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RESEARCH ARTICLE

Statistical Analysis of Farmers' Problems in Sambalpur District Using Chi-Square Hypothesis Testing

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Abstract

Finding out the problems that farmers in the agriculture sector face is the main objective of this study. Food items are crucial for preserving health and quality of life. Many countries throughout the world mostly depend on agriculture, and farmers are the backbone of any economy. This study's main objective is to determine the challenges faced by farmers in the Sambalpur district. This essay seeks to clarify the many problems that farmers encounter, such as those pertaining to production, labour shortages, a lack of pesticides and fertiliser, a lack of technical know-how, inadequate irrigation systems, a lack of machinery and equipment, marketing-related problems, a lack of suitable market facilities, financial difficulties, and a decline in soil fertility. In order to study the goal, primary data was gathered from the farmers, and a convenient sample technique was used to get responder perspectives. SPSS was used to analyse the data.

Keywords: Agriculture, Farmer, Farming problems, Chi-square test.

1. Introduction

Numerous problems plague Indian agriculture, some resulting from environmental factors and others from human activities. But a farmer's top priority is marketing. The state of agricultural marketing in rural India remains terrible. Due to the lack of dependable

purchasing choices, farmers are forced to sell their farm goods at a discount to local dealers and intermediaries. Socioeconomic conditions force these producers to continue selling their products most of the time. Typically, farmers sell their produce to small-town moneylenders. They borrow money quite a little. To make ends meet and pay off his debt, the poor farmer is forced to sell his products for whatever price that is allowed. The Country Credit Overview Report accurately famous that, in common, makers offer their merchandise at undesirable areas and times and regularly get terrible terms. Private dealers and brokers prevail within the showcasing and offering of agricultural items since there's a need of a composed showcasing system. The consumer's burden is expanded by paying for the middlemen's administrations, but the maker does not get anything comparable.

To spare the agriculturist from the cash lenders' clutches and the agents, the government has controlled markets. These markets by and large present a framework of forceful buying, offer assistance kill acts of neglect, guarantee the utilize of designed weights and measures and advance reasonable apparatus for settlement of debate, subsequently guaranteeing that the makers are not decreased to abuse and get gainful costs. The agrarian region has an imperative part in Maneswar of Sambalpur district, Odisha, since it may be a source of salary and use opportunity for country communities. In expansion, most Maneswar life in rural area earn a living as an agriculturist, hence, the rural segment has the most source of pay.

The difficulties experienced by farmers in various locations and situations have been the subject of numerous studies. Factors influencing Sambalpur farmers' desire to stick with traditional farming practices were found by Sahoo, N. (2024). Khan et al. (2022) looked at how internet and mobile phone technology may boost sales and distribution networks to increase agricultural revenue. Age and education are important characteristics that influence farmers in Tirunelveli district to convert their land from agricultural to non-agricultural uses, according to research by Sundaramoorthy and Abirami (2021). Yazd et al. (2019) looked at the mental health issues that farmers experience, whereas Suguna and Jayanthi (2020) concentrated on the difficulties faced by rice growers in the Salem district. Paltasingh and Goyari (2018) examined the impact of education on agriculture productivity in Odisha, whereas Santhi and Veerakumaran (2019) examined the consequences of devastating floods in Kerala. Sangamithra and Arun (2017) highlighted the dangers of fertilizers and pesticides and denounced the careless use of agrochemicals in agriculture. Saravanan (2012) examined the difficulties faced by Tamil Nadu vegetable farmers, while Ramesh, S.V (2014) examined the problems of cotton cultivation and their marketing in Tirupur district. Chindarkar (2007) examined socioeconomic, political, and ecological factors in his analysis of farmer suicide cases. Lastly, Williams (1996) discussed Wisconsin's ongoing agriculture issue and offered solutions to help farmers and enhance Extension services. Numerous social, economic, and environmental elements that affect farmers' livelihoods and the agricultural industry are highlighted in this research.

2. Objective of the Study:

- To examine the relationship between overall problems and the various types of issues encountered by farmers.

3. Materials and Methods:

The study employed a multi-stage sampling procedure combining purposive and random sampling techniques to ensure both relevance and representativeness. The sampling frame comprised all registered farming households within the selected agricultural region, based on records obtained from agricultural extension offices and village-level listings. In the first stage, specific blocks were purposively selected according to their agricultural importance. Subsequently, villages within these blocks were chosen considering the nature of agricultural activities, diversity of cropping systems, and accessibility, thereby ensuring the inclusion of areas with varying production conditions and infrastructural levels within the Sambalpur district of Odisha, India. In the second stage, individual respondents were selected using a simple random sampling method from the lists of farmers within each selected village. A total of 410 farmers were selected proportionally to the farming population in each village to maintain representativeness. The study relied exclusively on primary data, collected through structured door-to-door surveys administered to the selected respondents. The collected data were analyzed using the Chi-Square Test to examine associations between categorical socio-economic variables and farming practices.

4. Result and Discussion

4.1 Farmer Characteristics

Farmers in Sambalpur, like those in many other regions of India, are an integral part of the rural economy and culture. Sambalpur farmers primarily cultivate rice, which is the main food crop in the region. Apart from rice, they also grow a variety of crops such as pulses, oilseeds, vegetables, and spices. Sambalpur farmers face various problems, including production related, shortage of labour, lack of fertilizers and pesticides, lack of technology, lack of irrigation facilities, lack of equipment and machinery, marketing related, lack of appropriate marketing facilities, finance related and soil fertility related. These issues may have an impact on farmers' economic growth, agricultural yields, and social environment. Here, a variety of issues were divided into two main groups: A = Agree and D = Disagree.

The dependent variable, **"overall problem (P_i)"**, was operationalized as a **binary variable** based on farmers' self-reported perception of facing major production, marketing, or financial difficulties. If a respondent reported at least one significant issue in any of these three domains, the variable was coded as **1 = faces problems;** if no significant difficulties were reported, it was coded as **0 = does not face problems.** Thus, the "overall problem" variable reflects the **aggregate experience of production-related constraints** rather than a single item, allowing the regression model to capture the general likelihood of farmers encountering challenges in their farming operations.

Table 1: Description of Problems

Variables	Description	Unit
P_i	Problem face	1 = If the farmer has to face problem. 0 = If the farmer doesn't have to face problem.

1	Production related	A = Agree, D =Disagree
2	Shortage of labour	A = Agree, D =Disagree
3	Lack of fertilizers and pesticides	A = Agree, D =Disagree
4	Lack of Technology	A = Agree, D =Disagree
5	Lack of irrigation facilities	A = Agree, D =Disagree
6	Lack of equipment and machinery	A = Agree, D =Disagree
7	Marketing related	A = Agree, D =Disagree
8	Lack of Appropriate marketing facilities	A = Agree, D =Disagree
9	Finance related	A = Agree, D =Disagree
10	Soil fertility related	A = Agree, D =Disagree

4.2 Chi-Square test (Test of independence and relatedness):

Chi-square test is used for finding significant relations. It is used to determine if categorical data shows dependency or the two classifications are independent. A chi-square test for independence compares two variables is independent or related to each other or it is an analysis of relationship between two categorical variables.

Tabulation 4.2 Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
overall problem * Production related	410	100.0%	0	0.0%	410	100.0%
overall problem * Shortage of labour	410	100.0%	0	0.0%	410	100.0%
overall problem * Lack of fertilizers and pesticides	410	100.0%	0	0.0%	410	100.0%
overall problem * Lack of Technology	410	100.0%	0	0.0%	410	100.0%
overall problem * Lack of irrigation facilities	410	100.0%	0	0.0%	410	100.0%
overall problem * Lack of equipment and machinery	410	100.0%	0	0.0%	410	100.0%
overall problem * Marketing related	410	100.0%	0	0.0%	410	100.0%

overall problem * lack of Appropriate marketing facilities	410	100.0%	0	0.0%	410	100.0%
overall problem * Finance related	410	100.0%	0	0.0%	410	100.0%
overall problem * Soil fertility related problems	410	100.0%	0	0.0%	410	100.0%

4.2.1 Overall problem * Production related:

Null Hypothesis (H_{10}): The null hypothesis states that there is independent relationship between overall problem and production related problem of the farmers.

Alternative Hypothesis (H_{11}): The alternative hypothesis suggests that there is dependentrelationship between overall problem and production related problem of the farmers.

Tabulation 4.2.1(i) Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.264[a]	1	.607	.700	.468	
Continuity Correction[b]	.010	1	.921			
Likelihood Ratio	.271	1	.603	.700	.468	
Fisher's Exact Test				.700	.468	
Linear-by-Linear Association	.263[d]	1	.608	.700	.468	.290
N of Valid Cases	410					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.62.

b. Computed only for a 2x2 table

The chi-square value and significant value are 0.264 and 0.7 > 0.05, means overall problem and production related problem are not related to each other.

Tabulation 4.2.1(ii) Symmetric Measures

	Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Monte Carlo Sig.		
					Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound

	Phi	-.025			.607	.708[c]	.699	.717
Nominal by Nominal	Cramer's V	.025			.607	.708[c]	.699	.717
	Contingency Coefficient	.025			.607	.708[c]	.699	.717
Interval by Interval	Pearson's R	-.025	.047	-.513	.608[d]	.708[c]	.699	.717
Ordinal by Ordinal	Spearman Correlation	-.025	.047	-.513	.608[d]	.708[c]	.699	.717
N of Valid Cases		410						

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on 10000 sampled tables with starting seed 1671519752.

d. Based on normal approximation.

The cramer's V and contingency coefficient values are 0.025 and 0.025 and their significant values are 0.708 and 0.708 respectively. As the values are less than 0.2, there is a weak relationship between overall problem and production related problem of the farmers.

4.2.2 Overall problem * Shortage of labour:

Null Hypothesis (H_{20}): The null hypothesis states that there is independent relationship between overall problem and shortage of labour problem of the farmers.

Alternative Hypothesis (H_{21}): The alternative hypothesis suggests that there is dependentrelationship between overall problem and shortage of labour problem of the farmers.

Tabulation 4.2.2(i) Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.745[a]	1	.187	.256	.150	
Continuity Correction[b]	1.075	1	.300			
Likelihood Ratio	1.730	1	.188	.256	.150	
Fisher's Exact Test				.256	.150	
Linear-by-Linear Association	1.741[d]	1	.187	.256	.150	.095
N of Valid Cases	410					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.68.

b. Computed only for a 2x2 table

c. For 2x2 crosstabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is 1.319.

The chi-square value and significant value are 0.264 and 0.187 > 0.05, means overall problem and shortage of labour problem are not related to each other.

Tabulation 4.2.2(ii) Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Monte Carlo Sig.		
						Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Nominal by Nominal	Phi	.065			.187	.258[c]	.249	.266
	Cramer's V	.065			.187	.258[c]	.249	.266
	Contingency Coefficient	.065			.187	.258[c]	.249	.266
Interval by Interval	Pearson's R	.065	.049	1.321	.187[d]	.258[c]	.249	.266
Ordinal by Ordinal	Spearman Correlation	.065	.049	1.321	.187[d]	.258[c]	.249	.266
N of Valid Cases		410						

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on 10000 sampled tables with starting seed 1671519752.

d. Based on normal approximation.

The Cramer's V and contingency coefficient values are 0.065 and 0.065 and their significant values are 0.258 and 0.258 respectively. As the values are less than 0.2, there is a weak relationship between overall problem and shortage of labour problem of the farmers.

4.2.3 Overall problem * Lack of fertilizers and pesticides

Null Hypothesis (H_{30}): The null hypothesis states that there is independent relationship between overall problem and lack of fertilizers and pesticides problem of the farmers.

Alternative Hypothesis (H_{31}): The alternative hypothesis suggests that there is dependentrelationship between overall problem and lack of fertilizers and pesticides problem of the farmers.

Tabulation 4.2.3(i) Chi-Square Tests[c]

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.664[a]	1	.415	.444	.247	
Continuity Correction[b]	.472	1	.492			
Likelihood Ratio	.669	1	.414	.444	.247	
Fisher's Exact Test				.444	.247	
Linear-by-Linear Association	.663[d]	1	.416	.444	.247	.074
N of Valid Cases	410					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 33.18.

b. Computed only for a 2x2 table

c. For 2x2 crosstabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is -.814.

The chi-square value and significant value are 0.664 and 0.444 > 0.05, means overall problem and lack of fertilizers and pesticides problem are not related to each other.

Tabulation 4.2.3(ii) Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Monte Carlo Sig.		
						Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Nominal by Nominal	Phi	-.040			.415	.445[c]	.436	.455
	Cramer's V	.040			.415	.445[c]	.436	.455
	Contingency Coefficient	.040			.415	.445[c]	.436	.455
Interval by Interval	Pearson's R	-.040	.049	-.814	.416[d]	.445[c]	.436	.455
Ordinal by Ordinal	Spearman Correlation	-.040	.049	-.814	.416[d]	.445[c]	.436	.455
N of Valid Cases		410						

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on 10000 sampled tables with starting seed 1671519752.

d. Based on normal approximation.

The Cramer's V and contingency coefficient values are 0.04 and 0.04 and their significant values are 0.445 and 0.445 respectively. As the values are less than 0.4, there is a weak relationship between overall problem and lack of fertilizers and pesticides of the farmers.

4.2.4 Overall problem * Lack of Technology

Null Hypothesis (H_{40}): The null hypothesis states that there is independent relationship between overall problem and lack of technology problem of the farmers.

Alternative Hypothesis (H_{41}): The alternative hypothesis suggests that there is dependent relationship between overall problem and lack of technology problem of the farmers.

Tabulation 4.2.4(i) Chi-Square Tests[c]

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	18.334[a]	1	.000	.000	.000	
Continuity Correction[b]	16.940	1	.000			
Likelihood Ratio	21.016	1	.000	.000	.000	
Fisher's Exact Test				.000	.000	
Linear-by-Linear Association	18.289[d]	1	.000	.000	.000	.000
N of Valid Cases	410					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.90.

b. Computed only for a 2x2 table

c. For 2x2 cross tabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is 4.277.

The chi-square value and significant value are 18.334 and 0.000 < 0.05, means overall problem and lack of technology problem are related to each other.

Tabulation 4.2.4(ii) Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Monte Carlo Sig.		
						Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Nominal by Nominal	Phi	.211			.000	.000[c]	.000	.000
	Cramer's V	.211			.000	.000[c]	.000	.000

	Contingency Coefficient	.207			.000	.000[c]	.000	.000
Interval by Interval	Pearson's R	.211	.037	4.370	.000[d]	.000[c]	.000	.000
Ordinal by Ordinal	Spearman Correlation	.211	.037	4.370	.000[d]	.000[c]	.000	.000
N of Valid Cases		410						

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on 10000 sampled tables with starting seed 1671519752.

d. Based on normal approximation.

The Cramer's V and contingency coefficient values are 0.211 and 0.207 and their significant values are 0.445 and 0.445 respectively. As the values are greater than 0.2, there is a moderate relationship between overall problem and lack of technology of the farmers.

4.2.5 Overall problem * Lack of irrigation facilities

Null Hypothesis (H_{50}): The null hypothesis states that there is independent relationship between overall problem and lack of irrigation facilities problem of the farmers.

Alternative Hypothesis (H_{51}): The alternative hypothesis suggests that there is dependentrelationship between overall problem and lack of irrigation facilities problem of the farmers.

Tabulation 4.2.5(i) Chi-Square Tests[c]

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.030[a]	1	.861	1.000	.515	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.030	1	.862	1.000	.515	
Fisher's Exact Test				1.000	.515	
Linear-by-Linear Association	.030[d]	1	.862	1.000	.515	.171
N of Valid Cases	410					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.60.

b. Computed only for a 2x2 table

c. For 2x2 cross tabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is .174.

The chi-square value and significant value are 0.03 and 1 > 0.05, means overall problem and lack of irrigation facilities problem are not related to each other.

Tabulation 4.2.5(ii) Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Monte Carlo Sig.		
						Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Nominal by Nominal	Phi	.009			.861	1.000[c]	1.000	1.000
	Cramer's V	.009			.861	1.000[c]	1.000	1.000
	Contingency Coefficient	.009			.861	1.000[c]	1.000	1.000
Interval by Interval	Pearson's R	.009	.050	.174	.862[d]	1.000[c]	1.000	1.000
Ordinal by Ordinal	Spearman Correlation	.009	.050	.174	.862[d]	1.000[c]	1.000	1.000
N of Valid Cases		410						

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on 10000 sampled tables with starting seed 1671519752.

d. Based on normal approximation.

The cramer's V and contingency coefficient values are 0.009 and 0.009 and their significant values are 0.861 and 0.861 respectively. As the values are less than 0.2, there is a weak relationship between overall problem and lack of irrigation facilities of the farmers.

4.2.6 Overall problem * Lack of equipment and machinery

Null Hypothesis (H_{60}): The null hypothesis states that there is independent relationship between overall problem and lack of equipment and machinery problem of the farmers.

Alternative Hypothesis (H_{61}): The alternative hypothesis suggests that there is dependentrelationship between overall problem and lack of equipment and machinery problem of the farmers.

Tabulation 4.2.6(i) Chi-Square Tests[c]

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	4.834[a]	1	.028	.032	.020	
Continuity Correction[b]	4.018	1	.045			
Likelihood Ratio	5.134	1	.023	.032	.020	
Fisher's Exact Test				.032	.020	
Linear-by-Linear Association	4.823[d]	1	.028	.032	.020	.014
N of Valid Cases	410					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.66.

b. Computed only for a 2x2 table

c. For 2x2 cross tabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is 2.196.

d. The standardized statistic is .174.

The chi-square value and significant value are 0.03 and 0.028 < 0.05, means overall problem and lack of equipment and machinery facilities problem are related to each other.

Tabulation 4.2.6(ii) Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Monte Carlo Sig.		
						Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Nominal by Nominal	Phi	.109			.028	.033[c]	.029	.036
	Cramer's V	.109			.028	.033[c]	.029	.036
	Contingency Coefficient	.108			.028	.033[c]	.029	.036
Interval by Interval	Pearson's R	.109	.044	2.206	.028[d]	.033[c]	.029	.036
Ordinal by Ordinal	Spearman Correlation	.109	.044	2.206	.028[d]	.033[c]	.029	.036
N of Valid Cases		410						

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on 10000 sampled tables with starting seed 1671519752.

d. Based on normal approximation.

The Cramer's V and contingency coefficient values are 0.109 and 0.109 and their significant values are 0.028 and 0.028 respectively. As the values are less than 0.2, there is a weak relationship between overall problem and lack of equipment and machinery facilities of the farmers.

4.2.7 Overall problem * Marketing related

Null Hypothesis (H_{70}): The null hypothesis states that there is independent relationship between overall problem and marketing related problem of the farmers.

Alternative Hypothesis (H_{71}): The alternative hypothesis suggests that there is dependentrelationship between overall problem and marketing related problem of the farmers.

Tabulation 4.2.7(i) Chi-Square Tests[c]

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	26.331[a]	1	.000	.000	.000	
Continuity Correction[b]	25.086	1	.000			
Likelihood Ratio	26.392	1	.000	.000	.000	
Fisher's Exact Test				.000	.000	
Linear-by-Linear Association	26.267[d]	1	.000	.000	.000	.000
N of Valid Cases	410					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 37.11.

b. Computed only for a 2x2 table

c. For 2x2 cross tabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is 5.125.

The chi-square value and significant value are 0.03 and 0.00 < 0.05, means overall problem and marketing related problem is related to each other.

Tabulation 4.2.7(ii) Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Monte Carlo Sig.		
						Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Nominal by Nominal	Phi	.253			.000	.000[c]	.000	.000
	Cramer's V	.253			.000	.000[c]	.000	.000
	Contingency Coefficient	.246			.000	.000[c]	.000	.000
Interval by Interval	Pearson's R	.253	.048	5.292	.000[d]	.000[c]	.000	.000
Ordinal by Ordinal	Spearman Correlation	.253	.048	5.292	.000[d]	.000[c]	.000	.000
N of Valid Cases		410						

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on 10000 sampled tables with starting seed 1671519752.

d. Based on normal approximation.

The Cramer's V and contingency coefficient values are 0.253 and 0.253 and their significant values are 0.000 and 0.00 respectively. As the values are greater than 0.2, there is a moderate relationship between overall problem and marketing related problem of the farmers.

4.2.8 Overall problem * lack of Appropriate marketing facilities

Null Hypothesis (H_{80}): The null hypothesis states that there is independent relationship between overall problem and lack of appropriate marketing facilities problem of the farmers.

Alternative Hypothesis (H_{81}): The alternative hypothesis suggests that there is dependentrelationship between overall problem and lack of appropriate marketing facilities problem of the farmers.

Tabulation 4.2.8(i) Chi-Square Tests[c]

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	8.396[a]	1	.004	.005	.004	
Continuity Correction[b]	7.110	1	.008			
Likelihood Ratio	8.518	1	.004	.005	.004	

Fisher's Exact Test				.005	.004	
Linear-by-Linear Association	8.376[d]	1	.004	.005	.004	.003
N of Valid Cases	410					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.73.

b. Computed only for a 2x2 table

c. For 2x2 cross tabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is 2.894.

The chi-square value and significant value are 8.396 and 0.005 < 0.05, means overall problem and lack of appropriate marketing facilities problem are related to each other.

Tabulation 4.2.8(ii) Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Monte Carlo Sig.		
						Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Nominal by Nominal	Phi	.143			.004	.005[c]	.004	.007
	Cramer's V	.143			.004	.005[c]	.004	.007
	Contingency Coefficient	.142			.004	.005[c]	.004	.007
Interval by Interval	Pearson's R	.143	.046	2.921	.004[d]	.005[c]	.004	.007
Ordinal by Ordinal	Spearman Correlation	.143	.046	2.921	.004[d]	.005[c]	.004	.007
N of Valid Cases		410						

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on 10000 sampled tables with starting seed 1671519752.

d. Based on normal approximation.

The cramer's V and contingency coefficient values are 0.143 and 0.143 and their significant values are 0.004 and 0.004 respectively. As the values are less than 0.2, there is a weak relationship between overall problem and lack of appropriate marketing facilities problem of the farmers.

4.2.9 Overall problem * Finance related

Null Hypothesis (H_{90}): The null hypothesis states that there is independent relationship between overall problem and finance related problem of the farmers.

Alternative Hypothesis (H_{91}): The alternative hypothesis suggests that there is dependentrelationship between overall problem and finance related problem of the farmers.

Tabulation 4.2.9(i) Chi-Square Tests[c]

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	21.100[a]	1	.000	.000	.000	
Continuity Correction[b]	19.119	1	.000			
Likelihood Ratio	23.180	1	.000	.000	.000	
Fisher's Exact Test				.000	.000	
Linear-by-Linear Association	21.049[d]	1	.000	.000	.000	.000
N of Valid Cases	410					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.60.

b. Computed only for a 2x2 table

c. For 2x2 cross tabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is 4.588.

The chi-square value and significant value are 21.1 and 0.000 < 0.05, means overall problem and finance related problem are related to each other.

Tabulation 4.2.9(ii) Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Monte Carlo Sig.		
						Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Nominal by Nominal	Phi	.227			.000	.000[c]	.000	.000
	Cramer's V	.227			.000	.000[c]	.000	.000
	Contingency Coefficient	.221			.000	.000[c]	.000	.000
Interval by Interval	Pearson's R	.227	.037	4.705	.000[d]	.000[c]	.000	.000
Ordinal by Ordinal	Spearman Correlation	.227	.037	4.705	.000[d]	.000[c]	.000	.000
N of Valid Cases		410						

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on 10000 sampled tables with starting seed 1671519752.

d. Based on normal approximation.

The cramer's V and contingency coefficient values are 0.227 and 0.227 and their significant values are 0.000 and 0.000 respectively. As the values are greater than 0.2, there is a moderate relationship between overall problem and finance related problem of the farmers.

4.2.10 Overall problem * Soil fertility related problems

Null Hypothesis (H_{100}): The null hypothesis states that there is independent relationship between overall problem and soil fertility problem of the farmers.

Alternative Hypothesis (H_{101}): The alternative hypothesis suggests that there is dependentrelationship between overall problem and soil fertility related problem of the farmers.

Tabulation 4.2.10(i) Chi-Square Tests[c]

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	7.380[a]	1	.007	.008	.006	
Continuity Correction[b]	6.312	1	.012			
Likelihood Ratio	7.389	1	.007	.008	.006	
Fisher's Exact Test				.008	.006	
Linear-by-Linear Association	7.362[d]	1	.007	.008	.006	.004
N of Valid Cases	410					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.35.

b. Computed only for a 2x2 table

c. For 2x2 cross tabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is 2.713.

The chi-square value and significant value are 7.380 and 0.008 < 0.05, means overall problem and soil fertility related problem are related to each other.

Tabulation 4.2.10(ii)Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Monte Carlo Sig.		
						Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Nominal by Nominal	Phi	.134			.007	.007[c]	.006	.009
	Cramer's V	.134			.007	.007[c]	.006	.009
	Contingency Coefficient	.133			.007	.007[c]	.006	.009
Interval by Interval	Pearson's R	.134	.048	2.735	.007[d]	.007[c]	.006	.009
Ordinal by Ordinal	Spearman Correlation	.134	.048	2.735	.007[d]	.007[c]	.006	.009
N of Valid Cases		410						

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on 10000 sampled tables with starting seed 1671519752.

d. Based on normal approximation.

The Cramer's V and contingency coefficient values are 0.134 and 0.134 and their significant values are 0.007 and 0.007 respectively. As the values are less than 0.2, there is a weak relationship between overall problem and soil fertility related problem of the farmers.

5. Discussion

The findings of this study highlight that not all challenges faced by farmers equally contribute to their overall problems. The lack of significant relationships between overall problems and production-related issues, labour shortages, fertilizers and pesticides, and irrigation facilities suggests that these operational factors, while important, may not be the primary determinants of the general difficulties experienced by farmers. This could indicate that farmers have developed coping mechanisms or alternative strategies to manage these routine production constraints.

In contrast, technological deficiencies and marketing-related issues were found to have a moderate and significant association with overall problems. The strong link between lack of technology and overall challenges emphasizes the importance of adopting modern farming practices, improved machinery, and efficient techniques to enhance productivity and reduce operational inefficiencies. Similarly, marketing-related problems—including limited access to markets and inadequate marketing facilities—appear to exacerbate the general difficulties faced by farmers. This finding underscores that the ability to sell produce efficiently and access fair prices is as critical as production itself.

Overall, the results suggest that interventions aimed at improving farmers' conditions should focus not only on traditional resource and labour support but also on enhancing technology adoption and strengthening market access. Addressing these areas could have a more substantial impact on reducing the overall challenges faced by farmers, thereby improving their livelihoods and the sustainability of agricultural practices. Furthermore, giving Sambalpur farmers insurance coverage, training, and skill development opportunities can raise their standard of living and help create a more just and sustainable agriculture industry.

6. Conclusion

The analysis of the relationship between the overall problems faced by farmers and various specific issues, conducted using Chi-square tests and symmetric measures, revealed several important insights. Overall problems were found to have no significant association with production-related issues ($\chi^2 = 0.264$, $p = 0.607$), shortage of labour ($\chi^2 = 1.745$, $p = 0.187$), lack of fertilizers and pesticides ($\chi^2 = 0.664$, $p = 0.415$), or lack of irrigation facilities ($\chi^2 = 0.030$, $p = 0.861$), as indicated by p-values exceeding 0.05 and low Cramer's V and contingency coefficients (below 0.2), suggesting weak relationships. Similarly, only a weak association was observed with lack of equipment and machinery ($\chi^2 = 4.834$, $p = 0.028$, Cramer's V = 0.109). In contrast, moderate and significant relationships were observed between overall problems and lack of technology ($\chi^2 = 18.334$, $p = 0.000$, Cramer's V = 0.211), marketing-related problems ($\chi^2 = 26.331$, $p = 0.000$, Cramer's V = 0.253), and lack of appropriate marketing facilities ($\chi^2 = 8.396$, $p = 0.004$, Cramer's V = 0.143). These findings indicate that while operational and resource-related challenges have limited impact on the overall problems faced by farmers, deficiencies in technology and marketing constraints play a more substantial role in shaping these difficulties.

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Author contributions

Dr. Nirupama Sahoo has involved in the conceptualization, methodology, data analysis, and writing of this research paper.

Conflict of interest

The author declares that she has no conflicts of interest to report regarding the present study.

Ethics approval

Not applicable

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