

Adoption of Rice Production Techniques among Wetland Farmers in Southeastern Nigeria

E. M. Igbokwe*

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Summary

The study was designed to determine wetland rice production techniques adopted by a sample of 80 farmers in Enugu State, Nigeria, and the factors influencing the intensity of adoption. Out of the 15 techniques prescribed in the wetland rice production leaflet of the State Agricultural Development Authority, five were not adopted by a majority of the farmers. The mean yield for paddy was 1.99 ton/ha. However, there was no significant difference in yield between high and low adopters. It was also shown that intensity of adoption was influenced by level of education, farming experience, primary occupation and tenurial status. Because some of the farmers were part-time and non-resident in the farm locations, it was recommended that rescheduling extension visits in the farms during weekends when many of them can be located in the farms will improve extension contact. Mass methods of extension especially radio should be utilized to increase awareness.

Résumé

Adoption des techniques de production du riz dans une rizière humide au sud-est du Nigeria

L'étude s'est proposée de déterminer non seulement les techniques de production du riz dans une rizière humide, adoptées par un échantillon de 80 cultivateurs dans l'Etat d'Enugu au Nigeria, mais également les facteurs influant sur l'intensité de l'adoption. Parmi les 15 techniques vulgarisées par le «State Agricultural Authority», cinq n'ont pas été adoptées par la majorité des cultivateurs. La production moyenne de riz paddy était de 1,99 tonnes/ha et aucune différence significative n'a été observée entre les fermiers pratiquant ces techniques à différents niveaux. L'étude a également révélé que l'intensité d'adoption était influencée par le niveau d'éducation, l'expérience agricole, le métier principal et le statut foncier. Comme quelques agriculteurs travaillent à temps partiel et ne résident pas sur le lieu de travail, il a été recommandé que les visites chez les fermiers se fassent les week-ends afin d'améliorer les contacts. L'utilisation de la radio représente un moyen médiatique de sensibilisation.

Introduction

In Nigeria, rice has become a staple food especially in urban centers and has assumed a cash crop status in production areas. Domestic consumption of rice rose from about 3 kg/yr person in 1970 to about 11 kg/yr per person in 1980 (7). This has led to chronic rice shortages because the increasing demand for rice has outpaced the supply from domestic production. Attempts to reduce the shortages led to massive imports which rose to 600,000 metric tons in 1982 (6) and caused a serious drain on the nation's foreign exchange reserve. To check this trend and encourage local production, the government prohibited rice imports in 1985. This action was contrary to trade liberalization which has been prescribed by the World Bank as one of the strategies for restoration of growth in the developing countries (4, 13). Since then, domestic rice shortages have re-emerged together with other food shortages. A number of steps have been taken to increase local production. One of these steps was the Structural Adjustment Programme (SAP) which was intended to reserve some of the adverse developments in the agricultural sector (5) and

to induce the adoption of improved farm practices (8), especially in smallholder agriculture. The establishment of state-wide Agricultural Development Programmes (ADPs) as opposed to enclave integrated rural development projects was a bold step toward supervised extension management systems with the objective of transferring farm innovations to farmers through fortnightly visits by extension agents following the Training and Visit (T and V) extension principle. However, since its inception, SAP has drastically reduced subsidies on agricultural inputs. Devaluation of the local currency has led to inflation. This has impaired the capacity of the nation to finance technology, imports and domestic substitutes, and to adequately finance the operational and wage costs of the ADPs in order to ensure effective discharge of their functions. Given the inflationary trend in cost of inputs and dwindling funds for extension, it is doubtful if the continued adoption of farm technologies by rice farmers is possible, especially in the absence of adequate credit and extension services. However, in view of the growing demand for rice, the assumption

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*Department of Agricultural Extension, Faculty of Agriculture, University of Nigeria, Nsukka, Nigeria.

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here is that farmers' adoption of improved production practices will be on the increase. The objective of the paper, therefore, is to investigate farmers' adoption of rice production practices as disseminated by the ADPs. More specifically, the study intends to:

- determine the levels of use or adoption of the practices;
- compare farmers' yield per hectare according to intensity of adoption; and
- isolate factors which influence farmers' adoption of the practices.

Methodology

Data for the study were primary data collected by means of repeated visits and use of semi-structured questionnaire from a sample of rice growers in Enugu State in the 1995 farming season. Two agricultural zones, Enugu and Abakaliki, out of the three in the State, were selected for the study. One local government area (L.G.A.) namely, Ishielu, in Abakaliki zone and Awgu zone, was selected from each zone. From each L.G.A., one community each (Ezillo in Ishielu and Oduma in Awgu) was selected. A list of rice growers was compiled with the assistance of extension supervisors from which 120 farmers were randomly selected. However, only 80 copies of the questionnaire were correctly completed and were used for the analysis.

Data analysis

Mean adoption score was calculated for each of the 15 practices prescribed in the Enugu State Agricultural Development Programme (ENADEP) leaflet on rice production. Each practice adopted was scored one while non-adoption of the practice was scored zero. An average adoption score was calculated (0.69) and was used as adoption index. For each of the respondents the total number of practices used was summed up and a grand mean was calculated (10.7). Rice growers whose intensity of adoption scores were less than 10.7 were grouped as low adopters, while those with scores greater than 10.7 were labelled high adopters. A chi-square test was used to determine any significant difference in yield per hectare between the two groups ($P < 0.05$). In order to determine the functional relationship between intensity of adoption and a set of relevant socio-economic variables which influence adoption, the following model was adopted:

$$Y = (x_1, x_2, x_3, x_4, x_5, x_6, x_7, u)$$

Where:

Y= adoption intensity measured by number of techniques or practices prescribed by ENADEP extension agent in wetland rice production adopted by the farmers;

X₁= farmer's age in years;

X₂= farmer's level of education measured by number of years in school;

X₃= farming experience measured in years in rice growing;

X₄= primary occupation. This is a dummy variable with a value of unity if the subject is a full-time farmer and a zero if otherwise;

X₅= farm size measured in hectares of rice farm in 1994;

X₆= frequency of extension contact measured as the number of times the farmer was visited by an extension agent;

X₇= tenurial status. This is a dummy variable with a value of unity if the farmer is owner operator and zero if otherwise.

The expectation of the above model is that the seven independent variables have a positive relationship with the dependent variable (Y) up to a certain limit. Three functional forms were tested, namely: linear, semi-logarithmic and double logarithmic forms. The semi-logarithmic form was found to best fit the data, and was chosen as the lead equation for the interpretation.

Result and discussion

Socio-economic characteristics

The mean age of the sampled farmers was 40.8 years. Most of the farmers were young with 41.3 percent in the age bracket of 31- 40 years; 32.5 percent were between 41- 50; and 15.0 percent were in the 20- 30 years age bracket. Level of literacy was high with 72.5 percent having had 4 to 11 years of formal schooling. Slightly over half (56.3 percent) of the rice growers were full-time farmers; 12.5 percent were wage earners made up mainly of teachers and civil employees; and 21.2 percent were petty traders and artisans. It was interesting to note that over half of the growers (57.1 percent) were resident in urban areas and commuted to work their fields. About 74 percent had grown rice for between one and ten years indicating their relatively young entry into the enterprise. Mean size of the farms was 2.1 ha with about 34 percent cropping 1- 1.9 ha and 30 percent cropping 2- 2.9 ha. It was also interesting to note that 28 (80 percent) of the part-time operators had contiguous fields in single blocks while a majority of other farmers had their plots scattered in two to three locations. Most part-time operators rented government agricultural land mainly at Ezillo while the others depended on private plots. Extension contact for the growers was low. About 19 percent had no contact in 1994; 23 percent had three to four contacts; 10 percent had five to six contacts and five percent had over six contacts. Among the sample the mean yield of paddy was 1.99 ton/ha in 1994. This was found to be close to 2.19 ton/ha reported for male rice growers in the State for 1994 by the monitoring and evaluation unit of ENADEP (2). About 31 percent had yields of 1- 1.9 ton/ha; 26 percent recorded 2- 2.9 ton/ha; 25 percent had 3- 3.9 ton/ha; and about 18 percent had less than 1 ton/ha.

Adoption of rice production techniques

Out of the 15 techniques prescribed and disseminated by extension, over half of the farmers were not using five of the techniques (Table 1).

About 63.0 percent of the sample did not dress seeds with APRON PLUS or Fernasan D; all farmers used different fertilizer formulations 2- 3 weeks after planting but 68 (85.0 percent) did not carry out second application with nitrogen fertilizer at 9- 10 weeks after planting;

Table 1
Distribution of Non-adopters and major reasons for Non-adoption of recommended technical knowledge

S/No	Techniques	Mean Adoption	No. of Non-adopters	Major Reasons for Non-adoption
1	Selected hydromorphic soil	0.90	0 (0.0)*	—
2	Selected recommended HYV	0.35	29 (36.3)	Own seeds reliable
3	Dress seeds with Apron PLUS or Fernasan D	0.45	49 (61.3)	Agrochemicals are unavailable
4	Use 45- 50 kg of seed per ha	0.56	11 (13.8)	Seed rate not known
5	Plant nursery 3- 4 weeks	0.91	0 (0.0)	—
6	Transplant June- July	0.66	11 (13.8)	Time depends on rainfall
7	Transplant 3- 4 seedlings at 20 cm x 20 cm	0.69	8 (10.0)	Unawareness
8	Weed twice at 2- 3 weeks and 6- 7 weeks	0.96	13 (16.3)	High cost of labour
9	Apply 8 bags of NPK 15-15-15 per ha 2- 3 weeks after transplanting	0.95	15 (18.8)	Fertilizer is costly
10A	Apply 2 bags of CAN or 1 bag of Urea 9- 10 weeks after transplanting	0.42	68 (85.0)	Unawareness
11	Apply systemic insecticide at 25 kg per ha fortnightly to prevent gall midge	0.58	62 (77.5)	Pesticides are scare and costly
12	Scare birds from flowering until harvesting	0.86	19 (23.8)	Unnecessary
13	Harvest when 75% - 80% of panicle head turn straw colour	0.85	3 (3.7)	Seeds go bad easily
14	Dry field 2 weeks before harvesting	0.55	74 (92.5)	Unnecessary
15E	Expected yield is 1.5 ton/ha to 4.5 ton/ha	0.35	63 (78.8)	Unawareness

Adoption index = 0.69 *Numbers in parentheses are percentages

62 (78.0 percent) did not apply any insecticide; 74 (92.5 percent) did not drain their fields before harvesting; and 63 (79.0 percent) did not know the expected yield range of 1.5 to 4.5 ton/ha. Reasons commonly given by most farmers for not using these five techniques included: high cost and unavailability of insecticides (78.0 percent); most farmers did not know about topdressing (87.0 percent); draining the field before harvesting is unnecessary (80.0 percent); and that yield was dependent on the amount of rainfall in the year (87.0 percent). With an adoption index of 0.69 as the cut off point, it could be shown that seven practices were highly adopted (Table 1). These were soil selection (0.90); nursery planting (0.91); transplanting and spacing (0.69); weeding at 2- 3 weeks and 6- 7 weeks after planting (0.69); application of fertilizer at 2- 3 weeks (0.95); scaring of birds (0.86); and harvesting when 75%- 80% of panicle heads turn straw colouring (0.85). In spite of the reasons given, it could be deduced that farmers tended to internalize and practise techniques which they consider essential for production irrespective of extension messages delivered. Secondly, repeated extension visits become necessary in order for the farmers to become convinced of the importance of agronomic practices as a condition for obtaining higher yields. However, a chi-square test of significance showed that there was no significant difference between high and low adopters of the techniques ($\chi^2 = 0.8955$, table $\chi^2 = 5.99$ at 5 percent). This lack of difference could be attributed to the fact that the year under study was a "good year" according to the farmers. There was no incidence of pest and disease on an epidemic level and rainfall was adequate. In spite of the claims, it should be admitted that the farmers could still obtain higher yields without adopting some techniques such as draining field before harvesting, and

which they might consider unnecessary. This could strongly influence the above result.

Regression result of adoption of rice production techniques

The functional relationship between intensity of adoption (Y) and some relevant socio-economic characteristics influencing it is as follows:

$$\ln Y = 6.72 - 0.24x_1 + 0.32x_2 + 0.28x_3 + 0.31x_4 - 0.42x_5 - 0.35x_6 + 0.26x_7$$

$$(SE) = (0.95) (0.042) (0.052) (0.002) (0.14) (0.043) (0.03)$$

Multiple R	0.97
R ²	0.95
Adjusted R ²	0.92
Standard Error	0.13
F- Statistics	34.19

The value of coefficient of determination (R²) = 0.96. The result shows that intensity of adoption (Y) is an increasing function of such socio-economic characteristics as level of education (x₂), farm experience (x₃), occupation (x₄) and tenurial status (x₇). By the standard error test these variables have significant influence on adoption of rice production practices by growers in the study locations.

However, age (x₁), farm size (x₅) and extension contact were not found to be significant parameters of adoption within the content of the study. As for the age the finding is consistent with those reported by Okoye (9), Onu (10) and Onyenweaku and Mbuba (11). The findings on farm size and extension contact were unusual because other writers such as Agbamu (1) and Atala *et al.* (3)

have shown them to influence adoption. This finding could arise from inadequate information supplied in our own data.

The value of coefficient of determination (0.96) indicates that about 96 percent of the total variation in the dependent variable (Y) was explained by the variations in the explanatory variable (x_5). The adjusted R^2 was also high (0.93). It could be concluded that there is a strong positive relationship between adoption (Y) and level of education (X_2), farm experience (X_3), primary occupation (x_4) and tenurial status (x_7), and this agrees with the expectation.

Conclusion

The study revealed that rice growers were relatively young and had a good level of education. Although a fairly large number of them were part-time farmers and some were resident outside the farm locations, their age and education should be considered an advantage for the acceptance of innovations. However, the non-residency of some of the farmers posed a problem to extension agents as places and time of day to meet them could not be predicted. This could be seen in the lack of influence of extension contact on adoption and the low level of extension contacts reported. In a situation where extension contact is very poor, it is suggest-

ed that agents in collaboration with supervisors should develop a strategy for overcoming the difficulty in visiting farmers. This will entail shifting emphasis away from home visits to farm visits. Secondly, because part-time farmers are more likely to work on weekends, agents could schedule to visit such farmers in the field on weekends, and in agreement with their supervisors they can take days-off during the working week. Thus, through increased contact, farmers will interact often with agents and will be in a better position to adopt all the techniques as prescribed by the ADP. Personal contact can be supplemented with radio jingles especially during the production season in order to create awareness. Lastly, extension agents should emphasize those techniques that directly influence yield and leave out those considered unnecessary by farmers such as bird scaring and field draining before harvesting.

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E. M. Igbokwe, Nigerian, Ph.D. in Agricultural Education, Lecturer/ Researcher in Agricultural Sociology, Department of Agricultural Extension, Faculty of Agriculture, University of Nigeria, Nsukka, Nigeria.