ISSN 1810-3030 (Print) 2408-8684 (Online)
Journal of Bangladesh Agricultural University
Journal home page: http://baures.bau.edu.bd/jbau, www.banglajol.info/index.php/JBAU

Increasing rice production through adoption of improved variety in Niger State, Nigeria

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ARTICLE INFO

Article history:
Received: 12 February 2018
Accepted: 25 June 2018

Keywords:
Adoption, Farmers, Improved variety, Increasing, Rice production

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Abstract

The study examined the performance of Faro 44 improved rice variety in increasing rice production in Niger State, Nigeria. To achieve the objectives of the study, 203 farmers were randomly selected from three Local Government Areas in the State. Validated interview schedule with reliability co-efficient of 0.89 was used for collecting data and collected data were analyzed using descriptive statistics and Pearson's Product Moment Correlation analysis. The result indicated that the mean age of the respondents was 43 years, with mean farm size of 2.1ha. Finding also revealed that a total 97.54% of the respondents adopted Faro 44 improved rice variety in their farms. The mean yield of the respondents was 6 Tons/ha., which increased the rice output of more than half (52.22%) of the respondents twice. The mean income was ₦675, 000.00 ($ 1,824.32); this led to empowerment of the respondents in the areas of attending to family welfare needs (89.66%), re-investment in farming businesses (70.94%) and acquisition of landed properties (50.73%). Challenges of adoption were complexity of some components of improved variety (39.90%) and late delivery of improved seeds (35.47%). The result further showed that respondent's educational level (r = 0.285), farm size (r = 0.309) and extension contacts (r = 0.236) had significant relationship with adoption of improved rice variety. Thus, it was recommended that extension service providers should provide follow-up information to the farmers to educate them more on the agronomic practices of the improved rice variety. It was also suggested that back-up inputs such as improved seeds should be made available to farmers adequately and on time by relevant stakeholders.

Introduction

Agriculture plays very significant role in economic development. Thus, it is major source of income for majority of people in the developing countries who use or relies on traditional methods of production and this has reduced the level of productivity because of small farm sizes and usage of local varieties by the farmers which has very low yield potentials (Muzari *et al*., 2012). Nagoyetes (2005) reported that at least seventy five percent of farms in most of African and Asian nations are two hectares or less. Similarly, World Bank (2007) observes that small-scale farming is the prominent type of agriculture in many developing nations. The source further stated that approximately three billion people live in the rural areas of developing countries with over two billion of them engaged in agriculture with small farm holdings. Though, Morton (2007) opined that small-scale farm holders can be efficient in the utilisation of purchased production inputs than the large-scale farm holders. Also, Thirtle *et al.* (2005) said that small-scale farming has high potential to decrease poverty and increase agricultural production. This suggests that if agriculture is transformed, there would be increase in production.

One of the ways of transforming agriculture and increasing productivity is through adoption of modern agricultural technologies. The most popular area of agricultural technology generation and promotion for crop production include new improved varieties, management regimes, soil fertility management, weed/ pest control and water management (Loevinsohn *et al*., 2012). According to Challa (2013), agricultural technologies include all kinds of improved practices and techniques which raise the level of agricultural production and reduce cost of production as well as drudgery in farming.

For instance, Challa (2013) reported that adopters of improved technologies increase their production resulting in constant socio-economics growth. The author further reported that adoption of improved agricultural technologies has been associated with higher earnings, lower poverty, improved nutritional status, lower food prices and increase in employment opportunities. Similarly, Ravallion and Chen (2004) observed that the success of Green Revolution Programme in Asian countries was largely due to the adoption of improved technologies. Also, Sunding and Zilberman (2000) reported that technological transformation has been a critical issue shaping agriculture in the recent past. In Nigeria, there was increase in agricultural production during 2016 cropping season specifically in rice production, which was largely attributed to the adoption of improved varieties. However, since the dissemination of Faro 44 improved rice variety to farmers, independent assessment on the

performance of the improved variety has been scanty. This study therefore, is taking the challenge of filling this research gap of examining the performance of Faro 44 improved rice variety in the field in terms of yield per hectare in relation to target yield, enhancement and empowerment to provide information that would increase adoption and rice production in order to revamp the dwindling economy. The specific objectives were to:

i. describe socio-economic characteristics of the respondents;
ii. examine the adoption of Faro 44 improved rice variety by the respondents;
iii. determine the output/yield and income of the respondents;
iv. examine the extent of enhancement and empowerment of the respondent; and
v. identify the challenges for improved rice variety adoption.

Methodology

The study was undertaken in Niger State which is located within Guinea Savannah ecological zone of Nigeria. The State's coordinates is 10.2155° N, 5.3904° E. With annual growth rate of 3.4%, the State has estimated population of 5,337,149 in 2015, of which 85% of the people are farmers. Annual rainfall ranges from 1,100mm in the northern part to 1,600mm in the southern part of the State. The mean average temperature is around 32^{o}C. Some of the crops grown in Niger State include yam, cotton, maize, sorghum, millet, soybean, cowpea, rice and groundnut. While some of the tree crops cultivated are mango, citrus, cashew, banana, pawpaw. Livestock reared include goat, sheep, cattle, chicken, camel and donkey. The State has 25 Local Government Areas (LGAs) with three Agricultural Zones (Niger State Geographic Information System, 2007).

Multistage sampling technique was used for the selection of respondents for the study. The first stage was purposive selection of three LGAs namely Lavun, Paiko and Wushishi from Agricultural Zones I, II and III, respectively, because of high participation of farmers in rice production in those localities. The second stage involved random selection of three rice producing villages from each of the selected LGA. This gave a total of 9 villages. The third stage was simple random selection of 10% of farmers from the selected villages. Thus, a total of 203 respondents were selected for the study from the sampling frame of 2030 farmers obtained through village heads with the assistance of village extension workers attached to the villages sampled.

Content validity of the interview schedule was ensured through expert consultation and literature scan. The validated interview schedule which was subjected to Cronbach's Alpha reliability test (r = 0.89) was used for data collection in December, 2016. Data were collected on socio-economic characteristics, adoption of improved rice variety, yield/income, extent of enhancement/ empowerment and challenges for adoption. Socio-economic characteristics such as age and educational level were measured in years. While farm size and extension contacts were measured in hectare and number of contacts respectively. Adoption was measured in terms of the total land area devoted to improved rice variety production, as used by Ojiako (2007). Output was measured as total quantity (kg) of rice obtained by a farmer, while yield was measured in kilogram per hectare and income was measured in Naira/Dollar. Extent of enhancement and empowerment were determined by asking the respondents to indicate extent of enhancement of rice output and area of empowerment. Challenges were ascertained by asking the respondents to indicate constraints faced in the adoption of improved rice variety. Descriptive statistics were used to achieve objectives one, two, three, four and five, while Pearson's Product Moment Correlation analysis was used to determine relationship between socio-economic characteristics and adoption of improved rice variety.

Results and Discussion

Socio-economic Characteristics of Respondents

Result in Table 1 indicated that the mean age of the respondents was 43 years. The finding suggests that the respondents were in their middle productive years which could be instrumental to adoption of improved technology because of the innovativeness and perception of this age category towards technology adoption. Thus, the youthfulness of the majority of the respondents in the study area holds brighter future for the adoption of improved rice varieties in the area. In a related study, Shiek *et al*. (2003) reported that age of the farmers affect their attitude toward improved technologies and practices. Similarly, finding in Table 1 showed that about 60.0% of the respondents in the study area had one form of formal education or the other. The result implied that majority of the respondents were literate. Awoniyi and Salman (2012) said that high educational level of farmer enhances their technical competence in technology adoption.

Also, Table 1 revealed that the mean farm size of the respondents in the study area was 2.1 hectares implying that majority of the farmers in the area were into medium-scale farming which may in turn limit investment in technology adoption and output level. Furthermore, Table 1 indicated that close to half (48.77%) of the respondents received extension agents once throughout the cropping season, while 42.86% of the respondents had contacts with extension agents twice. Only abysmal 4.93% and 3.44% received extension agents three and four times respectively, during the cropping season in the area. Going by Training and Visit (T&V) Extension System which recommended fortnightly visits to farmers monthly, the respondents in the area were grossly underserved with extension services which should be a driving force for technology adoption by farmers.

Table 1. Socio-economic characteristics of respondents (N= 203)

Socio-economic characteristics	Frequency	Percentage	Mean
Age (years)			
18–35 (young)	59	29.06	
36–55 (middle)	104	51.23	43
> 55 (old)	40	19.70	
Total	203		
Educational level			
No formal education (0 year**)**	47	23.15	
Primary education (1–6years)	43	21.18	
Secondary education (7–12years)	51	25.12	
Tertiary education (13–17years)	24	11.83	
Adult education (1–3years)	38	18.72	
Total	203	100.00	
Farm size (ha)			
< 1 (marginal)	32	15.76	2.1
1 – < 2 (small farms)	63	31.03	
2 – < 4 (medium farms)	102	50.25	
≥ 4 (large farms)	6	2.96	
Total	203	100.00	
Extension contacts			
Once/year	99	48.77	
Twice/year	87	42.86	
Thrice/year	10	4.93	
Four times/year	7	3.44	
Total	203	100.00	

Source: Field survey, 2016

Adoption of Faro 44 Improved Rice Variety

Finding in Table 2 revealed that 46.80% and 24.63% of the respondents, respectively devoted 30.0%–49.9% and 10.0–29.9% of their lands to improved rice variety. On the whole, 97.54% of the respondents were considered as adopters of this improved rice variety in the study area having devoted up to 10% of their total farm lands to the improved rice variety cultivation. Ojiako *et al.* (2007) posited that a farmer that devoted at least 10% of his or her total farm land to improved rice variety production is considered as an adopter for that particular technology. This finding shows greater level of acceptance for this improved rice variety in the study area which may not be unconnected with the various emphases on agriculture by the present government, as a means of enhancing agricultural production and revitalized the Nigeria economy.

Table 2. Adoption of improved rice variety

Percentage of land devoted to improved variety	Frequency	Percentage
Less than 10%	5	2.46
10.0–29.9%	50	24.63
30.0–49.9%	95	46.80
50.0–69.9%	31	15.27
70.0–89.9%	19	9.36
90.0% and above	3	1.48

Output, Yield/ha and Income from Adoption of Faro 44 Improved Rice Variety

Result in Table 3 revealed that 44.83% of the respondents got 6000kg or less of paddy rice output during the cropping season. Slightly above one quarter i.e 26.11% of the respondents got between 6,001 to 12,000kg of paddy rice output, while a total of 29.06% of the respondents got between 12,001 to 30,000kg of paddy rice output depending on the farm size. The mean yield of the respondents per hectare in the study area was 6000kg (6tons), which is less than the 8000kg (8tons) obtainable per hectare for Faro 44 improved rice variety. This suggests that the yield of the adopted improved variety is yet to be maximized in the study area.

However, when the output was converted into monetary value, 44.83% of the respondents got up to ₦540,000.00 as income, while a combined total of 55.17% of the respondents got between ₦540,001.00 – ₦2,700,000.00 based on the selling price of ₦9,000.00($ 24.32) per 100kg bag of paddy rice. The mean income of the respondents was ₦675, 000.00 which was equivalent to $ 1,824.32 at the exchange rate of ₦370.00. When the Dollar value of the mean income was further divided by a year, the respondents earned about five Dollars ($ 4.998) per day. This helps to enhanced agricultural activities, reduced poverty and empowered the respondent farmers in many ways as shown in Table 4. World Bank (2007) reported that Ghana reduced rural poverty between 1990 to 2005 through the introduction and adoption of improved technologies.

Table 3. Output, yield/ha. and income of respondents (N= 203)

Output, Yield/ha. (Income– ₦)	Frequency	Percentage	Mean income- ₦($)
≤ 6,000kg (≤₦540,000.00)	91	44.83	₦675,000 ($ 1,824.3
6,001–12,000kg (₦540,001.00– ₦1,080,000.00)	53	26.11	
12,001–18,000kg (₦1,080,001.00– ₦1,620,000.00)	33	16.25	
18,001–24,000kg (₦620,001.00– ₦2,160,000.00)	20	9.85	
24,001–30,000kg (₦2,160,001.00– ₦2,700,000.00)	6	2.96	
Meanyield: 6000kg/ha.			

Source: Field survey, 2016

Extent of Enhancement and Empowerment

Figures in Table 4 showed that all (100.00%) the respondents in the study area affirmed that adoption of Faro 44 improved rice variety improved their rice output. When asked on the extent of enhancement, more than half of the respondents (52.22%) indicated that adoption of improved rice variety increased their rice output twice, while 28.07% and 19.71% reported that adoption of improved rice variety increased their output once and thrice respectively. This result implied that the improved variety enhanced paddy rice output of the respondents when compared with the previous yields from local varieties.

Table 4. Extent of enhancement and empowerment (N = 203)

Enhancement/empowerment	Frequency	Percentage
Adoption enhanced output		
Yes		
No	203	100.00
Extent of enhancement	-	-
Once	57	28.07
Twice	106	52.22
Thrice	40	19.71
Empowerment		
Re-investment in farming	144	70.94
Acquisition of landed property	103	50.73
Investment in other businesses	51	25.12
Sponsor children to schools	85	41.87
Settle health care bills	82	40.39
Pilgrimage	12	5.91
Attend to other welfare needs	182	89.66
Purchase social assets	62	30.54

Source: Field survey, 2016

Furthermore, Table 4 indicated that nearly 90.00% of the respondents used income from sells of improved rice variety to attend to their welfare needs. As expected, majority (70.94%) of the respondents re-invested their proceeds in agricultural production by expanding their farm lands, acquiring more inputs as well as purchasing of livestock for fattening and as a work bull. Also, 50.73% of the respondents utilised their income to buy landed properties. This was followed by 41.87% and 40.39% of the respondents who used their incomes for education and healthcare purposes. Findings further revealed that incomes were utilised for acquisition of social assets such as cars, motorcycle television, radio and household needs (30.54%), other businesses (25.12%) and pilgrimage (5.91%). Those findings showed that the respondents in the study area were empowered through the adoption of Faro 44 improved rice variety. These results collaborates the findings of Ogunbameru and Idrisa (2013) who reported that adoption of improved soya bean seed empowered farmers in terms of re-investment in farming, children's education, purchase of landed property and investment in other businesses.

Challenges for Adoption of Improved Variety

From Table 5, some of the aspects of improved rice variety technology remain poorly understood as indicated by 39.90% of the respondents. Such aspects of technicality of concern to the respondents were planting depth, spacing and appropriate planting time. Similarly, 35.47% of the respondents complained of problem of lateness in the delivery of improved variety seeds by the seed suppliers. On the other hand, 8.37% and 5.91% of the respondents in the study area had limited access to credit and extension services respectively. From this finding, it can be inferred that the respondents had both technical and institutional challenges in the adoption of improved rice variety in the study area.

Table 5. Challenges for improved rice variety adoption (N=203)

Challenges	Frequency	Percentage
Complexity of some aspects of improved variety	81	39.90
Untimely delivery of improved seeds	72	35.47
Limited access to credit	17	8.37
Inadequate extension services	12	5.91

Source: Field survey, 2016

Relationship between socio-economic characteristics and adoption of improved rice variety

The result in Table 6 showed that at 5% level of significance, educational level (0.285), farm size (0.309) and extension contacts (0.236) had significant positive relationship with adoption of Faro 44 improved rice variety. This result is not surprising because increase in educational level would expose the farmers to improved technologies, while increase in the farm sizes would improve the farmers' capacities to bear the risk associated with the adoption of improved technologies. Similarly, increase in extension contacts would improve farmers' level of awareness and knowledge on improved technologies, which would consequently increase adoption and output. Those results concur with the finding of Umar *et al.* (2013) who stressed that educational status and farm size influenced adoption of improved practices by farmers in Niger State.

Table 6. Relationship between socio-economic characteristics and adoption of improved rice variety

Socio-economic characteristics	Correlation coefficients	Remarks
Age	0.174	NS
Educational level	0.285	S
Farm size	0.309	S
Extension contacts	0.236	S

Source: Computed from field survey data, 2016
S=Significant
NS=not significant

Conclusion

From the findings of the study, it was concluded that the respondents were in their productive middle ages. Majority of the respondents adopted Faro 44 improved rice variety in their farms. The yield per hectare for the improved rice variety is yet to be maximized. However, when the outputs were converted to monetary values, its alleviated poverty and empowered the farmers. Challenges for the adoption of improved rice variety were technicalities of some of the components of the technology and untimely delivery of improved variety. Educational level, farm size and extension contacts had significant relationship with the adoption of improved variety by the respondents in the study area.

Recommendations

In order to maximize yield per hectare from adoption of improved rice variety, extension agents should provide backup information to the respondents to educate them more on the components of improved rice variety such as planting depth, spacing and appropriate planting time. Also, other backup inputs such as improved variety should be made available to farmers adequately and timely by relevant agencies and input providers.

In view of the high potential of the improved rice variety in alleviating poverty and empowerment, agricultural extension workers should intensify education and awareness campaign on the improved rice variety all over the State to improve agricultural production.

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