R-2837
[1-6]

RESEARCH ARTICLE Agricultural Reviews

Agricultural Market Linkages and Income Security: A Comparative Assessment of Punjab and Rajasthan

Shilpa Parihar[1]

10.18805/ag.R-2837

ABSTRACT

Background: Agricultural market linkages significantly determine farmers' income security in India's diverse agrarian landscape. This cross-state study compares the strength of market linkages and their influence on income security among farmers in Punjab and Rajasthan-two states with contrasting agricultural ecosystems.

Methods: A multistage sampling design was used to select 120 farmers (60 from each state). Component-wise indices for market access, information flow, storage and transport, price realization, digital connectivity and institutional linkages were developed using unit score standardization. Principal Component Analysis (PCA) was conducted to identify dominant components contributing to income security, while Garrett's ranking technique was applied to determine key marketing constraints.

Result: Results indicate that Punjab farmers possess comparatively stronger market linkages, primarily due to structured procurement networks and cooperative mechanisms, leading to higher income security. Rajasthan farmers show moderate to weak linkages due to dependence on intermediaries, price volatility and limited institutional support. The study proposes a dual-level intervention framework combining farmer capacity-building and market system reforms. Strengthened linkages, improved infrastructure and digital market integration can substantially enhance income security across both states.

Key words: Agricultural market linkages, Farmer market access, Income security, Livelihood resilience, Market efficiency, Price realization, Rural marketing infrastructure.

JEL classification codes: Q13, D31, O18, D40, Q12, Q11, Q18, O15, R11, R20.

INTRODUCTION

Agricultural marketing plays a decisive role in shaping farm incomes, livelihood stability and long-term economic resilience (Gulati *et al*., 2018, Venkattakumar *et al*., 2024). In India, disparities in market infrastructure, procurement systems, institutional support and logistics lead to significant differences in income security across states. Punjab, with its well-established mandi system and strong procurement networks, stands in contrast to Rajasthan, where agricultural markets are more dispersed, semi-organized and heavily influenced by middlemen (Babu *et al*., 2013; Nedumaran and Ravi, 2019; Padaria *et al*., 2022; Rao and Basavaraj, 2015).

Market linkages include all formal and informal connections that enable farmers to sell produce-APMC mandis, cooperatives, digital platforms, private buyers, processors, wholesalers and aggregators (Davis *et al*., 2025.; Ghanti, 2024; Sajesh, 2018; Singh, 2016). Strong linkages ensure better price discovery, lower transaction costs, reduced distress sales and enhanced income security (Kapoor *et al*., 2023; Rao and Basavaraj, 2015). Weak linkages expose farmers to price volatility, information asymmetry and market risks (Padaria *et al*., 2022).

This study compares agricultural market linkage strength in Punjab and Rajasthan and examines how these influence farmers' income security. The analysis aims to generate policy-relevant insights for improving marketing efficiency in diverse agrarian systems.

[1]Aishwarya College of Education (Autonomous), Jodhpur-342 008, Rajasthan, India.

Corresponding Author: Shilpa Parihar, Aishwarya College of Education (Autonomous), Jodhpur-342 008, Rajasthan, India. Email: shilpa27@icloud.com

How to cite this article: Parihar, S. (2026). Agricultural Market Linkages and Income Security: A Comparative Assessment of Punjab and Rajasthan. *Agricultural Reviews*. 1-6. doi: 10.18805/ag.R-2837.

Submitted: 02-01-2026 **Accepted:** 19-02-2026 **Online:** 12-03-2026

Objectives

1. To assess the extent and strength of agricultural market linkages in Punjab and Rajasthan.
2. To measure and compare income security levels among farmers in both states.
3. To identify key constraints affecting effective market linkages and income stability.
4. To propose a market linkage strengthening framework for enhancing income security.

MATERIALS AND METHODS

The present study adopted a rigorous and systematic methodology to comparatively assess agricultural market linkages and income security among farmers in Punjab and Rajasthan (Saini *et al*., 2022; Satyasai and Pereira, 2019; Singh, 2024). Given the structural and institutional differences across the two states, a multistage sampling

design was employed to ensure adequate representation from diverse geographical and market environments. The methodology integrated both quantitative and qualitative approaches, enabling a comprehensive understanding of market access conditions, price realization mechanisms, infrastructural support, institutional participation and their combined effects on farm income stability (Ma *et al*., 2024; Othuon and Oyugi, 2017; Thanichanon *et al*., 2018). Data were collected through a structured questionnaire supported by focus group discussions (FGDs), rapid rural appraisal (RRA) exercises and key informant interviews with agricultural marketing officials, APMC functionaries and leaders of Farmer Producer Organizations (FPOs). This multi-pronged approach ensured that both statistical patterns and real-world behavioral factors influencing market linkages were captured in depth. There has been a growing sense of confusion regarding the package of practices for organic/natural farming (Singh *et al*., 2022).

Study area

- Name of the institute-Agriculture University, Jodhpur (Raj.)
- Research area-Punjab and Rajasthan.
- **Punjab:** Ludhiana and Moga districts.
- **Rajasthan:** Jaipur and Ajmer districts.
- Research period 2020-2024.
- Method-empirical study.

These states were selected to represent high-procurement (Punjab) and semi-organized market systems (Rajasthan).

Sampling design

A multistage sampling technique was utilized to systematically select respondents from both states, as follows (Table 1).

Data collection tools

Data collection was carried out using a structured and pre-tested questionnaire developed specifically for this study. The questionnaire included items on market access, information flow, price realization, storage and transportation, institutional linkages and digital market connectivity, as well as indicators of income security. To supplement quantitative data, qualitative methods were incorporated. Focus Group Discussions (FGDs) were conducted with groups of farmers to capture collective perceptions regarding market challenges and opportunities. Rapid Rural Appraisal (RRA) tools such as problem ranking and seasonal marketing calendars helped identify context-specific bottlenecks. Moreover, key informant interviews with agricultural experts, APMC officials, cooperative society members and FPO leaders provided critical insights into market functioning, policy interventions and infrastructural gaps. This triangulation of data sources enhanced the reliability and validity of the findings.

Market linkage components

The following six components were adopted:

1. Market access.
2. Market information flow.
3. Price realization.
4. Storage and transportation.
5. Institutional linkages (APMC, FPOs).
6. Digital connectivity.

Index construction

Unit score standardization:

$$U_{ij} = \frac{Y_{ij} - Min_j}{Max_j - Min_j}$$

Composite market linkage index (MLI) and income security index (ISI) were computed.

Statistical tools

- Descriptive statistics.
- PCA (Principal component analysis).
- Garrett ranking.
- Cross-state comparative analysis.

RESULTS AND DISCUSSION

This section presents the empirical results of the study and interprets them within the broader context of agricultural marketing systems in Punjab and Rajasthan. The analysis focuses on the Market Linkage Index (MLI) (Table 2), the Income Security Index (ISI) (Table 3), component-wise linkage scores (Table 4), results of the

Table 1: Sample design.

Stage	Punjab	Rajasthan
Districts	2	2
Blocks	2 per district	2 per district
Villages	3 per block	3 per block
Farmers	5 per village	5 per village
Total sample	60	60

Grand total = 120 respondents.

Table 2: Distribution of farmers by market linkage categories.

Category	Punjab (%)	Rajasthan (%)
Low	13.33	18.33
Medium	56.67	66.67
High	30.00	15.00

Punjab displays stronger linkage strength due to procurement centers and cooperative structures. Rajasthan exhibits wide intra-regional variability.

Table 3: Income security category distribution.

Category	Punjab (%)	Rajasthan (%)
Low	10.00	21.67
Medium	55.00	63.33
High	35.00	15.00

Income security is directly correlated with linkage strength.

principal component analysis (PCA) (Table 5) and the marketing constraints perceived by farmers (Table 6). Together, these results provide a comprehensive understanding of how market structures, institutional support and access to information shape income security in the two states (Table 7, Table 8). The comparative nature of the study allows for insights into the systemic strengths of Punjab's procurement-driven environment and the challenges posed by Rajasthan's semi-organized and geographically dispersed market systems.

Market linkage index (MLI)

Income security index (ISI)

Component-wise scores

PCA analysis

Interpretation

- Punjab's PC1 heavily loads on market access, price realisation and institutional linkages.
- Rajasthan's PC1 loads strongly on market information and digital connectivity.

Marketing constraints (Garrett ranking)

Conceptual framework

Below is a schematic conceptual framework showing how market linkages influence income security (Fig 1).

The comparative assessment of agricultural market linkages and income security in Punjab and Rajasthan provides valuable insights into how structural, institutional and infrastructural differences shape farmers' marketing experiences and economic well-being. The findings of the study indicate that Punjab benefits from a relatively mature and organized agricultural marketing system characterized by strong institutional linkages, well-established APMC mandis, extensive procurement networks and higher levels of market access. These structural advantages significantly contribute to greater income security among farmers, reducing their vulnerability to market fluctuations and ensuring more stable and predictable earnings. The presence of functional cooperatives, Farmer Producer Organizations (FPOs) and reliable procurement mechanisms strengthens farmers' bargaining positions and improves price realization, further contributing to economic resilience.

In contrast, the situation in Rajasthan underscores the challenges faced by farmers operating within fragmented and semi-organized market environments. Although farmers in the state demonstrate moderate levels of market engagement, systemic limitations such as inadequate market infrastructure, limited institutional support, scattered procurement facilities and heavy dependence on intermediaries hinder their ability to secure favorable prices. The weaker performance of Rajasthan in market linkage indicators is directly reflected in the lower income security levels observed among its farmers. Frequent price volatility, delayed payments and high transportation costs create additional financial stress and reduce the stability of agricultural incomes. These challenges highlight the urgent need for targeted interventions aimed at improving market infrastructure, strengthening institutional mechanisms and enhancing access to reliable and timely market information.

The study also reveals that despite the differences between the two states, the improvement of market linkages holds enormous potential for enhancing income security across diverse agricultural settings. Strengthening storage and transportation infrastructure, expanding

Table 4: Average unit scores by component.

Component	Punjab	Rajasthan
Market access	0.73	0.52
Market information	0.69	0.55
Price realisation	0.76	0.48
Storage and transport	0.61	0.44
Institutional linkages	0.78	0.39
Digital connectivity	0.66	0.58

Punjab outperforms Rajasthan on all components except for marginal parity in digital connectivity.

Table 5: PCA eigen values (Punjab).

Component	Eigen value	% variance
PC1	3.018	50.30
PC2	1.224	20.40
Total	-	70.70

Table 6: PCA eigen values (Rajasthan).

Component	Eigen value	% Variance
PC1	2.287	38.10
PC2	1.364	22.70
Total	-	60.80

Table 7: Ranked constraints (Punjab).

Rank	Constraint
1	High transport/logistics cost
2	Storage shortages
3	Mandi congestion
4	Input price rise
5	Labour shortage

Table 8: Ranked constraints (Rajasthan).

Rank	Constraint
1	Price volatility
2	Middlemen dominance
3	Lack of organised procurement
4	Poor storage
5	Inadequate transport connectivity

procurement facilities, modernising APMC operations and promoting the role of cooperatives and FPOs can significantly enhance marketing efficiency and reduce the prevalence of distress sales. Furthermore, the increasing relevance of digital platforms and market information systems suggests that technology-driven solutions can help bridge existing gaps, particularly in regions where physical market infrastructure remains limited. Empowering farmers with digital literacy, expanding access to price information tools and integrating rural markets with digital platforms like e-NAM can help reduce information asymmetry and improve market participation.

Overall, the study emphasises the need for a dual-level approach that integrates farmer-driven initiatives with systemic reforms to create a more robust, inclusive and equitable agricultural marketing system. Policies aimed at supporting collective marketing, enhancing investment in rural market infrastructure and strengthening institutional linkages will play a critical role in improving the economic well-being of farmers. The comparative analysis between Punjab and Rajasthan demonstrates that while structural advantages can significantly boost market linkage strength, proactive institutional and infrastructural interventions can uplift even the most underserved regions. By adopting a holistic and state-specific strategy, policymakers and development agencies can facilitate sustainable agricultural growth, promote resilient livelihoods and support long-term income security for farming communities.

Recommendations

Based on the comparative findings from Punjab and Rajasthan, several recommendations emerge to strengthen agricultural market linkages and improve income security for farmers. The recommendations are presented at two levels-farmer-level and system-level-recognizing that market challenges stem from both individual constraints and broader institutional or infrastructural gaps. Implementing these recommendations holistically can enhance marketing efficiency, reduce vulnerability to price-related risks and promote sustainable income growth for farming households in both states.

Farmer-level recommendations

At the farmer level, there is a pressing need to enhance organizational capacity, improve knowledge of market mechanisms and promote technological adoption. Farmers should be encouraged to join Farmer Producer Organizations (FPOs), cooperatives, or cluster-based marketing groups, as these collective platforms strengthen negotiation power and reduce exploitation by intermediaries. Through collective action, farmers can pool resources for transportation, storage and input procurement, enabling cost-efficient and coordinated market participation. Training programmed focused on grading, sorting, packaging and primary processing are essential for improving the market value of produce and securing better price realisation.

Digital literacy must be promoted through village-level workshops and extension programmed so that farmers can effectively use mobile applications such as e-NAM, Kisan Suvidha and state-level mandi portals. Improved awareness of government schemes, procurement guidelines, MSP policies and insurance programmes will help farmers make informed selling decisions and reduce their dependence on informal market actors. In addition, farmers should be encouraged to adopt diversified cropping patterns and integrate allied activities such as dairy and horticulture to reduce income volatility and enhance economic resilience. A proactive approach to financial planning-including savings, credit management and risk mitigation-can further strengthen income security at the household level.

System-level recommendations

System-level interventions are critical for addressing the structural and institutional challenges that restrict efficient market functioning. In Punjab, improving existing market infrastructure is essential, particularly by modernising APMC mandis, upgrading weighing and quality assessment systems and introducing digital queue management to reduce congestion during peak procurement seasons. Enhancing transport networks and expanding cold storage facilities will support the sale of perishable commodities and minimise post-harvest losses. Policies encouraging public-private partnerships

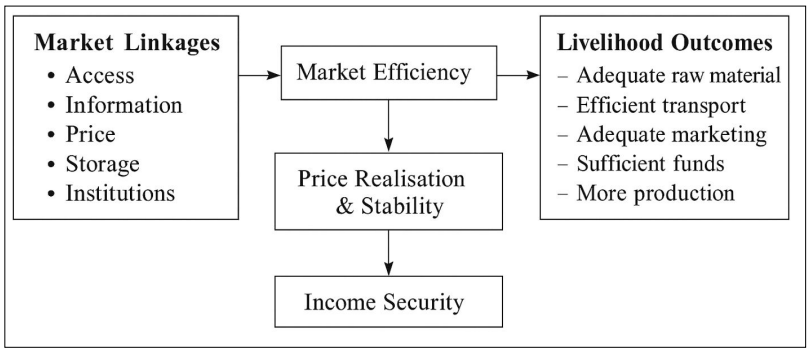


Fig 1: Market linkage and livelihood resilience framework.

(PPPs) in logistics, warehousing and rural market management would supplement government efforts and increase market efficiency. They reported the possibilities of digitalization in agriculture and agribusinesses. Research by (Solanki and Enumula 2021).

Rajasthan, however, requires more foundational reforms. Establishing additional procurement centres, strengthening the APMC system and developing rural warehouses and village-level aggregation points are necessary to reduce transportation burdens and increase farmers' access to regulated markets. Institutional reforms that simplify mandi regulations, strengthen market oversight and promote cooperative-based procurement models can significantly reduce middlemen dominance. Expanding digital infrastructure-such as reliable internet connectivity in remote villages-should be prioritised to enable seamless access to market information and online platforms. Additionally, government agencies must increase awareness campaigns and facilitate easier access to agricultural credit, market-linked subsidies and crop insurance schemes so that farmers can engage confidently in marketing activities without fear of financial risk.

Policy recommendations

From a policy standpoint, there is a need to promote a more coordinated and state-specific strategy for enhancing market linkages and income security. Policymakers should prioritise investments in rural infrastructure, including roads, warehouses, cold chains and market yards, recognising these as essential components for agricultural development rather than auxiliary services. Strengthening FPOs through financial support, capacity-building and operational autonomy can decentralise market power and promote farmer-led marketing initiatives. Integrating digital platforms with existing physical market structures-by expanding e-NAM coverage and introducing digital payment systems in mandis-will enhance transparency and reduce transaction delays.

State governments must also focus on developing regionally tailored MSP procurement mechanisms for commodities grown extensively within the region. In Rajasthan, introducing local procurement for pulses, oilseeds and coarse grains could provide a crucial safety net against price fluctuations. Finally, cross-state knowledge-sharing initiatives between Punjab and Rajasthan could facilitate the transfer of best practices relating to mandi management, cooperative functioning, digital integration and farmer training models. These policy-level efforts will collectively contribute to a more inclusive and robust agricultural marketing system across both states.

CONCLUSION

The comparative assessment shows that while Punjab has stronger market linkages and higher income security, Rajasthan exhibits moderate to weak linkages that undermine income stability. Institutional marketing structures, procurement facilities and organised market channels significantly enhance income security. Investments in market infrastructure, digital platforms, transport and warehouse facilities are critical to strengthening linkages and improving income resilience for farmers across different agro-ecological zones.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The authors declare no conflicts of interest regarding this manuscript.

REFERENCES

Babu, S.C., Joshi, P., Glendenning, C.J., Asenso-okyere, K. and Rasheed, S.V. (2013). the state of agricultural extension reforms in India: Strategic priorities and policy options. *AgEcon Search (University of Minnesota, USA)*. **26(2):** 159. https://doi.org/10.22004/ag.econ.162155.

Davis, K., Gandhi, R., Koo, J., Kramer, B., Miller, A., Repishti, J., Spielman, D. and Sulaiman V., R. (2025). Agricultural Extension Services from Transfer of Technology to Facilitation for Innovation. IFPRI Book Chapters. In: Global Food Policy Report 2025: Food Policy: Lessons and Priorities for a Changing World. *International Food Policy Research Institute (IFPRI)*. **8:** 195-220.

Ghanti, N.S. (2024). A Study on Growth and Opportunities for MSME in India. *International Research Journal of Humanities and Interdisciplinary Studies.* **5(7):** 121-132. https://doi.org/03.2021-11278686.

Gulati, A., Sharma, P., Samantara, A. and Terway, P. (2018). Agriculture Extension System in India: Review of Current Status, Trends and the Way Forward. https://think-asia.org/handle/11540/8400

Kapoor, D., Yadav, S., Sharma, M.M.M. and Sharma, P. (2023). Interaction between metal nanoparticles and pgpr on the plant growth and development. *Nanomaterials and Nanocomposites Exposures to Plants*. pp 327-351. https://doi.org/10.1007/978-981-99-2419-6_17.

Ma, W., Rahut, D. B., Sonobe, T. and Gong, B. (2024). Linking farmers to markets: Barriers, solutions and policy options. *Economic Analysis and Policy*. **82:** 1102. https://doi.org/10.1016/j.eap.2024.05.005.

Nedumaran, S. and Ravi, N. (2019). Agriculture extension system in India: A meta-analysis. *Res. Jr. of Agril. Sci.* **10(3):** 473-479.

Othuon, V.O. and Oyugi, M.A. (2017). Smallholder accelerated market access for inclusive growth, food security and poverty reduction in Kenya; Institutional and macroeconomic perspective: Lessons from Netherlands. *VNU Journal of Science: Natural Sciences and Technology (Vietnam National University)*. **8(14):** 204. http://iiste.org/Journals/index.php/JEDS/article/view/37995.

Padaria, R.N., Ranjith, P.C., Tanwar, R. and Shasani, S. (2022). State of agricultural extension reforms in India and the need of convergence. *Current Science*. **123(3):** 264. https://doi.org/10.18520/cs/v123/i3/264-270.

Rao, P. P., and Basavaraj, G. (2015). Status and Prospects of Millet Utilization in India and Global Scenario. In: Millets: Promotion for Food, Feed, Fodder, Nutritional and Environment Security, Proceedings of Global Consultation on Millets Promotion for Health and Nutritional Security. Society for Millets Research, ICAR Indian Institute of Millets Research, Hyderabad, pp. 197-209. ISBN 8189335529.

Saini, R., Kaur, M., Singh, R., Arora, K., Singh, G., Kaur, G., Singh, S., Singh, A. and Singh, D.K. (2022). Understanding sustenance of small farm holders: A study of income inequality among farm households in Indian Punjab. *Sustainability*. **14(20):** 13438. https://doi.org/10.3390/su142013438.

Satyasai, K.J.S. and Pereira, C. (2019). Can better market access lead to higher incomes for farmers? *Agricultural Economics Research Review*. **32:** 113. https://doi.org/10.5958/0974-0279.2019.00021.1.

Singh, A. (2024). Social and economic consequences of agriculture crises: A study of farm labour in Punjab, India. *Asian Journal of Agricultural Extension Economics and Sociology*. **42(7):** 21. https://doi.org/10.9734/ajaees/2024/v42i72513.

Singh, M., Rana, R.K., Monga, S. and Singh, R. (2022). Organic and natural farming-A critical review of challenges and prospects. *Bhartiya Krishi Anusandhan Patrika*. **37(4):** 295-305. doi: 10.18805/BKAP569.

Solanki, S. and Inumula, K.M. (2021). Farmers market: An analysis of the determinants of the consumer attitude and behaviour. *Asian Journal of Agriculture and Rural Development*. **11(1):** 63-70.

Sajesh, V.K. (2018). Pluralism in agricultural extension in india: Imperatives and implications. *Economic Affairs*. **63(4).** https://doi.org/10.30954/0424-2513.4.2018.27.

Singh, C. (2016). Green marketing in India: An overview. *SMS Journal of Entrepreneurship and Innovation*. **3(1).** https://doi.org/10.21844/smsjei.v3i01.6788.

Thanichanon, P., Schmidt, V.D., Epprecht, M., Heinimann, A. and Wiesmann, U. (2018). Balancing cash and food: The impacts of agrarian change on rural land use and wellbeing in Northern Laos. *Plos One*. **13(12).** https://doi.org/10.1371/journal.pone.0209166.

Venkattakumar, R., Venkatesan, P., Avinashilingam, N.V., Rathore, S., Shirur, M., Rao, C.S., Challa, L.N. and Dori, B. (2024). Challenges and strategies for farmer-centric extension system in India. *Current Science*. **127(9):** 1019. https://doi.org/10.18520/cs/v127/i9/1019-1028.

Venkattakumar, R., Venkatesan, P., Senthil Vinayagam, S., Venkateshwarlu, G. and Rao, C.S. (2024). Strengthening Farmer-Centric Extension System in India.