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Determinants of Farmers' Willingness to Participate in Wheat Seed Contract Farming in Punjab, India

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HIGHLIGHTS

- Social influence and trust shape farmers' decisions through participation in meetings, peer observation, local group influence, company reputation, and prior contract farming experience.
- Production proficiency encourages adoption by improving farm productivity, enabling convenient marketing, and ensuring access to high-quality seeds.
- Market assurance boosts farmers' confidence by ensuring assured markets, timely payments, stable income, reduced uncertainty, and comparative advantages over non-contract farming.
- Institutional support and incentives strengthen farmers' participation by providing training and capacity-building opportunities, regular technical inspection, and higher price.

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ABSTRACT

The study conducted during 2025 aims to identify the key factors influencing wheat farmers' willingness to adopt wheat seed contract farming. Four major constructs were identified: social influence and trust, market and income stability, production and marketing efficiency, and institutional support and incentives, comprising sixteen significant factors. Among these, social influence and trust emerged as the most important dimensions, explaining 26.32% of the total variance. This construct is primarily driven by observing other farmers (0.941), participation in meetings (0.909), influence of local farmer groups (0.872), company reputation (0.810), and prior contract farming experience (0.809). The second construct, market and income stability, explains 22.27% of the variance and includes assured markets (0.905), smooth payment systems (0.918), stable income (0.911), comparative advantages (0.796), and reduced market risk (0.785). Production and marketing efficiency accounts for 17.21% of the variance, highlighting productivity gains (0.964) and access to quality seed (0.952). Lastly, institutional support and incentives explain 14.89% of the variance, with training (0.963), technical inspection (0.948), and better pricing (0.815) emphasized. Overall, these findings highlight that farmers' participation is shaped by social trust, economic stability, production efficiency, and institutional support.

INTRODUCTION

Agriculture remains the backbone of food security, rural livelihoods, and economic development in developing nations. This holds true for India, where the farm sector has always remained central to the country's sustenance and food security. Punjab, located in northwestern India, occupies a distinctive position in the country's agrarian system due to its high irrigation coverage, extensive mechanization, and favorable agro-climatic conditions. Despite its relatively small geographical area, the state is also a perennially significant contributor to food grains in the country (Mann, 2017; Singh et al., 2020), especially wheat and rice. Indian

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agriculture is characterized by the prevalence of marginal and small farmers, who account for 85% of the farming population and own almost 47% of agricultural land (NABARD, 2025). In the case of Punjab, semi-medium and medium farmers are also highly exclusive due to land concentration in their hands (68.6% of operational holdings are behind them), and 33% (i.e., small and marginal) farmers own a negligible 10% of cultivated land (Gulati et al., 2021). Despite this comparative advantage, farmers continue to face increasing production and marketing challenges, particularly in seed production, including difficulties in meeting quality standards, timely access to inputs, and unstable market prices. These persistent issues have renewed policy and academic interest in "supermarket model" institutional arrangements aimed at reducing uncertainty and improving market coordination for farmers. Previous research studies indicate that contract farming can enhance farm efficiency, reduce transaction costs, and stabilize incomes by mitigating market and price risks (MacDonald et al., 2004; Otsuka et al., 2016; Liu et al., 2020). Meeting the future food grain requirement of 310 MMT by 2030 will depend significantly on the input of productivity enhancers and superior seed quality (Kumar et al., 2016). PAU plays a significant role in the development and dissemination of wheat seed, and it alone produces around 3,000·00 tons of different wheat seed (its bit vague) every year. Most of the seed produced is multiplied and marketed under contract farming with either public or private sector companies registered with the Punjab State Seed Certification Authority (PSSCA) (Sharma et al., 2013; Gajbhiye et al., 2014). Contract farming in Punjab has been extensively studied in the context of high-value horticultural crops; empirical evidence on wheat seed contract farming remains limited. This research gap is especially glaring in the case of wheat, a strategic value for which seed companies are increasingly concentrated in three districts Bathinda, Mansa, and Sri-Muktsar Sahib. Moreover, the bulk of previous studies have focused on economic implications, and little is known about attitudes and decision-making behavior regarding wheat seed. In this context, the study examines the following underlying factors of farmers' participation in wheat seed contract farming, with particular emphasis on social trust, production skills, and market guarantees. The study offers insights into how institutions and social and economic factors coalesce to influence farmers' decisions to contract, and it has important implications for policy-making, seed companies, and agricultural development strategies.

METHODOLOGY

The researcher employed a scheduled survey method, and the survey was conducted in 2025. A multistage sampling design, combining simple random and purposive sampling techniques, was used to collect the necessary data. In the first stage, three private contract farming companies were selected purposively based on their engagement with a relatively large number of contract farmers and their operational focus on wheat, a crop of strategic importance. These companies are primarily concentrated in the districts of Bathinda, Mansa, and Sri Muktsar Sahib, ensuring adequate representation of major contracting entities in the study region. In the second stage, a sample of 419 wheat seed contract farmers was drawn from a population of 900 farmers associated with the selected companies using Taro Yamane's (1967) formula, considering a 5% margin of error and a 95% confidence level to ensure statistical representativeness, consistent with approaches adopted in earlier studies (Rashid et al., 2026; Kumar et al., 2026). This was followed by proportionate sampling to achieve balanced representation across all three contract farming arrangements. The study is primarily based on cross-sectional primary data collected through a structured questionnaire administered to wheat seed-producing farm households. In total, the study covered 13 development blocks (Tehsils) across three different districts of Punjab - Bathinda, Mansa, and Sri Muktsar Sahib, located in the Malwa region, from which respondents were randomly selected. Additionally, to boost the survey instrument's credibility and reliability, a pre-test was conducted on a pilot survey of 30 respondents outside the sample area. The researcher's assessment of internal consistency employed Cronbach's alpha, which yielded a value of 0.755, exceeding the acceptable threshold of $\geq$0.70. Thereby indicating satisfactory reliability of the measurement scale (Ray et al., 2021).

The data's goodness-of-fit was tested before PCA was applied. The KMO sample adequacy test and Bartlett's sphericity test were used to determine whether the correlation matrix was suitable for factor analysis. KMO value of 0.708 and statistically significant Bartlett's K-Square ($P < 0.05$) are recommended for PCA analysis in this dataset (Yadav et al., 2026; Yadav et al., 2026). Subsequently, PCA was performed on the standardized correlation matrix.

This method decomposes the total offering into linear combinations of the original variables, where each principal component being orthogonal to the others and accounting for a smaller share of the total variance. For component extraction, Caesar's criteria were used, retaining components with eigenvalues greater than 1, where the Eigen's value (l) reflects the average number of clauses interpreted by each construct, obtained from the following equation.

$$Rv = \lambda v \quad \text{... (1)}$$

Where, R is the correlation matrix, v is the eigenvector, and λ is the eigenvalue. To improve the explanation, Varimax orthogonal rotation was applied, reordering the variance among the residual components while keeping them unrelated. The variables with factor weights greater than 0.60 were considered essential contributors to the component. Depending on the rotating factor load, components were assigned to the group with the highest load. The component score for each family was calculated using the regression method, as expressed below:

$$Si = W1\ Zi1 + W2\ Zi2 + ... + Wk\ Zik \quad \text{... (2)}$$

Where Si, i^{th} is a component score for the i^{th} family, Zij reflects standardized variable values, and Wj represents the component loads. These scores were later used for descriptive and comparative analyses across households, and this was verified using CFA afterwards. A model fit analysis was performed to assess the hypothesized model's goodness of fit, followed by the development of the confirmatory model.

Also, four items were used to investigate farmers' perceptions about contract farming, while two were used to solicit farmers' financial risk perceptions. During the data collection, respondents ranked their level of agreement with each perception statement. A

farmer who highly disagreed with a particular risk statement was assigned a value of –1, disagreed was assigned –0.5, neutral was assigned 0, agreed was assigned 0.5 and highly agreed was assigned 1. Following (Avane et al., 2012; Amrago & Mensah, 2023) the simple arithmetic mean was used to compute the farmer's perception index as follows:

$$\text{Perception index} = \frac{\Sigma\pi}{N} \quad ...(3)$$

Where, N is the number of perception statements, and is the mean score for each perception statement, which is estimated as:

$$\pi = \frac{\Sigma \text{Frequency1} \times \text{Wieght1}}{n} \quad ...(4)$$

Where n, denotes the number of respondents.

RESULTS

Table 1 presents farmers' perceptions of private-sector wheat seed contract farming across four dimensions. Social influence and trust emerge as strong drivers, with around 75–80% of farmers acknowledging the role of peer interactions, meetings, local groups, company reputation, and prior experience (mean = 0.452). Similarly, production and marketing efficiency are perceived positively, as nearly three-fourths of respondents noted improved productivity, convenient marketing, and better access to quality seeds (mean = 0.452). In contrast, market and income stability reflects weaker confidence (mean = 0.210), with only about 43% agreed on assured markets, with many remaining neutral regarding payment and income stability. Institutional support and incentives showed moderate agreement (mean = 0.291), particularly regarding training, technical support, and better prices. Overall, the grand perception index (0.346) indicates a moderately favorable attitude, suggesting that while farmers generally recognize the structural benefits of contract farming despite some concerns about market stability.

Table 3 presents the EFA results, revealing four latent constructs: Social Influence and Trust, Production and Marketing Efficiency, Market and Income Stability, and Institutional Support and Incentives. All indicators exhibit strong standardized factor loadings (>0.60), confirming good convergent validity.

The Social influence and trust construct is defined by five key indicators peer influence, participation in meetings, local farmer groups, company reputation, and prior contract farming experience highlighting the importance of social learning and institutional credibility in shaping adoption decisions. Production and marketing efficiency captures productivity gains, convenient marketing, and access to quality seed, reflecting the operational advantages provided by contract farming. Market and income stability encompasses assured markets, smooth payment systems, stable income, reduced market risks, and comparative advantages, emphasizing the role of contractual arrangements in minimizing uncertainty. Institutional Support and Incentives includes access to training, technical support, and better pricing, indicating the supportive role of firms in enhancing farmers' capabilities.

Institutional support and incentives is portrayed in access to training, facilities of technical support during pre- and post-production periods, and higher incentive price than normal market

Table 1. Summary of farmers' motivation to join private contract

Perception statements	Mean
Social influence and trust	
Participation in farming related meetings has influenced my decision to adopt contract farming.	0.43
Observing other farmers has positively influenced my decision to engage in contract farming	0.49
Local farmers' groups have influenced my decision to adopt contract farming.	0.41
The company's trustworthiness and reputation have positively influenced my decision to opt for contract farming.	0.12
Prior experience with contract farming has influenced my decision-making.	0.38
Perception score	0.452
Production and marketing efficiency	
Contract farming enhances farm productivity.	0.46
Contract farming facilitates convenient and efficient marketing procedures.	0.48
Contract farming ensures access to high-quality seeds.	0.54
Perception score	0.452
Market and income stability	
Contract farming ensures access to a guaranteed market.	0.27
Contract farming has relative advantages over non-contract farming.	0.37
Contract farming provides a stable and predictable income.	0.10
Contract farming reduces the risks associated with market uncertainty.	0.28
Perception score	0.210
Institutional support and incentives	
Contract farming provides access to training and capacity-building opportunities.	0.26
Contract farming facilitates regular technical inspection and monitoring.	0.15
Contract farming offers prices higher than the Minimum Support Price (MSP).	0.39
Perception score	0.291
Grand perception index	0.346

Table 2. Exploratory Factor Analysis

Contract farming dimensions	Loadings	Cronbach's alpha (α)	Composite reliability (CR)
Social influence and trust			
Participation in farming related meetings has influenced my decision to adopt contract farming.	.909	.919	.939
Observing other farmers has positively influenced my decision to engage in contract farming	.941		
Local farmers' groups have influenced my decision to adopt contract farming.	.872		
The company's trustworthiness and reputation have positively influenced my decision to opt for contract farming.	.810		
Prior experience with contract farming has influenced my decision-making.	809		
Production and marketing efficiency			
Contract farming enhances farm productivity.	.966	.965	.972
Contract farming facilitates convenient and efficient marketing procedures.	.964		
Contract farming ensures access to high-quality seeds.	.952		
Market and income stability			
Contract farming ensures access to a guaranteed market.	.905	.912	.936
Contract farming facilitates timely and smooth payment mechanisms.	.918		
Contract farming provides a stable and predictable income.	.911		
Contract farming reduces the risks associated with market uncertainty.	.785		
Contract farming offers comparative advantages over non-contract farming	.796		
Institutional support and incentives			
Contract farming provides access to training and capacity-building opportunities.	.963	.897	.936
Contract farming facilitates regular technical inspection and monitoring.	.948		
Contract farming offers prices higher than the Minimum Support Price (MSP)	.815		

Single-factor bias (Herman approach, 26.32%)

Table 3. Discriminant validity

	Social trust	Production and marketing efficiency	Market and income stability	Institutional support and incentives
Social trust	0.823			
Production and marketing efficiency	0.131	0.950		
Market and income stability	0.101	0.042	0.796	
Institutional support and incentives	0.084	0.058	0.040	0.886

Table 3 reports the Fornell–Larcker discriminant validity matrix for the four latent constructs: Social Trust, Production Proficiency, and Market Assurance.

make contract farming an attractive institutional arrangement for seed producers of wheat. The reliability test also supports the robustness of the measurement model. All constructs have Cronbach's alphas greater than the suggested cut-off value of 0.70, indicating strong internal consistency among the measurement items. Composite reliability of the constructs also lies within the acceptable range, supporting the rigor and stability of the constructs as indicated by the indicators. The Fornell–Larcker criterion test was conducted for discriminant validity as presented in Table 3. The square roots of the AVE for each construct are greater than the inter-construct correlations. This implies that the constructs are empirically distinct and that they measure distinct concepts. The relatively low correlations among the constructs (ranging from 0.040 to 0.131) suggest that farmers clearly differentiate between social, production, market, and institutional dimensions when evaluating contract farming. This distinction reinforces the multidimensional nature of farmers' perceptions and confirms that each construct captures a unique aspect of their decision-making process.

The Confirmatory Factor Analysis (CFA) results confirm a strong and statistically significant measurement structure across all four latent constructs, with all factor loadings being positive and significant ($p < 0.001$). Social Trust shows high loadings (0.614–0.990), emphasizing the importance of peer interactions, meetings, and prior experience, consistent with earlier findings. Production Efficiency exhibits very strong loadings (0.920–0.969), indicating a robust construct aligned with farmers' positive perceptions of productivity, marketing convenience, and input access. Market and Income Stability shows greater variability in its loading (0.526–0.986), reflecting the mixed perceptions, particularly regarding income stability and risk reduction, which corresponds to the lower mean scores observed in the descriptive analysis. Finally, Institutional Support also demonstrates strong loadings (0.649–0.94+), confirming the relevance of training, technical support, and pricing incentives. Overall, the CFA results validate the constructs and are consistent with the descriptive findings.

DISCUSSION

The study's primary purpose is to understand the different dimensions of contract farming from the farmers' perspective. The research identified and validated four major construct, which include

Table 4. Confirmatory factor analysis

Latent variables	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std. all
Social trust =~						
ST1	1.380	0.049	28.083	0.000	1.380	0.990
ST2	1.121	0.057	19.599	0.000	1.121	0.796
ST3	1.392	0.053	26.1863	0.000	1.392	0.953
ST4	0.746	0.051	14.692	0.000	0.746	0.644
ST15	0.891	0.064	13.846	0.000	0.891	0.614
Production efficiency =~						
PME1	0.978	0.036	27.037	0.000	0.978	0.969
PME2	1.046	0.039	26.633	0.000	1.046	0.961
PME3	0.936	0.038	24.629	0.000	0.936	0.920
Marketing and income stability =~						
MIS1	1.072	0.041	26.295	0.000	1.072	0.952
MIS2	1.034	0.037	28.052	0.000	1.034	0.986
MIS3	0.951	0.035	26.871	0.000	0.951	0.963
MIS4	0.628	0.055	11.511	0.000	0.628	0.526
MIS5	0.658	0.055	11.928	0.000	0.658	0.542
Institutional support =~						
IS1	1.428	0.050	28.726	0.000	1.428	1.011
IS2	1.383	0.054	25.565	0.000	1.383	0.949
IS3	0.911	0.061	14.850	0.000	0.911	0.649

Notes: =~ indicates factor loadings of observed variables on latent constructs. Std. Err denotes standard error; Std. all represents fully standardized loadings. All estimated loadings are statistically significant ($p < 0.01$).

16 factors that influence farmers' decisions to adopt wheat seed contract farming. In the social dimension, participation in meetings, observing fellow participating farmers, motivation from local farmer groups, the reputation of contracting companies and previous contract farming experiences emerge as the most powerful factors influencing the decision to join contract farming. Farmers also gain information on contracting agencies and the volume to be contracted through attending these meetings, thereby mitigating informational deficiencies and moral hazard problem. Such exchanges facilitate trust in the contracting relationship by enabling farmers to share concerns on prices, quality specifications, and terms of delivery (Bijman, 2008). And then, watching other growers who are already under contract is a form of social learning within the peanut policy environment. Favourable experiences lower perceived risk and encourage adoption through the demonstration effect and social imitation (Kumar & Singh, 2010; Nain & Kumar, 2010; Schewe Stuart, 2016, Vellema et al., 2019; Arouna et al., 2021; Mao et al., 2022). Knowing the contracting firms is also an essential aspect for building farmers' trust. Also, knowledge of contracting companies trust-building were essential issues among farmers. It is those companies with a good reputation, fair practices in treating farmers, on-time payments, clear explanations of the terms of payment for procurement that are considered more competitive in attracting farmers under contract (Mao et al., 2022; Pham et al., 2026). Past experience enhances farmers' capacity to make informed decisions regarding efficient profitable production and marketing strategies. In particular, experience with contract farming emerges as a significant determinant influencing farmers' transition from traditional to more commercialized farming systems (Ba et al., 2019). A strong institutional reputation signals credibility and reduces concerns about opportunistic behavior, lowers transaction costs and strengthens long-term contractual relationships (Singh et al., 2025). Prior studies have shown that farmers' production and marketing decisions are strongly influenced by peers' observed behaviour through information sharing, demonstration effects, and informal learning (Pham et al., 2026). We expect the peer effect instrument to affect an individual farmer's probability of contracting with a private firm by influencing how they evaluate benefits and risks, as well as the credibility of contracts. Furthermore, significant predictors of contract farming participation among farmers include farm productivity, convenience and speed of selling produce, and access to good seed under the production and marketing proficiency dimension. Contract farming improves farm productivity by encouraging the use of advanced production technologies, uniform cultivation methods, and promptly addressing production requirements. Through embedded services such as technical supervision and input, and the transfer of the final product to the company premises, with proper coordination between the firms and farmers, farmers' tendency towards contract farming is boosted. The study's findings align with those of Key and Runsten (1999) Swinnen and Maertens (2007), Saroj et al. (2023), who found that contracting firms reduce production inefficiencies and enable farmers to achieve higher, more consistent yields. These coordinated procurement mechanisms significantly enhance production efficiency by streamlining post-harvest operations and reducing transaction costs. By simplifying the selling process, farmers can focus on production decisions and avoid unnecessary marketing decisions, thereby contributing to a decline in farm efficiency (Warning & Key, 2002; Bellemare, 2016). Contracting firms are directly connected with agricultural institutions, enabling them to obtain first-hand, high-quality seeds. These are distributed to farmers through local contracting arrangements, which in turn

reinforce farmers' linkages and dependence on contracting firms. The provision of good-quality seed increases biological productivity, reduces fear of crop failure, cognitive dissonance about low yields and qualitative rejections, and transaction costs that poor farmers experience in meeting contracts (Birthal et al., 2007). In the market and income stability dimension, indicators including smooth payment mechanisms, income stability, assured market access, comparative advantages, and mitigation of market uncertainty demonstrate factor loadings exceeding the acceptable threshold, identifying them as critical determinants of farmers' participation in contract farming. The majority of private-sector firms operate in close proximity to farming areas, fostering strong farmer–firm relationships that enable flexible financial arrangements. Farmers generally procure foundation seed without upfront payment, as the cost is adjusted against the final settlement. Furthermore, farmers may seek advance financial support from contracting firms to facilitate the purchase of agricultural inputs, the studying findings are aligned with Khalili et al. (2024) who found that timely buyer payments can act as determinants of trust. A fixed price and assured market can provide a compelling economic incentive to reduce income and unpredictable market risks. Khalili et al. (2024) and Birthal et al. (2005) reported that price advantages significantly reduce market risk for farmers, thereby facilitating their participation in contract farming. Given these characteristics of contract farming, farmers find it more profitable than traditional farming. Rusu et al. (2024) found that access to credit, improved technologies, and enhanced production skills significantly mitigate price volatility risks, while stable income constitutes a major benefit of contract farming.

The institutional support and incentives dimension comprise three key components: access to training, technical inspection, and the provision of prices higher than those prevailing in local markets. Technical training is essential for enhancing productivity and strengthening farmers' technical capacity through the adoption of improved agricultural practices. Moreover, timely monitoring of crop germination and growth plays a critical role in improving crop performance. Contract farming companies facilitate higher productivity, improved quality compliance, and greater cost efficiency by providing extension services, training, and regular field supervision. Such technical support not only enhances farmers' production capabilities but also reduces information asymmetry and production risks, thereby positively influencing farm-level decision-making (Warning & Key, 2002; Bellemare, 2016; Kujur et al., 2026).

CONCLUSION

The study identifies four key dimensions social influence and trust, production and marketing efficiency, market and income stability, and institutional support as critical drivers of farmers' participation in wheat seed contract farming. Within the social trust dimension, participation in meetings, observation of fellow farmers, influence of local farmer groups, reputation of contracting firms, and prior contract farming experience collectively play a crucial role in reducing uncertainty, building trust, and encouraging adoption. Economic incentives, including assured markets, stable income, and reduced price risks, render contract farming more attractive than traditional systems. Institutional support through training, technical supervision, and financial facilitation improves farmers' capabilities and decision-making. These finding offer practical implications for policymakers, agribusiness firms, and extension agencies regarding the implementation of trust-based mechanisms, and effective production support services. Finally, the findings suggest that a viable and sustainable contract farming model should be structured to promote farmers' participation and increase income and food security.

DECLARATIONS

Ethics approval and informed consent: Informed consent was sought from the respondents and their organisations regarding the study during the course of the data collection.

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. The authors declare that during the preparation of this work, thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

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REFERENCES

Amrago, E. C., & Mensah, N. O. (2023). Trade credit from agrochemical vendors as an alternative source of finance for cabbage producers in the Bono East Region of Ghana. *Agricultural Finance Review, 83*(1), 43-82. https://doi.org/10.1108/AFR-11-2021-0155

Arouna, A., Michler, J. D., & Lokossou, J. C. (2021). Contract farming and rural transformation: Evidence from a field experiment in Benin. *Journal of Development Economics, 151*(3), 102626. https://doi.org/10.1016/j.jdeveco.2021.102626

Avane, A., Amfo, B., Aidoo, R., & Mensah, J. O. (2022). Adoption of organic fertilizer for cocoa production in Ghana: perceptions and determinants. *African Journal of Science, Technology, Innovation and Development, 14*(3), 718-729. https://doi.org/10.1080/20421338.2021.1892254

Ba, H. A., de Mey, Y., Thoron, S., & Demont, M. (2019). Inclusiveness of contract farming along the vertical coordination continuum: Evidence from the Vietnamese rice sector. *Land use Policy, 87*, 104050. https://doi.org/10.1016/j.landusepol.2019.104050

Barrett, C. B., Bachke, M. E., Bellemare, M. F., Michelson, H. C., Narayanan, S., & Walker, T. F. (2012). Smallholder participation in contract farming: comparative evidence from five countries. *World Development, 40*(4), 715–730. https://doi.org/10.1016/j.worlddev.2011.09.006

Bellemare, M. F., & Novak, L. (2016). Contract farming and food security. *American Journal of Agricultural Economics, 99*(2), 357-378. https://doi.org/10.1093/ajae/aaw053

Bijman, J. (2008). Contract farming in developing countries: An overview. Wageningen University, the Netherlands. Available at: https://edepot.wur.nl/ (Accessed on: 07 April 2026).

Birthal, P. S., Joshi, P. K., & Gulati, A. (2007). Vertical coordination in high-value food commodities: Implications for small holders. International Food Policy Research Institute.

Gajbhiye, R., Nain, M. S., Singh, P., Dubey, S. K., & Sharma, J. P. (2014). Comparative assessment of seed delivery system in Patiala district of Punjab. *Journal of Community Mobilization and Sustainable Development, 9*(2), 129-134.

Government of Punjab. (2020). The Punjab Tissue Culture-Based Seed Potato Act, 2020 (Act 18 of 2020). Punjab Government Gazette, Government of Punjab, India. Available at: https://www.indiacode.nic.in/handle/123456789/21764

Gulati, A., Roy, R., & Hussain, S. (2021). Performance of agriculture in Punjab. In: Gulati, A., Roy, R. and Saini, S. (Eds.), Revitalizing Indian agriculture and boosting farmer incomes (pp. 77-112). Springer. https://doi.org/10.1007/978-981-15-9335-2

Key, N., & Runsten, D. (1999). Contract farming, smallholders, and rural development in Latin America: The organization of agro processing firms and the scale of out grower production. *World Development, 27*(2), 381- 401. https://doi.org/10.1016/S0305-750X(98)00144-2

Khalili, F., Choobchian, S., & Abbasi, E. (2024). Investigating the factors affecting farmers' intention to adopt contract farming. *Scientific Reports*, *14*(1), 9670. https://doi.org/10.1038/s41598-024-60317

Kujur, S., Barua, S., Nain, M. S., Sahu, S., Sangeetha, V., Mukherjee, A., Praveen, K. V., Chaithanya, N. V. L. K., & Jha, G. K. (2026). Unveiling barriers and prioritizing strategies for empowerment of Oraon tribal women through multi-criteria decision analysis. *Frontiers in Sociology, 11*, 1707192. https://doi.org/10.3389/fsoc.2026.1707192

Kumar, P, Joshi, P. K., & Mittal, S. (2016). Demand vs supply of food in India: futuristic projection. *Proceedings of the Indian National Science Academy, 82*(5), 1579-1586. https://doi.org/10.56739/jor.v38i1.136999

Kumar, S. A., & Singh, P. (2010). Exploratory study on the motivational factors of contract farming. *Indian Journal of Extension Education, 46*(1&2), 26-30.

Kumar, S., Godara, R. S., Parihar, M., & Singh, J. (2026). Protected vegetable cultivation in Haryana: An analysis of marketing efficiency and major constraints. *Indian Journal of Extension Education, 62*(1), 123-128. https://doi.org/10.48165/IJEE.2026.62120

Liu, X., Shen, X., & You, M. (2020). Study on coordination and optimization of contract farming supply chain based on uncertain conditions. *Scientific Programming, 2020*(1), 8858812. https://doi.org/10.1155/2020/8858812

MacDonald, J. M., Perry, J., Ahearn, M. C., Banker, D., Chambers, W., Dimitri, C., & Southard, L. W. (2004). Contracts, markets, and prices: Organizing the production and use of agricultural commodities. USDA-ERS *Agricultural Economic Report*, 837. doi:10.2139/ssrn.753567

Mamun, M. M. R., Mondol, M. A. S., Rahman, M. S., & Jackson, T. (2026). Factors influencing agricultural diversification: The case of northern Bangladesh. *Indian Journal of Extension Education*, 62(2), 79-85. https://doi.org/10.48165/IJEE.2026.62213

Mann, R. S. (2017). Cropping Pattern in Punjab (1966-67 to 2014-15). *Economic and Political Weekly*, *52*(3), 30-33.

Mao, H., Fu, Y., Cao, G., & Chen, S. (2022). Contract farming, social trust, and cleaner production behavior: Field evidence from broiler farmers in China. *Environmental Science and Pollution Research, 29*(3), 4690-4709. https://doi.org/10.1007/s11356-021-15934-8

NABARD. (2025). Fostering rural prosperity. Available at: https://www.nabard.org/news-article.aspx?id=25&cid=552&NID=293

Otsuka, K., Nakano, Y., & Takahashi, K. (2016). Contract farming in developed and developing countries. *Annual Review of Resource Economics, 8*(1), 353-376. https://doi.org/10.1146/annurev-resource-100815-095459

Pham, T. T., Dang, H. L., Pham, N. T. A., & Dang, H. D. (2026). Adoption of contract farming for managing agricultural risks: a case study in rice production in the Mekong Delta, Vietnam. *Journal of Agribusiness in Developing and Emerging Economies, 16*(1), 1-22. https://doi.org/10.1108/JADEE-05-2021-0107

Ray, P., Panigrahi, R. S., & Shasani, S. (2021). Determinants of skill levels of farm youth about agripreneurship: A multinomial regression approach. *Indian Journal of Extension Education, 58*(1), 58-62. http://doi.org/10.48165/IJEE.2022.58113

Rusu, M., Cchitea, M. A., & Bruma, I. S. (2024). Variances between contract and non-contract farms in the use of sustainable farming practices: Case study. Scientific Papers Series Management, *Economic Engineering in Agriculture & Rural Development, 24*(2), 825–832.

Saroj, Paltasingh, K. R., & Jena, P. K. (2023). Does contract farming enhance farm efficiency? A case of wheat growers of Haryana, India. *Heliyon*, *9*(4), e15222. https://doi.org/10.1016/j.heliyon.2023.e15222

Schewe, R. L., & Stuart, D. (2016). Why Don't They Change? Contract farming, informational influence, and barriers to agricultural climate change mitigation. *Rural Sociology, 82*(2), 226–262. https://doi.org/10.1111/ruso.12122

Sharma, R. C., Sharma, I., Kaur, D. J., & Bala, R. (2013). Disease free seed production of wheat in Punjab: achievements. *Journal of Cereal Research, 3*(2), 27-29. https://doi.org/10.25174/br6ev046

Singh, A. K., Nagaraju, K., Singh, N., Thriveni, V., Kumar, N., Sharma, A., & Ahmed, R. (2025). Contract farming and its economic implications for small and marginal farmers: A critical review of policy and practices. *Journal of Experimental Agriculture International, 47*(8), 311–327. 10.9734/jeai/2025/v47i83674

Singh, L., Bansal, S., & Sharma, I. (2020). Sustainability of agriculture systems: A case study of Punjab. *Indian Journal of Economics and Development, 16*(2S), 225-231. https://doi.org/10.35716/ijed/NS20-046

Swinnen, J. F. M., & Maertens, M. (2007). Globalization, privatization, and vertical coordination in food value chains in developing and transition countries. *Agricultural Economics, 37*(s1), 89-102. https://doi.org/10.1111/j.1574-0862.2007.00237.x

Vellema, S., Adomaa, F. O., & Schoonhoven-Speijer, M. (2021). Making knowledge work in practice: An integrative methodology for researching performance in global commodity chains and local food markets. *The politics of knowledge in inclusive development and innovation,* (256–268). Routledge. DOI:10.4324/9781003112525-23

Warning, M., & Key, N. (2002). The social performance and distributional consequences of contract farming: An equilibrium analysis of the Arachide de Bouche Program in Senegal. *World Development, 30*(2), 255–263. https://doi.org/10.1016/S0305-750X(01)00104-8

Yadav, B., Maurya, A. S., Supriya, Narain, S., & Kumar, A. (2026). Socio-economic determinants of agriculture households in Punjab: A principal component analysis. *Indian Journal of Extension Education, 62*(1), 41-47. https://doi.org/10.48165/IJEE.2026.62107