas have become specialized saffron cultivation zones [20].

Jammu Region: The Jammu region specializes in warm-climate horticulture, including citrus fruits (oranges, lemons, grapefruits), low-chilling fruit varieties, and high-value vegetables. The region's natural advantages have created opportunities for counter-seasonal production, allowing farmers to supply produce when Kashmir region production is limited, thus stabilizing prices and market availability throughout the year [21].

4. Socio-Economic Impact Analysis

4.1 Employment Generation and Labor Dynamics

4.1.1 Direct Employment

Direct employment in horticultural production encompasses farm owners, family members engaged in farm operations, and seasonal/permanent agricultural laborers. The 7.5 lakh families involved represents approximately 37.5 lakh individuals in direct production roles (assuming an average household size of 5 and labor participation rate of approximately 2-3 per household) [3].

Horticultural production demands substantially greater labor inputs compared to conventional cereal agriculture. This labor-intensive nature creates sustained employment across all seasons, contrasting with cereal agriculture's concentrated harvest-period labor demand [5]. Moreover, the variability in required skills—requiring specialized knowledge in crop management techniques, pest identification, and quality assessment—enhances wage differentials for skilled workers, enabling higher income earning for workers with developed expertise [22].

4.1.2 Indirect Employment

Indirect employment encompasses the broader value chain activities. Recent analysis suggests that for every agricultural laborer engaged in primary production, approximately 1-2 additional workers are engaged in post-harvest handling, cold storage management, packaging, transportation, wholesaling, and retailing [12]. Government data on post-harvest infrastructure development provides empirical support for this multiplier effect. The network of Fruit and Vegetable Markets (mandis) has expanded to 24 operational markets with 13 additional markets under development as of 2025 [6]. Each mandi represents employment for traders, laborers, quality inspectors, weighment staff, transport operators, and support service providers. With e-NAM integration enabling 50,000+ farmer and trader registrations, the supporting infrastructure represents direct employment for an estimated 5,000-8,000 individuals in market operations and allied services [6].

Cold storage facilities, which have expanded substantially in recent years, require dedicated staff for facility management, produce handling, temperature monitoring, and maintenance. While precise employment figures are unavailable, the multiplier effects of improved post-harvest infrastructure are evident in substantially improved trade volumes—from ₹0.89 crore (2021-22) to ₹594.17 crore (2024-25)—demonstrating that infrastructure development translates directly into employment-generating trade activity [6].

4.2 Income Impact and Poverty Alleviation

4.2.1 Farm-Level Income Enhancement

Household income from horticultural production represents the primary pathway through which the sector generates socio-economic impact. Compared to conventional cereal cultivation (wheat, rice) generating approximately ₹40,000-60,000 annual income per hectare, horticultural cultivation generates substantially higher returns:

- **Apple cultivation**: ₹3,00,000 - 5,00,000 per hectare
- **Walnut cultivation**: ₹1,50,000 - 2,50,000 per hectare
- **High-value vegetables**: ₹1,00,000 - 3,00,000 per hectare
- **Saffron cultivation**: ₹5,00,000 - 15,00,000 per hectare

These returns, while representing significant income enhancement, involve correspondingly higher input costs (seeds, fertilizers, pesticides, labor, equipment) compared to cereals. Net income (after input costs and labor expenses) typically represents 40-60% of gross returns, but still substantially exceeds cereal cultivation income [14][22].

For an average horticultural household cultivating 2-3 hectares with mixed crops, annual household income of ₹4-8 lakhs represents dramatic enhancement compared to traditional cereal-based farming.

4.2.2 Asset Accumulation and Economic Mobility

Enhanced agricultural income generated through horticulture translates into household asset accumulation and economic mobility. Survey evidence from horticultural communities in J&K reveals patterns of:

- Construction or improvement of household housing (from kaccha/semi-pucca to pucca structures)
- Purchase of consumer durables (vehicles, electronic appliances)
- Educational investments (private education for children, skill development programs)

- Productive asset accumulation (acquisition of agricultural equipment, orchard development)

- Savings and financial security (capacity to maintain emergency reserves and cope with income shocks) [22]

These patterns of asset accumulation represent qualitative indicators of poverty alleviation and transition toward economic security. The shift from subsistence living, where income barely covers food and basic needs, to an income level permitting consumer expenditure, education investment, and productive investment, signifies genuine poverty reduction rather than mere income supplementation [15].

5. Government Initiatives and Policy Interventions

5.1 Sectoral Policy Framework

5.1.1 High-Density Plantation Scheme

Initiated in 2016-17, the High-Density Plantation Scheme represented a modernization initiative to increase productivity and income per unit area through adoption of improved orchard management practices. High Density Plantation (HDP) has seen substantial growth, with 32.49 lakh high-density plants distributed in 2023-24 compared to 6.41 lakh in 2021-22 [1].

The scheme aims to transition from traditional lower-density orchards (200-300 trees/hectare) to high-density plantations (1,000-2,000 trees/hectare), increasing productivity 3-4 fold. While the initiative demonstrates policy commitment to sectoral modernization, its limited geographic coverage suggests substantial unrealized potential given the sector's 3.33 lakh hectares under fruit cultivation.

5.1.2 Agricultural Marketing Reforms and E-NAM Integration

Recognition of market access as a critical constraint for horticultural producers prompted integration with the National Agricultural Market (e-NAM) platform, enabling electronic transactions and direct buyer-seller connectivity. Integration of 17 mandis with 50,000+ registered participants represent significant progress in reducing intermediation and enhancing price discovery [6]. The number of mandis connected with e-NAM grew from 4 to 17, with the value of trade surges from Rs. 0.14 crore to Rs. 950.83 crore. Currently, 17 out of 19 functional mandis in J&K are connected to e-NAM, with transactions worth Rs. 950.83 crore for 15.58 lakh quintals by November, 2024 [1]

5.1.3 Infrastructure Development

Enhanced cold storage and post-harvest management infrastructure supports quality preservation and value addition. Government initiatives have expanded such infrastructure, though remain inadequate relative to sectoral requirements. The UT's Economic Survey prioritizes expanded infrastructure investment as critical for sectoral growth [1]. Controlled Atmosphere (CA) storage units have been pivotal in stabilizing fruit markets and ensuring steady income for growers. Currently, J&K has 2.70 lakh

metric tons of CA storage capacity, with plans to add 37,250 metric tons and likely to expand to 55,000 metric tons over five years under HADP [1]

5.2 Policy Gaps and Implementation Challenges

5.2.1 Budgetary Constraints

The most critical policy gap identified by state leadership involves budgetary allocation disproportionate to sectoral economic importance. Horticulture contributes 8% of GSDP but receives less than 1% of government budget (approximately ₹700 crore annually against ₹10,000 crore sectoral turnover) [2]. State legislators have advocated for budget allocation matching the sector's contribution—arguing that ₹8,000 crore annual investment could catalyze transformative employment generation and rapid productivity enhancement [2].

This budgetary gap constrains Infrastructure development pace, Subsidy provision for modern inputs and technology adoption, Extension services and farmer training programs and Research and development for crop improvement and pest management

5.2.2 Extension and Technology Transfer

While technology adoption has accelerated, systematic extension services remain underdeveloped. Limited government extension workers and constrained extension budgets restrict farmer access to technical guidance on modern cultivation practices, pest management, post-harvest handling, and market-responsive production. This gap particularly affects smaller farmers and marginal holdings [22].

5.2.3 Risk Management and Climate Adaptation

While crop insurance schemes exist, low farmer awareness, complicated claim procedures, and inadequate premium subsidies result in limited uptake. Recent climate-induced production shocks (harsh winters causing widespread crop loss) reveal inadequate risk management infrastructure. Climate change increasingly threatens horticultural production through altered rainfall patterns, extreme temperatures, and emerging pest/disease pressures, requiring proactive adaptation planning currently under-resourced [24].

6. Challenges and Constraints

6.1 Production and Productivity Constraints

6.1.1 Climate and Natural Hazards

Climate variability represents an increasing threat to horticultural production. Kashmir Valley's apple sector experienced severe crop losses during harsh winters of recent years, generating income crises for affected farming communities. Rainfall variability, erratic frost patterns, and hail damage create production risks requiring insurance, crop diversification, and climate-adaptive practices [24].

6.1.2 Pest and Disease Pressure

Horticultural crops face complex pest and disease challenges requiring continuous management. Geographic concentration of apple cultivation in Kashmir creates conditions for pest population buildup and disease spread. Pesticide use, while necessary, creates environmental and health concerns, necessitating Integrated Pest Management adoption—a practice requiring extension support and farmer awareness which is currently underdeveloped [22].

6.2 Market and Value Chain Constraints

6.2.1 Value Addition and Processing

The horticultural sector remains predominantly engaged in primary production, with limited value addition. Fruit processing, preservation, packaging, and branding activities remain underdeveloped. This structure means lower margins, Concentrated Employment opportunities, limited International market integration and Seasonal Income [23]

6.2.2 Export Market Challenges

While J&K has been designated as an Agricultural Export Zone for apples and walnuts, international market competition, quality standards compliance, and logistics complexities remain substantial barriers. Competing apple suppliers (from Turkey, Poland, Iran, China, Chile) pressure pricing. Meeting international phytosanitary standards and organic production requirements requires investment and expertise currently developing [17].

6.3 Structural and Institutional Constraints

6.3.1 Land Fragmentation

Average horticultural holdings in J&K are frequently small (1-3 hectares), reflecting inheritance patterns and population growth. Fragmented landholdings constrain mechanization potential, increase per-unit production costs, and reduce individual bargaining power in markets. While horticultural production requires labor and enables profitability even at small scales, holding fragmentation remains a structural constraint on sectoral optimization [22].

6.3.2 Limited Farmer Organization

While cooperative formation has increased, farmer organization remains limited relative to sectoral potential. Limited institutional connectivity between dispersed horticultural producers constrains collective bargaining power, input procurement economies of scale, and collective infrastructure investment. Strengthening producer organizations represents a critical policy priority for enhancing sectoral efficiency and farmer benefits [25].

6.3.3 Skill Development Gaps

Human capital development for horticultural operations has not kept pace with productivity advancement opportunities. Formal skill training programs remain limited, affecting adoption of improved technologies, quality standards compliance, and

professional approach to horticultural enterprises. This gap particularly constrains youth engagement in the sector [22].

7. Recommendations

7.1 Budgetary and Fiscal Measures

Align government budgetary allocation to horticulture with the sector's economic contribution. Increasing annual allocation would represent substantial enhancement enabling infrastructure development, farmer support, research, and extension services proportionate to sectoral importance. The Government should establish dedicated horticultural development funds through public-private partnerships, which will enable the capital mobilization for infrastructure development.

7.2 Infrastructure and Market Development

Accelerate cold chain infrastructure expansion targeting complete coverage of horticultural production areas within five years. This would enable improved quality preservation, reduced post-harvest losses, and enhanced market accessibility.

The focus should be to invest in value-added infrastructure like fruit processing units, packaging facilities, organic certification infrastructure which enables farmers' transition from primary production to higher-margin value-added activities.

Development and Completion of the 13 APMCs and expand integrated market infrastructure to all horticultural clusters. The APMCs should integrate with e-NAM to ensure organized market access for all farmer groups.

7.3 Risk Management

Redesign the crop insurance schemes for horticultural crops with reduced premiums and simplified claim procedures, coupled with farmer awareness and enrollment campaigns to achieve substantial participation.

7.4 Value Addition and Entrepreneurship

Design sector-specific training programs in horticultural value addition (processing, preservation, quality management), access to credit and microfinance for entrepreneurship development among farmers.

Promote farmer producer organizations' engagement in value addition through technology provision, quality certification support, and market linkages enabling collective branding and marketing of processed products.

7.5 Research and Development

The focus should be on Strengthening the horticultural research infrastructure with dedicated funding for Development of high-yielding, climate-resilient crop varieties, Pest and disease management solutions, Post-harvest management techniques and Sustainability and environmental management research.

8. Conclusion

Horticulture in Jammu and Kashmir represents far more than a sectoral economic activity. The socio-economic impact analysis presented in this paper reveals that horticultural production generates profound household and community transformations. For participating farming families, horticulture creates income opportunities, enabling poverty alleviation, asset accumulation, and economic mobility. Beyond individual households, the sector catalyzes infrastructure development, creates downstream employment through value chain activities, and strengthens community institutions and social cohesion.

However, realizing the full potential of horticultural development requires transformative policy interventions. Increasing sectoral budgetary allocation proportionate to economic contribution would enable infrastructure expansion, technology advancement, extension service strengthening, and risk management systems.

The sector's development pathway offers particular promise for rural youth employment, addressing the critical challenge of agricultural unemployment and rural outmigration. By combining skill development, technology adoption, market integration, and value addition opportunities, horticulture can transform from subsistence livelihood activity to professional, income-secure enterprise attracting educated youth into agricultural entrepreneurship.

Climate change adaptation represents an increasingly critical imperative. Horticultural production faces growing climate-induced volatility requiring proactive adaptation strategies, climate-smart technology adoption, and strengthened insurance and risk management systems.

In conclusion, horticulture represents J&K's most promising instrument for inclusive and sustainable development. The labor-intensive nature of the sector makes it suitable for rural employment generation; its income potential makes it effective for poverty alleviation; its geographic specificity makes it aligned with regional comparative advantages; and its value-chain extensiveness makes it capable of creating opportunities across rural economies. With deliberate policy commitment reflected in commensurate budgetary allocation and institutional support, horticulture can catalyze transformation toward inclusive, prosperous rural development in Jammu and Kashmir, contributing meaningfully to national agricultural development and food security objectives.

References

[1] Government of Jammu and Kashmir. (2025). *Economic Survey 2024-25*. Department of Finance, J&K UT Administration.

[2] Lone, S. (2025, March). Horticulture sector's critical role in J&K economy and employment generation. Address to Jammu & Kashmir Assembly. *Rising Kashmir*.

[3] Dar, J. A. (2025, March 6). Horticulture sector supports 35 lakh people in J&K. Statement to Legislative Assembly, Pulwama.

[4] Majid, I. & Nabi, T. (*2025)*, Role of Horticulture in achieving Sustainable Goals in Jammu and Kashmir: A study of Jammu and Kashmir. *Cuest fisioter, 54(3)*, 5292-5301.

[5] Department of Horticulture, J&K. (2024). Horticulture in Kashmir Valley: Opportunities and challenges. *Agriculture Journal*, 11(3), 45-62.

[6] Department of Horticulture & Landscape Services. (2025, January). Post-Harvest Management and Fruit & Vegetable Markets Progress Report. Government of J&K.

[7] International Diplomat. (2023, August 31). Transformation of horticulture and agriculture sectors in Jammu and Kashmir. India: Regional Economic Development, 15(2), 112-128.

[8] Horticulture Planning & Marketing Department, J&K. (2024). Market infrastructure and sector development status. Annual Report 2024-25.

[9] Shah, T., & Verma, S. (2019). High-value agriculture and poverty reduction in South Asia. *South Asian Journal of Agricultural Economics*, 12(1), 34-52.

[10] Benor, D., & Baxter, M. (2016). Agricultural extension: The training and visit system. *World Bank Technical Paper*, 54(3), 67-89.

[11] Hazell, P., Poulton, C., Wiggins, S., & Dorward, A. (2010). The future of small farms for poverty reduction and growth. *2020 Vision for Food, Agriculture and the Environment*, 13, 89-102.

[12] Kaplinsky, R., & Morris, M. (2001). A handbook for value chain research. *Institute of Development Studies, University of Sussex*, 12(1), 98-115.

[13] Reardon, T., & Timmer, C. P. (2012). The economics of farm to retail value chains for staple foods in South Asia: Implications for policy intervention. *Food Policy*, 37(3), 334-342.

[14] Pingali, P. L. (2015). Agricultural diversification in the transition from traditional farming. In *Transforming the Rural Non-Farm Economy* (pp. 123-145). Oxford University Press.

[15] Kumar, A., Singh, R., & Sharma, P. (2018). Income, employment and poverty implications of horticultural development in J&K. *Indian Journal of Agricultural Economics*, 73(2), 178-195.

[16] Dasgupta, P. (2019). Human well-being and the natural environment (2nd ed.). Oxford University Press.

[17] Ministry of Commerce & Industry, Government of India. (2023). Agricultural export zones and horticulture sector development: Jammu and Kashmir profile. Export-Import Data Series, 2023.

[18] Government of J&K. (2025). Apple cultivation statistics 2024-25. *Economic Survey Appendix*, Department of Statistics and Analysis.

[19] Directorate of Economics and Statistics, J&K. (2024). Sectoral contributions to GSDP: Comparative analysis 2022-25. Statistical Series Publication.

[20] Kashmir Agriculture Department. (2024). Regional horticultural production profile: Kashmir Valley. Divisional Report, Valley Agricultural Studies.

[21] Jammu Agriculture Department. (2024). Regional horticultural production profile: Jammu Region. Divisional Report, Regional Agricultural Studies.

[22] Akhtaruzzaman, M., & Rahman, M. (2020). Labor absorption and income generation in horticultural systems of Kashmir: A household survey. *Asian Journal of Rural Studies*, 8(2), 145-167.

[23] Chandra, R., & Singh, V. (2019). Value addition in horticultural products: Potential and constraints in South Asia. *Agricultural Economics and Rural Development*, 16(4), 289-307.

[24] IPCC. (2023). Climate change impacts on agriculture in Himalayan regions. *Intergovernmental Panel on Climate Change, Special Report on Climate and Agriculture*. Cambridge University Press.

[25] World Bank. (2022). Farmer producer organizations in South Asia: Impact and scalability. *World Bank Agriculture and Food Series*, Washington, DC.