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## **Analysis of Some Factors Influencing the Adoption of Selected Improved Wheat Varieties in Nigeria**

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### **ABSTRACT**

Wheat is one of the most important crops in Nigeria's food basket. Most of the wheat consumed in the country is, however, imported. This drains the nation's scarce foreign exchange earnings. The establishment of the Nationally Co-ordinated Research Project (NCRP) is one of the several efforts by government to address this problem. The Lake Chad Research Institute (LCRI) today has the national mandate for wheat research under the NCRP. LCRI and some other institutions in the country have developed numerous improved wheat varieties, suitable for the various agro-ecological zones of the country. Some improved exotic varieties have also been tested for their adaptability to our local environments.

A number of these improved wheat varieties have been released to farmers for adoption with a view to increasing their productivity. The objectives of the study were to (1) investigate the extent of adoption of three improved wheat varieties, namely, pavon 76, siette cerros and seri by farmers; (2) investigate the factors affecting the adoption of these three improved varieties; and (3) make policy recommendations that would enhance increased adoption of the varieties of wheat.

An interview schedule was used to collect primary data from farmers. Pavon 76 was adopted in all sampled States except in Katsina where it was adopted only in 1996 and 1997. Siette cerros was adopted in all States in varying degrees and seri was not adopted in Borno State between 1993 and 1997. The adoption of these improved varieties was affected by the farmers' age, education, farm size and crop output. It was not affected by farming experience and household size. It was recommended among other things, that extension service should cover all categories of farmer's in the area and the needs of farmers be investigated before introduction of a new wheat variety.

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### **Introduction**

Wheat is very important today in the daily menu of Nigerians. It is used in the baking of bread, taken by majority of Nigerian urban families. Wheat is also used for making spaghetti, and numerous local menus, such as 'brabisco' (a local Kanuri menu) and 'fura' (a local Hausa menu).

The increased use of wheat in our menu drains the nation's scarce foreign exchange earnings annually because most of the wheat consumed is imported. In order to save our foreign exchange earnings and to increase local wheat production, the Federal Government established a number of programmes, such as the National Accelerated Wheat Production Programme (NAWPP), the Agricultural Development Projects (ADPs) and the National Agricultural Land Development Authority (NALDA). Relatively recently, the relevance of research into wheat production was recognized with the establishment of the National Agricultural Research Projects (NARP), which later sponsored the Nationally Coordinated Research Project (NCRP).

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Under the NARP and NCRP, the Lake Chad Research Institute has the national mandate for wheat research. The institute and related establishments developed improved wheat varieties suitable for the various agro-ecological zones of the country. A number of exotic improved wheat varieties have also been tested (on-station and on-farm) across the country for their ecological adaptability, social acceptability, cultural compatibility, technical feasibility and economic viability. Consequently, the institute released some of the improved varieties to farmers, such as the Pavon 76, siette serros and seri.

So far, not much has been done to determine the extent of adoption of these improved varieties and the factors affecting to their adoption in the country. This is the focus of this research.

### **Objectives of the study**

The general objective of the study was to analyze some factors influencing to the adoption of the three selected improved wheat varieties in Nigeria. The specific objectives of the study were to: (a) investigate the extent of adoption of three improved wheat varieties, namely Pavon 76, siette cerros, and seri; (b) investigate the factors influencing the adoption of these wheat varieties; and (c) make policy recommendations with a view to enhancing the adoption of the improved wheat varieties

### **Methodology**

Four states were used for the survey, namely, Borno, Jigawa, Katsina and Sokoto States. These were used because they constitute the major wheat growing areas of the country. The states lie between latitudes 10° and 14° North of the Equator and longitudes 4° E and 14° 30'E. This area is characterized by the harmattan caused by the cold North-East trade winds which makes wheat cultivation possible under irrigation.

Primary data for the survey were obtained from the use of an interview schedule which was administered on wheat farmers. The instrument was developed and pre-tested in a village in New Marte Local Government Area of Borno State. In each state, four enumerators were employed and trained on how to administer the interview schedule on farmers. The training included the organization of the Training and Visit (T&V) extension, restructuring the interview schedule in major languages spoken in the areas covered, the use of audio-visual aids and the reading of facial expressions of farmers.

The multi-stage stratified random sampling technique was used to select respondents for the survey. This was guided by the organization of the T and V extension in each of the State's ADP. The technique dealt with the selection of the zones, blocks, areas, cells, farmers' groups and the wheat farmers. Purposive sampling was used to select the zones. The only one ADP zone in Borno State that cultivates wheat was selected. For other states with more than one zone, at least 2 zones were used in the survey. Two "blocks" were selected from each zone, and two areas from each block. It was decided from the beginning that 80 wheat farmers would be selected from each state. Based on this, the number of farmers' groups and farmers selected was determined for each state in line with the number of zones used for the study from the state. A total of 320 wheat farmers were selected for the study. One of the questionnaires was wrongly filled, leaving a total of 319 respondents.

Adoption was measured in this study in terms of whether or not the respondent used any of the three improved wheat varieties on continued basis. A score of "1" was given for adoption and "0" for non-adoption. Crop yield was measured in terms of the total volume of the produce from the respondents' farm. It was observed during the pre-test of the interview schedules that: the jute bag, commonly known as the 'baba gana' was the commonest method of measure of wheat; after harvesting and milling, the wheat was stored in the jute bags. The jute bag was, therefore, taken as the unit of measurement of wheat. This was converted into standard measures as follows: 10 jute bags of wheat were weighed. The average weight was found to be 100 kg. Each bag contained 60 mudus (a local measure, each mudu being 18 cm diameter). It, therefore, became easy to estimate the crop output by this conversion.

Both descriptive and inferential statistics were used in the study. Descriptive statistics used included frequencies, means and standard deviations. Inferential statistics used were associational statistics such as chi-square and group difference statistics such as the *t*-test.

### **Data Analysis and Discussion**

This section is discussed under the following headings:

- (a) general characteristics of wheat farmers; (b) extent of adoption of the improved wheat varieties,
- (c) factors influencing the adoption of the improved wheat varieties; and (d) conclusions and recommendations, based on the findings of the study.

#### **General characteristics of wheat farmers**

The following characteristics are considered: age, education, farming experience, household size, farm size, crop output, tenure status and source of improved planting seeds.



**Age of wheat farmers**

Table 1 shows the distribution of wheat farmers by their age and state. The table shows that 228 out of the 319 sampled wheat farmers (71.47%) were between the age of 30 and 50 years. Only 66 farmers (20.68%) were 51 years and above, and 25 farmers (7.84%) were below 30 years. Farming requires the use of physical energy. The youth, who fall between the age of 30 and 50 would probably have more ability to farm, compared with the older people.

**Table 1.** Distribution of respondents by their age and State

Age group (years)	State				Total
	Borno	Jigawa	Katsina	Sokoto	
Below 30	11	4	8	2	25
30-40	37	37	31	34	139
41-50	22	23	21	23	89
51-60	10	11	12	12	45
61+	2	5	7	7	21
Total	82	80	79	78	319

**Education of wheat farmers**

This was measured by the number of years of formal education completed by the respondents. Table 2 shows the distribution of respondents according to their years of schooling completed and their states. The table shows that 173 (about 54%) of the respondents had between 1 and 10 years of formal education. The table also shows that wheat farmers in Katsina and Sokoto states had more years of formal education than those in Borno and Jigawa States. Sokoto state had the largest number of educated farmers while Borno State had the least. Education is important for farmers because it puts them in a position to use more sources of farm information. It also helps them to use complicated agricultural technologies.

**Table 2.** Distribution of respondents by their State and years of formal education completed

Years of schooling	State				Total
	Borno	Jigawa	Katsina	Sokoto	
0	42	21	1	0	64
1-5	26	12	14	53	105
6-10	9	20	26	13	68
11-15	4	10	13	10	37
Over 15	1	16	25	2	44
Total	82	80	79	78	319

**Farming experience**

The distribution of respondents according to their wheat farming experience and states is given in Table 3. The table shows that 189 (or about 59%) of the respondents had between 1 to 10 years of farming experience. Borno State had more experienced wheat farmers than other States. Fifty-Seven (or about 70% of the farmers in this state) had between 11 and 20 years of experience in wheat farming. There is an adage that: "experience is the best teacher". The respondents' number of years of experience as wheat farmers would, therefore, expose them to various practical farm problems and the ways and means of overcoming them in their production process. However, some farmers who have "bitter experience" of crop failure as a result of use of an innovation may find it difficult to try another.

**Household size**

Household size is an important source of farm labour, especially in rural areas. Often, the size of farm of a family head is determined by the size of his family, except he has money to hire labour. Table 4 shows the

distribution of respondents by their household size and states. The table shows that relatively few respondents 56 (about 17.55%) had a household size of between 1 and 5. Fewer respondents (9.09%) had a household size of over 20. The household size of the sampled wheat farmers was high because 263 of them (or about 82%) had a household size of over 5. This is probably because the four states covered by the survey have a predominantly Moslem population. Islam allows a man to marry more than one wife, and at most, 4.

**Table 3. Distribution of respondents according to their years of experience in wheat farming and States**

Farming experience (years)	State				Total
	Borno	Jigawa	Katsina	Sokoto	
0	4	1	1	1	7
1-10	20	61	62	46	189
11-20	57	16	13	20	106
over 20	1	1	3	11	16
Total	82	80	79	78	319

**Table 4. Distribution of respondents by their household size and States**

Household size	States				Total
	Borno	Jigawa	Katsina	Sokoto	
1-5	18	18	11	9	56
6-10	23	24	24	35	106
11-15	26	16	21	20	83
16-20	13	12	10	10	45
over 20	2	10	13	4	29
Total	82	80	79	78	319

#### *Farm size*

The distribution of respondents by their farm size and State is shown in Table 5. The table shows that 268 (or 84%) of the respondents had up to 6 hectares of wheat farms. The table also shows that only 28 (or 8.78%) of the respondents had over 9 hectares of wheat farms. In Katsina State, 53 (or 67.08%) of the farmers had less than 4 hectares of wheat farms. It is the state with the largest number of small scale farmers.

It was observed that no farmer had below one hectare of wheat farm. This is probably because they received assistance from government through the River Basin Development Authorities (RBDAs) through the supply of some facilities such as irrigation water, fertilizers and tractors and equipment. These are often provided on loan to the farmers who are expected to pay back the services in cash or kind.

#### *Tenure status of farmers*

A total of 197 (or 62%) of the respondents rented their farmlands. This is the major source of farmland for wheat farmers. This was so because the River Basin Development Authorities had a responsibility to provide irrigated agricultural land for farmers in addition to other facilities. Borno and Jigawa States had more farmers renting land for wheat farming. These two states also had the least number of farmers who obtained their farmlands through inheritance.

#### *Source of improved wheat varieties*

Table 7 shows the distribution of respondents according to their states and source of improved wheat varieties. A total of 178 (or 55.80%) of the respondents obtained their improved wheat seed varieties from government agents. Further investigations revealed that these government agents were the staff of the River Basin Development Authorities in the respective states, and the ADPs. Some who claimed to have obtained their planting materials from old stock later revealed that such old stock was originally obtained from "government agents". It is interesting

to note that on the basis of the findings, while Borno State farmers relied completely on "government agents" for their planting materials, farmers from other states, especially Sokoto and Katsina obtained theirs from other sources also.

Table 5. Distribution of respondents according to their farm size and State.

Farm size (ha.)	States				Total
	Borno	Jigawa	Katsina	Sokoto	
1-3	46	30	53	37	166
4-6	12	33	24	33	102
7-9	3	13	2	5	23
10+	21	4	0	3	28
Total	82	80	79	78	319

Table 6. Distribution of respondents according to their tenure status and States.

Tenure status	States				Total
	Borno	Jigawa	Katsina	Sokoto	
Freehold	2	8	10	5	25
Purchase	10	10	14	17	51
Inheritance	5	4	14	23	46
Rented	65	58	41	33	197
Total	83	80	79	78	319

Table 7. Distribution of respondents by their sources of improved wheat varieties used and States.

Source of seeds	States				Total
	Borno	Jigawa	Katsina	Sokoto	
Open market	0	12	9	21	42
Old stock	40	8	13	7	68
Government agent	42	56	36	44	178
Relations or exchange	0	3	5	3	11
Neighbour	0	1	16	3	20
Total	82	80	79	78	319

#### Extent of adoption of improved wheat varieties

The improved wheat varieties considered in this study include Pavon 76, Siette cerros, and seri. The extent of adoption is determined in this study as the percentage of farmers who adopted each of the improved wheat varieties in each state between 1993 and 1997 as shown in Table 8. By 1993 these varieties were released to farmers. It was expected that by 1997, a large number of farmers would have adopted them.

Table 8, however, shows that none of the sampled wheat farmers in Katsina State adopted Pavon 76 between 1993 and 1995. Only a few (2.3% and 2.5%) adopted this variety in 1996 and 1997, respectively. The variety was adopted in other states in varying proportions of farmers within this period - 1993 and 1997.

Siette cerros was adopted by a greater proportion of farmers in Katsina State than in other states (See Table 8). It is interesting to note that only 5.2% of the farmers in Sokoto state adopted Siette cerros in 1993. In 1994, the figure rose to 49.4% but declined to 24.1% in 1997.

Seri was not adopted by any farmer in Borno state between 1993 and 1997. In Katsina state, however, only

1.2% adopted the variety in 1993 and the figure rose to 21.2% in 1997. Across the years, this variety was more commonly grown in Jigawa State when compared to other states.

The extent of adoption of the three improved varieties was not encouraging because none of the varieties was adopted by up to 70% of the farmers in each of the 4 states. A lot needs to be done, probably in the area of extension services to get the farmers adopt the varieties.

**Table 8.** Percentage distribution of respondents by their adoption of some wheat varieties between 1993 and 1997

Wheat Variety	Year	% of farmers who adopted			
		Katsina	Borno	Jigawa	Sokoto
Pavon 76	1993	0	25.0	2.5	24.1
	1994	0	31.2	17.5	23.0
	1995	0	3.7	30.0	18.4
	1996	2.3	20.0	45.0	16.1
	1997	2.5	20.0	45.0	11.6
Siete Cerros	1993	47.0	36.2	10.0	5.2
	1994	60.0	27.5	12.5	49.4
	1995	65.0	11.2	18.7	43.7
	1996	61.2	37.5	21.2	34.5
	1997	48.7	27.5	20.0	24.1
Seri	1993	1.2	0.0	12.5	1.1
	1994	1.2	0.0	10.0	1.1
	1995	8.7	0.0	7.5	1.1
	1996	18.7	0.0	7.5	2.3
	1997	21.2	0.0	13.7	2.3
Others	1993	22.5	1.2	31.2	21.8
	1994	22.5	1.2	31.2	13.7
	1995	11.2	1.2	26.2	24.1
	1996	7.5	2.5	20.0	20.7
	1997	5.0	3.7	26.2	18.4

#### *Factors influencing to the adoption of the improved wheat varieties*

There are many factors influencing the adoption of improved wheat varieties. This survey, however, considers only the following factors: age, education, farming experience, household size, farm size and crop output. In this survey, an adopter is defined as a farmer who has decided to be planting any of the three varieties of improved wheat, namely: Pavon 76, siete cerros and Seri. A non-adopter, consequently, is the farmer who did not adopt any of the three varieties of wheat.

The *t*-test was used to determine if any relationship existed between the adopters and non-adopters of the three varieties of wheat in respect of their age, education, farming experience, household size, farm size and crop output (see Table 9).

#### *Age and adoption of improved wheat varieties*

Table 9 shows that the mean age of the adopters was 40.90 and that of non-adopters was 44.59. A *t*-test value of 3.39 shows that a significant difference existed between the adopters and non-adopters in terms of their age, at 0.01 level.

Age was conceptualized as having a relationship with adoption of improved agricultural technology. This is because the younger people tend to be more adventurous than the old, and would be more ready to try improved technology than the older people. The younger people in addition tend to be less conservative in their ideas compared with the older people [Rogers and Shoemaker, 1971]. Findings in this study tend to agree with those of Agbamu [1993] that younger people tend to take to farming as a vocation in recent years.

#### *Education and adoption of improved wheat varieties*

Table 9 shows that the mean age of adopters of improved wheat varieties and that of the non-adopters in respect of the years of formal education completed was 7.92 and 4.41, respectively. This means that the adopters were more educated than the non-adopters. The table also shows that the *t*-test value indicating the relationship between adopters and non-adopters in respect of their education was 2.78. This shows that there was a significant relationship between the adopters and non-adopters with respect to their education.



**Table 9.** T-test values showing the relationship between adoption and selected variables

Variable	Mean scores		DF*	T-test value	Remarks*
	Adopters	Non-adopters			
Age	40.90	44.59	225	2.39	S
Education	7.92	4.41	225	2.78	S
Experience	10.31	12.09	224	2.02	N
Household size	11.32	10.81	225	1.29	N
Farm size	2.42	1.22	225	4.33	S
Crop output	212.78	22.44	119	2.01	S

\*Legend: DF = Degree of freedom; S = Significant relationship; N = Non-significant relationship

It was conceived that education has a vital role to play in the adoption of agricultural innovations [Rogers and Shoemakers, 1971]. This is because education exposes the farmer to more sources of agricultural information, be it individual, group or mass media sources. Education is especially useful to the farmer if the technology to be adopted is complicated. There has, however, been conflicting research findings in this regard. Madukwe [1995] found that majority of farmers that adopted yam miniseti technology were educated but Agbamu [1993] found that no relationship existed between education and adoption.

#### *Farming experience and adoption of improved wheat varieties*

The mean farming experience of adopters was 10.31 years while that of non-adopters was 12.09 years. The t-test value showing the relationship between the adopters and non-adopters in respect of their years of farming experience was 2.02 (Table 9). This was not significant at 0.01 level. The implication is that no relationship existed between the adopters and non-adopters in terms of their farming experience.

An interesting observation in this finding is that adopters had less experience than non-adopters. Field observation showed that about 70% of the adopters were either serving or retired workers (in both public and private sectors). This group of people were, therefore, still new in farming, hence, less experienced but had higher education and were relatively younger than the non-adopters.

#### *Household size and adoption of improved wheat varieties*

The mean household size of adopters was 11.32 and that of non-adopters was 10.81 (see Table 9). The household size of the adopters was, thus, higher than that of non-adopters. It is understandable from the findings, therefore, that household size had some relationship with adoption of the improved wheat varieties.

However, such a relationship is not significant because the t-test value for adopters and non-adopters in terms of their household size (Table 9) was 1.29. Conceptually, a higher household size means higher farm labour for the family. However, with technological development, the use of tractors and equipment may reduce the need for farm labour. Also, economic and social development today makes it possible for labour to be hired and fired, further reducing the demand for household labour force.

#### *Farm size and adoption of improved wheat varieties*

The adopters had a mean farm size of 2.42 ha. and the non-adopters had 1.22 ha. The adopters had larger farm sizes than non-adopters (Table 9). Field experience also showed that most of the adopters of the improved varieties were happy with the higher yields and consequently invested more in farming, hence the larger farm sizes.

The t-test was used to show if a relationship existed between the adopters and non-adopters in respect of their farm size. The t-test value of 4.33 indicates that there was a significant relationship between farm size and adoption. This finding is contrary to that of Agbamu [1993] in which no significant relationship was found between adoption and farm size. This is probably because this survey was carried out in the Northern States of the country where farmlands are still abundant, with average farm size being relatively high.

#### *Crop output and adoption of improved wheat varieties*

Table 9 shows that the mean crop output for adopters was 212.78 bags while that of non-adopters was 22.44 bags. The table also shows that the t-test value for the two categories of farmers in respect of their crop output was 2.01. This shows that a significant relationship existed between adoption and crop output.

It is interesting to observe that there was a wide disparity between the output of the adopters and that of non-adopters. The explanation here is that from field observations, virtually all the adopters of the improved wheat



varieties benefitted from a working agreement they have with the RBDAs. The RBDAs provide the farmers with irrigation water during the dry harmattan period when the wheat is grown. The RBDAs also supply farmers with fertilizers, herbicides and other farm inputs at highly subsidized rates. Some non-adopters did not enjoy such benefits, hence their poor output. Also, many of the adopters operated larger farm sizes and were also more educated than the non-adopters.

### Summary and Conclusion

Farmers in the four states studied were mostly of the age grade of between 30 to 50 years, with between 1 to 5 years of formal education, 1 to 20 years of farming experience, having household size of between 6 to 10, had farm size of below six hectares, rented their farm lands and obtained their planting seeds mainly from government agents. Those who adopted each of the three improved varieties of wheat were relatively few but many of them adopted at least one of the varieties. A number of factors had significant relationship with the adoption of the improved varieties, such as age, education, farm size, and crop output.

### Recommendations

Based on the findings of the survey, a number of recommendations may be made that would enhance the adoption of the three (3) improved wheat varieties. Firstly, the fact that the seri variety, was not adopted at all in Borno State might mean that the felt-needs of the people were not investigated before its introduction such as its taste, colour, use of its stalk after harvest, smell, and other qualities. These and other factors, from field observation, accounted for the non-adoption of seri.

Secondly, farmers in the RBDAs enjoy a number of facilities while those farming at other places do not. There is need for government to see into the plight of these groups of farmers. Thirdly, it is recommended that for increased adoption of the improved wheat varieties, extension agents should visit farmers of all socio-economic groups such as farmers of all age grades, educational levels, and small, medium and large scale farmers. Age, education, farm size and crop output have some relationship with adoption and farmers in all strata of these factors should be covered by the extension agents. This implies, for instance, that the young, middle aged and old farmers should be covered by the extension agents. Similarly, both the educated and illiterate farmers and the small and large-scale farmers should also be covered.

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