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ECONOMICS OF MAIZE (*Zea mays L*) PRODUCTION IN KAZAURE LOCAL GOVERNMENT AREA, JIGAWA STATE, NIGERIA

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ABSTRACT

The research was carried out in Kazaure Local Government Area of Jigawa State to analyze the economics of maize farming. A sample of 119 maize farmers was selected using a multistage sampling method. The findings regarding the socioeconomic characteristics of the farmers revealed that 32.8% were aged between 41 and 50 years, 95% were male, 42% had not received formal education, with an average household size of 8 people, and 45.5% were members of a cooperative society. Moreover, the regression analysis demonstrated that age, membership in a cooperative association, and level of education were statistically significant at a 1% level, while household size was significant at a 5% level. The study further found that the total revenue per hectare of maize was ₦228,780, while the total production cost was ₦146,030 per hectare, resulting in a net farm income of ₦82,750 per hectare. Constraints identified in maize production included the high prices of farm inputs (26.5%), pest and diseases (18.1%), poor storage facilities (15.1%), and low market prices (10.1%). Despite these challenges, it is recommended that public-private partnerships be promoted to provide inputs at subsidized rates, develop pest and disease-resistant varieties, and improve market prices for maize.

Keywords: Economics, Maize production, Kazaure and Jigawa State.

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INTRODUCTION

The significance of agriculture, particularly cereal crops, to Nigeria's economy cannot be overstated. Agriculture stands as the primary lifeline for rural communities, supporting approximately 86 percent of households and contributing significantly to domestic food supplies (Fabunmi & Agbonlahor, 2012) Following oil, agriculture is a vital sector of the Nigerian economy. From 2013 to 2019, the sector has made a consistent average contribution of 24% to the nation's gross domestic product (GDP). The agricultural sector accounted for approximately 24 percent of Nigeria's Gross Domestic Product in 2021, with crop production constituting approximately 21 percent of the GDP. With maize, sorghum, rice, and millet being among the main staple crops produced in substantial quantities.

Maize, a staple cereal crop cultivated across Nigeria's rainforests, guinea and derived savannah zones. The crop has been a dietary mainstay for people in Nigeria for generations. Originally a subsistence crop, it has evolved into a vital commercial commodity, crucial to various agro-

based industries (Iken & Amusa, 2004). Introduced to West Africa by the Portuguese in the 10th century, maize has since become deeply ingrained in Nigerian agriculture. In Nigeria, maize holds a prominent position among cereal crops, with an annual consumption rate averaging 43 kilograms per person among over 150 million citizens (Oyelade & Awanane, 2013). Its consumption spans various regions and socioeconomic strata, making it a cornerstone of Nigerian diets.

Moreover, maize serves as a vital source of income for smallholder farmers, who rely on its cultivation to sustain their livelihoods (Oyelade & Awanane, 2013). With every part of the plant offering economic value, maize is a versatile crop with diverse applications. From its grains, leaves, stalks, tassels, to cobs, maize finds utility in a wide array of food and non-food products (Oladejo & Adetunji, 2012). In industrialized nations, maize predominantly serves as livestock feed and a raw material for various industrial products, whereas in low-income countries like Nigeria, it is primarily utilized for human consumption (IITA, 2001). From traditional dishes like pap and popcorn to industrial applications such as starch and alcohol production, maize plays a multifaceted role in Nigerian society.

Despite its importance, research in the study area has predominantly focused on production and agronomic practices, highlighting the need to delve into the economic aspects of maize farming to enhance efficiency and profitability. Despite ample cultivable land, labor supply, and favourable soil and weather conditions, maize production in Nigeria remains at the subsistence level mainly due to; inadequate nitrogen fertilizer application (Falade & Labaeka 2020), low soil fertility (Imoloame & Omolaiye, 2016) and periodic droughts resulting to up to 15% yield losses annually (Falade & Labaeka 2020). This production shortfall is alarming, especially due to the pivotal role of maize in food security enhancement, employment generation, and income generation for farmers and entrepreneurs. Therefore, since production challenges to maize production have been investigated by many researchers, understanding socioeconomic factors influencing maize production and productivity is therefore essential to meet the rising demand for this critical crop. This study therefore seeks to answer the following research questions;

i) What are the socio-economic characteristics of maize farmers in the study area?
ii) What is the profitability of maize in the study area?
iii) What are the socioeconomic determinants of maize yield in the study area?

Methodology

Study area

Kazaure, situated in the northwestern part of Jigawa State, occupies a geographical area between longitude 120 30” to 120 45” and latitude 80 15” to 80 30 North and East respectively (Isma’il et al., 2013). It shares borders with Daura (Katsina State) to the North, Ingawa (Katsina State) to the West, Babura (Jigawa State) to the East, and Dambatta (Kano state) to the South. The region falls within the Sudan Savannavegetational zone, experiencing rainfall typically from May to June, tapering off around September to October, with an annual average of about 600mm, peaking in July and August. The primary occupation of the populace is agriculture, with staple crops including millet, guinea corn, maize, wheat, and rice (Isma’il et al., 2013).

Temperature variations range from a minimum of 15.85^0C to a maximum of 39^0C, dropping as low as 10^oC during the harmattan season, typically between December and January. Kazaure observes two distinct seasons: rainy and dry, with the majority of the population engaging in farming activities throughout both seasons, (rain-fed and irrigated agriculture). With a total area of 690 square miles (1,780 square kilometers) and a population of 161,494 as of the 2006 census conducted by the National Population Commission (NPC), Kazaure represents a significant agricultural hub within Jigawa State.

Sampling Procedure and Sample Size

The research was conducted in Kazaure Local Government Area (LGA) of Jigawa State, Nigeria, which comprises eleven villages: Gada, Daba, Sabaru, Ba'auzini, Dandi, Dabaza, Maradawa, UnguwarArewa, UnguwarGabas, UnguwarYamma, and Kanti.

Initially, seven villages were purposefully chosen due to their high maize production. In the second stage, a random selection process was employed to choose maize farmers from each of these village areas. To determine the sample size, 10% of the total sample frame of 1190 registered maize farmers, obtained from the Jigawa Agricultural and Rural Development Authority (JARDA), was utilized. Consequently, 119 maize farmers were selected as the sample size for the study.

Data Collection

Data for the study was gathered from both primary and secondary sources. Primary data was collected using structured questionnaires and interview schedules. Trained enumerators from the State Agricultural Development Program offices and Extension Agents were deployed to the study area to gather information directly from the respondents. Secondary data, on the other hand, was sourced from various published and unpublished documents.

Data Analysis

The data collected from the field was analyzed using descriptive statistics, inferential statistics, and gross margin analysis. Descriptive statistical tools such as frequency, mean, and percentages were employed. In addition, inferential statistics, specifically regression analysis, were conducted using SPSS version 16 and E-VIEWS.

Model Specification

For the gross margin analysis, the model was specified as follows:

GM = GI - TVC or NFI = GM – TFC ---------- (i)

Where:

GM = Gross margin (₦)
GI = Gross income (₦)
TVC = Total variable cost (₦)
TFC = Total fixed cost (₦)
NFI = Net farm income/profit (₦)

Regression analysis was utilized to assess the impact of socio-economic characteristics and production. The model used is expressed as follows:

Linear function:

$Q = \alpha + \beta 1\ X1 + \beta 2\ X2 + \beta 3\ X3 + \beta 4\ X4 + \beta 5\ X5 + U$ ---------- (ii)

Where:

Q = Quantity of maize (kg)

X1 = Age of maize farmers

X2 = Gender of maize farmers

X3 = Household size of maize farmers

X4 = Cooperative association of maize farmers

X5 = Level of education

α = constant

β = Regression coefficient

RESULTS AND DISCUSSION

Socio-Economic Characteristics

Age of the Maize Farmers

Table 2 illustrates that 50.4% of the farmers were aged between 21 to 40 years, while 32.8% fell within the age range of 41 to 50 years. Additionally, approximately 16.8% were aged above 50. This distribution indicates that a significant portion of maize farmers are within the active age range of 21 to 50 years, with mean age of 37 years. Age plays a crucial role in the adoption of innovations and the ability to cope with the challenges associated with crop production. The findings suggest that maize production is likely to be sustained in the future in the state. This aligns with the results of Issa et al. (2016), who reported a mean age of 37 years for maize farmers in Ikara Local Government Area of Kaduna State, Nigeria.

Gender Distribution of Maize Farmers

According to the findings in Table 2, a significant majority (95.8%) of maize farmers are male. This gender distribution reflects the prevailing trend in agricultural production in the northern part of the country, where men typically play a more active role in farming activities, while women are often involved in processing agricultural products into other goods. This observation is consistent with the research conducted by Adedoyin and Fapojuwo (2007), which similarly reported that men dominate the workforce in Nigerian agricultural production.

Marital status and household size

The results in Table 2 showed that, only (11.8%) were single, majority of the maize farmers were married (88.2%). This agreed with the findings of Nathaniel *et al.*, (2015) that majority (88%) of small scale maize farmers in Safana Local Government Area of Katsina State, Nigeria were married. The result in the Table also reveals that the household sizes 42.8% of farmers have between 6 and 10 members in their households, while approximately 25.2% have 1 to 5 persons. Moreover, 10.1% have between 16 and 20 members, and only 3.4% have 20 or more people in their households. With an average household size of 8, there appears to be an adequate supply of family labour for farm operations in the study area. This finding is consistent with the research of Sadiq et al. (2013), who found that a majority (70%) of respondents had household sizes ranging from 1 to 10 persons. As noted by Ozor and Cynthia (2010), a

relatively large family size suggests that more family labor is available for household farm activities.

Educational Level

According to the findings in Table 2, approximately 13.4% of respondents had attained tertiary education, while 23.5% had completed secondary education. Additionally, 21.0% of respondents had primary education, and the majority, about 42.0%, had no formal education. Muhammed-Lawal *et al*. (2009) observed that the level of education is likely to influence farmers' adoption of agricultural innovations and decision-making in various aspects of farming. They emphasized the importance of education for sustainable agricultural growth and development.

Farming Experience

In relation to farming experience, result in Table 2 revealed that the majority (63.9%) have been engaged in maize production for 1 to 10 years. Additionally, approximately 21.0% had 11 to 20 years of experience, while 10.1% had 21 to 30 years of experience. A smaller percentage (5.0%) had been producing maize for over 30 years. The mean years of experience was found to be 10 years. The relatively low level of experience in maize production among farmers suggests that they may have limited expertise in managing farm risks and uncertainties such as price fluctuations, disease outbreaks, and pest infestations in maize. However, their farming experience compensates for their lack of formal education, highlighting the importance of experiential knowledge in participatory extension methods, where farmers' practical experience plays a significant role

Membership of Cooperative Associations and years of membership

Table 2 indicates that only 44.5% of the maize farmers interviewed are members of clubs, associations, or cooperatives, while the remaining 55.5% do not belong to any group. Belonging to such organizations could offer farmers valuable opportunities, including access to credit, receipt of inputs, and access to important and up-to-date information regarding their farming activities. Regarding years of membership, result in Table 1 highlight that approximately 70% of respondents have been part of cooperative associations for 1 to 10 years. Similarly, about 11.32% and 9.43% were members of cooperative associations for 11 to 15 years and 16 to 20 years respectively.

This result suggests that more than half of maize farmers in the study area are not benefiting from the presumed advantages that cooperative societies offer, such as pooling resources for expansion, efficiency, effective resource management, micro credit and input subsidy. Ekong (2003) noted that membership in cooperative societies provides advantages including access to micro-credit, input subsidies, and opportunities for exchanging ideas and information.

Farm size

Table 2 reveals that the majority of farmers (62.2%) work with less than 1 hectare of farmland for maize production. Following this, 24.4% of farmers work with 1 to 2 hectares, while 9.2% work with 2.1 to 3 hectares. A smaller percentage, 4.2%, works with >4 hectares of land. These findings suggest that farmers are predominantly operating on a small scale. This aligns with

the research conducted by Madaki et al. (2016), which reported that the majority of respondents (75%) had 1-2 hectares of farmland

The relationship between various socio-economic variables such as age, membership in cooperative associations, level of education, gender, and household size and the output of respondents was examined using linear regression analysis. In this study, maize output per season per hectare served as the dependent variable, and the results are outlined in Table 3.

The statistics derived from the production function revealed that the estimated model yielded an F-statistic value of 115.47, signifying the fitness of the overall model at 1% probability level. Additionally, the R^2 value of 86% indicates that 86% of the variation in the output were accounted by the independent variables in the model, while the remaining 14% are due to variables not included in the model. The coefficient of age was positive and significant at 1% probability level, indicating a positive relationship between age and maize output. This suggests that as farmers grow older, their vigor and strength tend to increase, at least up to certain productive age leading to higher yields. This finding is consistent with the research of Ayoola et al. (2011), who also observed a positive relationship between farmers' age and farm output. Similarly, the coefficient of cooperative membership is positive and significant at the 1% level, suggesting that being a member of a cooperative society could enhance maize output.

The coefficient of farmers' education was also positive and significant at the 1% level. This implies that each additional year of education leads to an increase in maize output. This finding aligns with the assertion made by Anigbogu et al. (2015) that farmers' inherent entrepreneurial qualities are greatly enhanced by their educational level. Furthermore, the coefficient of household size was positive and significant at the 5% level. This indicates that, holding other variables constant, maize output increases by 8.28% for every 1% increase in the number of household members. This finding is consonance with the work of Sibiko et al. (2013), who observed that a larger family size implies more family labour available for household farm activities, resulting in higher output.

Cost and Returns of maize production

Table 4 provides insights into the breakdown of variable costs associated with maize production. Fertilizer emerges as the largest component, accounting for 43.8% of the variable cost, followed by weeding (7.9%), harvesting (6.7%), planting (4.9%), farm implements (4.9%), land clearing (4.5%), herbicides (4.1%), threshing (4.3%), pesticides (3.8%), sacks (3.8%), organic manure (3.4%), seed (3.0%), and transportation (1.8%). Renting of land represents the fixed cost at 3.3%, while farm implements constitute 4.6% of fixed costs. By-products of maize make up the smallest percentage of income at 3.8%, followed by gifts (7.7%) and home consumption (23.1%). The majority of income, constituting 65.4%, is derived from the sale of the crop and its related products, indicating that maize production in the area is primarily for commercial purposes.

The gross margin was found to be ₦94,280, with a net farm income of ₦82,750. This translates to a return per naira invested of ₦1.56, indicating that for every ₦1 invested in maize production in the study area, maize farmer on average made a return of ₦1.56. Additional financial measures include the operating ratio (0.59), fixed ratio (0.05), and gross ratio (0.64).

These results suggest that maize production in the study area is profitable despite the production constraints faced by farmers.

Constraints of Maize production in the study area

Table 5 presents the distribution of respondents according to the constraints they face in maize production. A significant portion, 26.5% of respondents, highlighted the high price of farm inputs as a major constraint. This indicates that inputs such as improved seeds, fertilizer, and agrochemicals are too expensive for farmers to afford. Additionally, 18.1% of respondents reported facing challenges related to insect pests and diseases, which can lead to yield reductions and potential losses if not addressed promptly with proper control measures. Furthermore, 15.1% of respondents identified poor storage facilities as a problem. Adequate storage is crucial for preserving maize after harvest and selling it at reasonable prices later on. These findings agree with previous research by Issa et al. (2016) who highlighted the high price of farm inputs, insect pests and diseases, and poor storage facilities as significant constraints to maize production.

Low market prices were identified as another challenge affecting maize production, with 10.1% of respondents facing this issue. Lack of government support was also cited as a constraint by 8.0% of respondents, indicating that governments at all levels have not been sufficiently responsive in subsidizing agricultural inputs, controlling the prices of agricultural produce, and providing loans to farmers at affordable interest rates. Other constraints mentioned include poor infrastructure (5.0%), high transportation costs (4.0%), market glut (3.8%), and unpredictable changes in weather and climate (2.9%). These findings underscore the multifaceted challenges faced by maize farmers in the study area, including both natural and socio-economic factors.

Conclusion and Recommendations

Maize production in Kazaure Local Government Area of Jigawa State is predominantly undertaken by subsistence farmers cultivating 0.5 to 1ha. On average, maize farmers in the area achieved a yield of 2.5 tones/ha. Various socio-economic factors such as age, membership in cooperative associations, level of education, years of farming experience, and household size were found to influences maize productivity in the study area. Despite multiple constraints identified (high input prices, pest and disease infestations, and inadequate storage facilities) maize production remains profitable for farmers in the area.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

1. To reduce the high costs associated with inputs, maize farmers should be sensitize to recognize the use of cooperative Societies, as this will allow farmers to benefit from economies of scale when purchasing inputs.
2. There should be frequent sensitization and awareness on Pest and Disease Control, Extension agents should educate farmers on effective pest and disease control measures, particularly through integrated pest management (IPM).

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3. Provision of adequate markets and storage facilities that will guarantee profitable prices for maize farmers. Likewise, good storage facilities will further boost maize production by enabling farmers to store their produce and sell at a more favorable price.

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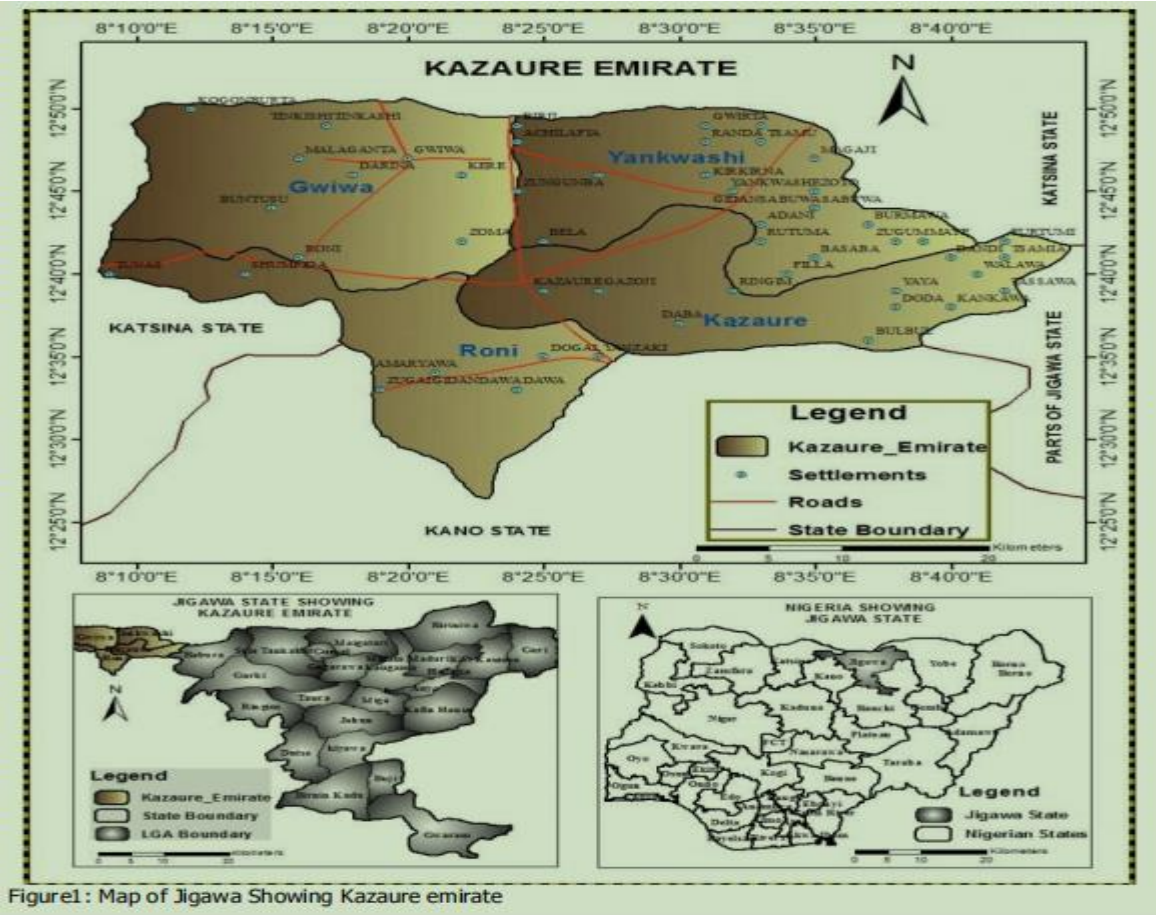

Figure1: Map of Jigawa Showing Kazaure emirate

Fig. 1: Map of Jigawa State showing the Study Area

Table 1: Sample size of Maize Farmers

	Sample Frame	Sample size
Gada	260	26
Ba'auzini	168	17
Sabaru	183	18
Dabaza	148	15
Maradawa	134	13
Dandi	191	19
Unguwargabas	106	11
Total	**1190**	**119**

Source: Jigawa State Agricultural and Rural Development Authority (JARDA)

Table 2: Socio-economic Characteristics of Maize Farmers (N =119)

Variables	Frequency	Percentage (%)
Age of the respondents		Mean = 37 years
21-30	29	24.4
31-40	31	26.0
41-50	39	32.8
>50	20	16.8
Gender		
Male	114	95.80
Female	005	04.20
Marital Status		
Married	105	88.24
Single	014	11.76
Household Size		Mean = 8 person
1-5	30	25.21
6-10	51	42.85
11-15	22	18.49
16-20	12	10.08
> 20	04	3.360
Level of Education		
No-formal	50	42.01
Primary	25	21.00
Secondary	28	23.53
Tertiary	16	13.45
Years of Experience		Mean = 10 years
1-10	76	63.87
11-20	25	21.00
21-30	12	10.08
>30	6	5.04
Membership of cooperative		
Yes	53	44.54
No	66	55.46
Years of Membership		Mean = 6 years
1-5	29	54.72
6-10	8	15.10
11-15	6	11.32
16-20	5	9.43
>20	5	9.43
Farm Size (ha)		Mean = 0.87 ha
<1	74	62.18
1.1 – 2	29	24.37
2.1 – 3	11	9.24
>3	5	4.20

Source: Farm Survey, 2020

Table 3: Influence of the socio-economic characteristics on Maize Production

VariableCoefficientStd. ErrorT-Statistic		Prob		
Constant	6.684246	0.082462	81.05838	0.0000***
Age	0.299715	0.042557	7.042740	0.0000***
Membership of cooperative Association	0.002278	0.000804	2.833977	0.0055**
Education level	0.002420	0.000768	3.152573	0.0021**
Years of experience	0.002192	0.000809	2.708295	0.0078**
Gender	0.057079	0.070583	0.808674	0.4204Ns
House-hold size	8.284528	3.470256	2.387296	0.0187*
R-Squared	**0.86**			
Adjusted R-squared	**0.85**			
F-Statistic	**115.47**			

Source: Field Survey (2019). Note NS = Not significant * = Significant at 5% **= significant at 1%

Table 4: Costs and Returns per hectare of maize production

Variables	**Unit price (₦)**	**Quantity**	**Total cost/ha**	**% T.C**
Variable cost				
Seed (kg)	220	20	4400	3.0
Herbicides (liters)	3000	2	6000	4.1
Pesticides (liters)	2800	2	5,600	3.8
Fertilizers (Kg)	160	400	64,000	43.8
Organic manure	50	100	5,00	3.4
Labor (Man-day)				
Land clearing	650	10	6500	4.5
Planting	600	12	7,200	5.9
Weeding	580	20	11,600	7.9
Harvesting	650	15	9750	6.7
Threshing	250	25	6250	4.3
Sacks	220	25	5500	3.8
Transportation	150	18	2700	1.8
TVC			134,500	
Fixed Cost				
Cost of renting			4800	3.3
Farm Implements (Depreciation)			6730	4.6
TFC			11,530	
TC= (TVC+TFC)			146,030	100
Returns of Maize (kg)				
Sales	88	1700	149600	65.4
Consumption	88	600	52800	23.1
Gift	88	200	17600	7.1
Maize by product			8,780	3.8
Total Gross Income			228,780	100
Gross Margin (N) (GI/TVC)	94,280			
Net Farm Income (GI/TC)	82,750			
Return per Naira Invested (GI/TC)	1.56			
Operating Ratio (TVC/TR)	0.59			
Fixed ratio (TFC/TR)	0.05			
Gross ratio (TC/TR)	0.64			

Source: Field survey, 2019

Table 5: Distribution of the respondents by constraints to maize production

Constraints	Frequency	Percentage (%)	Rank
High price of farm input	63	26.5	1st
Pest and diseases	43	18.1	2nd
Poor storage facilities	36	15.1	3rd
Low market price	24	10.1	4th
Lack of government support	19	8.0	5th
Low labour availability	14	5.9	6th
Poor infrastructure	12	5.0	7th
High transportation cost	11	4.6	8th
Market glut	9	3.8	9th
Change in weather climate	7	3.3	10th
Total	**238**	**100**	

Source: Field Survey (2019) *Multiple responses exist