



Socio-Economic Determinants of Agricultural Mechanization Use among Rural Farmers in Ahoada East Local Government Area of Rivers State – Nigeria

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Abstract

The study examined the socio-economic determinants of agricultural mechanization use among rural farmers in Ahoada East Local Government Area, Rivers State. A three-stage random sampling technique was used to select a total of 100 respondents from ten (10) communities for the study. Data were collected with the aid of a structured questionnaire and analyzed using frequency count, percentage, mean and correlation analysis. The findings revealed that majority of the respondents were female (56%), married (49%), within the age range of 31-40 (33%), the mean age was 30.5years, most of the respondents had secondary education (32.0%) and majority were full time farmers (62%). An average monthly income of ₦40,500 was reported. The study also revealed that majority (90.0%) of the respondents agreed "Yes" to land clearing. This was followed by, transportation (88.0%), tilling operation (86.0%), processing (85.0%), fertilizer application (81.0%), harvesting (81.0%), storage (79.0%), harrowing operation (78.0%), planting activities (73.0%), (72.0%) for stumping operation, ridging (63.0%), weeding (61.0%), are various farm operation where agricultural mechanization can be used in the farming process. The correlation analysis showed that the socio-economic characteristics of the farmers significantly influence their use of agricultural mechanization. Farm size, gender, educational level, and household size are the significant socioeconomic determinant of the agricultural mechanization use in the study area. The study concludes that agricultural mechanization that agricultural mechanization use poses a lot of benefits which include increased productivity, reduces time spent in the farm, preserve the quality of production, and reduces spoilage and wastage of farm produce. Hence, the study recommends that government should make agricultural mechanization accessible to farmers to maximize production.

Key words: Socio-Economic, Determinants, Agricultural Mechanization



INTRODUCTION

Agricultural mechanization is the process whereby equipment, implements and machineries are utilized by farmers to boost food and agricultural production in order to solve the problem of drudgery in production. It is the application of machines in the production process in agriculture ranging from land clearing, tilling, planting, harvesting among others, to maximize productivity, reduce time at work and meet up with food demand of the society (Folaranmi, 2019).

According to Bafana (2019), an African woman with hoe in hand is the default symbol of agriculture in Africa, and Women grow 70% of Africa's food on smallholder farms, a task anchored by physical labour. Now, with Africa's population expected to double by 2050, the continent must ditch the hoe in favour of modern technology, which will complete the same tasks far more efficiently. A transformation from small-scale subsistence farms to mechanized, more commercially viable farms is essential, say experts at the Ghana-based African Centre for Economic Transformation. Currently, mechanization levels on farms across Africa are very low, with the number of tractors in sub-Saharan Africa ranging from 1.3 per square kilometer in Rwanda to 43 per square kilometer in South Africa, compared with 128 per square kilometer in India and 116 per square kilometer in Brazil.

According to the Food and Agriculture Organization (FAO 2019), a United Nations specialized agency that champions efforts to defeat hunger, Africa overall has less than two tractors per 1,000 hectares of cropland. There are 10 tractors per 1,000 hectares in South Asia and Latin America. Without mechanized agriculture, productivity suffers drastically, lowering farmers' earnings, notes the Alliance for a Green Revolution in Africa, an organization funded by the Bill and Melinda Gates and Rockefeller Foundations that seeks to promote agricultural transformation and improve food security in Africa. Africa currently spends a whopping \$35 billion annually on food imports, according to the African Development Bank (AfDB), which projects that if the current trend continues, food imports could rise to \$110 billion by 2050. Africa should be the breadbasket of the world, says AfDB president Akinwumi Adesina. "Technologies to achieve Africa's green revolution exist but are mostly just sitting on the shelves. The challenge is a lack of supportive policies to ensure that they are scaled up to reach millions of farmers. Agricultural productivity in Nigeria is still tedium laden, hence only a few of the youths go into agriculture. Though it is obvious that there is a lot of prosperity in agriculture, yet the rate of the use of old equipment and the



antecedent drudgery involved send many away from engaging in agriculture. The story of farming in the developing economy is a completely different one.

In Nigeria, agricultural workers make up a very small portion of the population, but agriculture employs anywhere between 50 percent and 90 percent of the population for farming in the developing countries (Oduwole, 2018). These various powers are used in different region depending on the choice of the farmer and the farm operation the farmer wants to carry out. The basic importance of the use of these implements is to maximize productivity thereby increasing the input to farming activities hence intensifying productivity in the agricultural sector and meeting the high demand of agricultural products. The technique is employed by farmers at different stages of production. According to Rijk (2019), machines are used in ploughing of land, crop production, planting, stumping, ridging, fertilizer application, weeding, harvesting among others. Other area where mechanization is applicable includes land clearing, tilling operation, harrowing, transportation, processing and storage. As a result of the adoption of agricultural mechanization, Mbanasor and Onwusiribe (2019), noted that the use of machines, greatly increase farm workers' productivity.

Lamidi and Akande (2023), opined that there is reduction in drudgery, improved timeliness and effectiveness in various farm operations thereby bringing more land under cultivation, preserve the quality of production as well help in improving the living condition and notably improve the economic growth of the rural sector. To have a policy to 'mechanize' would imply that the introduction and expansion of mechanized inputs is an end in itself (Oduwole, 2018). Lawal (2013), stressed that agricultural mechanization is beneficial in that it boost food production, increase information dissemination level, encourage youth participation, encourage multiple cropping, reduce drudgery, ensure food sufficiency, encourage foreign exchange revenue, improved processing and packaging, increase participation, increase economic return to farmers, improved timeless and precision of operation, improve working environment, improve farm worker dignity, increase steady supply of raw materials among others. Nigerian farmer have often been described as "The man with the hoe", (Odigboh, 2000). Reid (2019), noted that farm mechanization is one factor that has a significant effect in agriculture since the beginning of modern agriculture.

Despite these benefits recorded by researchers, Akande (2020), noted that Nigeria farmers have not really keyed in into this system or techniques as majority are subsistence farmers



who cultivate about 1-2 hectares of land usually scattered over a wide range area. FAO (2019), noted that most farmers tend not to welcome the idea of the use of machine in farming which may be attributed to some challenges affecting them in farming including affordability, availability, and lack of maintenance and repair service. Hilkih and Okparanma (2024), also noted that some of the factors identified for the low level of agricultural mechanization in Rivers State include continued fragmentation of farmlands, poor capital based of individual farmers and weak commitment to implementation of mechanization programmes and poor land tenure system. The resulting low productivities were due to poverty, lack of knowledge of the implements, lack of initiatives to use machinery in agricultural practices, and traditional tools being cheap and readily available to the rural farmer. Haven viewed the various operational areas, importance and challenges facing agricultural mechanization in Africa, Nigeria, and Rivers State, farmers in these areas seem not to be much involved in the use of mechanization as to resolve the use of crude implement.

According to Rijk (2019), most farmers raised issues that mechanization has replaced labour thereby putting some farmers out of work; high capital is required for mechanized farming. Agricultural mechanization is a male-dominated technology; farm areas are in fragment therefore cannot encourage the use of machine among others. Lamidi and Akande (2023), noted that land tenure system and access to capital have a major setback to the use of mechanization by farmers in Nigeria. Onyema (2019), and Odigboh (2000), reported that despite the heavy benefits in mechanization techniques, Nigeria farmers has access to only less than one percent of this conventional power, thereby attributing it to land tenure system, scarcity of machinery, illiteracy of the farmers, lack of maintenance technicians, inconsistent government policies, poor infrastructure, poverty and inaccessibility to credit, shortage of spare parts, prevailing agronomic practice, lack of trained machinery operators among others. According to Nkakini *et al* (2020), farmers in Rivers State employed only a low level of mechanization because of continues fragmentation of farmlands, poor capital based of individual farmers and weak commitment to implementation of mechanization programme.

Ekwonwa and Osuala (2017), noted that rural farmers are still using traditional farming practices and often reluctant to embrace agricultural mechanization because of their poor socioeconomic status. This has resulted in low farm production and poor socio-economic



development of the local communities. Despite its advantages in increasing crop yields, providing economic and time-saving benefits, and generally enhancing production, rural farmers in Ahoada East Local Government Area have been slow to embrace agricultural mechanization as many farmers remain unconvinced of the efficacy of these machines. It is on this note that the study seek to examine the socio-economic determinants of agricultural mechanization use among rural farmers in the study area. The specific objectives were to

- i. describe the socio-economic characteristics of the respondents in the study area
- ii. identify farming activities where agricultural mechanization is applied;

The null hypothesis which states that there is no significant relationship between the socio-economic characteristics of the rural farmers and their agricultural mechanization use in the study area.

Methodology

The study was conducted in Ahoada East is a Local Government Area of Rivers State, Nigeria. It is located between Latitude 5.0833° North and Longitude 6.6500° East with an estimated population of about 340, 567 inhabitants based on the proposed 3% annual population growth (NPC, 2021). Christianity and traditional religion are the widely practiced faiths in the area while majority of the population are farmers.

A Multistage sampling procedure, involving purposive and simple random sampling techniques, was used to select a sample size of 100 respondents for the study. The first stage involved purposive selection of Ahoada East and grouping Ahoada East into two (2) clans. Second stage involved simple random selection of six (6) communities from Upata clan, and four from Akoh clan making it ten (10) selected communities based on their prevalence on farming activities. Thirdly, 10 crop farmers were selected using simple random technique from these communities to give sample size of 100 respondents for the study area.

Primary data for this study were collected through use of structured questionnaires which were administered to the crop farmers. Data obtained from the study were analyzed using descriptive statistics such as frequency count, percentages, and mean. Correlation analysis was used to test the hypothesis which states that there is no significant relationship between the socio-economic characteristics of the rural farmers and their agricultural mechanization use in the study



Results and Discussion

Socio-economic Characteristics of Respondents in the study Area

Table 1 shows that large proportion, (56%) were females while 44% were males and this implies that majority of the farmers were females. This could be due to the fact that females are predominantly involved in agricultural activities while their male counterpart are mostly involved in other sectors of production. This corroborates with the findings of Bafana (2019) that stated that women grow 70% of Africa's food on smallholder farms, a task anchored by physical labour.

The table also shows that majority (33%) of the respondents in the area were within the ages of 21-30 years, while 26% were within the ages of 41-50 years, 23% were within 31-40 years, 18% of were above 51 years, with an average age of 31 years. This implies that farming was a female dominated occupation in the in the study area. This could mean that the crop farmers in the study area are young, energetic, active and they are in their productive age. This is not in line with the findings of Oluwatayo (2022) and Anyawu (2015) who noted that the mean age of active farmers in Nigeria falls around 44 years old. This is so because agricultural mechanization requires strong, active and energetic people for maximum productivity.

The result indicated that majority (49.0%) of the respondents were married. Also 29% were single, 12% widowed, 6% divorced, and 4% were separated. The finding could mean that the respondents are married and responsible. This could also mean that they are married for procreation as a way of raising families that could serve as source of farm labour force.

The educational distribution of the respondent shows that majority (32%) of the respondents had secondary education. Also 28% have primary education; 21% non-formal education; and 20% had tertiary education. This implies that over 80% of rural farmers in the study area had one level of formal education or the other. This decision may be because the respondents have the understanding that education is the key to effective decision making on agricultural mechanization for effective agricultural activities.

The table shows that majority (37%) of the rural farmers in the study area belong to a household size of between 4-6 members. This was followed by those with 1-3 members 31% while those with 7-9 members accounted for 22%. The average household size was revealed to be 5.0 persons per household. The result is in line with the findings of Wizer and Wli



(2019) which revealed average household size in Nigeria to be about 6.0 persons per household. This is relatively large household size. Usman, et al (2020) opined that large household size is a human capital available for agricultural activities. It is likely that members of the household could be used as tools for effective agricultural mechanization (Adebayo, 2022).

The distribution of the respondent by years of farming experience shows that majority (32%) had between 10-13 years farming experience. This was followed by 28% had 6-9 years farming experience, 22% had 2-5 years farming experience, while 18% had 14-17 years farming experience. The average farming experience of the rural farmers was 8 years. This could mean that the farmers have considerable good level of experience in the farming subsector and as such could use this expertise judiciously for improved mechanized farming activities. This collaborates with Asadu, Agbo, Asadu and Onyema (2019), they maintained that experience is a vital tool for improved mechanization in farming activities.

The table captures majority (62.0%) respondents as full-time farmers, while 38.0% of the respondents were part time farmers. This could imply that most of the farmers are engaged in other productive ventures other than farming. This agrees with the findings of Jackson et al (2023) who opined that Ahoada East Local Government area is an agrarian environment.

The result shows that 44% of the respondent earn between 31,000-50,000 monthly, 23% earned between 51,000-70,000 monthly, 18% earned 11,000-30,000 while 15% of the respondents earn above 70,000 on monthly basis. The average income of the farmers per month was found to be 44,500. This could mean that agriculture in the study area is an income generating venture since most of the farmers are into mechanized farming activities.

This is consistence with the findings of Yilangai, Pinena and Kambai (2015) who reported that the average income realized in farming in Jos, Plateau state per individual on monthly basis was N52,000. This income is important to the farm family because it will enable them to purchase mechanized farm tools/equipment's, which will enable carryout effective farming activities (Adebayo, et al 2012).



Table 4.1: Distribution of respondent by socio-economic characteristics

Variables	Category	Frequency (n = 100)	(f)	Percentage (%)	Mean (\bar{x})
Gender					
	Male	44		44.0	
	Female	56		56.0	
Age (years)					
	21-30 Years	23		23.0	31 years
	31-40 Years	33		33.0	
	41-50 Years	26		26.0	
	Above 51	18		18.0	
Marital status					
	Single	29		29.0	
	Married	49		49.0	
	Divorced	6		6.0	
	Separated	4		4.0	
	Widowed	12		12.0	
Educational level					
	Non-formal Education	21		21.0	
	Primary Education	28		28.0	
	Secondary Education	32		32.0	
	Tertiary Education	19		19.0	
Household Size					
	1-3	31		31.0	5.0
	4-6	37		37.0	
	7-9	22		22.0	
	Above 10	10		10.0	
Years of Farming Experience					
	2-5	22		22.0	8 years
	6-9	28		28.0	
	10-13	32		32.0	
	Above 14	18		18.0	
Farming Status					
	Full Time	62		62.0	
	Part Time	38		38.0	
Income per Month (₦)					
	11,000-30,000	18		18.0	



31,000-50,000	44	44.0	40,500
51,000-70,000	23	23.0	
Above 70,000	15	15.0	

Source: Field Survey (2023)

Farming activities and where agricultural mechanization is applied.

Table 2 shows farming activities where agricultural mechanization is applied by farmers. The table shows that majority (90.0%) of the respondents agreed “Yes” to land clearing. This was followed by, transportation 88.0%, tilling operation 86.0%, processing 85.0%, fertilizer application 81.0. %, harvesting 81.0%, storage 79.0%, harrowing operation 78.0%, planting activities 73.0%, 72.0% for stumping operation, ridging 63.0%, weeding 61.0%, respectively are various farm operation stages where agricultural mechanization can be used in the farming process. This study is complimented by Folaranmi (2019) and Rijk (2016) who noted that in this modern world of technology, there are machines which are used for various farm operations such as land clearing, planting and weeding, harvesting, processing, storage among others. This operations have different machines which are used to execute them at various levels which according to Rijk (2016) help in intensifying productivity in agriculture and meeting the high demand of agricultural products.

Table 2: Distribution of farming activities and where agricultural mechanization is applied.

Variables	Yes Frequency(f)	Percentage (%)	Ranking
n = 100			
Land clearing	90	90.0	1 st
Transportation	88	88.0	2 nd
Tiling operation	86	86.0	3 rd



Processing	85	85.0	4 th
Fertilizer application	81	81.0	5 th
Harvesting	81	81.0	5 th
Storage	79	79.0	6 th
Harrowing operation	78	78.0	7 th
Planting activities	73	73.0	8 th
Stumping operation	72	72.0	9 th
Ridging	63	63.0	10 th
Weeding	61	61.0	11 th

Source: Field survey, (2023)

Multiple Responses

Correlation analysis showing relationship between the socioeconomic characteristics of the rural farmers and their agricultural mechanization use

Result the correlation analysis in Table 3 shows significant influence of the socio-economic characteristics of farmers on their use of agricultural mechanization in the study area.

The correlation coefficients (r) indicate the strength and direction of the relationships between each socio-economic characteristic and mechanization use in different farming activities:

Land Preparation: Household size (0.916): Very strong positive correlation, suggesting that larger households tend to have more mechanization use for land preparation.



Farm size (0.917): Very strong positive correlation, implying that larger farm sizes are associated with more mechanization use in land preparation.

Planting and Seeding: Gender (0.669): Moderate positive correlation, meaning that gender (likely male farmers) might influence the use of mechanization in planting. Marital status (0.037) and Educational level (0.001): These show very weak or insignificant correlations (likely p-values indicating no significant relationship). Farm size (0.957): Very strong positive correlation, suggesting that larger farms use more mechanization for planting.

Irrigation: Gender (0.552): Moderate positive correlation, showing that gender influences irrigation mechanization. Educational level (0.050): Weak positive correlation, indicating a slight influence of education on mechanization use for irrigation. Farm size (0.857): Very strong positive correlation, highlighting that larger farms are more likely to use mechanized irrigation systems.

Fertilizer/Pesticide Application: Farm size (0.833): Strong positive correlation, implying that larger farms tend to use mechanization for fertilizer and pesticide application.

Weeding and Weed Control: Marital status (0.072) and Educational level (0.005): Weak to moderate positive correlation, suggesting that marital status and education influence mechanization use for weeding. Farm size (0.755): Strong positive correlation, indicating that larger farms use more mechanization in weeding.

Harvesting: Marital status (0.008), Educational level (0.005): These variables show weak or insignificant correlations, suggesting these socio-economic factors might have a lesser influence on mechanization use in harvesting. Farm size (0.860): Very strong positive correlation, implying large farms are more likely to use mechanized harvesting methods.

Processing: Farm size (0.686): Moderate to strong positive correlation, indicating that larger farms tend to use mechanization in processing activities. Storage and Preservation: Farm size (0.749): Strong positive correlation, suggesting that larger farms are more likely to employ mechanization for storage and preservation activities.

Livestock Management: Gender (0.730) and Educational level (0.010): Moderate positive correlations, indicating that gender and education influence the use of mechanization in livestock management.

Mechanized Transportation: Educational level (0.016) and Farm size (0.021): Weak positive correlations, suggesting that education and farm size slightly influence mechanized transportation use.



Farm Size appears to be the most significant factor in the use of agricultural mechanization, with strong positive correlations across almost all farming activities. Gender shows a moderate influence on mechanization use for planting, irrigation, livestock management, and land preparation. Educational level shows weak influences, with the strongest correlations in planting, harvesting, and livestock management. Household size has the strongest positive correlation with land preparation mechanization, suggesting larger households may have more access to mechanization resources.

Table 3: Correlation analysis showing influence of socio-economic characteristics of rural farmers on agricultural mechanization use.

Agricultural Mechanization Use	Socio-economic characteristics							
	Gender	Age	Marital status	Educational level	Household size	Monthly income	Farming experience	Farm size
Land preparation	0.492	0.135	0.145	0.264	0.916	0.345	0.736	0.917
Planting and seeding	0.669	0.017*	0.037*	0.001**	0.157	0.288	0.628	0.957
Irrigation	0.552	0.002**	0.050*	0.050*	0.853	0.174	0.044*	0.857
Fertilizer/pesticide application	0.400	0.6021	0.321	0.098	0.830	0.877	0.556	0.833
Weeding and weed control	0.450	0.072	0.047*	0.005**	0.758	0.602	0.043*	0.755
harvesting	0.450	0.008**	0.005**	0.858	0.487	0.010**	0.860	0.482
Processing	0.730	0.197	0.519	0.897	0.721	0.198	0.686	0.020*
Storage and preservation	0.974	0.915	0.735	0.658	0.749	0.244	0.132	0.749
Livestock management	0.730	0.730	0.627	0.010**	0.560	0.523	0.620	0.566
Mechanized transportation	0.119	0.203	0.371	0.016*	0.629	0.419	0.028*	0.021*

* Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed)

Source: Field Survey, 2023



Conclusion

Based on the findings of the study, it was concluded that agricultural mechanization can be used by farmers to perform different farm operations ranging from land clearing, stumping, tilling, planting, harvesting, and storage among other operations. Farm size, gender, educational level, and household size are the significant socioeconomic determinant of the agricultural mechanization use in the study area.

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