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Effects of Membership of Rice Farmers Associations on Size of Rice Field and Farm Input Utilisation in Kaduna State, North-West Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author OA designed the study and wrote the protocol. Authors TKA, JGA and RAO supervised the work. Author OA carried out the field work and performed the statistical analysis. Author OA wrote the first draft of the manuscript and managed the literature searches. Authors TKA, JGA and RAO edited the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

The study investigated the effects of membership of Rice Farmers Associations (RFAs) on size of rice fields and rates of selected farm inputs applied among rice farmers in Kaduna State, Nigeria. A multi-stage sampling procedure was used for the selection of 94 respondents comprising of 47 members and 47 non-members while semi-structured questionnaires were used for data collection. Data analysis was done using descriptive statistics and z-test. Results of the study showed that apart from age, there were no significant differences in socioeconomic characteristics of members and non-members of RFAs in the study area. Membership of RFAs did not have any significant effects on size of rice field and rates of fertiliser and herbicide applied. Consequently the study recommended that the capacity of RFAs should be strengthened by the relevant frontline agencies of government to make them more effective. Secondly, the government should ensure that rice

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farmers regardless of their group membership status have access to agricultural extension services and farm inputs necessary for increased productivity.

Keywords: Membership; rice farmers associations; fertilizer; herbicide; socioeconomic characteristics; Nigeria.

1. INTRODUCTION

Rice is a major cereal crop in Nigeria and its consumption is increasing rapidly due to urbanisation, relative ease of preparation, and convenience in storage [1]. Increase in rice output can be achieved through increase in land area and increase in productivity. Rice is cultivated in about 32 States in Nigeria with a total land area of about 2.43 million hectares and annual production of 4.47 million metric tons of milled rice thus giving and average yield of 1.84 metric tons per hectare [2]. Nigeria has depended largely on increasing land area for rice cultivation to improve production.

Kaduna State is one of the largest producers of rice in Nigeria with a land area of 344,890 hectares representing 14.17% of the total land area under the cultivation of the crop across the country [2]. Rice production in the State was 732,420 metric tons in 2011 accounting for 16.37% of the total production in the country. The average yield per hectare for the same period was 2.12 metric tons per hectare [2]. Rice is cultivated in almost all the 23 Local Government Areas (LGAs) in the State. According to a survey of rice production clusters in Kaduna, 98% of the respondents have been applying fertiliser to their rice fields while 2% of them used it before [3]. In the same manner, 72% of the respondents have continued to apply herbicide to their rice fields while 2% of them have stopped using it and 26% have never used it. The capacity of farmers to learn and share agricultural innovations is crucial to the attainment of sustainable food production system. It has been observed that farmers who belong to cooperative groups are in a better position to access and adopt agricultural innovations than their counterparts who operate individually [4-6]. However, recent studies [4,7,8] are divided over the issue of effects of membership of cooperative associations on adoption of agricultural innovations and farmers' outputs. For example, membership of Farmers Associations was found to have no significant influence on the adoption of chemical pest control among cowpea farmers in Makarfi Local Government Area of Kaduna State, Nigeria [8]. According to [9] there was no significant relationship between membership of social organisation and adoption of fertiliser among rice farmers in Bende Local Government Area of Abia State, Nigeria. In a study on farmers' perceptions of cooperative societies in Enugu State, Nigeria, [10] reported that most of the farmers that joined cooperatives did so to attract services from the government thereby perceiving cooperatives as government agencies rather than an autonomous business outfit. It is against this background that the study was conducted to determine the effect of membership of Rice Farmers Associations (RFAs) on size of rice field and farm input utilisation in the study area. The specific objectives of the study were to:

- Compare the socioeconomic characteristics of members and non-members of RFAs in the study area;
- Determine the effect of membership of RFAs on size of rice field; and
- Determine the effect of membership of RFAs on the rate of application of modern rice production technologies such as fertiliser and herbicide.

The study hypothesised as follows:

Ho_1: There is no significant difference in size of rice field among members and non-members of RFAs in the study area

Ho_2: There is no significant difference in the rate of application of each modern rice production technology among members and non-members of RFAs in the study area.

2. METHODOLOGY

2.1 Study Area

The study was conducted in Kaduna State in the North West geopolitical zone of Nigeria. The State lies between latitude 09° 02'N and 11° 32'S and between longitude 96° 15'E and 08° 60'E, at Coordinates: 10°31'23''N 7°26'25''E (11) where it occupies a land area of 45,567 km^2 with a projected population of 7,328, 597 in 2012 based on 3.2% annual growth rate [12] and a population density of 500 people per kilometre especially within the Kaduna and Zaria axis. The State is

made up of 23 LGAs. The State has an altitude of 500 -1000 m above sea level and an annual average rainfall of 1,272 m [13]. The farming season in the State is characterised by the rainy season which lasts for six months from May to October and the dry season from November to April. The vegetation in the State ranges from the Guinea Savannah in the southern part to the Sudan Savannah in the north. Maize, Rice, Sorghum, Millet, Soybean and Groundnut are some of the major crops grown by farmers in the State.

2.2 Sampling Procedure and Sample Size

Rice farmers from Kaduna State were the target population for the study. Multi-stage sampling procedure was used for selecting respondents. The first stage involved purposive selection of two LGAs from the State. In this regard, Igabi and Kajuru were preferred on account of the importance of rice as a prominent crop in the areas. The sample frame for RFAs was constituted by 314 registered members based on figures for the selected LGAs provided by Kaduna Agricultural Development Programme and Kano Agricultural and Rural Development Authority. In the second stage of sampling, two settlements were purposively selected from each of the 2 LGAs. The selected locations for Igabi LGA in Kaduna State were Fako and Ligyara. In Kajuru LGA, Kasuwan Magani and Kallah were the preferred locations for the study. The locations were selected based on the presence of rice growers both as members and non-members of RFAs. From the sample frame of 314 members of RFAs, 47 respondents (15%) were selected randomly across settlements in the State for the study. The same number of non-members of RFAs was selected randomly from each location giving a total of sample size of 94 comprising of 47 members and 47 non-members. Data collected were analysed using Z-test and descriptive statistics such as frequency, mean and percentage.

3. RESULTS AND DISCUSSION

3.1 Socioeconomic Characteristics of Respondents

Apart from age of farmers, the results showed that there were no significant differences in the other socioeconomic characteristics of members and non-members of RFAs. Members were significantly older (41 years) than non-members (33 years). Non-members had a larger household size (8.82) than members (7.92) while size of household labour among members was greater (4.33) than the figure obtained among non-members (4.14). In terms of years of experience in rice farming, members were marginally better [15] than non-members [14] but non-members had more years (5.55) of formal education than members (4.90). There were more users of mobile phones among non-members (81%) than members (77%). No significant differences were observed in household size, use of mobile phones, household labour, years of experience in rice farming and years of formal education. [14] found no significant difference in age among members (38 years) and non-members (40 years) of women farmers' cooperatives in Benue State while significant differences were observed in household size and years of formal education.

3.2 Size of Rice Fields among Members and Non-members of Rice Farmers Associations (RFAs) in Kaduna State

Majority of members (44.5%) and non-members (57.45%) of RFAs cultivated 1 to 3 hectares of land. The average size of rice field cultivated by members was 4.03 hectares and 3.27 hectares for non-members. There was no significant difference (P =.05) in the size of rice field cultivated by the two groups of farmers given that the calculated Z-value (1.506) was lower than the tabulated Z-value (1.96). This necessitated the acceptance of the null hypothesis which stated that there is no significant difference in the size of rice field among members and non-members of RFAs in the study area and the rejection of the alternate hypothesis. In South West, Nigeria [7] obtained 1.72 and 1.64 hectares as farm size among cooperative and non-cooperative rice farmers whereas the average size of farm cultivated by women cooperative members in Benue State (5.10) was significantly higher (3.02) than that of non-members [14].

3.3 Rate of NPK Fertiliser Applied by Members and Non-members of Rice Farmers Associations (RFAs) in Kaduna State

Majority of members (77%) and non-members (88%) of RFAs in Kaduna used ≤ 100 kg/ha of NPK 15.15.15 fertiliser on their rice fields. This is much lower than the recommended rate of 200 kg per hectare. The mean rate of NPK fertiliser applied was 117 kg among members and 75 kg among non-members. The mean NPK fertiliser

rate applied by members was higher than that of non-members though the difference was not significantly different (P =.05) based on the Z-test value. Consequently, the null hypothesis stating that there is no significant difference in the rate of NPK fertiliser applied among members and non-members of RFAs was accepted while the alternate hypothesis was rejected. In a survey on rice production in Nigeria, [3] reported that NPK fertiliser dosage among rice farmers in the country was 150 kg per hectare while [15] obtained 85.6 kg per hectare. This is much lower than the rate of NPK applied per hectare by members and non-members of RFAs.

3.4 Rate of Urea Fertiliser Applied by Members and Non-members of Rice Farmers Associations (RFAs) in Kaduna State

Majority of members (86%) and all non-members of RFAs in Kaduna used ≤ 100 kg /ha of Urea fertiliser on their rice fields. The recommended rate is 100-150 kg. The mean rate of Urea fertiliser applied was 91 kg among members and 48 kg among non-members. The mean Urea fertiliser rate applied by members is higher than that of non-members though the difference is not significant (P =.05) based on the Z-test value. On account of this analysis, the null hypothesis stating that there is no significant difference in the rate of Urea fertiliser applied by members and non-members of RFAs in the study area was accepted while the alternate hypothesis was rejected. However, this is contrary to the finding of [7] that members of rice cooperative farmers used more of fertiliser and herbicide than non-members though the data was not subjected to test of significance. According to [3] the rate of Urea fertiliser applied per hectare by rice farmers in a survey on rice production in Nigeria was 69 kg. With the recent advance in fertiliser subsidisation and direct distribution to farmers by the Federal Government of Nigeria through private sector participation, it is expected that fertiliser utilisation by rice farmers would be much better than the situation in the country about ten years ago.

Table 1a. Socioeconomic characteristics of members and non-members of Rice Farmers Associations (RFAs) in Kaduna State

Variable	Members		Non-members	
	Frequency	Percentage	Frequency	Percentage
Age				
≤ 20	2	4.2	6	12.5
21-40	30	62.5	32	66.7
41-60	10	20.8	10	20.8
> 60	6	12.5	0	0.0
Total	48	100	48	100
Mean	41.12		33.33	
Calculated z	3.081*			
Tabulated z	1.96			
Household size				
0-5	13	33.3	11	28.2
6-11	18	46.2	19	48.7
12-17	7	18.0	8	20.5
18-23	1	2.5	1	2.5
Total	39	100	39	100
Mean	7.92		8.28	
Calculated z	-0.352			
Tabulated z	1.96			
Household labour				
0-3	19	44.2	23	53.5
4-7	17	39.5	14	32.6
8-11	7	16.3	5	11.6
>11	0	0	1	2.3
Total	43	100	43	100
Mean	4.326		4.140	
Calculated Z	0.266			
Tabulated Z	1.96			

Table 1b. Socioeconomic characteristics of members and non-members of Rice Farmers Associations (RFAs) in Kaduna State

Variable	Members		Non-members	
	Frequency	Percentage	Frequency	Percentage
Years of formal education				
0-6	28	73.68	24	63.16
7-13	9	23.68	14	36.84
14-20	1	2.63	0	0.00
Total	38	100	38	100
Mean	4.895		5.553	
Calculated Z	-0.732			
Tabulated Z	1.96			
Years of rice farming experience				
<4	0	0.00	5	14.29
4-11	18	51.43	13	37.14
12-19	4	11.43	5	14.29
20-27	6	17.14	8	22.86
28-35	7	20.00	4	11.43
>35	0	0.00	0	0.00
Total	35	100	35	100
Mean	15.086		13.743	
Calculated Z	0.616			
Tabulated Z	1.96			
Ownership of mobile phone				
Yes	37	77.1	39	81.25
No	11	22.9	9	18.75
Total	48	100	48	100
Chi-Square	0.25(0.62)			

Table 2. Test of significance and distribution of respondents by size of rice field

Size of rice field in hectares	Members		Non-members	
	Frequency	Percentage	Frequency	Percentage
<1	1	2.12	2	4.26
1-3	21	44.48	27	57.45
4-6	19	40.43	13	27.66
7-9	2	4.26	4	8.51
10-12	4	8.51	1	2.13
Total	47	100	47	100
Mean	4.032		3.266	
Calculated Z-value	1.506			
Tabulated Z-value	1.96			

3.5 Rate of Herbicide Applied by Members and Non-members of Rice Farmers Associations (RFAs) in Kaduna State

Majority of members (84%) and non-members (98%) of RFAs in Kaduna used 0-5 litres of herbicides on their rice fields. The mean rate of herbicide applied was 2.85 litres among members and 2.12 litres among non-members. The mean herbicide rate applied by members was higher than that of non-members though the difference was not significant (P =.05) based on the Z-test value. On the basis of this analysis, the null hypothesis stating that there is no significant difference in the rate of herbicide applied by members and non-members was accepted. The rate of herbicide applied per hectare by members and non-members is lower than 2.5 litres per hectare reported by [3] in a survey on rice production in some selected States in Nigeria.

Table 3. Rate of NPK fertiliser applied by members and non-members of Rice Farmers Associations (RFAs) in Kaduna State

Rate of NPK fertiliser in kg/ha	Members		Non-members	
	Frequency	Percentage	Frequency	Percentage
≤100	33	76.74	38	88.37
101-200	5	11.63	3	6.98
201-400	3	6.98	2	4.65
401-600	1	2.33	0	0.00
601-800	0	0.00	0	0.00
801-1000	1	2.33	0	0.00
Total	43	100	43	100
Mean	117.08		75.30	
Calculated Z-value	1.541			
Tabulated Z-value	1.96			

Table 4. Rate of urea fertiliser applied by members and non-members of Rice Farmers Associations (RFAs) in Kaduna State

Rate of urea fertiliser in kg/ha	Members		Non-members	
	Frequency	Percentage	Frequency	Percentage
≤100	37	86.05	43	100
101-200	4	9.30	0	0.00
201-400	0	0.00	0	0.00
401-600	1	2.23	0	0.00
601-800	0	0.00	0	0.00
801-1000	1	2.23	0	0.00
Total	43	100	43	100
Mean	90.76		48.23	
Calc Z-value	1.799			
Tab Z-value	1.96			

Table 5. Rate of herbicide applied by members and non-members of Rice Farmers Associations (RFAs) in Kaduna State

Rate of herbicide in litres/ha	Members		Non-members	
	Frequency	Percentage	Frequency	Percentage
0-5	36	83.72	42	97.67
5.1-10	6	13.95	1	2.33
11.1-20	1	2.33	0	0.00
>20	0	0.00	0	0.00
Total	43	100	43	100
Mean	2.85		2.12	
Calculated Z-value	1.672			
Tabulated Z-value	1.96			

4. CONCLUSION AND RECOMMENDATIONS

Members of RFAs were not significantly different from non-members in terms of household size, household labour, years of formal education and years of experience in rice farming but members were significantly older than non-members. Size of rice field cultivated by members was not significantly different from than that of members implying that membership of RFAs did not have a significant effect on rice field. At the same time, membership of RFAs did not have significant effects on utilisation of NPK, Urea and herbicides among rice farmers in the State. There was an indication that RFAs especially those that were registered with the government institutions exist only in nomenclature and not in actual delivery of services that would add value to their members. Consequently the study recommended that the capacity of RFAs should be strengthened by the relevant frontline agencies of government to

make them more effective. Secondly, the government should ensure that rice farmers regardless of their group membership status have access to agricultural extension services and farm inputs necessary for increased productivity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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