

**Adoption of OS6 variety of rice in Ife Division, Oyo State of Nigeria.**

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**Abstract**

An investigation was conducted into the factors that influenced the adoption of the OS6 variety of rice in Ife Division. The extent and rate of adoption of the crop, the problems, personal and socio-economic characteristics of the rice farmers and farm characteristics associated with adoption of the crop were studied. Fifty-four adopters and 56 randomly selected non-adopters were interviewed in 8 villages where the crop had been adopted, between September and December, 1975.

Data analysis showed a four-year time-lag between awareness and adoption of the crop. Statistically significant associations were found between age, years of schooling, innovation proneness, family labour, income, use of mass media, access to credit facilities, participation in organisations, cosmopolitanism, knowledge of extension workers, method of acquiring farmland, farm size, discontinuance of planting some crops, growing of permanent or annual crops, and adoption. No significant relationship was found between farming experience and adoption. Invasion by field pests was the major problem encountered.

**Introduction**

Rice is a major staple food in Nigeria. To boost internal production, the OS6 variety which was released by the Federal Government Research Station at Bida was introduced into Western Nigeria about 14 years ago. This variety matures in 4 to 5 months. It is high yielding, giving up to 3.4-4.5 metric tonnes per hectare on government experimental farms. It is fairly resistant to rice blast disease, though susceptible to lodging. It has robust grain size and glassy appearance. It swells well after cooking and it is more palatable than other varieties like "Ofada" and "Tapa" (Anthonio and Osajuyigbe, 1972). It also stores well, especially in paddy, and controls high market demand.

Yields fluctuate on government multiplication plots in the forest areas of Southern Nigeria. For example, in the Ilesa Local Government Area, the yields were 0.58 metric tonnes/ha. in 1976/77 planting season, 1.03 metric tonnes/ha. in 1977/78 and 0.94 metric tonnes/ha. in 1978/79.<sup>1</sup>

Like other rice varieties, the OS6 is labour intensive. Much of the labour is often devoted to planting, fertilizing, weeding and harvesting. In 1976/77 in the Ilesa Local Government Area, labour requirement was 168 mandays/ha. With increased mechanisation of some of the operations such as land preparation, and introduction of weed control by herbicides in 1978/79, labour requirement dwindled to 91 mandays/ha. Regardless of the problems enumerated, this rice variety is still the most widely grown by farmers in Southern-western Nigeria, including Ilesa and Oranmiyan Local Government Areas (Oyedokun, 1979 Olanrewaju, 1979).

To facilitate improved adoption of the crop, it is necessary to determine the extent of adoption, examine the problems, personal and socio-economic characteristics of the respondents and farm characteristics associated with adoption of the crop.

Adoption researchers have recognised that the process occurs in stages. Ryan and Gross (1943) and Wilkening (1953) used the four stage concept, while Emery and Oeser (1958), used the three stage concept of the adoption process. The five stage concept generally accepted include awareness of the idea, developing interest in it, evaluating its possibility, trying out the idea on a limited scale and finally adopting the idea.

Fliegel (1950) and Alao (1971) found literacy in English, number measure both the social structure of the community and the individual characteristics of adopters so as to refine traditional measures and come up with new predictive variables associated with adoption. Several of such variables have been studied in relation to adoption. Clark and Akinbode (1968) found characteristics such as education of farmer, use of mass communication media, frequency of agents' contacts, participation in organisations, and farm characteristics such as farm size, significantly and positively correlated with adoption of recommended practices by the M.A.N.R. for growing N.S. I maize variety. Alao (1971) found literacy in English, number of wives and number of children to be positively and significantly

1. Information obtained from the office of the Ministry of Agriculture and Natural Resources, (M.A.N.R.), Ilesa in May, 1979.

associated with adoption of farm practices like cocoa and poultry farming, while literacy in Yoruba, number of years of formal schooling and age of farmers had no significant association. Francis (1974) found positive associations between many variables such as age, rotating crops, sale of crops, and adoption of farm innovations such as raising peanuts, cotton, use of chemical insecticides on stored products in the Republic of Togo. Inayatullah (1962) found no relationship between education, participation in formal organizations, number of social contacts, income and adoption rates among Pakistani farmers..

Owing to the variations of findings in relation to factors associated with adoption, it is necessary to look at such factors within various social contexts, particularly when a new crop like the OS6 rice variety is introduced. This study is the first attempt at investigating the adoption of the OS6 rice variety in Southern Nigeria since its introduction to farmers.

#### **Methodology**

To identify the adopters of the OS6 rice variety in Ife Division (i.e. Oranmiyan Local Government Area), a list of 8 villages, where the crops was being grown, was obtained from the Agricultural Extension Office of the M.A.N.R., Oyo State, located at Ile-Ife. In each village, systematic sampling with a random start was employed in selecting the respondents. This was done by selecting the first person to be interviewed on random basis, and proceeding by interviewing every other head of household. Structured interview was therefore the major source of data.

Respondents were asked whether they had ever heard of the OS6 variety of rice. Those who did were further asked if they had ever planted it, planted it and discontinued or accepted planting it as one of their farm practices. A total of 54 respondents who indicated that they had accepted the innovation were interviewed. Interviews with adopters stopped when no other respondent indicated having accepted the innovation. For comparative purpose, 56 non-adopters were also interviewed. These consisted of 17.9% who had never heard of the innovation, 73.2% who heard of it but had not planted it and 8.9% who planted in the past but discontinued. According to Rogers (1962) discontinuances are one type of rejection. Rejection is a decision not to adopt an innovation. Data in Table 1 consist of the estimated population of each village, number of adopters and non-

adopters interviewed in each village between September and December 1975.

Innovation proneness was measured by the number of other farming innovations, apart from OS6 rice variety, ever accepted by the respondent. Farming experience was measured by the number of other crops, apart from OS6 rice variety, grown by the farmers. Cosmopolitaness score was computed by assigning a score of one for each major town visited within the previous three years. Organisational participation score was computed by assigning a score of 1, 2 and 3 respectively for each membership, committee membership and officership of voluntary organisations held by respondents. Family labour was measured by the number of family members who assisted the respondents with farm work; access to credit facilities was measured by scoring one point for having access to cash or kind; use of mass media was measured by scoring one point for indicating listening to radio and another point for indicating reading newspaper; knowledge of extension worker, by assigning one point for knowing in person an agricultural extension staff working in the village, one point for knowing him by name, and another point for knowing where he lives; and farm size, by the area of farm possessed in acres. Data were subjected to Chi-square and correlation analyses, frequencies and percentage distributions.

TABLE 1: ESTIMATED POPULATION AND NUMBER OF ADOPTERS AND NON-ADOPTERS OF OS6 RICE VARIETY INTERVIEWED IN EACH VILLAGE

<i>Name of Village</i>	<i>No. of adopters</i>	<i>No. of non-adopters</i>	<i>Population* estimate</i>
Itaosa	8	10	300
Ifetedo	10	7	2,000
Asipa	7	11	500
Iwaro	10	7	160
Alakowe	11	10	120
Toro	4	5	140
Okiti	2	3	50
Lakili	2	2	50
Total	54	56	3,320

\*Actual population figures were not available.

## Results and discussions

### *Awareness and adoption*

Figure 1 shows the graphic representation of the rates of awareness and adoption of the crop. While awareness of the crop started in 1965 and increased steadily to 1975, adoption started in 1969 and had since continued. This has revealed a four-year time-lag between awareness and adoption of the innovation. Furthermore, using the 1975 Food and Agriculture Organisation's percentage estimate of 58.1% as agricultural population for Nigeria (F.A.O., 1977), the agricultural population estimate of the villages studied was 1929, out of a total estimated population of 3,320. The 54 adopters identified represented only 3 percent. Adoption of the crop in the division therefore appeared low.

TABLE 2: PERSONAL CHARACTERISTICS OF ADOPTERS AND NON-ADOPTERS

<i>Personal characteristics</i>	<i>Chi-square</i>	<i>Degree of freedom</i>	<i>Significance level</i>
Age in years	9.17	2	0.02
Years of schooling	24.31	2	0.01
Innovation proneness	21.90	3	0.01
Farming experiences	3.92	3	N.S.*

\*N.S. = Not significant at 0.05 level.

### *Personal characteristics and adoption*

Data in Table 2 show the relationship between age, years of schooling, innovation proneness, farming experience and adoption.

The chi-square analysis shows that age was significantly related to adoption at 0.02 level. Adopters were younger than non-adopters. While only 3.9% of the adopters were 65 years and over, 21.4% of non-adopters belonged to this old age category. On the other hand, while many adopters (48.05%) were 25-44 years old, only a few non-adopters (3.6%) belonged to this relatively young age category. Most non-adopters (75%) were 45-64 years old, while 48.05% of the adopters belonged to this age category. The mean age of 42.8 for adopters and 58.3 for non-adopters also supported this relationship.

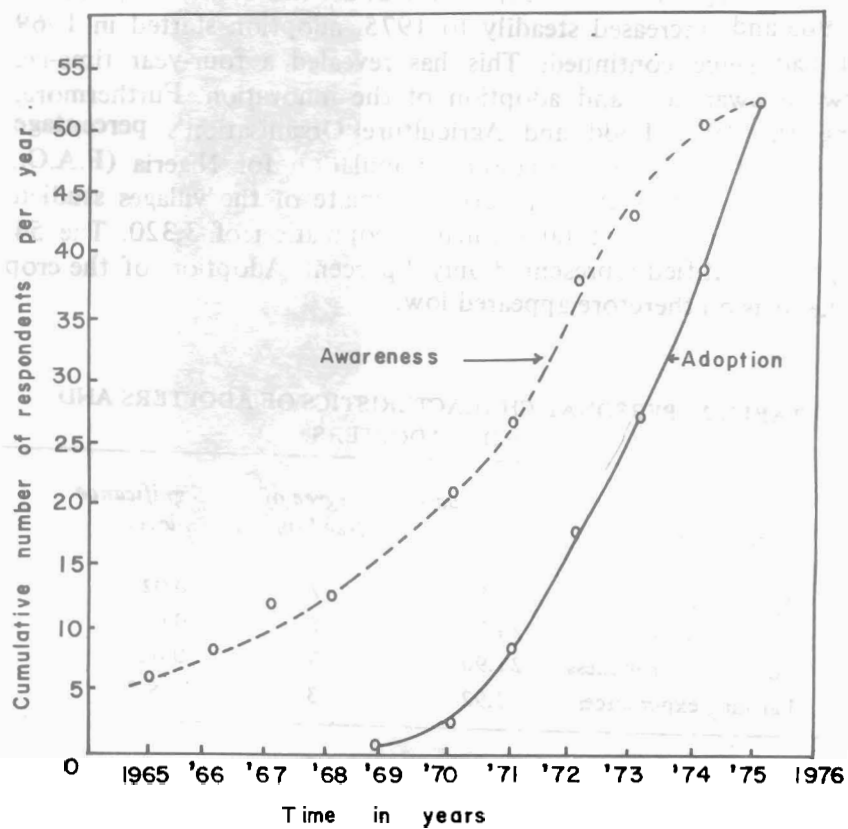


Fig.1: Cumulative rates of awareness and adoption of OS6 variety of rice.

It might be that relatively young farmers had more vigour, interest and enthusiasm needed to embrace and accomplish farming innovations than the older farmers.

The chi-square value of 24.31 which was significant at 0.01 level also showed that there was a significant relationship between years of schooling and adoption. Detailed analysis showed that most non-adopters (75%) did not go to school; a lower percentage (46.3%) of adopters belonged to this category. While 31.5% of adopters had 1 to 6 years of schooling, 21.4% of non-adopters did the same. The percentage of adopters who spent above six years at school was 22.2%, while for non-adopters, it was only 3.6 percent. The mean years of schooling was 2.8 for adopters and 1.3 for non-adopters.

Innovation proneness is the predisposition to accept new ideas. The chi-square value of 21.90 showed a significant relationship between innovation proneness and adoption. Detailed analysis showed that a much greater percentage of adopters (61%) than non-adopters (17.8%) indicated that they accepted 1 to 2 other innovations besides OS6 rice variety in the past. The remaining respondents indicated that they had not accepted other innovations in the past. The mean innovation proneness score was 0.74 for adopters and 0.23 for non-adopters. Success in an innovation must have encouraged the adopters to accept some other subsequent innovations and thereby enhance their innovation proneness.

Farming experience was not significantly related to adoption. The chi-square value of 3.92 showed no statistical significance at 0.05 level. The mean farming experience score of 2.41 for adopters compared favourably with 2.22 for non-adopters. This shows that both categories of farmers had similar farming experiences with commonly grown crops in the area, particularly in relation to the number of such crops grown.

#### *The intervening variables*

As there is lack of certainty concerning relationships of some variables, particularly age and years of schooling to adoption, some intervening variables which are related to age and years of schooling, could explain the relationships of these variables to adoption if they are themselves related to adoption. Table 3 shows the correlation analysis of some of these variables.

**TABLE 3: CORRELATIONS ( $r$ ) OF AGE AND YEARS OF SCHOOLING  
WITH SOME OTHER VARIABLES**

<i>Variables</i>	<i>r with age</i>	<i>Levels of Significance</i>	<i>r with years of schooling</i>	<i>Level of Significance</i>
Years of schooling	- 0.50	0.001		
Total number of crops grown	-0.26	0.030	0.30	0.013
Number of perma- nent crops grown	0.28	0.022	0.24	0.042
Number of arable crops grown	0.35	0.005		0.013
Number of family labour	0.46	0.001	0.20	0.076
Cosmopoliteness	- 0.28	0.019	0.35	0.005
Sale of rice in naira	0.09	0.252	0.30	0.013
Total income in naira	0.15	0.145	0.11	0.221
Farm size	0.14	0.152	0.22	0.052
Participation in organisations	- 0.06	0.343	0.22	0.059

All the factors were associated with age among the adopters at 0.05 level of significance or less, except sale of rice in naira, total income in naira, farm-size and participation in organisations. Similarly all the factors were associated with years of schooling at 0.05 level or less except participation in organisation, number of family labour and total income in naira.

Cosmopoliteness is the degree to which the interests and activities of an individual extend beyond his local community. Two intervening variables which were related to both age and adoption can be used to explain the relationship between these two variables. The intervening variables were number of family labour and cosmopoliteness (Tables 3 and 4). While number of family labour increased with age ( $r = .46$ ), adopters had greater number of family labour than non-adopters. The chi-square value of 21.80 for this relationship was significant at 0.01 level when the degree of freedom was 4. This means that mature farmers who had enough family labour



to help in operating the farm could still adopt innovations. This important finding indicates that increasing age "per se" is not a deterrent to adoption, provided there is labour to take care of the innovation.

Similarly, while cosmopolitanness score declined with age ( $r = -0.28$ ), adopters scored higher on this variable than non-adopters. The chi-square value of 71.66 for this relationship was significant at 0.01 level with 2 degrees of freedom. This means that older farmers might have been less exposed to innovative ideas and hence, developed less innovation proneness (Table 2), and had a declined tendency to adopt the crop.

The positive and significant relationship between years of schooling and adoption can be explained by the same intervening variable, that is, cosmopolitanness. This variable was significantly associated with years of schooling ( $r = 0.35$ ), as well as adoption (Table 4). With increasing years of schooling the farmers become more cosmopolitan, thereby increasing their tendency to be exposed to innovative ideas and hence their predisposition to accept innovations in their communities.

#### *Socio-economic characteristics and adoption*

Table 4 shows that there was a significant relationship between each socio-economic factor studied and adoption. The chi-square values for family labour, total income, access to credit facilities, participation in organisations, use of mass media, cosmopolitanness, knowledge of extension worker and method of acquiring farmland, showed a significant relationship with adoption at 0.01 level. A greater possession of each of these characteristics by adopters than non-adopters must have been instrumental to facilitating adoption. Detailed analysis showed that a greater proportion (88.8%) of adopters than non-adopters (67.82%) inherited their farmlands. Land acquired through inheritance confers a greater security of ownership on the possessor than that bought, given or borrowed. Furthermore, the mean score for each of the above factors was higher for adopters than non-adopters. For family labour, the mean scores were 4.2 and 3.95 by adopters and non-adopters respectively; for total income, 858.07 and 520 naira respectively; access to credit facilities, 0.31 and 0.07 respectively; participation in organisations, 1.15 and 0.40 respectively; use of mass media, 1.50 and 0.59 respectively; cosmopolitanness, 1.96 and 1.04; and for knowledge of extension

sion workers, the mean scores were 1.59 and 0.54 for adopters and non-adopters respectively.

TABLE 4: SOCIO-ECONOMIC CHARACTERISTICS AND ADOPTION

<i>Socio-economic characteristics</i>	<i>Chi-square**</i>	<i>Degree of freedom</i>
Family labour	21.80	4
Total income	69.68	3
Access to credit facilities	9.03	1
Participation in organisations	16.04	2
Use of mass media	18.77	2
Cosmopolitaness	71.66	2
Knowledge of Extension worker	36.44	3
Method of acquiring farmland	16.04	2

\*\* Significant at 0.01 level.

TABLE 5: RELATIONS BETWEEN FARM SIZE AND ADOPTION

<i>*Acreage of farmland</i>	<i>Adopters</i>		<i>Non-adopters</i>	
	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>
1-4 acres	10	18.3	46	82.2
5-8 acres	28	51.9	8	14.2
9-12 acres	16	29.6	2	3.6
Total	54	100	56	100

Means                      7.08 acres                      3.30 acres

Chi-square = 12.42; Significant at 0.01 level

\*The areas in acres can be converted to hectares using  
1 hectare = 2.47 acres.

The chi-square value of 12.42 was significant at 0.01 level at 2 degrees of freedom. The mean acreage of 7.08 for adopters was higher than 3.30 for non-adopters. While 81.5% of adopters had 5 to 12 acres of farmland, only 17.8% of non-adopters had the same farm size. Adopters therefore had larger farmland than non-adopters. The possession of large farmland should encourage farmers to adopt farming innovations because availability of land on which to try such innovations will not constitute a constraint.

#### *Discontinuance of planting crops*

Poor yield, crop-land shortage, ill-health of farmers, crop pests and diseases were some reasons given for discontinuing planting some crops which respondents planted in the past. Table 6 shows that discontinuance was less prevalent among adopters than non-adopters. Sixty-one per cent of adopters and 39.4% of non-adopters indicated no discontinuance, while 18.5% of adopters discontinued planting one crop, 51.7% of non-adopters did the same. Adopters possibly fared better than non-adopters in terms of crop yield and health. They had greater area of farm-land than non-adopters (Table 5). Hence they had less incidence of discontinuance.

TABLE 6: RELATIONSHIP BETWEEN DISCONTINUANCE OF PLANTING SOME CROPS AND ADOPTION

Numbers of crops discontinued	Adopters		Non-adopters	
	Frequency	(%)	Frequency	(%)
None	33	61	22	39.4
One	10	18.5	29	51.7
Two and over	11	20.5	5	8.9
Total	54	100	56	100

Chi-square = 22.66; Significant at 0.01 level.

### *Growing of permanent and arable crops*

The permanent crops grown included cocoa, orange, plantain and banana. The arable crops were maize, melon, cassava and yam. Table 7 shows a significant relationship between growing of permanent and arable crops and adoption in this area.

TABLE 7: RELATIONSHIP BETWEEN GROWING OF PERMANENT OR ARABLE CROPS AND ADOPTION

Type of crops	Adopters		Non-adopters	
	No.	%	No.	%
Permanent crops	51	62	31	41
Arable crops	31	38	44	59
*Total	82	100	75	100

Chi-square = 6.88

Significant at 0.01 level

Mean of permanent crops 1.11

0.63

Means of arable crops 1.11

1.83

Many adopters (62%) grew permanent crops while majority of non-adopters (59%) grew arable crops. This might be because adopters had greater land security due to inheritance than non-adopters

TABLE 8: PROBLEMS OF OS6 RICE VARIETY FARMING AND MARKETING

Type of Problem	No. Respondents	Existing	Non-existing Frequency %
Field Pests	54	78	22
Pest Control			
Method	42	45	55
Storage	52	31	69
Marketing	35	37	63

\* Totals for adopters and non-adopters were greater than 54 and 56 respectively, because some adopters and non-adopters planted both permanent and arable crops.

### *Problems encountered in growing and marketing the crop*

The major problem encountered in growing the crop in this area was field pest infestation. Most respondents (78%) indicated having field pests like insects, birds, goats and rodents; 55% had no means of pest control, 45% used traps to kill rodents, chased birds and rodents out of the field and killed insects with insecticides (see Table 8).

Most (69%) of the 52 adopters who stored the rice for one month or less had no storage problems. Thirty-one per cent mentioned rodents, insects and moisture as storage problems. Of the 35 adopters who sold rice, 63% had no storage problems, while 37% mentioned lack of adequate number of buyers. Experience has shown that the problems mentioned here are not peculiar to OS6 rice farming and marketing.

### **Conclusions and implications**

Adoption of the OS6 rice variety has been limited in the villages studied. Out of an estimated farming population of about one thousand and nine hundred in all the villages, 54 farmers adopted the idea. This represents 3 percent, which was quite low. Problems of field pests for which the adopter had no means of control were reported. Storage problems and the problem of getting enough customers were not rampant among the adopters, possibly, because production was still at a low scale. The mean acreage of 0.78 devoted to the rice cultivation was quite low. The MANR can increase the adoption rate of the crop by launching a well-organised campaign to improve adoption. Schemes should be designed to deal with field pest problems. An effective method of dealing with bird control acclaimed by extension workers is the use of indigenous medicine (Olanrewaju, 1979). Chemical and psychological studies of these should be encouraged so as to possibly make them available on a wide scale in future.

In carrying out the above-mentioned revamping scheme, an understanding of the associations between the characteristics of adopters and non-adoption of the crop could be of great value. Educated middle-aged farmers who had a history of embracing innovations should be identified and reached as the primary target. Co-operation is likely to be secured among this category of people because of the relationships between age, years, of schooling, innovation proneness and adoption of the crop.

**Implementation** of the above suggestion could be improved by **understanding** that two variables were identified to be associated with **age** as well as adoption. These were cosmopolitanism and **number of family labour**. These factors therefore intervened between **age** and adoption. As the farmers advanced in age, they became less cosmopolitan. This might be because their interest and vigour needed to travel to towns and other places, where they could learn about other innovations which were yet to reach their communities, declined. Hence they had declining exposure to innovative ideas and got less interested in trying innovations. Farmers who are cosmopolitan are therefore likely to accept the crop. The significant relationship of number of family labour to both age and adoption also imply that provided family labour is available, age should not constitute a constraint to adoption of the crop.

Similarly, cosmopolitanism which was related to years of schooling and adoption can be used to explain the relationship between years of schooling and adoption. It is possible that with increasing years of schooling, respondents acquired increasing propensity to travel out of their villages. Extra local travels in turn exposed them to innovative ideas which positively influenced their tendencies to adopt other innovations.

The positive relationships of total income and access to credit facilities with adoption imply the need for provision or supervised loans in cash and kind and subsidies to interested farmers, to accompany the campaign for adoption of the crop. In such a campaign, adequate use of mass media and personal contact with the extension agent have to be emphasized as uses of these methods were positively related to adoption. To provide the farmers with secure land, rice co-operative movements could be inaugurated, in which land owners should be encouraged to be members and land donors for cultivating the crop. This is necessary because of the association between land inheritance as a predominant means of acquiring land to grow the crop and adoption of the crop.

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