



RESEARCH ARTICLE

Impact of crop insurance and crop loans on agricultural growth in Haryana: A factor analysis approach

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Abstract

This study aims to evaluate the impact of crop loans and crop insurance on the agricultural sector's growth and development in Haryana, India. Through a quantitative analysis involving factor analysis, it investigates how these financial instruments influence agricultural productivity, sustainability, and farmers' livelihoods. Data for the study was gathered through a structured questionnaire distributed to 846 farmers across various districts in Haryana. The survey included questions about the use and impact of crop loans and crop insurance and demographic information. Factor analysis was employed to identify and interpret the underlying factors influencing agricultural growth related to these financial mechanisms. The analysis revealed several key factors contributing to the agricultural sector's growth in Haryana. These include the direct impacts of crop insurance and crop loans, governmental and economic influences, and the accessibility and awareness of these financial tools among farmers. The study found that crop loans and insurance significantly contribute to agricultural productivity and sustainability but also identified areas where improvements are needed, such as in policy implementation and farmer education. The research highlights the crucial role of crop loans and crop insurance in supporting agricultural growth in Haryana. However, it also points out the need for more tailored financial products and policies to better address the diverse needs of the farming community. The study provides valuable insights for policymakers, financial institutions, and agricultural stakeholders, suggesting a more integrated and farmer-centric approach in developing agricultural finance strategies.

Keywords: Crop insurance, Crop loan, Agricultural growth, Factor analysis.

Introduction

Agriculture remains a cornerstone of India's economy, contributing significantly to the gross domestic product (GDP) and employing a large portion of the population. The state of Haryana, known for its rich agricultural heritage, has played a pivotal role in the Green Revolution and continues to be a major contributor to the nation's grain basket. Despite advancements, the agricultural sector in Haryana, as in many parts of India, faces numerous challenges, including climatic risks, market volatility, and financial constraints.

Farmers in Haryana frequently contend with uncertainties that threaten their livelihoods and crop productivity. Limited access to financial resources and risk management tools can significantly impact their ability to invest in agricultural activities and respond to adverse events. Crop loans and crop insurance are two critical financial instruments designed to mitigate these challenges. However, their effectiveness and impact on the agricultural sector's growth and sustainability in Haryana are not fully understood.

The primary objective of this research is to analyze the impact of crop loans and crop insurance on agricultural growth in Haryana. By employing a quantitative approach, specifically factor analysis, this study aims to dissect the multifaceted influence of these financial mechanisms on the agricultural sector. The research identifies and interprets various factors that emerge from the data, offering a comprehensive view of how crop loans and crop insurance contribute to agricultural development.

Understanding the role of financial tools in agriculture is crucial for policy formulation, farmer support initiatives, and the sector's overall development. This study adds to the academic discourse on agricultural finance and provides practical insights for policymakers, financial institutions, and farmers. It aims to bridge the gap between the theoretical

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understanding of agricultural finance and its practical implications in the context of Haryana's agrarian economy.

Literature Review

The literature on agricultural finance in India predominantly focuses on the role of credit and insurance in supporting farm activities. Studies by Singh *et al.* (2016) and Kumar (2018) emphasize the critical role of financial support in enhancing agricultural productivity, risk management, and farmers' welfare. These works highlight the historical evolution of agricultural finance policies in India, noting significant milestones like the Green Revolution and subsequent policy reforms.

The literature on crop loans in India underscores the vital role of credit in agricultural development. Studies in this area focus on various aspects, such as the importance of cooperative banks in rural development (Joshi, 2023), underutilization of financial services (Nithyashree & Vallabhaneni, 2023), inefficiencies in credit distribution (Ramasamy & Malaiarasan, 2023), and the necessity of post-credit supervision (Ray & Das, 2023). Key findings include the challenges faced by female farmers in accessing credit (Chakraborty & Kumar, 2022), insights into crop diversification (Pattanayak, 2022), and evaluations of schemes like the Kisan Credit Card (Bhanot *et al.*, 2021). The literature paints a detailed picture of the intricacies involved in agricultural credit in India, emphasizing disparities in access and the impacts of credit on agricultural productivity.

Crop insurance is widely acknowledged as a crucial tool for risk management in agriculture. Jain and Singh (2020) conducted a comprehensive review of crop insurance schemes in India, analyzing their coverage, impact, and farmer awareness. Their findings suggest that while crop insurance schemes like Pradhan Mantri Fasal Bima Yojana (PMFBY) have made strides in protecting farmers against crop losses, issues such as delayed claim settlements and lack of awareness impede their full potential.

The reviews on crop insurance reveal the complexities of various schemes and their reception among farmers. Studies by Kalimuthu & Priyanka (2023) and Rao (2021) highlight issues in risk coverage and trust in the Pradhan Mantri Fasal Bima Yojana (PMFBY). Awareness and timely compensation are important (Sharon *et al.*, 2023; Thapa & Noel, 2023; Kumar, 2020). Studies also explore the influence of extreme weather events on insurance uptake (Bjerge, 2018; Ghadiri, 2017) and the limitations of weather-based insurance (Rajarajan, 2016; Smith, 2016). The research collectively indicates the need for better awareness, cost-effectiveness, and timely support to improve crop insurance schemes for Indian farmers.

Studies discuss the importance of crop loans and insurance in managing farm profits and mitigating adverse events (Kaur & Malhotra, 2023; Raahalaya *et al.*, 2023). The link between financial literacy and awareness of digital credit is highlighted (Sarfo *et al.*, 2023), as well as critiques of crop

insurance schemes in India (Green, 2023). The potential of alternative financing mechanisms like peer-to-peer crowdfunding is explored (Handage *et al.*, 2023), illustrating the multifaceted issues faced by farmers, including financial literacy, access to credit, and the need for improved agricultural policies.

Studies from Pakistan (Ali *et al.*, 2021; Ghazanfar *et al.*, 2014, 2015) and India (Chandrasekar & Pandi, 2021; Bobade & Mahajan, 2014; Karthik & Ramalingam, 2013) discuss the impact of climate change on farm income, awareness of crop insurance, and the influence of social participation and education on insurance adoption. The importance of insurance for stabilizing farm production in the face of uncertainty is emphasized (Daravath, 2021; Kumar *et al.*, 2011).

Crop loans have been the subject of extensive study in the context of Indian agriculture. Researchers like Sharma (2017) and Gupta (2019) have explored the accessibility and impact of crop loans on small and marginal farmers. These studies reveal that while crop loans have the potential to boost agricultural productivity and income, challenges like high interest rates, stringent repayment terms, and accessibility issues often diminish their effectiveness.

The link between financial instruments and agricultural sustainability is a key area of exploration. Patel and Kumar (2021) examined how financial support influences sustainable agricultural practices, emphasizing that access to finance is pivotal for adopting sustainable technologies and practices. Their work aligns with global studies, which underscore the importance of finance in achieving sustainable agricultural growth (FAO, 2018).

Region-specific studies, particularly focusing on Haryana, are crucial in understanding the localized impact of agricultural finance. Research by Mehta and Singh (2019) provides insights into the state's agricultural landscape, highlighting the unique challenges and opportunities present. Their findings indicate that while Haryana has benefitted from financial instruments, the impact varies significantly across different regions and farmer demographics.

Despite the extensive body of literature, there remains a gap in understanding the combined effect of crop loans and insurance on agricultural growth in Haryana. Most studies focus on either crop loans or insurance in isolation, lacking a comprehensive analysis that integrates both aspects.

Research Methodology

Research Design

This study adopts a quantitative research approach to examine the impact of crop loans and crop insurance on agricultural growth in Haryana.

Sample Selection

The sample consists of 846 respondents, selected using stratified random sampling.

Data Collection Instrument

A structured questionnaire serves as the primary data collection instrument. The questionnaire comprises multiple sections, including demographic information, access and use of crop loans and insurance, and perceptions of their impact on agricultural growth. The survey includes closed-ended and open-ended questions, allowing for quantitative analysis and qualitative insights.

Factor Analysis

The study employs factor analysis, a statistical method used to identify underlying variables (factors) that explain the pattern of correlations within a set of observed variables. This technique is particularly suitable for analyzing the complex relationships between various aspects of crop loans, crop insurance, and agricultural growth.

Data Analysis Procedure

Preliminary analysis

Initial data screening for completeness, outliers, and normality.

Factor extraction

Employing principal component analysis (PCA) to extract factors from the survey responses.

Factor rotation

Utilizing varimax rotation for a clearer interpretation of the factors.

Reliability and validity testing

Assess the internal consistency of the questionnaire using Cronbach's alpha and conduct validity tests to ensure the accuracy of the factors identified.

Result

The perception of sample 846 respondents with respect to 35 statements has been analyzed using factor analysis method. 35×35 inter-correlation matrix. A high degree of significant correlation exists in the variables.

Table 1 contains results from two statistical tests often used in the context of factor analysis: the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity.

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy

The KMO test measures the proportion of variance among variables that might be common variance. The value ranges

from 0 to 1. A KMO value of .903 is very high. This indicates that a large proportion of variance in the variables is shared and that factor analysis is likely to be suitable. KMO values above 0.6 are generally considered acceptable, with values closer to 1 being ideal.

Bartlett's Test of Sphericity

This test checks the null hypothesis that the correlation matrix is an identity matrix, which would indicate that variables are unrelated and, therefore, unsuitable for structure detection. The test gives a Chi-square value of 9092.330 with 595 degrees of freedom (df) and a significance (Sig.) level of 0.000. A significance level of 0.000 means that the test found that the correlation matrix is not an identity matrix and that there is significant intercorrelation among the variables.

Table 2 presents the results from a PCA, which is a dimensionality reduction technique used to reduce the complexity of data while retaining most of the variation in a dataset.

Extraction Method: Principal Component Analysis

Initial Eigenvalues

These values represent the amount of variance captured by each component before extraction. The "Total" column shows the eigenvalues for each factor or component. The "% of Variance" shows the percentage of the total variance attributed to each factor. The "Cumulative %" column shows the total variance accounted for by that factor and all preceding factors. The first factor (1) has an eigenvalue of 8.628, which explains 24.652% of the variance. The cumulative percentage for the first factor is the same since it's the first factor being considered.

Extraction sums of squared loadings

After factors are extracted based on eigenvalues, these columns show how much of the total variance is explained by the factors retained in the analysis. Only factors with an eigenvalue greater than 1 are typically retained, as an eigenvalue less than 1 indicates that the factor explains less variance than a single original variable. The first factor still accounts for 24.652% of the variance, and by the time we include the eighth factor, we have accounted for 54.248% of the variance.

Rotation sums of squared loadings

After extraction, the factors can be rotated to achieve a simpler and more interpretable structure, often using methods like varimax rotation. The "Total" after rotation gives the eigenvalues for each factor, the "% of Variance" gives the percentage of the total variance attributed to each rotated factor, and the "Cumulative %" column shows the total variance accounted for by that factor and all preceding factors after rotation. After rotation, the first factor explains a smaller percentage of the total variance (9.893%), but the variance

Table 1: KMO and Bartlett's test

<i>Kaiser-Meyer-Olkin measure of sampling adequacy.</i>		.903
Bartlett's test of sphericity	Approx. Chi-square	9092.330
	df	595
	Sig.	0.000

Table 2: Total variance explained

Statement	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	8.628	24.652	24.652	8.628	24.652	24.652	3.462	9.893	9.893
2	2.401	6.860	31.512	2.401	6.860	31.512	2.687	7.678	17.570
3	1.690	4.830	36.342	1.690	4.830	36.342	2.589	7.396	24.967
4	1.657	4.735	41.077	1.657	4.735	41.077	2.282	6.520	31.487
5	1.238	3.537	44.614	1.238	3.537	44.614	2.220	6.343	37.830
6	1.206	3.445	48.059	1.206	3.445	48.059	2.123	6.065	43.895
7	1.122	3.205	51.264	1.122	3.205	51.264	1.812	5.177	49.072
8	1.044	2.984	54.248	1.044	2.984	54.248	1.812	5.176	54.248
9	.974	2.783	57.031						
10	.953	2.724	59.755						
11	.870	2.486	62.241						
12	.857	2.449	64.690						
13	.850	2.428	67.118						
14	.820	2.342	69.460						
15	.773	2.209	71.669						
16	.736	2.102	73.771						
17	.703	2.009	75.780						
18	.622	1.778	77.558						
19	.593	1.694	79.253						
20	.584	1.668	80.920						
21	.562	1.605	82.525						
22	.557	1.591	84.116						
23	.542	1.548	85.663						
24	.520	1.485	87.149						
25	.490	1.399	88.547						
26	.478	1.365	89.913						
27	.459	1.313	91.225						
28	.435	1.244	92.469						
29	.428	1.224	93.693						
30	.407	1.163	94.856						
31	.400	1.143	95.999						
32	.379	1.082	97.081						
33	.359	1.025	98.106						
34	.346	.988	99.094						
35	.317	.906	100.000						

explained is more evenly distributed among the factors. By the eighth factor (which is also the last one reported after rotation), we have accounted for 54.248% of the variance.

Figure 1 displays the eigenvalues of the components resulting from a PCA on the x-axis and the component numbers on the y-axis. A point where the slope of the curve changes from steep to shallow is often called the "elbow." The components before this point are considered significant,

and the components after this point—where eigenvalues are closer to 1 or below—are often considered less important.

Table 2 shows that the first few PCs capture a significant portion of the variance. The eigenvalue of each successive component decreases, and so does its contribution to the overall variance. The table also suggests that, initially, a few components capture a large portion of the variance (23.02% by the first component), but as more components are

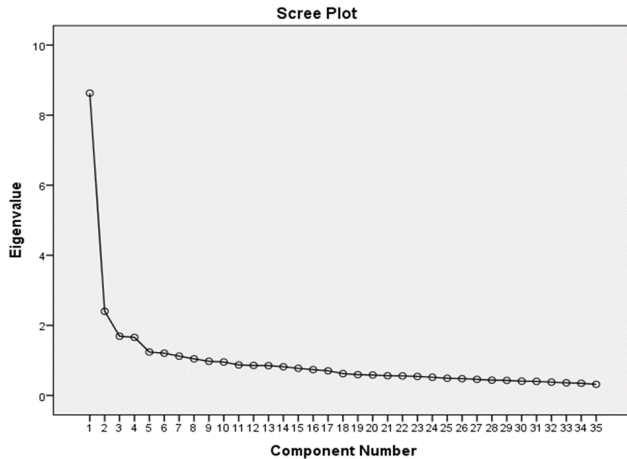


Figure 1: Scree plot

included, their individual contributions become smaller. This pattern is typical in PCA, where the first few components often capture the most significant patterns in the data, and the importance of each subsequent component decreases.

Table 3 shows the results from a PCA. Specifically, it provides the loadings of each variable (statements S1 to S35) on the extracted components (1 to 8) and the communalities after extraction.

Component loadings

The loadings represent the correlation between the original variables (statements) and the components. High absolute values indicate a strong relationship between the variable and the component. Each statement's loading on a component can be interpreted as the degree to which the statement contributes to or is associated with the component. For example, S1 has a loading of .084 on component 1, indicating a relatively low association with this component. In contrast, S17 has a loading of .275 on component 1, suggesting a stronger association.

Communalities (h^2)

Communalities represent the proportion of each variable's variance that is explained by the components. They are the squared sum of the loadings for a variable across all components. The commonality for a variable can range from 0 to 1, where values closer to 1 indicate that the extracted components account for more of the variable's variance. For instance, S1 has a commonality of .576, meaning that the eight components explain approximately 57.6% of the variance in statement S1. This leaves around 42.4% of the variance in S1 unexplained by these components.

Table 4 presents an analysis of factors affecting the Indian agriculture sector, particularly focusing on Haryana. It is divided into eight factors, each explaining a varying percentage of variance. The first factor, 'Crop Insurance Impact,' with the highest variance explained (24.652%),

emphasizes the significant role of crop insurance in providing safety, enhancing resilience, and suiting the specific needs of farmers. Statements like the efficiency of the claims process and the affordability of premiums highlight this impact. The second factor, 'Governmental and Economic Influence' (6.860%), combines the effects of crop loans and insurance, underlining the government's effective role and the positive economic impact. The third factor, 'Crop Loans and Sustainability' (4.830%), focuses on crop loans' stability, reduced risks, and positive sustainability impact. 'Synergistic Effects of Loans and Insurance' (4.735%) as the fourth factor, highlights the combined greater effect of loans and insurance than their individual impacts. The fifth, 'Accessibility and Financial Support' (3.537%), details the accessibility and reasonable terms of crop loans. Factor six, 'Innovation and Awareness' (3.445%), links crop loans to innovative practices and highlights the high awareness of crop insurance. The seventh factor, 'Agricultural Diversification and Loan Terms' (3.205%), emphasizes the role of loans in diversifying agriculture and providing manageable terms. Lastly, 'Crop Loan Benefits and Affordability' (2.984%) focuses on the increased attractiveness of farming and affordability of crop loans and insurance. Each statement within these factors is associated with a factor loading, indicating its relevance to the factor it represents.

Factor 1 in Table 4, "Crop Insurance Impact," accounts for a significant 24.652% of the variance explained in the study. This factor encapsulates crop insurance's perceived effects on Haryana's agricultural sector. With their respective factor loadings, the statements under this factor highlight various aspects of crop insurance's impact. Notably, statements like S17 and S18, which have higher loadings (.645 and .662, respectively), emphasize the role of crop insurance in fostering a willingness to adopt new farming techniques and improving the sector's resilience. This suggests a strong belief among respondents that crop insurance offers financial security against unforeseen events like natural disasters (as noted in S16) and encourages innovation and adaptability in farming practices. The moderate to high loadings of other statements, such as the efficiency of the claims process (S20) and the suitability of crop insurance schemes to local needs (S19), indicate a general consensus that crop insurance is a pivotal element in supporting and stabilizing agriculture in Haryana. Overall, this factor reflects a positive perception of crop insurance as a tool for risk management, innovation facilitation, and enhancing the overall robustness of the agricultural sector.

Factor 2, "Governmental and Economic Influence," explains 6.860% of the variance in the data. It reflects how government policies and economic factors influence the agricultural sector in Haryana, particularly through the lens of crop loans and crop insurance. Statements like S11,

Table 3: Component score coefficient matrix and communalities

Statement	Component								Communalities extraction (h^2)
	1	2	3	4	5	6	7	8	
S1	.084	-.104	.111	.081	-.057	-.304	-.023	.199	.576
S2	.015	-.052	.094	.066	.052	-.243	.005	.122	.456
S3	-.036	.080	-.078	-.078	.044	-.033	.006	.365	.507
S4	-.091	-.099	-.024	.041	.070	.013	-.022	.436	.556
S5	-.055	-.086	-.003	-.085	.412	.039	.018	.018	.610
S6	-.027	.026	-.040	-.057	.368	-.083	-.038	.009	.585
S7	-.023	-.092	.055	-.005	.360	-.060	-.041	-.002	.599
S8	-.132	-.010	-.079	.018	.225	-.053	.412	-.059	.620
S9	-.023	-.059	-.060	.029	-.049	-.004	.463	-.004	.617
S10	.086	.073	-.033	-.056	-.095	-.106	.324	-.039	.492
S11	.038	.218	.097	-.231	-.067	-.074	.200	-.060	.546
S12	-.065	.170	.174	-.223	-.134	.067	.067	.195	.548
S13	-.121	-.127	.271	.026	-.113	.046	.166	.136	.522
S14	-.137	-.052	.390	.050	.011	.048	-.082	-.048	.607
S15	-.042	-.096	.393	-.038	.091	-.007	-.085	-.106	.652
S16	.067	-.067	.268	-.029	.035	-.050	-.058	-.109	.570
S17	.275	-.018	-.032	-.141	.083	-.046	-.009	-.098	.577
S18	.306	.019	-.080	-.086	-.029	-.142	.039	-.074	.592
S19	.230	.038	-.040	-.101	-.013	.014	.036	-.118	.498
S20	.278	-.058	-.064	-.061	-.055	.041	-.038	.047	.511
S21	.279	-.099	-.132	-.034	-.108	.004	-.080	.282	.484
S22	.117	.041	-.055	.107	-.134	-.060	-.117	.173	.415
S23	.159	-.146	.035	.146	-.029	.057	-.122	.004	.499
S24	.071	-.063	-.026	.046	.016	.246	-.054	.000	.502
S25	.161	-.272	-.018	.107	-.109	.134	.037	.164	.561
S26	-.009	.221	-.021	-.080	.074	.137	-.138	.000	.442
S27	-.096	.333	.005	-.036	.015	.126	-.160	-.010	.564
S28	-.054	.195	-.025	-.074	.018	.323	-.087	.014	.540
S29	-.072	.077	.056	-.006	-.071	.329	-.023	-.009	.456
S30	.060	.146	.007	-.052	.027	.017	.023	-.113	.426
S31	-.077	.034	-.028	.362	-.085	-.080	-.004	.019	.575
S32	-.107	-.101	-.034	.438	.012	.035	.089	-.084	.641
S33	-.114	-.019	-.003	.400	-.030	.085	-.036	-.029	.621
S34	-.081	.253	-.137	.173	-.068	.034	.050	-.018	.536
S35	-.061	.303	-.118	.055	-.087	-.012	.096	-.007	.486

S12, S26, S27, S28, S30, S31, S34, and S35, which have factor loadings ranging from .313 to .633, underscore the pivotal role of government initiatives in promoting agricultural sustainability and economic growth. These statements collectively suggest that through effective crop loan and insurance policies, governmental support has encouraged younger generations to engage in farming, reduced financial risks, and lessened the debt burden on farmers. They also highlight the perceived effectiveness of government efforts

in promoting crop insurance and their contribution to the overall economic growth of the sector. The presence of both crop loan and insurance-related statements in this factor indicates a recognition of their combined importance in transforming agriculture in Haryana, suggesting that policies integrating these two elements are crucial for the sustained growth of the sector. The negative factor loading of S25 (Crop insurance has played a crucial role in stabilizing farm incomes in Haryana) at -.313 indicates a nuanced

Table 4: Resultant factors

Factor No.	Factors - affecting Indian agriculture sector (% of variance explained)	Statement	Factor loading
1	Crop insurance impact (24.652)	S10 The process of obtaining crop loans in Haryana is straightforward and transparent.	.336
		S16 Crop insurance has provided a safety net for farmers in Haryana against natural disasters.	.382
		S17 Crop insurance has increased the willingness of Haryana farmers to try new farming techniques.	.645
		S18 The availability of crop insurance has improved the resilience of the agricultural sector in Haryana.	.662
		S19 Crop insurance schemes are well-suited to the specific needs of Haryana's farmers.	.583
		S20 The claims process for crop insurance in Haryana is efficient and fair.	.625
		S21 Crop insurance premiums are affordable for most farmers in Haryana.	.516
		S22 Crop insurance coverage is comprehensive and relevant for the risks in Haryana.	.342
		S23 Crop insurance has enhanced the confidence of farmers in making long-term investments in agriculture.	.502
		S24 The awareness of crop insurance among Haryana farmers is high.	.340
		S25 Crop insurance has played a crucial role in stabilizing farm incomes in Haryana.	.364
		S30 Crop insurance has been a key factor in reducing the vulnerability of farmers to climate change.	.369
		S11 Crop loans have encouraged younger generations to engage in farming in Haryana.	.454
		S12 Crop loans have reduced the financial risks associated with farming in Haryana.	.321
		S25 Crop insurance has played a crucial role in stabilizing farm incomes in Haryana.	-.313
2	Governmental and economic influence (6.860)	S26 Crop insurance has led to a decrease in the debt burden of farmers in Haryana.	.458
		S27 The government's role in promoting crop insurance in Haryana has been effective.	.633
		S28 Crop insurance has contributed to the overall economic growth of the agricultural sector in Haryana.	.311
		S30 Crop insurance has been a key factor in reducing the vulnerability of farmers to climate change.	.390
		S31 Together, crop loans and crop insurance have transformed agriculture in Haryana.	.334
		S34 The synergy between crop loans and crop insurance has accelerated the development of the agricultural sector in Haryana.	.550
3	Crop loans and sustainability (4.830)	S35 Policies related to crop loans and crop insurance should be further enhanced to sustain the growth of agriculture in Haryana.	.593
		S1 Crop loans have significantly increased the financial stability of farmers in Haryana.	.314
		S11 Crop loans have encouraged younger generations to engage in farming in Haryana.	.370
		S12 Crop loans have reduced the financial risks associated with farming in Haryana.	.420
		S13 The availability of crop loans has improved the standard of living for farmers in Haryana.	.508
		S14 Crop loans have positively impacted the sustainability of agriculture in Haryana.	.722
		S15 The impact of crop loans on agricultural growth in Haryana has been consistently positive over the years.	.729
		S16 Crop insurance has provided a safety net for farmers in Haryana against natural disasters.	.583
		S23 Crop insurance has enhanced the confidence of farmers in making long-term investments in agriculture.	.359
		S31 Together, crop loans and crop insurance have transformed agriculture in Haryana.	.617
4	Synergistic effects of loans and insurance (4.735)	S32 The combined effect of crop loans and insurance has been greater than the sum of their individual impacts.	.689
		S33 Both crop loans and insurance are essential for the sustainable growth of agriculture in Haryana.	.666
		S34 The synergy between crop loans and crop insurance has accelerated the development of the agricultural sector in Haryana.	.419

5	Accessibility and financial support (3.537)	S5	Crop loans have helped farmers in Haryana to overcome financial crises.	.714
		S6	The interest rates on crop loans are reasonable and affordable for Haryana farmers.	.672
		S7	Crop loans are easily accessible to most farmers in Haryana.	.666
		S8	Repayment terms for crop loans are fair and manageable for Haryana farmers.	.430
6	Innovation and awareness (3.445)	S1	Crop loans have significantly increased the financial stability of farmers in Haryana.	-.498
		S2	Access to crop loans has led to more innovative farming practices in Haryana.	-.388
		S24	The awareness of crop insurance among Haryana farmers is high.	.552
		S25	Crop insurance has played a crucial role in stabilizing farm incomes in Haryana.	.442
		S28	Crop insurance has contributed to the overall economic growth of the agricultural sector in Haryana.	.582
7	Agricultural diversification and loan terms (3.205)	S29	The benefits of crop insurance in Haryana outweigh its costs.	.618
		S8	Repayment terms for crop loans are fair and manageable for Haryana farmers.	.635
		S9	Crop loans have contributed to the diversification of agriculture in Haryana.	.733
		S10	The process of obtaining crop loans in Haryana is straightforward and transparent.	.520
		S11	Crop loans have encouraged younger generations to engage in farming in Haryana.	.345
8	Crop loan benefits and affordability (2.984)	S13	The availability of crop loans has improved the standard of living for farmers in Haryana.	.355
		S1	Crop loans have significantly increased the financial stability of farmers in Haryana.	.317
		S3	Crop loans have made farming a more attractive profession in Haryana.	.630
		S4	The availability of crop loans has significantly increased crop yields in Haryana.	.700
		S12	Crop loans have reduced the financial risks associated with farming in Haryana.	.400
		S21	Crop insurance premiums are affordable for most farmers in Haryana.	.435

perspective, where respondents may have mixed feelings about the role of crop insurance in income stabilization compared to its other benefits.

Factor 3, "Crop Loans and Sustainability," explains 4.830% of the variance in the data. This factor emphasizes the role of crop loans in enhancing the sustainability and stability of the agricultural sector in Haryana. It includes statements that highlight the positive impacts of crop loans, such as increasing the financial stability of farmers (Statement 1), encouraging younger generations to engage in farming (Statement 11), reducing financial risks (Statement 12), improving the standard of living for farmers (Statement 13), and positively impacting the sustainability of agriculture (Statement 14). The highest factor loading is seen in statements 14 and 15, which directly relate to the sustainable impact of crop loans on agriculture. Statement 16, concerning crop insurance, also appears under this factor with a significant loading, suggesting an interconnected impact of crop insurance in supporting agricultural sustainability. Overall, this factor captures the critical role of crop loans in not just immediate financial support but also in fostering long-term sustainability and growth in the agricultural sector of Haryana.

Factor 4, "Synergistic Effects of Loans and Insurance," highlights the combined impact of crop loans and crop insurance on the agricultural sector in Haryana. This factor, accounting for 4.735% of the variance explained, underscores the idea that the interplay between these two

financial instruments is more significant than their individual contributions. The factor loadings indicate strong agreement among respondents that the synergy between crop loans and crop insurance is crucial for the sector's development. Statements such as S31, S32, and S33, with loadings of .617, .689, and .666, respectively, suggest that the integration of these two mechanisms transforms agriculture, creating an impact greater than the sum of their parts. They are seen as essential for sustainable growth. S34, with a loading of .419, reinforces this perception, indicating that this synergy accelerates agricultural development. This factor reflects the belief that the collaborative effect of loans and insurance is pivotal for advancing Haryana's agriculture.

Factor 5, "Accessibility and Financial Support," highlights a crucial aspect of crop loans in Haryana's agricultural sector. This factor, which explains 3.537% of the variance in the data, emphasizes how crop loans have bolstered the financial resilience of farmers. Statements S5, S6, S7, and S8, with high factor loadings ranging from 0.430 to 0.714, collectively indicate that crop loans are a critical tool for farmers to overcome financial crises and are characterized by reasonable interest rates and manageable repayment terms. The accessibility of these loans is highlighted as a key feature, suggesting that they are readily available to a broad spectrum of farmers. This factor underscores the essential role of crop loans in providing financial support and stability, enabling farmers to navigate financial challenges more effectively and sustain their agricultural practices.

It highlights the importance of financial accessibility and supportive loan conditions in strengthening the agricultural sector in Haryana.

Factor 6, "Innovation and Awareness," reflects a key dimension in the impact of financial tools like crop loans and crop insurance on the agricultural sector in Haryana. This factor, which explains 3.445% of the variance, highlights a dual focus: firstly, it underscores the role of crop loans in fostering innovative farming practices, suggesting that financial support might lead to more progressive and modern agricultural methods. Secondly, it emphasizes farmers' high level of awareness about crop insurance, indicating effective communication and understanding of this financial tool. Additionally, the factor suggests that crop insurance has played a crucial role in stabilizing farm incomes and has contributed significantly to the economic growth of the agricultural sector. The inclusion of the statement about the benefits of crop insurance outweighing its costs further reinforces the positive perception of these financial tools. Overall, this factor encapsulates the intertwined nature of financial support and awareness in driving innovation and economic stability in Haryana's agriculture.

Factor 7, "Agricultural Diversification and Loan Terms," highlights the role of crop loans in promoting agricultural diversification and the impact of their terms on farmers in Haryana. This factor explains 3.205% of the variance in the data, suggesting a moderate influence in the overall analysis. The high factor loading of statement 9 (.733) underscores that crop loans are instrumental in aiding the diversification of agriculture in the region. This is crucial for enhancing resilience against market fluctuations and environmental challenges. Statement 8, with a factor loading of .635, indicates that the repayment terms of these loans are perceived as fair and manageable, which is essential for maintaining the financial health of the farming community. The factor also includes statement 10 (.520), emphasizing the straightforward and transparent process of obtaining crop loans, which is vital for farmers' accessibility to these financial resources. Additionally, Statements 11 and 13 with factor loadings of .345 and .355, respectively, suggest that crop loans positively encourage younger generations to take up farming and improve the standard of living for farmers. This factor reflects the interconnectedness of financial accessibility, agricultural diversification, and the broader socio-economic impact of crop loans in Haryana's agricultural sector.

Factor 8, "Crop Loan Benefits and Affordability," encapsulates the positive effects and accessibility of crop loans on the agricultural sector in Haryana, as perceived by the respondents. This factor accounts for 2.984% of the variance explained in the study. The key elements of this factor include the significant increase in financial stability for farmers due to crop loans (Statement 1), the enhancement of

farming as an attractive profession (Statement 3), a notable increase in crop yields attributed to the availability of crop loans (Statement 4), and the reduction of financial risks associated with farming (Statement 12). Additionally, the affordability of crop insurance premiums for most farmers (Statement 21) is also a part of this factor. Collectively, these statements highlight how crop loans have made farming more financially viable and less risky and potentially led to increased productivity and attractiveness of the agricultural profession. The inclusion of crop insurance premiums in this factor suggests a perceived relationship between the affordability of crop insurance and the benefits of crop loans, indicating that financial support mechanisms in agriculture are closely interconnected in the minds of the respondents.

Discussion

The study aligns with existing literature by affirming the crucial role of financial mechanisms in enhancing agricultural productivity and sustainability. It uniquely emphasizes the synergistic impact of combining crop loans and insurance, a facet not extensively explored before. The positive correlation between financial support and agricultural growth implies the need for more comprehensive and accessible Haryana schemes tailored to the specific needs of diverse farming communities. However, a notable divergence between farmers' perceptions and actual effectiveness of these tools underscores challenges like accessibility issues and inadequate coverage, necessitating more transparent and farmer-centric implementation. Regional disparities within Haryana call for region-specific strategies considering unique agricultural contexts. Despite its insights, the study's limitations, including sample representativeness and reliance on self-reported data, should be acknowledged. Future research could address these limitations by incorporating longitudinal data, qualitative studies for deeper insights, and comparative analyses involving other Indian states for a broader perspective on agricultural finance and policy effectiveness.

Conclusion

Significant Contribution to Agricultural Finance Literature

The research provides a comprehensive analysis of the impact of crop loans and insurance on agricultural growth in Haryana, India, making a substantial contribution to the existing literature on agricultural finance.

Factor Analysis Reveals Key Influencing Factors

Employing factor analysis on data from 846 respondents, the study identifies crucial factors influencing agricultural productivity and sustainability, shedding light on the multifaceted nature of financial mechanisms in the agricultural sector.

Combined Effect of Crop Loans and Insurance

The study uniquely examines the combined impact of crop loans and insurance, addressing a gap in previous research that often isolated these elements. This holistic perspective offers a nuanced understanding of their collective role in promoting financial stability and risk mitigation for farmers.

Policy Implications for Agricultural Growth

The research emphasizes the need for farmer-friendly, accessible, and efficient financial support mechanisms, suggesting tailored agricultural policies considering regional variations and specific challenges faced by farmers in Haryana. This has direct implications for policymakers aiming to enhance the effectiveness of crop loans and insurance schemes.

Importance of Financial Tools for Risk Management

Findings underscore the importance of leveraging financial tools for better risk management and agricultural growth in the farming community. The study advocates for increased awareness and education among farmers regarding the benefits and processes associated with crop loans and insurance.

Call for Tailored Agricultural Policies

The research highlights the necessity for tailored agricultural policies that consider regional differences and address specific challenges faced by farmers in Haryana. Such policies could further enhance the effectiveness of crop loans and insurance schemes, emphasizing the need for customization based on local contexts.

Recommendations for Future Research

The study identifies limitations, suggesting areas for future research. Recommendations include exploring longitudinal impacts, conducting comparative analyses with other regions, and delving into qualitative research to gain deeper insights into the experiences and challenges faced by farmers in accessing and utilizing these financial tools.

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