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Research Article

Analyzing Marketing Hurdles: Agricultural Produce In Sirsa, Haryana

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ABSTRACT

Agriculture is a highly volatile industry because of its dependence on changing market conditions and its inherent vulnerability to natural disasters. The marketing of agricultural products faces a broad variety of difficulties on both a global and a local scale. The Sirsa district is one of the most important contributors to agricultural output in Haryana State. The agricultural industry's sales and marketing face a wide variety of challenges. On the other hand, an agreement can guarantee a stable and lucrative return on the efforts put forth by farmers, in addition to maintaining the market price of agricultural goods in a constant manner. It can protect the worries of all consumers as well as producers. However, farmers in Sirsa encounter a great deal of difficulty in the marketplace for their agricultural products. The primary objective of this research is to learn how Sirsa's farmers are suffering with the many difficulties they confront while trying to sell their produce (Haryana). This study analysed the challenges that farmers in the Indian state of Haryana have faced while attempting to sell their wheat, rice, and cotton harvests. More than 350 farmers from the Sirsa region were selected at random for the study. Farmers' biggest problem while selling wheat, rice, and cotton was identified in the research. In this study, Surveys were used to collect the data. In this study we statistical analysis was performed using SPSS.

Keywords: Agriculture, Farmers, Marketing, Problems, Haryana.

Introduction

Agriculture is a highly volatile because of its dependence on changing market conditions and its inherent vulnerability to natural disasters. The marketing of agricultural products faces a wide variety of difficulties on both a global and a local scale. Prior to British colonial rule, Indian agriculture primarily consisted of subsistence farming that was organized within small village communities. Farmers typically cultivated crops solely to sustain themselves and the non-agricultural members of their community [1]. The shifting to market-oriented farming presented extra challenges for farmers selling their produce. The output marketing system includes farmers, village/primary traders, wholesalers, processors, importers, exporters, marketing cooperatives, regulated marketing committees and retailers [2]. Farmers around the world are facing significant challenges in agriculture, including issues with production, supply chain, weather risks, and climate change demanding for the changes in the agricultural These challenges can lead to reduced income for farmers and negatively impact their financial stability. Farmers are compelled to make storage decisions due to insufficient specialised facilities and inadequate transportation. As a result, 90 per cent of the marketable surplus lost within a few days of harvest. During the busiest part of the marketing year, farmers lose out on a fair price for their produce because of poor processing and storage, while consumers pay more than they should. The food we eat every day has travelled a long way to get to us, from its agricultural origins through a market system. The effectiveness of this approach has real-world implications. The agricultural market system explains how food is transported from farms to consumers all around the nation.

If you want to ensure the long-term prosperity and food supply of a country, look no further than agriculture. This is especially true in India. It's a terrible reality, but farming has always been a dangerous profession. Farmers must establish a balance between the productivity of their land, their own well-being and that of their families, and the sporadic nature of the weather. Because crop pricing is so important, the contemporary agricultural infrastructure and NAS (New Agricultural Systems) are working to shift from production-oriented agriculture to market-oriented, sustainable agriculture. The farmer's ability to make a living depends on it, after all [3].

Sirsa district is one of the significant contributors to agricultural production in Haryana State. Out of the total geographical area of 4.27 lakh hectares, 4.05 lakh hectares (94.6%) is a cultivable area. Sirsa has the highest cropped area in the Haryana State. 53.4% of the farmers are small and marginal, with up to 2 hectares of landholding irrigated/un-irrigated. 14.6% of the total area holding is with these farmers. About 58% of the total area is covered under wheat crops, and 50.5% is under cotton crops. The total irrigated area is 97.7% of the net area sown, which is highest in Haryana. 78.4% of irrigation is through the Bhakra canal. The principal crops are Wheat, Rice, and cotton. Sirsa is the largest producer of wheat (14.44 lakh Tonnes) and cotton (8.35 lakh Tonnes) in Haryana State [4,5]

There are numerous issues with farming sales and marketing. However, an arrangement can ensure a secure and profitable return on farmers' efforts, as well as keep the market price of agricultural products consistent. It can safeguard all customers' and manufacturers' concerns. However, farmers of Sirsa face many challenges relating to agriculture marketing, some of them are under:

1. Lack of Storage Facility: Farmers in the villages do not have adequate storage or warehousing facilities to store their agricultural products. Because of the lack of suitable storage facilities, 15 to 30 percent of agricultural produce is ruined each year, either by rats or rain. Thus, Lack of storage facilities necessitates a distress sale.
2. Distress Sale: Since they lack access to sufficient financing, farmers cannot afford to wait for a better market price. When farmers sell their goods to the local 'cum merchants' (also known as 'mandis') in the village, they often lower their prices. Mandi prices are at their lowest three to four months after harvest and their highest just before. In order to fund the acquisition of planting supplies, farmers maximise their revenues immediately after harvest.
3. Inadequate Transportation Facilities: Due to inadequate road transportation infrastructure and excessive transportation expenses, farmers are unable to reach neighbouring mandis to sell their goods at a reasonable price. So, they avoid middlemen and instead sell their goods at local farmers' markets.
4. Unfavourable Mandis: In addition, the APMC mandis are in poor shape, which hurts farmers. Farmers who don't have access to cold storage wait to sell their harvest at the mandi. In most APMCs, however, consumers must go via approved third-party intermediaries for all their shopping needs (aadhatiyas). As a "service," these middlemen usually demand a cut of the transaction fees paid by the buyer and the vendor.
5. Intermediaries: Between the cultivator and the consumer, there are many intermediaries. These intermediaries and dalals seek a significant margin, reducing the farmers returns.
6. Malpractices in Unregulated Market's: There are numerous unregulated markets that engage in a variety of malpractices. In India's village markets, the prevalence of false weights and measures, as well as a lack of grading and standardisation of products, are always working against the interests of ignorant, small, and poor farmers.
7. Market Intelligence: Farmers are unaware of the market rates for their products in large markets. As a result, they accept any low-paying price provided by traders or intermediaries for their produce.
8. Lack of Grading and Standardization: Farmers in India do not value product grading. They are hesitant to separate the high-quality crops from the low-quality crops. As a result, they are unable to obtain a reasonable price for their high-quality goods.
9. Lack of Institutional Finance: In the absence of adequate institutional finance, the aadhatiyas are frequently used as loan sharks, supplying farmers with seeds, fertilizers, and pesticides on credit. They are then compelled to sell through them and pay their debts to them.
10. Price volatility: Because of these erratic cycles of surplus and scarcity, prices tend to fluctuate wildly. Commodity price predictions sometimes rely on historical patterns that may not be repeated, resulting to either over- or under-planting.

Objectives

1. The primary aim of this research is to assess the current state of issues related to the marketing of agricultural products in Sirsa (Haryana).
2. Using the case of Sirsa, identify the current problems of agricultural produce faced by the farmers of Sirsa demographically.

Significance of the study

The current study seeks to analyse the status of agricultural produce marketing and identify the challenges faced by the people of the district in marketing practices to improve existing marketing strategies and provide basic information to the people in this regard. And trying to solve the puzzle of the conditions that need to be put in place to alleviate the adverse effects of the marketing challenges that are unique to the sale of agricultural products in the Sirsa district.

Review of Literature

(A. Kumar et al., 2019) India is second only to China when it comes to the overall volume of veggies grown in the world. Cauliflower, potato, radish, tomato, and onion are some of the most cultivated vegetables in Haryana. There is a lot of cauliflower growing in Haryana as well. To better understand the difficulties farmers and intermediaries in Haryana experience in the production and selling of essential vegetables, a study was conducted out in that state. In Sonipat, Yamunanagar, Ambala, and Gurugram, scientists studied cauliflower, potatoes, onions, tomatoes, and radishes, among other things. It was vital to gather data for the 2014-2015 production year in a thorough manner because this research relies exclusively on primary sources of information. The production of vegetables is complicated by a variety of issues, including a scarcity of cold storage facilities, the high cost of fertilizer, seed, and labour, a lack of knowledge about how to grow vegetables, fraudulent plant protection agents, and a lack of financial resources. A lack of storage facilities and processing firms and units, high labour expenses and transportation costs, and delays in payments were all factors that contributed to the substantial price disparities.

(R. Kumar, 2020) A common commercial crop in India is Allium cepa L., which is a member of the Allium genus. The Nuh area of Haryana was chosen for this inquiry because of its high onion output. One hundred thirty onion farmers from the Tauru block were selected at random for this study. During the 2017-2018 farming season, the most prevalent data gathering method was farmer-to-farmer interviews. According to a recent study of onion industry participants, transportation costs, the absence of minimum support prices, and the existence of various middlemen have impeded the selling of onions. At the very least, 80%. Most onion farmers faced issues such a shortage of technical staff, higher power, and fuel costs, as well as variations in the price of raw materials, according to research (66.67 percent).

(Gohain, 2018) Natural disasters and shifts in market conditions are two of the most important factors that contribute to the risk of doing business in agriculture. A lack of storage facilities, transportation facilities, quality control and packaging facilities, facilities for price risk management, and cold chains are some of the issues that afflict the country's agricultural marketing sector. Haryana farmers selling rice, wheat, corn, and cotton have been studied for their challenges. There were 180 participants polled in the research, all of them were farmers in six different locations. The farmers in the sample were divided into small, semi-medium, medium, and big depending on the size of their operational holdings. Increasing grain moisture caused delays in market procurement and commission agency deductions that affected rice and wheat sales, according to a study published in the Journal of Agricultural Economics. A lack of public procurement for basmati was the result of middlemen's dishonest behaviour. Due to poor pricing for maize and cotton and a lack of government procurement, most farmers have trouble selling their products to customers.

(Sain et al., 2014) Haryana's Hansi, Barwala Block, Fatehabad, and Sirsa districts were the places where this investigation was conducted. Because guava growing takes up the most acreage and produces the most fruit in these locations, they were handpicked. The market was also examined in addition to those in Hisar, Fatehabad, and Sirsa. Ultimately, this research included sixty farmers, each of whom was randomly selected from one of two blocks within their respective districts to take part. In order to estimate the production limits, a budgeting approach and a number of economic instruments were utilized. This conclusion was based on consideration of the data's make-up. Guava farmers faced a dearth of healthy seedlings, damage caused by odd weather conditions, and a lack of information about critical agricultural practices during the production process. Marketing was hampered by a lack of a support price, a lack of market structure, and a lack of processing facilities. In order for large-scale cannabis cultivation to take place, the state must first have adequate marketing and processing infrastructure in place. Because of this, large-scale cannabis cultivation requires a lot of space.

(Ashu et al., 2018) The presence of aphids, black spots, and bacterial blight disease was seen in both contract and non-contract farming operations, despite the fact that contact farmers had a lower risk of experiencing these issues. Farmers who interacted with each other were not affected by this. During the seed manufacturing process, FEOs supplied particular directions to the parent firm, allowing the organization to accomplish its goal. FEOs provided specific directions Government failure to recognize the items produced by contract farmers limited their capacity to market their production by 53.3%. (377.8 percent). As a result, the amount of food available for purchase by owners decreased by 75.56 percent, but marketing expenditures increased (71.11 percent). There is less marketing infrastructure in place for farmers without contracts (57.78 percent). The parent company's field executive officers (FEO) made sure that the contract farming of potato seed was properly supervised and paid for throughout the whole production process. Therefore, potato seed producers should consider contract farming

(C. Prasannakumaran, 2018) everything else in a country's economy is tied to the agriculture industry. Rural and urban poverty may be addressed more quickly as the economy expands. Agriculture is the cornerstone of any country's economic growth strategy if it is well-managed. Farming is particularly prone to these kinds of problems because of the wide range of variables that can affect its success, including changing weather patterns, diminished water resources, declining soil quality, and a rising number of pests and illnesses. Tamil Nadu's administration is working hard to find solutions to these problems. The slow expansion of India's agricultural sector has been caused in part by the country's agricultural industry's limitations over the years. Farming has a wide range of difficulties to deal with, including concerns relating to production, marketing, and finances. As a result, it aims to bring attention to the current opposition to this practice among agricultural workers.

(Dhakshanaand & Rajandran, 2017) Even in direct marketing, producers and buyers might have face-to-face interactions. Addresses the fundamentals of direct selling, as well as some of the inherent pitfalls of this method. Farmers have a number of challenges when it comes to direct marketing, but with greater knowledge, they might overcome these obstacles. Eventually, this research might prove to be beneficial to others. This study tries to discover the core reasons of the difficulties farmers face while selling directly to customers. There are several aspects that impact direct marketing, according to the study's findings. It is estimated that the poll was completed by 61 direct-to-consumer farms, according to the data. It was concluded that statistical analysis would be required to deal with the problem's most difficult parts. Direct sales rivalry and a lack of cold storage facilities are mentioned as important issues for farmers' businesses today.
(Azad et al., 2014) Vegetable producers face a variety of challenges, and researchers wanted to find out whether there were any correlations between these challenges and specific characteristics of the growers included in the study More than 109 Bangladeshi vegetable growers were interviewed in six villages located in the Belgachi Union of Alamdanga Upazila between the 15th of January and the 13th of February, 2013, using a pretested interview schedule. According to the Pearson product moment correlation, producers' responses to surveys outlining their crop production methods were linked. For 79.90% of those who responded, growing vegetables was a moderate to high level of difficulty, while just 21.10% thought it was not much of an issue when it comes to growing vegetables, just two of the nine variables examined had a substantial negative impact on the farmers' perceptions of their current condition. "Disease attack," "bug attack," "lack of technical skills," "no HYV seedling 1" and "losses of vegetable yield due to natural calamity" were the next top-ranking factors on the index, followed by "vegetable pricing." HYV seedling number 1 was the only one to miss out on the top ten spots.

Material and Methods

This study employs a cross-sectional design, utilizing structured surveys with a stratified random sample of farmers in Sirsa, Haryana, to collect data on demographic factors (age, education, land holdings) and their impact on outcomes related to agricultural markets and practices, analyzed using ordinal logistic regression, with the results used to test hypotheses, inform policy recommendations, and share findings through reports and presentations while maintaining ethical standards and considering avenues for further research.
Population: All farmers in Sirsa, Haryana.
Stratified random sampling has used to collect data from the farmers in Sirsa, Hrayan. Stratified random sampling was selected as to ensure representation of different demographic groups (age, education, and land holdings). Sample sizes of 255 were taken to ensure reliability of the result. The data was collected using a structured survey questionnaire with items related to demographic information, agricultural practices, and challenges faced by farmers.
Variables:
Dependent Variables: The different outcomes related to agricultural markets and practices (e.g., unfavorable mandis, intermediaries, malpractices).
Independent Variables: Age, education level, and land holdings.

Data Analysis:

Ordinal logistic regression was employed using SPSS to analyse the association between independent variables (age, education, and land holdings) and the ordinal dependent variables (outcomes). At some point the regression analysis was also applied to fit the model with and statistical significance of coefficients.
According to the size of their working land, the farmers in the study's sample were classified as either "marginal," "small," "semi-medium," "medium," or "large." In Table 1 we see the different types of farmers. Out of a sample size of 350 farmers, the graph revealed that 66.9% were rated as medium or better in wheat production, 55.4% in rice production, and 65.5% in cotton production.

"Table 1: Category wise distribution of sample farmers of major crops"

"Crops"	"Categories of farmers"				
	"Marginal"	"Small"	"Semi-medium"	"Medium"	"Large"
Wheat	36(10.3)	26 (7.4)	234(66.9)	20(5.7)	34(9.7)
Rice	50(14.3)	42 (12.0)	46(13.1)	194(55.4)	18(5.1)
Cotton	51(14.6)	22 (6.3)	26(7.4)	229(65.4)	22(6.3)

Research Hypothesis

H 1.0: There is no statistically significant variation in the problems faced by farmers in Sirsa related to agricultural produce when analysed demographically.
H 1.1: There are statistically significant variations in the problems faced by farmers in Sirsa related to agricultural produce when analyzed demographically.

Results and discussion

This section presents the statistical results based on the data collected from the research participants. In this section of the study, the researcher presents the findings based on quantitative data analysis. The information was initially inputted into an Excel spreadsheet and then exported to SPSS. The results of the present study were analyzed using SPSS software. The study's sample size is n=225 The analysis conducted was a percentage analysis to determine the demographic information of the respondents. Descriptive statistics are a set of statistical measures that are employed to summarize and describe the main features of a dataset. They provide an overview of the data, allowing analysts to better understand the characteristics and patterns of the information. The average of a set of values is typically represented by a variable expressed as the mean. Ordinal logistic regression is a data analysis method that uses mathematics to determine the relationships between two data factors. The relationship predicts the value of one parameter based on the other.

Reliability Analysis

Before starting the analysis, we check the internal consistency of the data by calculating the Cronbach's alpha (α) value. One of the measurements in reliability analysis is Cronbach's alpha value. There is a relationship between Cronbach's alpha and correlation. Cronbach's alpha tends to increase as the correlation among the items increases.

Based on the Cronbach's alpha value, we concluded the following about the data:

- If $\alpha \geq 0.9$ – Excellent
- If $0.7 \leq \alpha < 0.9$ – Good
- If $0.6 \leq \alpha < 0.7$ – Acceptable
- If $0.5 \leq \alpha < 0.6$ –Poor
- If $\alpha < 0.5$ – Unacceptable
- Cronbach's alpha value – What amount of internal consistency existing among the data of items.
- Cronbach's alpha if item deleted – It gives the information about which item appeared to have low consistency among other items.

Table 2: Reliability Analysis

	No. of items	Cronbach's Alpha	Remark
Challenges faced by the farmers of Sirsa	10	0.713	Accepted

The study uses Cronbach's alpha to assess the internal consistency of data within each factor. The results of the reliability analysis is presented in Table 2. Cronbach's alpha values indicate high internal consistency (α = 0.713) for all factors.

Association of age, education and land holdings between Unfavorable Mandis

Table 3: Model Fitting Information

Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	406.439			
Final	335.349	71.090	12	.000

The information relevant to the model is shown in Table 3. All of the explanatory factors (the final model) and each independent variable (the "intercept only" model) are compared to the model to see whether it improves the predictability of the outcome variable. The statistically significant chi-square statistics x2 (12) = 71.090, p=.000 indicate that when comparing the final model to the baseline, it is important to assess whether the fit to the results has significantly improved. The final model shows a significant improvement in the results say that the final model shows a significant improvement over the intercept-only baseline model., indicating that The model's predictions are more accurate than a basic guess that relies solely on the response options with the highest frequency. As a result, the analysis is continued until the goodness of fit test is conducted.

Table 4: Goodness-of-Fit

Goodness-of-Fit			
	Chi-Square	df	Sig.
Pearson	265.663	228	0.054
Deviance	242.277	228	.246
Link function: Logit.			

Both Pearson's and deviance-based chi-square statistics are included in Table 4. According to non-significant test results, the model fits the data well (McHugh, 2013). The statistics determine if the observed data and the fitted model match. Both the Pearson's chi-square test (x2 (228) = 265.663, p = 0.054), and the deviance test (x2 (228) = 242.277, p = 0.246), were not appropriate to the data in this case. Such findings point to a strong match model.

Table 5: Pseudo R-Square

Pseudo R-Square	
Cox and Snell	0.271
Nagelkerke	0.286
McFadden	0.108

R-squared represents the proportion of variance in the dependent variable explained by the independent variable. The correlation square ranges from 0 to 1, so the correlation coefficient ranges from -1 to 1, indicating the strength and direction of the linear relationship between two variables. Regardless of whether the correlation is positive or negative, a higher R-squared indicates a stronger relationship between expected and actual value. Here is a detailed explanation of how the independent variable affects the dependent variables in the regression model presented in Table 5. According to pseudo R2 values, such as Nagelkerke = 0.286, only 29% of the explanatory variables adequately explain the association of age, education and land holdings between unfavourable mandis. Considering the multitude of both internal and external factors, it is only natural to expect this outcome. Hence, other categories should be used as independent variables to match the model.

Table 6: Test of Parallel Lines

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	335.349			
General	293.714	41.634	36	0.239

Table 6 shows the test of parallel lines. If the results of the parallel line test are not significant, it is interpreted as fulfilling the presumption. Statistical significance is often interpreted as evidence that the statement being tested is not true. The explanatory variables in ordinal regression have equivalent effects over different thresholds. Hence, the presumption of proportional odds is commonly known as parallel lines (Richard Williams, 2016). This means that, regardless of the threshold used, the explanatory variables have an equal impact on the odds. We interpret the findings of our study to mean that the expectation is met because the p-value is 0.239.

Table 7: Parameter Estimates

	Estimate (B)	SD	Wald	df	Sig.	95% Confidence Interval		Exponent B
						Lower Bound	Upper Bound	
[Threshold = 1]	-8.639	1.241	48.486	1	0.000	-11.070	-6.207	0.000
[Threshold = 2]	-6.496	1.219	28.420	1	0.000	-8.885	-4.108	0.002
[Threshold = 3]	-5.698	1.211	22.138	1	0.000	-8.071	-3.324	0.003
[Threshold = 4]	-3.089	1.148	7.236	1	0.007	-5.340	-0.838	0.046
[Age=1]	-1.646	0.503	10.711	1	0.001	-2.632	-0.660	0.193
[Age=2]	-1.115	0.455	5.991	1	0.014	-2.007	-0.222	0.328
[Age=3]	-0.603	0.484	1.552	1	0.213	-1.551	0.346	0.547
[Education=0]	-6.906	1.499	21.235	1	0.000	-9.844	-3.969	0.001
[Education=1]	-6.349	1.246	25.959	1	0.000	-8.791	-3.906	0.002
[Education=2]	-6.033	1.266	22.701	1	0.000	-8.515	-3.551	0.002
[Education=3]	-6.153	1.262	23.758	1	0.000	-8.628	-3.679	0.002
[Education=4]	-5.628	1.237	20.705	1	0.000	-8.052	-3.204	0.004
[Landholdings=1]	0.576	0.655	0.773	1	0.000	-0.707	1.859	1.778
[Landholdings=2]	0.034	0.583	0.003	1	0.000	-1.109	1.176	1.034
[Landholdings=3]	0.702	0.597	1.380	1	0.000	-0.469	1.873	2.017
[Landholdings=4]	0.809	0.609	1.766	1	0.184	-0.384	2.002	2.245

The chart parameter estimates (Table 7) is the association of age, education and land holdings between unfavorable Mandis. The model's predictor effect can be better understood by examining the coefficients for

covariates and relative values of factor level coefficients. When the predictor variables show positive correlations, it suggests that there is a positive relationship between the predictor and outcome variables. On the other hand, negative correlations suggest that there is a differential relationship between the predictor and outcome variables. A covariate variable with a positive coefficient increases the probability of being in one of the "better" preference groups. Having a higher coefficient rating for a factor in one of the higher cumulative evaluation classes increases the likelihood of its presence. The coefficient indication of a factor level is dependent on its influence relative to the reference categories. The Wald statistic refers to the ratio of the squared factor to its standard error. P-values and coefficients work together in regression analysis to identify important relationships within the model and the nature of those relationships. The coefficients describe the mathematical relationship between each independent variable and vector. The p-value coefficients indicate that these relationships hold significant statistical importance. However, the 3 covariates, viz., age, education and Landholdings are positively associated with Intermediaries. The aforementioned important variables showed a positive relationship with the outcome as indicated by their positive regression coefficients.
Association of age, education and land holdings between Intermediaries

Table 8: Model Fitting Information

Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	334.892			
Final	274.127	60.765	12	.000

The information relevant to the model is shown in Table 8. All of the explanatory factors (the final model) and each independent variable (the "intercept only" model) are compared to the model in order to see whether it improves the predictability of the outcome variable. The statistically significant chi-square statistics x2 (12) = 60.765, p = 0.000 indicates a significant improvement of the final model compared to the baseline, the final model has shown a significant improvement in the results obtained, say that, under the intercept-only baseline model, the final model provides a marked change, indicating that the model's predictions are stronger than those based solely on the marginal response categories. Consequently, the analysis is carried out till the goodness of fit test.

Table 9: Goodness-of-Fit

Goodness-of-Fit			
	Chi-Square	df	Sig.
Pearson	256.020	228	0.054
Deviance	212.427	228	.246
Link function: Logit.			

Both Pearson's and deviance-based chi-square statistics are present in Table 9. Based on the statistical test results, it can be concluded that the model fits the data well, although the difference observed may not be significant enough to draw any strong conclusions. (McHugh, 2013). The statistics are used to determine if the observed data and the fitted model match. Both the Pearson's chi-square test (x2 (228) = 256.020, p = 0.054), and the deviance test (x2 (228) = 212.427, p = 0.246), were not appropriate to the data in this case. Such findings point to a strong match model.

Table 10: Pseudo R-Square

Pseudo R-Square	
Cox and Snell	0.237
Nagelkerke	0.265
McFadden	0.121

R-squared represents the proportion of the variance in the dependent variable explained by the independent variable(s). The correlation square is, therefore, from 0 to 1, so the correlation square ranges from -1 to 1, indicating the strength and direction of the correlation. Regardless of whether the correlation is positive or negative, a higher R-squared indicates a stronger relationship between expected and actual values. Here we provide a detailed analysis of how the independent variable affects the dependent variables within the regression model presented in Table 10. Based on the pseudo-R2 values, such as Nagelkerke, with a value of 0.265, it appears that only 27% of the explanatory variables are sufficient to explain the correlation between age, education, land holdings and malpractices in unregulated markets. Given the numerous internal and external factors, it is only to be expected. Hence, to match the model with an independent variable, other categories need to be considered.

Table 11: Test of Parallel Lines

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	274.127			
General	219.006	55.121	36	0.211

Table 11 shows the test of parallel lines. If the results of the parallel line test are not significant, it is interpreted as fulfilling the presumption. When we say that a result has statistical significance, it means that the evidence suggests that the result is not likely due to chance. In other words, it is an indication that the statement being tested has not been supported by the data. The presumption of proportional odds (parallel lines) in ordinal regression is that explanatory variables have equivalent effects across various thresholds (Richard Williams, 2016). This means that, regardless of the threshold, the explanatory variables have an equal impact on the odds. We interpret the findings of our study to suggest that the expectation has been met, with a p-value of 0.221.

Table 12: Parameter Estimates

	Estimate (B)	SD	Wald	df	Sig.	95% Confidence Interval		Exponent B
						Lower Bound	Upper Bound	
[Threshold = 1]	-8.996	1.292	48.446	1	0.000	-11.529	-6.463	0.000
[Threshold = 2]	-5.905	1.192	24.559	1	0.000	-8.241	-3.570	0.003
[Threshold = 3]	-3.342	1.158	8.329	1	0.004	-5.612	-1.072	0.035
[Threshold = 4]	-1.140	0.536	4.535	1	0.033	-2.190	-0.091	0.320
[Age=1]	-1.272	0.490	6.737	1	0.009	-2.232	-0.311	0.280
[Age=2]	-1.726	0.525	10.816	1	0.001	-2.754	-0.697	0.178
[Age=3]	-3.260	1.483	4.835	1	0.028	-6.167	-0.354	0.038
[Education=0]	-3.046	1.205	6.392	1	0.011	-5.408	-0.685	0.048
[Education=1]	-2.946	1.234	5.698	1	0.017	-5.365	-0.527	0.053
[Education=2]	-3.352	1.224	7.504	1	0.006	-5.751	-0.954	0.035
[Education=3]	-2.598	1.209	4.621	1	0.032	-4.967	-0.229	0.074
[Education=4]	-0.627	0.692	0.820	1	0.365	-1.984	0.730	0.534
[Landholdings=1]	-0.476	0.616	0.597	1	0.440	-1.684	0.731	0.621
[Landholdings=2]	-0.798	0.632	1.596	1	0.207	-2.036	0.440	0.450
[Landholdings=3]	0.278	0.645	0.186	1	0.666	-0.986	1.543	1.321
[Landholdings=4]	-8.996	1.292	48.446	1	0.000	-11.529	-6.463	0.000

The chart parameter estimates (Table 12) is the association of age, education and land holdings between Intermediaries Insightful predictors can be obtained by analyzing the coefficients of covariates and the relative values of factor level coefficients. When predictor variables show positive correlations, it indicates a positive relationship between the predictor and the outcome. On the other hand, negative correlations suggest a differential relationship between the predictor and the outcome. A covariate variable with a positive coefficient implies a higher probability of being in one of the cumulative "better" preference groups. Factors in the higher cumulative evaluation classes with a higher factor rating coefficient would increase the chances of being selected. The coefficient for a factor level depends on its relative influence compared to the reference categories. The Wald statistic refers to the ratio of the squared factor to its standard error. P-values and coefficients work together in regression analysis to identify important relationships within the model and the nature of those relationships. The coefficients describe the mathematical relationship between each independent variable and vector. The p-value coefficients indicate that these relationships hold significant statistical importance. However, the 3 covariates, viz., age, education and Landholdings are positively associated with Intermediaries. The aforementioned important variables showed a positive relationship with the outcome as indicated by their positive regression coefficients.

Association of age, education and land holdings between Malpractices in unregulated Markets

Table 13: Model Fitting Information

Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	397.152			
Final	342.126	55.026	12	0.000

The information relevant to the model is shown in Table 13. All of the explanatory factors (the final model) and each independent variable (the "intercept only" model) are compared to the model in order to see whether it improves the predictability of the outcome variable. The statistically significant chi-square statistics x2 (12) = 55.026, p = 0.001 indicates a significant improvement of the final model compared to the baseline, the final model has shown a significant improvement in the results obtained, say that, under the intercept-only baseline model, the final model provides a marked change, indicating that the model's predictions are stronger than

those based solely on the marginal response categories. Consequently, the analysis is carried out till the goodness of fit test.

Table 14: Goodness-of-Fit

Goodness-of-Fit			
	Chi-Square	df	Sig.
Pearson	384.265	228	0.060
Deviance	243.547	228	0.227
Link function: Logit.			

Both Pearson's chi-square statistic and deviance-based chi-square statistic are present in Table 14. Based on the statistical test results, it can be concluded that the model fits the data well, although the difference observed may not be significant enough to draw any strong conclusions. (McHugh, 2013). The statistics are used to determine if the observed data and the fitted model match. Both the Pearson's chi-square test (x2 (228) = 384.265, p = 0.060), and the deviance test (x2 (228) = 243.547, p = 0.227), were not appropriate to the data in this case. Such findings point to a strong match model.

Table 15: Pseudo R-Square

Pseudo R-Square	
Cox and Snell	0.217
Nagelkerke	0.229
McFadden	0.082

R-squared represents the proportion of the variance in the dependent variable explained by the independent variable(s). The correlation square is, therefore, from 0 to 1, so the correlation square ranges from -1 to 1, indicating the strength and direction of the correlation. Regardless of whether the correlation is positive or negative, a higher R-squared indicates a stronger relationship between expected and actual values. Here we provide a detailed analysis of how the independent variable affects the dependent variables within the regression model presented in Table 15. Based on the pseudo-R2 values, such as Nagelkerke, with a value of 0.229, it appears that only 23% of the explanatory variables are sufficient to explain the correlation between age, education, land holdings and malpractices in unregulated markets. Given the numerous internal and external factors, it is only to be expected. Hence, to match the model with an independent variable, other categories need to be considered.

Table 16: Test of Parallel Lines

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	342.126			
General	238.796	103.330	36	0.121

Table 16 shows the test of parallel lines. If the results of the parallel line test are not significant, it is interpreted as fulfilling the presumption. When we say that a result has statistical significance, it means that the evidence suggests that the result is not likely due to chance. In other words, it is an indication that the statement being tested has not been supported by the data. The presumption of proportional odds (parallel lines) in ordinal regression is that explanatory variables have equivalent effects across various thresholds (Richard Williams, 2016). This means that, regardless of the threshold, the explanatory variables have an equal impact on the odds. We interpret the findings of our study to suggest that the expectation has been met, with a p-value of 0.121.

Table 17: Parameter Estimates

	Estimate (B)	SD	Wald	df	Sig.	95% Confidence Interval		Exponent B
						Lower Bound	Upper Bound	
[Threshold = 1]	-7.444	1.130	43.379	1	0.000	-9.659	-5.229	0.001
[Threshold = 2]	-5.639	1.115	25.591	1	0.000	-7.824	-3.454	0.004
[Threshold = 3]	-4.257	1.103	14.903	1	0.000	-6.419	-2.096	0.014
[Threshold = 4]	-2.350	1.052	4.986	1	0.026	-4.413	-0.287	0.095
[Age=1]	-0.976	0.485	4.048	1	0.044	-1.926	-0.025	0.377
[Age=2]	-0.491	0.441	1.240	1	0.265	-1.356	0.373	0.612
[Age=3]	-0.206	0.471	0.191	1	0.662	-1.129	0.717	0.814
[Education=0]	-6.136	1.419	18.703	1	0.000	-8.917	-3.355	0.002
[Education=1]	-6.034	1.168	26.671	1	0.000	-8.323	-3.744	0.002
[Education=2]	-5.373	1.188	20.450	1	0.000	-7.701	-3.044	0.005
[Education=3]	-5.328	1.180	20.376	1	0.000	-7.642	-3.015	0.005
[Education=4]	-5.206	1.160	20.123	1	0.000	-7.480	-2.931	0.005

[Landholdings=1]	-0.038	0.648	0.003	1	0.954	-1.308	1.232	0.963
[Landholdings=2]	0.124	0.576	0.047	1	0.000	-1.004	1.253	1.133
[Landholdings=3]	0.428	0.590	0.526	1	0.000	-0.728	1.583	1.534
[Landholdings=4]	0.243	0.599	0.165	1	0.685	-0.931	1.418	1.276

The chart parameter estimates (Table 17) is the association of age, education and land holdings between Malpractices in unregulated Markets. Insights into the predictor effect of the model can be gleaned from the expression of coefficients for covariates and the relative values of factor level coefficients. When predictor variables show positive correlations, it indicates a positive relationship between the predictor and the outcome. On the other hand, negative correlations suggest a differential relationship between the predictor and outcome. A covariate variable with a positive coefficient increases the probability of being in one of the "better" preference groups cumulatively. Factors in higher cumulative evaluation classes are more likely to be accepted if they have a higher factor rating coefficient. The coefficient of a factor level is dependent on its relative influence compared to the reference categories. The "Wald statistic" is calculated by squaring the ratio of a factor to its standard error. P-values and coefficients work together in regression analysis to determine the nature and significance of relationships within the model. The coefficients describe the mathematical relationship between each independent variable and vector. The p-value coefficients indicate that these relationships have significant statistical importance. However, the 3 covariates, viz., age, land holdings and education are positively associated with Malpractices in unregulated Markets. These significant varibles showed a positive relationship with the outcome variable, as indicated by their positive regression coefficients.

Discussion and conclusion

The ordinal regression analyses conducted to assess the association of age, education, and land holdings with different outcomes related to unfavorable mandis, intermediaries, and malpractices in unregulated markets.
The final model significantly improves predictability compared to the intercept-only model ($p < 0.001$). The goodness-of-fit tests show a strong fit to the data. Pseudo R-Square values indicate that around 29% of the explanatory variables explain the association of age, education, and land holdings with unfavorable mandis. The test of parallel lines suggests that the assumption of proportional odds is met ($p = 0.239$). Parameter estimates reveal that age, education, and land holdings are positively associated with unfavorable mandis, with significant positive coefficients.
Pseudo R-Square values suggest that about 27% of the explanatory variables explain the association of age, education, and land holdings with intermediaries. The test of parallel lines suggests that the assumption of proportional odds is met ($p = 0.221$). Parameter estimates reveal that age, education, and land holdings are positively associated with intermediaries, with significant positive coefficients.
Pseudo R-Square values suggest that about 23% of the explanatory variables explain the association of age, education, and land holdings with malpractices in unregulated markets. The test of parallel lines suggests that the assumption of proportional odds is met ($p = 0.121$). Parameter estimates reveal that age, education, and land holdings are positively associated with malpractices in unregulated markets, with significant positive coefficients.
The results do not support Hypothesis 1.0. The analyses revealed that there are statistically significant variations in the problems faced by farmers in Sirsa related to agricultural produce when analyzed demographically. This is evidenced by the significant improvements in model predictability ($p < 0.001$) and strong goodness-of-fit test results for various demographic factors (age, education, and land holdings) across different outcomes, including unfavorable mandis, intermediaries, and malpractices in unregulated markets. The positive coefficients associated with these demographic factors further indicate their statistically significant positive associations with the agricultural problems under investigation.
The findings indicate that demographic variables play a significant role in understanding the challenges and issues faced by farmers in Sirsa, Haryana, in relation to agricultural produce. These factors, including age, education, and land holdings, are not uniform in their impact and exhibit statistically significant variations across different aspects of agricultural markets and practices. These findings and hypotheses provide insight into the relationships between demographic variables (age, education, and land holdings) and the outcomes related to agricultural markets and practices in the studied regions.

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Weblinks

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