FACTORS AFFECTING THE ADOPTION OF UPLAND NEW RICE FOR AFRICA (NERICA) VARIETIES IN AGRICULTURAL ZONE 1 OF NIGER STATE, NIGERIA.

Tsado, J. H.
Federal University of Technology Minna, Nigeria.
O. J. Ajayi
Federal University of Technology Minna , Nigeria.
David, T. G.
National Cereal Research Institute, Badeggi, Nigeria

The study was conducted in Agricultural Zone 1 of Niger State, Nigeria. A total of 75 upland NERICA Farmers were sampled. Data for the study were collected through structured interview schedule/questionnaire. Data were analyzed using descriptive statistics and inferential statistics (probit regression). The result revealed that majorities (62.70 %) of the respondents were still in their productive age of between 21-50 years and 84.00 % had one form of education or the other. The result of the study also showed that there was high level of awareness of different NERICA varieties among the respondents; the most popular were NERICA 7 (100%), NERICA 1 (92.00 %), and NERICA 8 (96.00%). Similarly the most adopted varieties include NERICA 7 (92.00%), NERICA 1 (81.33%) and NERICA 8 (73.33 %). It was found that the adoption of upland NERICA rice was influenced by NERICA farmers Age, Family size and education at 1% level of probability and farm size at 10%. The constraints perceived by the NERICA farmers as serious were: problem of weed, climatic problem and high cost of technologies. It is recommended that NERICA varieties that can withstand weed competition be developed and irrigation facilities be provided through public and private partnership efforts.

Key Words: **Adoption, upland, NERICA, rice, farmers.**

INTRODUCTION

NERICA is a new group of upland rice varieties that perfectly adapt to the rain fed upland ecology in sub-Saharan Africa (SSA), where smallholder farmers lack the means to irrigate or apply chemical fertilizers or pesticides. However, NERICA varieties also respond even better than traditional varieties to higher inputs. The upland or dry land ecology, where rain fed rice is grown without standing water, represents about 40% of the total area under rice cultivation in West and Central Africa (WCA) the rice belt of Africa and employs 70% of the region's rice farmers [3],[5].

The new varieties with higher yield potential are spreading faster than any new farm technology ever before introduced in Africa, covering by 2006 an estimated area of 200,000 hectares in West, Central, East and Southern Africa. The NERICA seeds offer hope to millions of poor farmers, and for countless others who struggles in urban squalor, spending most of their meager income on rice [3]. The NERICA rice varieties were developed at the Africa Rice Center (WARDA). In the early 1990s research center of WARDA in Bouake, Cote d'Ivoire, developed stable and fertile progeny from crosses between Asian rice, O. *sativa L.* and African rice, O. *glaberrima* Steud [13],[14].

a big player in international rice markets, accounting for 32% of global at a record level of 9 million tones that year. Africa's emergences as a big is explained by the fact that during the last decade rice has become the most growing food source in sub-Saharan Africa [20]. Indeed, due to population growth (4% incomes and shift in consumer preferences in favor of rice especially in The relative growth in demand for rice is faster in this region than anywhere in This is occurring throughout the sub-regions of sub-Saharan Africa (SSA). In production has been expanding at the rate of 6% per annum, with 70% of the across due mainly to land expansion and only 30% being attributed to an productivity [9],[10]. Much of the expansion has been in the rain fed systems, the two major ecosystems that make up 78% of rice land in West and Central the upland and rain fed lowland systems; nonetheless, demand for rice in outstripped the local production [6].

have been evaluated and characterized for a range of agronomic traits and African endemic diseases and pests. NERICA varieties generally have shorter than most traditional rice varieties. A number of NERICA varieties possess which is an important trait for weed competitiveness in rice, thus improving the labor. Moreover, some of them also have tolerance to drought and soil characteristics include cooking and eating qualities particularly acceptable NERICA protein content is generally higher than that of much of the available in African local markets [3].

(by 50-70 days) earlier than farmers varieties. Resistance to local stresses termites). High yield advantage (up to 6 tones per hectare under favorable High protein content (by 25%) and good taste. Early maturing (within 80-100 days earlier than farmers' varieties) under low altitude conditions (<1;000 level masl). Early vegetative growth contributes to the shorter duration of NERICA varieties which is one of their major attractions for farmers. This can be escape drought or compete with weeds, and it enables farmers to diversify systems through rotations or intercrops. Some of the second generation recently characterized by WARDA appear to mature in less than 85 days. tolerance to blast, stem borers and termites in NERICA varieties has also been

varieties have high yield potential and short growth cycle. Several of them posses' during the vegetative growth phase and this is a potentially useful trait for weed Likewise, a number of them are resistant to African pest and diseases, such blast, to rice stem borers and termites. They also have higher protein acid balance than most of the imported rice varieties. Participatory varietal trials in rain fed environments across WCA have met with an enthusiastic farmers [4].

of this study includes to:

the socio-economic characteristics of small-scale NERICA rice farmers.

the level of awareness of NERICA rice farmers of existing improved NERICA varieties.

the level of adoption of the improved NERICA varieties by farmers.

the factor affecting the adoption of NERICA varieties by farmers.

v. determine the NERICA farmers perception of the constraint faced in adopting upland NERICA varieties by farmers.

METHODOLOGY

This study was conducted in Agricultural zone 1 of Niger state. The state is bordered to the North by Zamfara state to the North-west by Kebbi state, to the south by kogi, to the south west by Kwara state while Kaduna state and the federal capital territory border the state North-west and North-east respectively. The major tribes in the state are mostly Nape's Gwari's'and Hausa's.

Multistage sampling technique was adopted for this study. The first stage involves the purposive selection of Agricultural zone 1 of Niger state Agricultural development project. The second stage involved the identification of National Cereal Research Institute demonstration locations in the zone; seven of such locations were identified. The third stage involves the identification of upland NERICA farmers collaborating with NCRI staff. A total of 75 of them were identified and were used as respondents.

Data for this study were collected mainly through primary source. A well structured interview schedule/ questionnaires were designed to illicit information from the upland NERICA rice farmers. Descriptive statistics technique was employed in the analysis of socio-economic characteristics, level of awareness and the level of adoption of NERICA varieties, these includes frequency distribution tables, percentages, Mean, likert type of scale and probit regression analysis technique was applied to determine the factor affecting adoption of the upland NERICA varieties.

The probit regression model is express as Y = 1, if farmers adopted, and 0 if otherwise
B_0 = is the intercept
Bi = are regression coefficients that explain the adoption of the farmer,
ei is error term and xi = independent variables (I = 1,2,3.....) as defined below;
the dependent variables specified as factors affecting adoption of varieties of NERICA rice.

$$Y = f(X_1, X_2, X_3, X_4, X_5, \ldots\ldots\ldots\ldots X_n)$$

Where
Y = adoption of the NERICA rice varieties
X_1 = Age of the farmer (in years)
X_2 = Family size (number of household member)
X_3 = Years of experience (in years)
X_4 = Farm size (in hectares)
X_5 = Level of education (number of years spent in school)

RESULTS AND DISCUSSIONS

Age: Table 1, showed that majority (62.7 %) of the respondents were between the age range of 21-50years while 24.0% of the respondents were between 51-60yrs. This implies that majority of the respondents in the study area were in there middle aged, thus they are in their economically active age, which could have positive effect on NERICA production and adoption of improved varieties. This result is in agreement with that of [1] who pointed out that the youth were more involved in carrying out agricultural activities than the aged.

ISSN 2356-847X

Table .1: Socio-Economic Characteristic of Upland NERICA Farmers

Characteristic	Frequency	Percentage
AGE		
21-30yrs	10	13.3
31-40yrs	14	18.7
41-50yrs	23	30.7
51-60yrs	18	24.0
>60yrs	10	13.3
SEX		
Female	27	36.0
Male	48	64.0
MARITAL STATUS		
Single	11	14.7
Married	55	73.3
Divorced	5	6.7
Separated	4	5.3
HOUSEHOLD SIZE		
1-5	30	40.0
6-10	33	44.0
11-15	7	9.3
16-20	1	1.3
>20	4	5.3
EDUCATIONAL LEVEL		
Primary	23	30.7
Secondary	5	6.7
Tertiary	2	2.7
Arabic & Quaranic education	2	2.7
Adult education	31	41.3
Non	12	16.0
MAJOR OCCUPATION		
Trading	6	8.0
Civil servant	23	32.0
Farmer	45	60.0
FARMING EXPERIENCE		
1-5yrs	3	4.0
6-10yrs	7	9.3
11-15yrs	14	18.7
16-20yrs	13	17.3
>20yrs	38	50.7

Source: *Filed survey, 2014*

Sex: The sex distribution of the respondents as shown in table 1 revealed that 36% of the respondents were female while male were 64%. This implies that majority of the NERICA rice farmers in the study area were male. This may not be unconnected with the fact that women in the study area are mainly involved in carrying out post harvest activities.

Marital status: As indicated in Table 1, majorities (73.3%) of the respondents were married and only 14.7% were single. Marriage most especially in rural and sub-urban communities

uplifts the status of an individual. And has the tendency of providing additional cheap source of labor (wives and children) to help out in farm work. This is in agreement with [7],[8] who found that marriage play a major role in agricultural production activities by providing additional cheap source of labor

Family size: Table 1 also revealed that. 44.0% of the respondents had a family size ranging between 6-10 while 40% reported that their family size is between 1-5. This shows that majority of the respondents had moderate family sizes. This implies that majority of the NERICA rice farmers have the tendency of easily accepting and adopting new technologies and to some extent meet other socio-economic needs of the family. This result is how ever inconsistent with that of [17] who noted that large households' sizes facilitate easy and quicker access to innovations.

Education: Majority (84.0%) of the respondents had one form of education or the other and only 16.0 claimed they do not have any form of education. This implies that spreading of new or improved innovations can be done speedily, because education is said to affect adoption significantly and positively.

Major occupation: Majority (60.0%) of the respondent are predominately farmers while 32.0% are civil servant. this indicates that most of the respondents participating in farming activities had farming as their major occupation and spent a greater proportion of their time on their farms, this can however, affect their decision to accepted and adopt new technologies to boost their production and to earn more income to be able to carter for their families.

Farming experience: The farming experience of the NERICA farmer indicated that 50.7% of the respondents had being in the farming business for over twenty years. About 17.3% and 18.7% had being in farming business for between 16-20 years and 11-15 years respectively. This implies that NERICA Rice farmers were experienced farmers; this could positively or negatively affect the acceptance and adoption of improved technologies. This is in agreement with [8],[18] who reported that long period of farming experience significantly and positively affect acceptance and adoption of improved practices

Table 2: Distribution of respondents' base on awareness of different upland NERICA Varieties.

NERICA	Varieties	Aware	Not aware
NERICA	1	74 (98.67)	1 (0.05)
NERICA	2	66 (88.00)	11 (14.67)
NERICA	3	56 (74.67)	19 (25.33)
NERICA	4	52 (69.33)	23 (30.67)
NERICA	5	51 (68.00)	24 (32.00)
NERICA	6	49 (65.47)	26 (34.67)
NERICA	7	75 (100)	00 (00)
NERICA	8	72 (96.00)	3 (96.00)

Source: Field survey, 2014

Table 2 revealed that there were basically eight varieties of NERICA upland rice available in the study area. NERICA 7, 1 and 8 were the most popular followed by other in their order

[illegible] that the NERICA upland rice farmers were very innovative [illegible] were always conversant with the latest varieties released. This may not be [illegible] with the fact that these categories of farmers from different locations work [illegible] with the NCRI Staff. [16] argued that the awareness of new innovations is an [illegible] of adoption.

[illegible] of Adoption by Adoption step for eight upland NERICA Varieties (% of [illegible] except for aware and Adoption which is % of whole sample). n = 75

[illegible]	Aware %	Tried (% of aware)	Adopted (% of tried)	Adoption %	Rank
[illegible] 1	98.67	85.14	96.83	81.33	2nd
[illegible] 2	88.00	65.15	93.02	53.33	4th
[illegible] 3	78.67	69.64	89.74	46.67	5ft
[illegible] 4	69.33	63.46	78.79	34.67	6th
[illegible] 5	68.47	46.07	79.17	25.33	7th
[illegible] 6	65.47	32.63	62.50	13.33	8th
[illegible] 7	100	96.00	95.83	92.00	1st
[illegible] 8	96.00	81.94	93.22	73.33	3rd

[illegible] Survey, 2014

[illegible] showed the incidence of adoption by adoption steps for eight upland NERICA [illegible]. The table indicated a varying degree of awareness, trial and adoption rates. Table 3 [illegible] high incidence of awareness, the rate of trial and adoption of these varieties were [illegible] low compared to the rate of awareness. adoption percentage revealed that there were [illegible] of NERICA 7, 1 and 8 which ranked 1st, 2nd and 3rd respectively, while [illegible] was the most adopted because of it peculiarities. This implies that awareness does [illegible] the same thing as trial and trial not adoption, a farmer may decide to stop at any of [illegible]. Adoption is when a farmer finally decided to put in full practice what he is aware [illegible] and ready to use on continual bases. This result is in agreement with that of [15] who [illegible] that farmers' awareness is a major pre-requisite to adoption

[illegible] Estimate of the Socio-Economic factors affecting adoption of upland [illegible] varieties.

[illegible]	ESTIMATE	STD ERROR	Z
[illegible]	-1.920	.132	-14.516***
[illegible]	.016	.003	5.544***
[illegible]	.021	.004	5.514***
[illegible] Experience	-002	.003	-626NS
[illegible]	.019	.010	1.946*

Education	.056	.006	9.794***
Chi-square value	1688.046***		

Source:FieldSurvey,2014

NOTE: *** Implies statistically significant at 1%
* Implies statistically significant at 10%
NS Implies statistically Non- significant

Table 4. The result of the probit analysis shows that age (z = 5.544), family size (z = 5.514), farm size (z = 1.946), education (z = 9.794) had positive and significant effects, except experience (z = -.626) which show negative and non-significant effect. All other variables were significant at 1% (0.01), in exception of farm size which is significant at 10% level of probability, these shows that there is a significant relationship between these variables: age, family size, farm size, education and NERICA adoption. The finding further reveals that experience is not significant and has a negative relationship with adoption of the Upland NERICA varieties. This result is in agreement with that of [19], who reported that personal characteristics like: age, education, family size, farm size and farming experience significantly and positively influence farmers acceptance and adoption of new and improved crop varieties.

Table 5: Upland NERICA Farmers Perception of the Constraints

Constraints	Mean	Remark	Rank
Low yield of upland NERICA	3.17	Serious	6th
Inferior quality of domestic upland rice	1.52	Not Serious	11th
Low price of rice	3.36	Serious	4th
Adequate extension contact	3.11	Serious	7th
Inadequate credit facilities	3.31	Serious	5ft
High cost of technologies/inputs	3.39	Serious	3rd
Climatic problem (drought and flood)	3.48	Serious	2nd
Problem of weeds	3.68	Serious	1st

	1.56	Not Serious	10th
Birds and Rodents	2.36	Serious	9th
	3.04	Serious	8th

Source: Field Survey, 2014

NERICA upland rice farmers perceived all the problems identified as exception of inferior quality of domestic upland rice (1.52), problem of and problems of birds and rodents (2.36). The most serious problem were climatic problem (drought and flood) (3.48) and high cost of which ranked 1st, 2nd and 3rd respectively. Weed drastically reduce upland because rice belongs to the same family with the major weeds in the there is always high rate of competition between the rice and the weeds, are more advantageous because they are more adaptive to the soil and than the NERICA rice varieties, which incidentally ranked 2nd , thereby than the real rice plant, this directly or indirectly affect rice growth This findings is in agreement with those of [12],[11] who pointed out that great potentials of drastically reducing upland rice yield because they are more and climatic conditions than the NERICA rice.

of adoption of upland NERICA rice identified by the study includes: education and farm size. The study revealed high level of awareness of the most adopted however, were NERICA 7, 1 and 8. The study upland NERICA rice farmers faced series and different problems: weed problems (drought and flood) and high cost of technologies/input

of awareness of different NERICA varieties of the respondents were agents should intensified their activities to persuade and encourage farmers to try out and adopt more improved varieties varieties that can withstand weed competition should be develop and inputs should be subsidized to the farmers through joint the farmers, government and non-government organizations like

A., Ajuna, A. M., Ayinla, O. A., Yaehere, M. T., and Adeogun, M. O. Application of Logit model in adoption Decision. A study of Hybrid in Lagos. Journal of Agricultural and environmental Science 4(40, 468-

(WARDA) (2005). Cotonou, Benin..

(WARDA) (2007): Rome Italy FAO: Tokoyo, Japen: Ssakaswa Association

4. Africa Rice Center (WARDA) (2008)./FAO/SAA. The New Rice for Afriaca-a Compendium. E. A.. Somado, R. G. Guei and S. O.keya (eds) Cotonou, Benin:

5. Balasubramanian V, Sie M, Hijmans RJ and K Otsuka. (2007). Increasing rice production in sub-Saharan Africa: challenges and opportunities. Advances in Agronomy 94: 55-133.

6. Dingkuhn M, Jones M, Johnson D, Fofana B and A Sow. (1997). *Oryza sativa* and *O. glaberrima* genepools for high yielding weed competitive rice plant types. In: Fukai S, Cooper M, Salisbury J (eds.). Breeding Strategies for rainfed lowland rice in drought-prone environments. ACIAR Proceedings No. 77. Australian Centre for International Agricultural Research, Canberra, Australia, 1997. Pp. 144-155.

7. Egwu, N, J. (2003).Adoption potential of IITA Black Sigatoka Resistant Hybrid Plantains (PTA-14) in south Eathen Nigeria. An unpublished M Sc. Thesis, Micheal Okpara University of Agriculture: Umudike, Abia State.

8. Ekong, E. W. (2000). Group and Nngroup Women Farmers Access to Agricultural Production Responses in Akwa Ibo State, Nigeria. A PhD thesis. Department of Agricultural Extension and Rural Development, Ibadan University of Ibadan

9. Fagade S. O. (2000). Yield gaps and productivity decline in rice production in Nigeria. Paper presented at the Expert Consultation on yield gap and production decline in rice, 5-7 September, 2000. FAO, Rome, Italy. 15 Pp.

10. Falusi A. O. (1997). Agricultural development and food production in Nigeria: problems and prospects. In: B Shaid, NO Adedipe, M Aliyu and Jir M. (eds). Integrated Agricultural production in Nigeria. Strategies and Mechanisms (NARP Monograph No. 5. Pp. 151-170.

11. Johnson D. E, M Dingkuhn, MP Jones and MC Mahamane. (1998). The influence of rice plant type on the effect of weed competition on *Oryza sativa and Oryza glaberrima.* Weed Research 38: 207-216.

12. Johnson, D. E, Riches CR, Diallo R and MJ Jones. (1997). Striga on rice in West Africa; Crop host range and the potential of host resistance. Crop Protection 16: 153-157.

13. Jones M. P, Dingkuhn M, Aluko GK and M Semon. (1997). Diversity and potential of *Oryza glaberrima* Steud. in upland rice breeding. Breeding Science 47, 390-398.

14. Jones M. P. (1998). Food security and major technological challenges: the case of rice in sub-Saharan Africa. Japanese J. Crop Science. 67, extra issue 2.

ISSN 2356-847X

The Perception of and Adaptation to Climate Change in Africa Discussion Paper 10, Ceepa, University of Pretoria, South

Hassa, R. (2007). Micro Level Analysis of Farmers Adaptation Change in South Africa. IFFRI discussion Paper 00714

and Akinwu, C. D. (2006). Adoption of Proven Soil Management Rural Women in Imo State, Nigeria. *International Journal of Sciences,* 2 (3) 262-267

Factors Influencing Adoption of Improved farm practices Women Farmers in Osun State. Journal of Human Ecology, 19

(2002).Technology Adoption and Food Security: The Role of the Scheme. Agro-Science, 1, 1-4

Rice is life in 2004 and beyond. International Rice Commission. 54, 1-10