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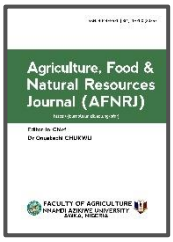

Original Article

Farmers' perception of mechanical rice seedling transplanter in Edu and Pategi Local Government Areas of Kwara State, Nigeria

OPEN ACCESS

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ABSTRACT

This study assessed rice farmers' perceptions of mechanical rice seedling transplanters in Kwara State, Nigeria. A multi-stage sampling procedure was used to select 150 rice farmers from Edu and Pategi Local Government Areas. Data were analysed using percentage and Pearson correlation. Results showed that most farmers (94.7%) had very high positive perceptions of mechanical transplanters, recognizing benefits like reduced seedling wastage, faster planting, labour savings, and improved crop uniformity. However, accessibility remained limited, with only 3.3% accessing government subsidies and 24.7% having finance to procure transplanters. Major challenges included inadequate funding, poor technical knowledge, and high maintenance costs. Significant relationships were found between farmers' perceptions and socioeconomic factors like age, farming experience, farm size, and income. While perceptions were positive, actual adoption was low due to accessibility barriers. Recommendations include expanding subsidies and training programs, developing targeted financial products, and formulating mechanization policies accounting for socioeconomic influences on adoption.

KEYWORDS: *Adoption, Farm size, Influence, Maintenance, Manual*

INTRODUCTION

The importance of agriculture in developing countries like Nigeria cannot be overemphasized because it is the main thrust of employment opportunities, food production, national survival, and foreign earnings. The climate condition of Nigeria is favourable for agricultural production (Oyewole *et al*., 2023). Rice holds a significant position in global agriculture, ranking as the third most-produced cereal after wheat and maize. It accounts for 20% of worldwide cereal consumption and is a primary cereal in human diets globally. As one of the world's most widely consumed foodstuffs, rice plays a crucial role in ensuring food security across the African continent (Yann *et al*., 2023).

Nigeria's yearly rice consumption was estimated at 7.8 million metric tons, while its production surpassed 12.85 million tons in 2018 (Federal Ministry of Agriculture and Rural

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Development, 2020). Despite the increase in production, its demand far exceeds domestic production. This is because government efforts to make the country self-sufficient in rice production have proved abortive. However, in West Africa, Nigeria is the largest producer of rice covering about 46 per cent of the region's total production (Sani *et al.,* 2022). Nigeria's rice production rose gradually over the years with area expansion to surpass major rice-producing countries like Cote d'Ivoire and Sierra Leone. The principal factors driving increased rice production in Nigeria are population growth and urbanization. In the last 30 years, production has increased sixfold with Nigeria producing 328 million tons of paddy rice (FAOSTAT, 2004; Stone, 2022).

Manual transplanting of rice seedlings into puddled fields is still widely practised. Transplanted crops require less seed, and are better able to compete against weeds but require much more labour to establish (Bhandari *et al.,* 2020). In areas where labour is becoming a problem, mechanical transplanters are starting to become popular. Most mechanical transplanters place seedlings in rows either 2030 cm apart within row spacing determined by ground speed or the head speed of the transplanter (Cheboi, 2021).

However, perception is an initial stage of decision by the farmers in accepting and developing the farm, the willingness of farmers to use a particular machine (Haruna *et al*., 2023). The general objective of the research was to assess the perception of mechanical rice transplanting by the rice farmers in Kwara state, Nigeria. The specific objectives are to: identify the level of perception of mechanical rice seedling transplanter of rice production; identify the level of accessibility of mechanical rice seedling transplanter of rice production and identify the challenges facing rice farmers usage of mechanical transplanting in the study area.

METHODOLOGY

This study was conducted in Kwara State of Nigeria. The State has an area of land totalling 32,500 km2 with Guinea Savannah Vegetation. Geographically, the State is situated between latitude 7^0 201 and 11^0 051 North of the equator and longitude 2^0 51 and 6^0 451 East of the prime meridian. Kwara State consists of sixteen local government areas with a population was 2.37 million based on the Nigeria 2006 Census, with 2.6% annual growth rate in Nigeria, Kwara state population should be 4.10 million people (in 2019) The population of the study were all rice farmers in Edu and Pategi Local Government Areas. A three-stage sampling procedure was adopted; the first stage involved a purposive selection of Patigi and Edu LGAs of the state. This was based on the prior information obtained from the Kwara State Agricultural Development Project (KWSADP) that the two LGAs are the major rice-producing areas in the state. The second stage was a random selection of five (5) farming communities from each of the selected LGAs using the state's Agricultural Development Project village listing. The third stage involved a random selection of fifteen (15) rice farmers from each of the selected communities to make a total of one hundred and fifty (150) respondents. The data were analysed using descriptive and inferential statistical tools such as frequency count, percentages, means and ranks. Pearson Product Moment Correlation (PPMC) was used to test the hypothesis.

RESULTS AND DISCUSSION

Farmer's perception of Mechanical Rice Seedling Transplanter

The results presented in Table 1 indicate that rice farmers have a highly positive perception of the mechanical rice seedling transplanter, with all perception items scoring above the 2.50 threshold. The highest-rated benefits include its ability to reduce stress and workload (3.78), require less time and labor than manual transplanting (3.69), and obtain better results than manual methods (3.61). Farmers also acknowledged its role in reducing seedling wastage (3.59), ensuring uniform spacing and plant density (3.55), and accelerating the planting process (3.52). However, the lowest-rated perception, though still positive, was that mechanically transplanted seedlings recover fast and mature uniformly (3.42), suggesting concerns about post-transplanting seedling establishment. This implies that farmers recognize the transplanter as an efficient and labor-saving technology capable of enhancing productivity and planting precision. The strong agreement on its ability to reduce workload and improve efficiency highlights the potential for mechanization to address labor shortages and enhance rice farming sustainability.

However, the slightly lower perception of seedling recovery and uniform maturity highlights the need for proper post-transplanting management, including optimized water and nutrient application, to maximize its effectiveness. This corroborates the findings of Rahman *et al*. (2019) and Okereke (2021), who reported that mechanized transplanting enhances productivity by minimizing seed wastage and ensuring optimal plant spacing. Similarly, Zhang *et al*. (2020) emphasized that while mechanization improves efficiency and reduces physical exertion, best agronomic practices are essential to achieving uniform crop establishment and maturity.

Level of Perception of Mechanical Rice Seedling Transplanter on Rice Production

The results presented in Table 2 indicates that the majority (94.7%) of rice farmers have a very high perception of the mechanical rice seedling transplanter, with a weighted mean of 3.59 ± 0.29, while 5.3% had a high perception and none had a poor perception. This implies that farmers recognize the benefits of the technology, such as increased efficiency, labor savings, and enhanced productivity, which can encourage its widespread adoption and contribute to improved mechanization in rice farming. This corroborates the findings of Fayose *et al*. (2021), who reported that mechanized rice transplanting enhances production efficiency and reduces drudgery. Similarly, Otsuka & Zhang (2021) found that farmers in South Asia viewed mechanical transplanting as a labor-saving and yield-enhancing innovation. Moreover, this supports the

findings of Muhammed & Bello (2020), who noted that farmers' positive perception of mechanized technologies.

Table 1: Farmer's perception of mechanical rice seedling transplanter

Perception items	Score	MS(n=150)
The use of a transplanter can reduce rice seedling wastage	539	3.59
Rice seedling transplanter can accelerate the process of planting	528	3.52
Rice seedling transplanter obtains better results than manual	542	3.61
It requires considerably less time and labour than manual	553	3.69
The Rice Seedling transplanter ensures uniform spacing and plant density	532	3.55
It reduces stress and workload	567	3.78
Mechanically transplanted seedlings recover fast and mature uniformly	513	3.42

Mean Score > 2.50 = Agreed. ***Source:*** *Field Survey, (2021).*

Table 2: Level of perception of mechanical rice seedling transplanter

Perception	Percentage	Weighted Mean
Poor (<2.0)	0	
High (2.0-3.0)	5.3	3.59±0.29
Very High (> 3.0)	94.7	

Source: Field Survey, (2021).

Accessibility of Mechanical Rice Seedling Transplanter on Rice Production

The level of accessibility of the farmers to mechanical rice seedling transplanters for rice production was assessed and the result was presented in Table 3.

The results in Table 3 show that farmers in Edu and Patigi Local Government Areas have limited access to mechanical rice seedling transplanters, mainly due to financial constraints (24.7%) and low government support (3.3%). While 42.0% benefit from training programs, only 13.3% access the machine through service providers or cooperatives. This implies that although training is available, affordability remains a major barrier, highlighting the need for subsidies and financial support. Expanding cooperative ownership and rental services could improve access. This aligns with Kumar *et al*. (2019), who found that financial constraints limit mechanization in South Asia, and Owusu and İşcan (2021), who emphasized the role of government policies in increasing farm mechanization in Nigeria.

Table 3: Accessibility to Mechanical Rice Seedlings Transplanter

Variables	Percentage
Government intervention on Subsidized machinery	3.3
Finance to procure and operate the mechanical rice seedling transplanter	24.7
Service providers or cooperatively own the machine	13.3
Training institute or program for its operators	42

Source: Field Survey, (2021).

Challenges Facing Rice Farmers' Usage of Mechanical Transplanting

The results presented in Table 4 indicates that inadequate funding (2.53) and inadequate infrastructure (2.51) are the most significant challenges affecting the adoption of mechanical rice seedling transplanters in Edu and Patigi Local Government Areas. The high cost of acquiring and operating the transplanter, combined with poor infrastructure such as inadequate roads, electricity, and irrigation facilities, limits farmers' ability to adopt and efficiently use the technology. This implies that without improved financial support and better infrastructure, farmers may continue to rely on manual transplanting, reducing productivity and efficiency. Government interventions, including subsidies, credit access, and rural infrastructure development, are crucial for promoting mechanization. This aligns with Alao (2021), who found that financial constraints and poor infrastructure are major barriers to mechanization in Nigeria, and Ojo *et al*. (2021), who emphasized the need for infrastructure investment to boost agricultural technology adoption. Other challenges, such as high maintenance costs (2.40) and poor technical know-how (2.33), indicate that even when farmers access transplanters, maintaining and operating them effectively remains a problem. Additionally, poor nursery management practices (2.07) and language barriers (1.89) highlight knowledge gaps that could hinder successful mechanization.

Table 4: Challenges to the Usage of Mechanical Rice Transplanter

Challenges	Score	$\bar{X}$
Inadequate Funding	376	2.53
Poor technical know-how	350	2.33
High cost of maintenance	360	2.4
Poor nursery management practice	311	2.07
Language barrier	283	1.89
Inadequate infrastructure	379	2.51

Source: *Field Survey, 2021.*

Result of Relationship between selected socio-economic Characteristics and Perception of Mechanical rice transplanter

Table 5 shows that age (r = -0.263, p = 0.001) and farming experience (r = -0.202, p = 0.013) have a significant negative relationship with farmers' perception of mechanical rice transplanters, suggesting that older and more experienced farmers are less likely to adopt mechanization. In contrast, income (r = 0.220, p = 0.007) and farm size (r = 0.203, p = 0.013) have significant positive relationships, indicating that wealthier farmers and those with larger farms are more inclined to adopt the technology. This implies that younger, wealthier farmers with larger farm sizes are more likely to perceive mechanical rice transplanters positively, while older, more experienced farmers may resist due to familiarity with traditional methods. This aligns with Okonji & Awolu (2021), who found that farm size and financial capacity strongly influence mechanization adoption in Nigeria. Similarly, Thar *et al*. (2021) emphasized that younger farmers are more likely to embrace mechanization, while older farmers tend to rely on conventional farming practices.

However, level of education (p = 0.392), household size (p = 0.609), and frequency of extension contact (p = 0.584) show no significant relationship. The lack of significance for education and extension contact suggests that awareness alone may not drive adoption unless financial and structural barriers are addressed.

Table 5: Relationship between selected socio-economic Characteristics and Perception of mechanical rice transplanter

Variables	r-value	p-value
Age	-0.263	0.001
Level of education	0.07	0.392
Household Size	0.042	0.609
Farming Experience	-0.202	0.013
Farm Size	0.203	0.013
Income	0.22	0.007
Frequency of extension contact	0.045	0.584

Significant at p<0.05. ***Source:*** *Field Survey, (2021).*

CONCLUSION AND RECOMMENDATION

The findings reveal that rice farmers generally have a very high level of awareness and positive perceptions regarding the benefits of mechanical rice transplanters. The majority of farmers agreed that mechanical transplanters can reduce seedling wastage, accelerate planting, achieve better results than manual methods, save time and labour, ensure uniform spacing and plant density, reduce stress and workload, and lead to faster recovery and uniform maturity of seedlings. The study concludes that there is a significant relationship between some socioeconomic characteristics (age, farming experience, farm size, income) and farmers' perceptions of mechanical transplanters. This suggests that these factors influence farmers' views and potential adoption of the mechanical rice seedling transplanter. While perceptions are high, actual adoption and accessibility of mechanical rice transplanters remain low in the study area due to various challenges. The study recommends that government and development agencies enhance access to mechanical rice transplanters for smallholder farmers through subsidies, cooperative ownership, and public-private partnerships. Expanding training and capacity-building programs is crucial to improving farmers' technical knowledge and skills in operating and maintaining the equipment. Also, financial institutions should introduce targeted loan products to address funding constraints and facilitate mechanization adoption.

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Authors' Contributions

Author IS who provided guidance on research design, data collection, and statistical analysis. AAO contributed by designing the structured questionnaire used for data collection, ensuring it captured relevant socioeconomic characteristics and farmers' perceptions. OSA was responsible for the field survey, coordinating data collection from 150 randomly selected rice farmers. YAO led the data analysis using descriptive and inferential statistics, including Pearson product-moment correlation, to test the hypothesis. POO focused on identifying key constraints faced by farmers, such as inadequate funding and poor technical know-how, while OOM examined the role of government intervention and accessibility factors, such as subsidized machinery and cooperative ownership of transplanters. Finally, HCO contributed to policy recommendations, advocating for improved credit facilities and government support to enhance mechanized rice farming.

Ethical statement

This study was conducted in accordance with ethical guidelines for research involving human participants. Participants were assured of confidentiality, and their responses were used solely for research purposes. No personal identifiers were recorded, and participation was voluntary, with the option to withdraw at any stage without any consequences.

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