FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 11 No. 2, June 2025 Special Issue: Pp.230-238

https://doi.org/10.33003/jaat.2025.1102.029

DETERMINANTS OF COMMERCIAL WHEAT (*Triticum aestivum*) PRODUCTION IN KANO STATE, NIGERIA

[1]M.D. Muhammad., [2]H. I. Ibrahim and [3]E.A. Ojoko.
Department of Agricultural Economics, Federal University Dutsin-Ma, Katsina State Nigeria
Corresponding Author: musamuhammadwee@gmail.com Tel. +234813-199-9992
ORCID: [1]0009-0006-3418-5113 [2]0009-0001-2006-7208 [3]0000-0003-4289-6696

ABSTRACT

The study was aimed at determining factors influencing level of commercialization of wheat production in Kano State, Nigeria. Multi-stage sampling procedure was employed for the study to select 274 wheat farmers which were interviewed using structured questionnaire. The data was analyzed using Household commercialization index (HCI) and ordinal logistic regression model. The result shows that the model group were those who's HCI were above 75% with 62.41% and the average household commercialization index was (56.38%) the, this implies that wheat farmers have a gap of (43.62%) to achieve full commercialization on wheat in the study area. The ordered logit result indicate that age, dependency ratio, farming experience, amount of credit, frequency of extension contact, distance to market and quantity of output produced were found to be significantly influencing level of wheat commercialization out of eleven explanatory variables. Inadequate credit facilities and Price fluctuation were the major constraints wheat commercialization. It was concluded that wheat production were financially profitable in the area at private prices given current technology, inputs, output price and policy transfers. It is recommended that current agricultural policies on wheat production have affected wheat farmers positively, the policies therefore needs to be sustained, and this would strengthen the competitiveness of the domestic wheat production.

Key words: Wheat: Production: Commercialization: Household: Index: Determinants:

INTRODUCTION

Wheat (Triticum aestivum) is a vital cereal grain in Nigeria, primarily processed into flour for staples like bread, noodles, and pastries, driven by rapid urbanization and changing consumer diets. Despite this critical demand, domestic production is critically low and has shown no significant upward trend over the past decade, often stagnating at less than 5% of the national requirement (FAO, 2023). This persistent deficit is due to major constraints, including the agro-climatic need for cool temperatures only available in specific highland and irrigated dry season zones in northern states like Kano, Jigawa, and Plateau coupled with limited access to improved heat tolerant varieties, high input costs, and pests (Adeboye et al., 2021; Ikuenobe et al., 2022). Consequently, Nigeria remains one of the world's largest wheat importers, relying on foreign supplies to meet over 95% of its domestic milling needs, with annual imports consistently exceeding 5 million metric tons and constituting a significant drain on foreign exchange reserves (USDA FAS, 2023; CBN, 2021).

The commercialization of wheat in Nigeria is inherently stunted by the overwhelming reliance on imports, which dictates that the entire value chain is oriented around port logistics rather than local farm gate collection. The level of commercialization for locally produced wheat is therefore very low, with most smallholder farmers selling small surpluses in informal, localized markets. The formal commercial sector is dominated by a few large milling companies (e.g., Flour Mills of Nigeria, Honeywell Flour Mills) whose operations and economics are optimized for processing imported grain (Sallau et al., 2023). To reverse this, the government has launched concerted efforts to improve commercial linkages. The cornerstone is the Central Bank of Nigeria's (CBN) Anchor Borrowers' Programme (ABP), which provides farmers with inputs and credit while mandating that participating mills (the "anchors") purchase the harvested grain, thereby creating a structured market (CBN, 2021). This is supported by the National Wheat Transformation Agenda, which aims to expand cultivated area and boost yields through the distribution of enhanced seed varieties and the promotion of better agronomic practices (FMARD, 2022).

Therefore broadly this study analyzed determinant of household wheat commercialization and specifically, the study

i) Determine the level of wheat commercialization in the study area.
ii) Identify factors affecting level of wheat commercialization in the study area.
iii) Identify perceived constraints militating against wheat commercialization in the study area..

METHODOLOGY

Description of the study area

The study was conducted in Kano state. Historically, Kano state has historically been an agricultural and commercial state. It is among the states with the greatest irrigation in Nigeria with more than 20 dams providing about two million cubic metres of water to support agricultural and industrial activities (KNSG, 2018). The major crops cultivated along with wheat are; maize, rice, tomatoes, groundnut, sorghum, soya beans, millet, pepper, cabbage, onions and sweet potato. Other agricultural activities carried out in the state are animal husbandry, fishery, processing and marketing of agricultural products (NRPD,

2013). The state is located in the North Western part of the country and lies between latitude 11^0 30 ' to 12^0 53N 'and longitudes 7^0 43 to 9^0 35E. ' The state has 44 local government area with a total land area of about 42,582.8km square out of which Agricultural land occupies 30,684.8km square, while forest and grazing land occupies 11,898 km square (KNSG, 2004). The population of the state stand at 13,076,900 people (NPC, 2016). The state has two distinct climate seasons (Dry and Raining season), The dry season spans the period between October/November to March/April, while the wet season spans the period between May/June to September/October, with an annual rainfall ranging between 787 and 960mm and a temperature ranging between 33^0C and minimum of 15^0 C although it falls sometimes during Hamattan to as low as 10^OC. The state has an altitude of 472.45m above sea level (Tankuro, 2017).

Sampling Procedure

Multi-stage sampling procedure was employed for the study. First stage involved the random sampling via balloting to select three Local Government Areas out of seven major wheat producing LGAs. The L.G.As selected were Kura, Bunkure and Bagwai. Second stage involved the random selection of four farming communities from each L.G.A to give a total of 12 farming communities. Third stage involved the application of Yamane. (1967) formula for sample size determination and 274 wheat farmers where recommended sample size for the study and proportionate sampling procedure was used to select the appropriate number of wheat farmers per farming community and simple random sampling was used to select wheat farmers.

The following expressions was used to determine the sample size as follows:

$$n = \frac{N}{1+(N)e2} \quad \text{..... (1)}$$

Where: n = sample size

N = Total number of J[th] wheat farmers in all 12 farming communities

e^2 = Confidence level $(0.05)^2$.

While for the proportionate sampling the expressions were as follows;

$$n = \frac{X}{D} * N \quad \text{..... (2)}$$

Where: n = sample size of J[th] wheat farmers selected per community

X = Number of J[th] wheat farmers in a farming community

D = Total number of J[th] wheat farmers in all 12 farming communities

N = Recommended sample size by Yamane's formula.

Data Collection

Primary data was used for the study. The primary data was collected with the aid of a structured questionnaire administered to the sampled wheat farmers by trained enumerators between, 25[th] April to 20[th] May 2023. Data collected contains information on the socio economic variables, inputs and output data on wheat production, domestic market price of output per kg, distance to the nearest market, cost of various inputs used such as fertilizer, seed, land, labor, fuel, water, capital, agro-chemical, storage and transportation cost.

Analytical Techniques

The data for the study was analyzed using descriptive statistics, household commercialization index and ordinal logistic regression models.

Level of wheat commercialization

Household Commercialization Index (HCI) was used to determine the extent to which wheat production is market-oriented in the study area. This was evaluated as the ratio of gross value of farm output to the value sold (Falola, Animashaun and Olorunfemi, 2014). The model is specified as;

$$HCI = \frac{Gross\ value\ of\ farm\ output\ sold}{Gross\ value\ of\ farm\ output\ produced}\ X\ 100 \quad \text{..... (3)}$$

The value ranges from 0 to 100%. The closer the index to 100 the higher the degree of commercialization. A value of zero is an indicator that the farmers are operating under subsistence agriculture (Omotesho, et al., 2012). The Household Commercialization Index of the Farmer's ranges from 0-100. A farmer whose HCI is between 0-29% regarded as low commercialize, between 30-75% considered as moderately commercialize and 75% above considered as highly commercialize farmer. (Paul J et al, 1999, Govereh et, al 1999) as cited by Abdu et, al (2016).

Determinant of wheat commercialization

Factors influencing household commercialization of wheat production was ascertained using ordinal logistic regression model. Ordinal logistic regression is a statistical analysis method used to model the relationship between an ordinal response variable and one or more explanatory variable. An ordinal variable is a categorical variable for which there is a clear ordering of the category levels.

According to Asuming-Brempong *et al.* (2013) commercialization had been divided into three categories: Low (< 30% of output sold), Medium (30–75% of output sold) and High (>75% output sold). The categorical ordered latent variable Y* has various threshold points. The value on the observed variable Y* depends on whether or not have crossed a particular thresholds where Y = 3. The threshold parameters are 30 and 75 this tell us the following since there are three possible values for Y. Where.

Yi = 1 if Y*i is < 30..... (4)

Yi = 2 if 30 ≥ Y*i ≤ 75.. ..... (5)

Yi = 3 if Y*i > 75…… (6)

The explicit form of the ordered logit regression model is as follows:

$Y_i = \alpha+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\beta6X6+\beta7X7+\beta8X8+\beta9X9+\beta10X10+\beta11X11+\mu$(7)

Y_i = Household commercialization index of *ith* household;
X_1 = Age of the farmer (Years);
X_2 = Dependency ratio;
X_3 = Level of education (years of schooling);
X_4 = Farming experience (years);
X_5 = Farm size (Number of hectares);
X_6= Cooperative membership (1 for membership, 0 if otherwise);
X_7= Amount of credit obtained (Naira);
X_8= Frequency of extension services (number of extension contact);
X_9 = Distance to market (Km);
X_{10} =Quantity of output produced (Kg);
X_{11} =Output price (naira);
U = Error term:

Farmers level of wheat commercialization

The result in Table 2, showed the distribution of wheat farmers according to level of commercialization. The HCI of the farmers ranges from 0 – 100%. Further analysis revealed that those whose HCI were between 0-29% were 8.39% implying that such farmers produced only for farmer household consumption and those whose HCI were between 30-75 were 29.20%, and the model group were those whose HCI were above 75% with 62.41% and mean household commercialization index ware 56.38% obtained in this study, Analysis of the result also revealed that those whose commercialization index fell below the mean were 37.59% while 62.41% of the farmers had their commercialization index greater or equal to the mean. The mean household commercialization index (56.38%) obtained in the study area implies that wheat producers still have a gap of 43.62% to achieve full commercialization in wheat production. The implication of this results is that almost half (43.62%) of the wheat produced by the farmers in the study area was used for farming household consumption while the remaining (56.38%) is being competed in the local market and wheat-based industries. Therefore, this implies that majority of the wheat producers fall in the moderately commercialize category. This result is in line with the finding of Falola et al., (2017) who reported 45.3% of the wheat produced by the farming household in Bakura is used for household consumption while the remaining 54.7% is being sold to= public consumers and wheat base industries.

Table 2: Distribution of the farmers according to level of wheat commercialization

HCI	Classification	Frequency	Percentage (%)	Minimum	Maximum	Mean
0 - 29	Low Commercialize	23	8.39	0.00	28.00	21.50
30 - 75	Moderately Commercialize	80	29.20	36.00	75.00	55.10
76 - 100	Highly Commercialize	171	62.41	76.00	100.00	92.53
TOTAL		**274**	**100**			

Source: Field survey, 2023.

Table 3: Ordered logit model for the Determinant of wheat commercialization

HCI	Coef.	Std. Err	P>|z|
Age	-0.271	0.081	0.001***
Dependency ratio	-0.285	0.084	0.001***
Level of education	0.077	0.186	0.679
Farming experience	1.706	0.475	0.000***
Farm size	0.297	0.587	0.613
Cooperative membership	-0.622	0.711	0.381
Amount of credit	0.001	4.140	0.002***
Frequency of extension contact	3.198	0.577	0.000***

Distance to market	-0.237	0.127	0.062*
Quantity of output produced	0.165	0.062	0.008***
Output price	0.001	0.0001	0.233
Pseudo R^2	0.3842		
Log likelihood	-79.350269		
Prob>chi2	0.000		

Source: Field survey, 2023. *** Significance at 1%, ** Significance at 5%, * Significance at 10%

Before performing the actual test, both pre-test and post-test estimation test were made in order to ascertain that the entire data undertaken for the study satisfied both necessary and sufficient conditions of econometric estimation. Study by Devkota et al,(2022) have argued that cross sectional data analysis involves two major problems, which are heteroscedasticity in error term and multicollinearity among explanatory variables. To overcome this variance inflation factor (VIF) test was performed using stata to deal with the problem of multicollinearity. The VIF estimate how much the variance of the regression coefficient is inflated due to multicollinearity in the model. VIF as per the calculation for undertaking model for this study were 3.20 this indicated that there is no multicollinearity in the used data set. Similarly, looking towards heteroscedasticity White robust standard error test was performed using stata to corrected heteroscedasticity in the case of the model.

It is only appropriate to use ordinal regression model if the data passes the proportionate odd assumption test which is the fundamental assumption of ordinal regression model. The test result shows that the p-value is not statistically significant (0.612), therefore it indicate that the slopes are equal across all the categories of the dependent variable, it implies that the proportionate odd assumption is not violated. Haven confirmed that the proportionate odd assumption is not violated. It should be noted that both pre-test and post estimation test passed the regression assumptions thereby confirming the reliability of the result. It is ideal to estimate the marginal effect and find out the size of effect of each of the predictors on the probabilities of being low, moderate and high level of commercialization**.**

Marginal effects of ordered logit model

The factors that determine the level of wheat commercialization and the effects of each significant explanatory variable that affect the level of wheat commercialization were presented in table 10, based on the marginal effect.

The result showed that age is statistically significant at 1% (P <0.01) and had a negative coefficient, this implies that age increases the likelihood of a farmer being in low level of commercialization by 0.049 and decreases the likelihood of a farmer being in moderate and high level of commercialization by 0.048 and 0.041 respectively. Therefore older age farmers are less likely to be in a higher level of commercialization and vice versa. This could result from the fact that the more farmers are getting older the less energetic are likely to become. All things being equal young farmers usually have more physical strength to carry out agricultural production activities than their older counterpart. These could explain the negative relationship that exist between age of farmers and their level of commercialization. This result is in line with the findings of Andaregie et al. (2021), who reported a negative relationship between Age and farmers level of market participation, However it also not in line with the findings of Beadgie and Zemedu (2019), Abajobir et al.(2018), who found that increasing the age of the household head by one year similarly improves the likelihood of farmer market participation.

Dependency ratio had a negative coefficient and statistically significant (p <0.01). This is might be because a large portion of wheat produced would be consumed by the family members and leaving little for commercialization. The coefficient confirmed that increases in number of

dependency by one unit would decrease the level of wheat commercialization and this implies that wheat farmers with high number of dependent are less likely to move into a higher level of commercialization, Dependency ratio increases the likelihood of farmers being in low level of wheat commercialization by 0.051 and decreases the likelihood of moving in to moderate and high level of commercialization by 0.050 and 0.048 respectively. The result is in agreement with the Richa, (2020), who reported that number of dependent had a negative effect on the amount of maize supplied to the market. This effect of dependency on market supply may imply that household with large number of dependents allocated more product for home consumption and supplied less quantity to the market. This finding also complies with the study of Kabeto (2014) and Hailua, et,al.(2022) who found that as the family size of the household increases it would lessen the level of output market participation.

Farming experience had a positive coefficient and the result proved to be positively significant at ($p < 0.01$). Similarly, the econometrics result shows that the farmer's wheat farming experience positively determined wheat commercialization, as a result a farmer with more wheat farming experience can produced more wheat and participate in wheat commercialization more than less experienced farmers. Therefore, Farming experience decreases the likelihood of being in low level of commercialization by 0.014 and increases the likelihood of being in moderate and high levels of commercialization by 0.013 and 0.011 respectively. This indicates that commercialization increases with increase in years of farming experience, wheat farmers with farming experience are more likely to move in to a higher level of commercialization compared with their counterpart. In other word farmers who have many years of farming experience are more commercialized than those with less experience. This result is in agreement with the finding of Adeoti et al, (2014) and Oparinde and Daramola (2023), who reported that the household heads experience and farm practice had a significant influence on maize market participation.

The relationship between access to credit and farmers level of commercialization were positive and also significant at 1%. This result proved to the a priori expectation that the more farmers acquire credit the more production is oriented towards market. Credit access is critical tool for household to purchase inputs, implements and hired labour on time and increases production when compared to noncredit users. On the other hand wheat farmers that obtained agric credit were more likely to move in to the higher level of commercialization. As revealed in the Table 10; that amount of credit obtained decreases the likelihood of a farmer being in low level of commercialization by 2.310 and increases the likelihood of a farmer being in moderate and high level of commercialization by 2.306 and 2.296 respectively. This result is consistent with the finding of Beadgie and Zemedu (2019), Abajobir et al. (2018), who found that credit access and use had a positive and significant influence on smallholder farmers likelihood of participation in maize marketing. In addition, it has a similar influence on the extent of maize marketing at a level of less 1% significance.

Frequency of Extension visit had a positive coefficient and significant at 1%. The result implies that wheat farmers who have more contact with extension agent are likely to be more commercialized than those with less or have no contact. Access to extension contact decreases the likelihood of a farmer being in the low level of commercialization by 0.571 and increases the likelihood of a farmer being in moderate and high level of commercialization by 0.567 and 0.537 respectively. This proved that an increase in extension contact of wheat farmers by one contact would increase the level of commercialization. It also implies that farmers that have contact with extension agents are more likely to move in to a higher level of commercialization compared to their counterpart. This is because of getting technical advice on the production and marketing of wheat enables farmers to

cultivate wheat by applying full production package and enhance the quantity of wheat marketed. This complies with Abajobir et al., (2018) study, which discovered a significant and positive link between frequency of extension contact per year and market participation decision.

Distance to nearest market has a negative coefficient and significant ($p<0.10$) this implies that Distance to the nearest market increases the likelihood of a farmer being in low level of commercialization by 0.042 and decreases the likelihood of a farmer to move in to moderate and high level of commercialization by 0.041 and 0.032 respectively. this implies that wheat farmers that are close to the market are more likely to move in to the higher level of commercialization and less likely as distance increases. This result consistent with the findings of Isma,il (2023), Changalima et al.,(2022), Badgie and Zemedu (2019), who indicated that the more access to the market the more household are likely to participate in maize commercialization. Furthermore, it agrees with that of Sigei et al,(2014), who discovered market information has a significant positive influence on the extent of market participation in pineapple sales.

Output quantity had a positive coefficient and statistically significant at 1%. The result proved to the a priori expectation that farmers who have more output are more commercialized than those with less output. Therefore output quantity decreases the likelihood of being in low level of commercialization by 0.029 and increases the likelihood of moving in to moderate and high levels of commercialization by 0.029 and 0.021s respectively. This justify that commercialization increases with an increase in quantity of wheat produced, wheat farmers with large quantity of output are more likely to move in to a higher level of commercialization compared with those with less or small quantity of output. In view therefore we rejected the Null hypothesis that says "there is no significance effect between quantity of wheat produced and level of wheat commercialization". This result agrees with the studies by Hailua., et al(2015) and Mamo et al.(2017), found that farmers decide to sell their produce if they have not used it for consumption or when they have a surplus.

Table 5: Marginal effects of ordered logit model

Variables	Marginal effect for low level of Commercialization	Marginal effect for moderate level of commercialization	Marginal effect for High level of commercialization
Age	0.049	0.048	0.041
Dependency ratio	0.051	0.050	0.048
Level of education	0.014	0.013	0.011
Farming experience	0.035	0.303	0.300
Farm size	0.053	0.052	0.051
Cooperative membership	0.111	0.110	0.107
Amount of credit	2.310	2.306	2.296
Extension contact	0.571	0.567	0.537
Distance to market	0.042	0.041	0.032

Output quantity	0.029	0.029	0.021
Output price	0.025	0.024	0.013
Pseudo R^2	0.3842		
Log likelihood	-79.350269		
Prob>chi2	0.000		
Observations	274		

Source: Field survey, 2023.

Perceived constraints militating against wheat commercialization

Table 6, shows constraints to wheat commercialization as perceived by the farmers. The table showed that 88% of the farmers agreed that Inadequate credit facilities was ranked first as the most important constraint militating wheat commercialization in the study area. Price fluctuation and Instabilities of government policies were ranked second and third constraints respectively. Furthermore, the result revealed that transportation problem, pest and disease were the least constraints on the table respectively.

Table 6: Constraints faces wheat commercialization

Constraint	Frequency	Percentages (%)	Rank
Inadequate credit facilities	241	88.00	1st
Price fluctuation	248	87.80	2nd
Instabilities of Government policy	235	86.70	3rd
Land tenure system	220	80.39	4th
Inadequate storage facilities	216	78.80	5th
Inadequate processing facilities	195	71.20	6th
High cost of production inputs	186	66.20	7th
Lack of improve seed	175	63.90	8th
Lack of extension agent	165	60.20	9th
Poor market system	134	48.90	10th
Transportation problem	122	44.50	11th
Pest and disease	102	37.20	12th

Source: Field survey, 2023. *Multiple responses was allowed

CONCLUSION

Based on the research findings, it was concluded that half of the wheat produced by the farmers in the study area was used for farming household consumption while the remaining is being competed in the local market and wheat-based industries. Therefore, majority of the wheat producers fall in the moderate level of wheat commercialization category. It was also concluded that farming experience, Amount of credit obtained for wheat production, Frequency of Extension contact, and Quantity of output produced were positively influencing the level of commercialization while Age, Dependency ratio and Distance to market were negatively significant. Inadequate credit facilities was ranked first as the most important constraint militating wheat commercialization in the study area. Price fluctuation and Instabilities of government policies where ranked as second and third constraints respectively.

RECOMMENDATIONS

There is need for concerted effort by the government and non-governmental organizations (NGOs) and other relevant agencies to expand wheat production in the area as most of the farmers were still under subsistence wheat production with a mean farm size of 0.97ha and thus relevant policies should be put in place and making wheat production a worthwhile venture for the wheat farmers, this could be achieved through expansion of irrigation scheme, provision of dams, improved seeds, rain feed seed, fertilizers, pesticides to farmers at zero interest or subsidized rate to boost wheat production and commercialization in the area. There is also need to sensitize wheat farmers on the benefits that can be derived

from commercialization of wheat. Doing this will make the farmers to plan ahead and increase their production oriented towards market, thereby, making it possible to attain and maintain their full commercialization.

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