Analysis of FARO 44 Rice Technologies Adoption among Farmers in Nigeria

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Abstract

The study examines the adoption of FARO 44 rice among Fadama project participants. A multistage sampling technique was used to select 336 Fadama project famers from three agricultural zones. Data collected were analysed using adoption scale and factor analysis as well as frequency and percentages. Majority of males were within the active age of 19-36years; married with farming experience of 16-20 years having 0.5-1ha of rice plot. Technologies such as improved seed recommended spacing; seed per hole; use of granular fertilizer were adopted by male respondents. Processing technologies adopted by male were only threshing and bagging. For storage technologies male respondents had adopted jute bags; rhumbus and silos while female respondents used only jute bags because it is cheaper and easy to handle. Factor constraining adoption were communication gap between farmers and facilitators; untimely delivery of inputs; transplanting too tedious and cost of false bottom. It was concluded that majority of the technologies were at evaluation and trial stage for both male and female respondents.

Keywords: Fadama project; Rhumbus; FARO; Rice; Factor analysis; Adoption and Nigeria

I**ntroduction**

"FADAMA" Is a Hausa name for irrigable land-usually low-lying plain underlay by shallow aquifers found along Nigeria's major rivers system. The *fadama* III Additional Financing a collaborative project of the world bank Federal and State Government has been of immense benefit to farmers in Niger State. The project has greatly enhanced the capacity of farmers, increased their income, boasted their economy and made life more worthy of living (Ibrahim, 2016). Niger State has implemented World Bank/FG assisted project under the agricultural sector namely Bida Agricultural Development Project, Multi-State Agricultural Development Project, National Agricultural Technology Support Project, *fadama* I and II, III and Presently implementing *fadama* III AF which have helped to develop farmers-managed irrigation scheme.

Rice has long become a stable food in the Nigeria food chain. Nigeria no doubt, has natural endowment to be self-sufficient in rice production in less than 5years but has been impeded all long by conflicting policies and import waivers which permitted large foreign owned rice processing mills to import brown rice from South East Asia there by exporting badly needed jobs to those countries of import and increasing unemployment locally. Farming is not just an option to us in Niger State but a necessity, considering the vast fertile land and other resources, the state can feed the entire West Africa (Ibrahim, 2016).

The most important determinants of the effectiveness of research results is the level of adoption of innovation that it generates, and on their profitability (Caswell, 2001). In addition, the faster the research can be completed, the higher the turnover of benefits. Moreover, the more evidence research results are, the easier it is to justify the implementation of and continues investment in research programmes. A common problem for many individual and organization is how to speed up the rate of diffusion of a research program's innovations (Roger, 1995)

Purpose of the study

The main objective of the study is to examine the factor analysis of FARO 44 adoption of *fadama* users group (FUGs)**.**

The Specific Objectives are to:

1. describe the socio-economic characteristics of the *fadama* user groups;
2. examine factor analysis of FARO 44 adoption level among beneficiaries;
3. identify constraining factors hindering adoption of FARO 44 adoption.

Methodology

The study was conducted in Niger State Nigeria. Out of twenty-five local governments that made up the state, three local governments namely Katcha (Zone 1), Shiroro Zone (II) Wushishi (III) were purposively selected for the study. Their selection were based on the preponderance of Fadama User Groups (FUGs). Multi-stage sampling techniques were adopted for the study. In the first stage two (2) production clusters were selected from each of the zones. In the second stage seven (7) production groups were randomly selected from each of the production cluster and finally four (4) female and four (4) male were interviewed from each of the production groups. This gave a total of 336 respondents. Data were collected from the respondents using structured interview scheduled. Data collected were analyze using descriptive statistics like mean, percentages. Adoption scale analysis was employed to analyses the level of adoption of FARO-44 technologies. Seven point likert scale was adopted to ascertain level of adoption. The scale are as follows; un aware (0), aware (1), interest (2), evaluation (3), trial (4), accept (5), reject (6).

Each item will therefore be computed by multiplying the frequency of each response pattern with its appropriate nominal value and dividing the sum with the number respondents to the item. This is summarized with equation below. XS= $\sum \frac{fn}{nr}$

Where XS= Mean score

∑= Summation

f=frequency

n= likert nominal value

nr= number of respondents

Any respondents that had means score of three (3) or greater than mean score is said to adopt FARO 44 Technology for that item while any score below three (3) is said to reject the technology in question.

Factor analysis procedure using factors with varimax rotation. The constraints were grouped using principal component analysis with iteration and varimax rotation method developed by Kaiser 1958. The cut-off point constraint loading was within the range of 0.3-0.5. variables that load in more than one constraint will be discarded following Akinnagbe (2013) and Ibrahim (2016).

The Model is presented in equation…… (1)

$Y_1 = a_{11}X_1 + a_{12}X_2 + **********+a_{1n}X_n$

$Y_2 = a_{21}X_1 + a_{22}X_2 + **********+a_{2n}X_n$

$Y_3 = a_{31}X_1 + a_{32}X_2 + **********+a_{3n}X_n$

* *

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$Y_n = a_{n1}X_1 + a_{n2}X_2 + **********+a_{nm}X_n$

Where;

Y_1, Y_2 …… Y_2 =Observed variable/ constraints to linkage / practice

a_1- a_n =Constraints to correlation coefficients;

X_1, X_2, …… X_n = Unobserved underlying factors constraining linkage practice

Results and Discussion

Table 1. Shows that (64.3%) of male were within the age bracket of 19-36years which is active stage of life which make it possible to withstand the rigor associated with the farming activities while only (41.7%) of the female counterpart were within that age bracket. About 62.5% of the male respondents had secondary education while only 30.4% of the female counterpart had same. This means that most of the female respondents were not allowed to continue with their secondary education because of marriage. More so. About 83.4% of male respondents had farming experience of 11-20years while only 32.8% of the female counterpart had same. This implies that with more experience in farming activities, farmers become less averse to the risk. All (100%)

respondents were a member of one cooperative or the other this was plausible because the sample of the respondent were drawn from production clusters. Almost all 98% of the two categories of the respondents cultivated one hectare of land, this may probably be as a results of the *fadama* III AF package. Majority (68.5%) of male respondents had the house hold size of 6-10 persons while only (35.7%) of their female counterpart had same, this disparity may probably be because of the polygamy been practice in most of the rural farm families in the rural communities. Effiong (2005) reported that a relatively large house hold size enhances the availability of labour. Majority of the respondents cultivate 1ha. This implies that adoption cost, risk perception labour requirement and human capital requirements are definitely reduced.

Table 1. Distribution of respondents according to socio-economics characteristics n=336

Socio-economics characteristics	**Male**		**Female**		**Pooled**	
	F	**%**	**F**	**%**	**F**	**%**
Age (years)						
1-18	-	-	3	1.8	3	0.9
19-36	108	64.3	70	41.7	178	53.0
37-54	50	29.8	90	53.6	140	41.7
>54	10	6.0	5	3.0	15	4.5
Marital status						
Single	3	1.8	5	3.0	8	2.4
Married	165	98.2	155	92.3	320	95.2
Separated	-	-	4	2.3	4	1.2
Divorce	-	-	4	2.3	4	1.2

Educational level						
No schooling	3	1.8	25	14.9	28	6.0
Primary	55	32.7	90	53.6	145	43.1
Secondary	105	62.5	51	30.4	156	46.4
Tertiary	5	3.0	2	1.2	7	2.1
Membership of cooperative						
Member	168	100	168	100	336	100
Non-member	-	-	-	-	-	-
Farming experience						
<5	-	-	7	4.2	7	2.1
5-10	20	11.9	89	53.0	109	32.4
11-15	50	29.8	35	20.8	85	25.3
16-20	90	53.6	20	12.0	110	32.7
21-25	6	3.6	15	9.0	21	6.3
26-30	2	1.2	2	1.2	4	1.2
Farm size						
0.5-1.0	165	98.2	166	98.8	331	98.5
1.1-1.5	3	1.8	2	1.2	5	1.4
House hold size				-		-
0-5	50	29.8	105	62.5	155	46.1
6-10	115	68.5	60	35.7	175	52.0
11-15	3	1.8	3	1.8	6	1.8
>15	-	-	-	-	-	-
Occupation						
Full time famer	165	98.2	128	98.2	293	87.2
Part time farmer	3	1.8	40	23.8	43	12.8

Source; field survey, 2017

Level of FARO 44 adoption technologies. The results show that recommended improve rice seed had the highest frequency of adoption (93) for the male famers with the mean ($\bar{x}$= 4.0) followed by recommended spacing of 20cm by 20cm (66) with the mean of (3.8) This means that male respondents want to optimized the space and maximized outputs. Recommended quantity of granular fertilizer application had (79) with the mean value of ($\bar{x}$=3.9). This implies that respondents attach value to granular fertilizer than any other production inputs in the study area

apart from improve rice seed. This may probably attributable to the fact the role fertilizer plays in increasing the output of the farmers.

Furthermore, seed per hole had only (43) by male respondents with the mean of ($\bar{x}$=3.0). This depict that with the minimum number of seed per hole, the rice plant stands the chance of tillers while only (10) of their female counterpart tried seed per hole with the mean value of ($\bar{x}$=2.7). This means that female respondents are not willing to adopt seed per hole as a technology.

Water management had (58) with the mean value of ($\bar{x}$=3.6). This attributable to the fact that rice is water loving plant. Harvesting method had mean value of ($\bar{x}$=3.1). this mean that timely harvest reduces loss while for female respondents, improved seed, transplanting, recommended spacing, and water management had the mean value of 3.4, 3.1, 3.8 and 3.1. this means that only four out of 17 production technologies were adopted by the female respondents.

For the processing technologies (75) of the female were at evaluation stage in term of false bottom usage with the mean of ($\bar{x}$=3.2) while only (25) of their male counterpart were in this stage. De-stoner had (80) adoption with the mean value of ($\bar{x}$=3.8) while only 18 of their counterpart were in this category. This implies that females were more interested in trying processing technologies then their male counterpart in the study area. This may probably be because, processing of agricultural product is purely a woman job. But for bagging male were at adoption stage with mean of $\bar{x} = 3.8$.

Storage technologies, Jute bag was the only storage technology adopted by both male and female. with the mean of ($\bar{x}$=3.4) and ($\bar{x}$=3.0) respectively. This may probably be because it is cheaper and lighter for handling. Rhumbus had mean value of ($\bar{x}$=3.2) for male respondents. The

technologies that suffer set back from female respondents in term of rejection were post emergence herbicide with the mean value ($\bar{x}$=1.9), liquid fertilizer (1.8%), puddling and bunding (1.2). These to them were not effective and may be additional cost if put in use. In conclusion that female farmers were receptive to processing technologies although male respondent accept most of technologies than their female counterpart. Generally, the finding depict that majority of the technologies were at evaluation and trial stage for both male and female respondents.

Table 2. Frequency distribution of male and female respondents by stages of adoption of FARO 44 rice production, processing and storage technologies.

TEC	Unaware		Aware		Interest		Evaluation		Trial		Adoption		Rejected		Adoption Mean Score	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
IS	0	0	12	19	20	38	13	25	30	32	93	54	0.0	0.0	4.0	3.4
TP	12	0	25	29	26	26	25	43	50	41	30	29	0.0	0.0	2.4	3.1
DP	31	0	35	25	37	39	30	53	35	30	0.0	21	0.0	0.0	2.0	2.9
TD	0	0	30	15	25	25	20	22	44	25	49	44	0.0	0.0	3.3	2.7
S	45	36	38	45	27	29	33	44	20	14	5	0.0	0.0	0.0	1.8	1.9
RS	0	0	7	6	20	15	35	45	40	35	66	67	0.0	0.0	3.8	3.8
SPH	0	0	45	58	25	35	27	25	28	20	43	10	0.0	20	3.0	2.7
PB	45	50	54	60	25	30	24	28	20	0.0	0.0	0.0	0.0	0.0	1.4	1.2
FAG	0	0	12	30	17	25	25	45	35	33	79	35	0.0	0.0	3.9	3.1
FAS	0	0	35	45	47	44	42	37	25	27	19	15	0.0	0.0	2.7	2.5
WCM	0	45	35	40	27	33	47	22	33	28	26	0.0	0.0	0.0	2.9	1.7
MBS	45	40	35	25	25	37	20	27	15	19	28	20	0.0	0.0	2.1	1.5
WM	0	0	15	17	25	47	30	38	40	34	58	32	0.0	0.0	3.6	3.1
FAL	0	38	45	40	40	39	30	27	23	24	10	0.0	20	0.0	2.6	1.8
FAS	0	44	55	36	45	45	25	21	10	22	13	0.0	20	0.0	2.3	1.6
H	0	45	35	38	28	40	45	32	33	13	7	0.0	20	0.0	3.1	1.7
R	0	32	35	41	45	34	37	27	31	34	20	0.0	0.0	0.0	2.7	1.9
Processing Technologies																
T	0	0	25	29	15	35	25	82	20	12	83	10	0.0	0.0	3.7	2.4
FB	45	0	25	20	35	15	15	75	25	35	10	23	13	0.0	2.2	3.2
DS	42	0	35	35	25	25	27	70	19	20	20	18	0.0	0.0	2.0	2.3
D	30	0	45	15	25	18	30	25	20	30	18	80	0.0	0.0	2.1	3.8
MG	0	0	45	47	35	40	25	33	20	19	15	17	28	12	2.9	2.6
B	0	0	12	55	18	25	25	35	45	28	68	15	0.0	10	3.8	2.4
Storage Technologies																
JB	0	0	27	30	29	38	15	37	37	30	60	33	0.0	0.0	3.4	3.0
R	0	0	20	38	35	20	32	30	43	45	38	35	0.0	0.0	3.2	2.6
WH	30	30	35	25	30	28	20	20	25	18	18	20	10	27	2.4	2.8

S	30	38	25	20	20	26	15	22	30	29	20	19	28	14	3.0	2.5

Source; Field survey, 2017

Where;

TEC= Technologies ranging from 1-26

Production Technologies

I.S (Improve seed) 25kg of FARO 44/ha; T.P (Time of planting) (June) D. P (Depth of planting) 3-4cm T.D (Touch down) (pre-emergence herbicide) S (Solito) (post emergence herbicides); R.S (Recommended spacing) 20cm by 20cm SPH (Seed per hole) 4-5 seed P. B (Puddling and bonding FAG (Fertilizer application "granular") first dose (NPK 15: 15: 15: 4 bags); FA (Fertilizer application) second dose (Urea 46:0:0 2bags); W.C (weed control measure) MBS (Methods of bird scaring) WM (Water management) FA (Fertilizer application) "liquid" first dose (NPK 2liters, Boron 2liters; FA (Fertilizer application second dose (Urea liquid 2liters); H. (Harvesting) R. (Recoup) 25%

Processing Technologies

T (Threshers) UFB (Use of False bottom) for per boiling; DS. (Drying slabs) D. (De-stoner) MG. (Measurement gauge)B. Bagging.

Storage Technologies

23. JB (Jute bag) R. (Rhumbus) WH (Ware house) Sale 85% to off takers.

Factors analysis constraining adoption of FARO 44 among respondents

Table 4. Showed factor matrix on adoption constraints. Factors base on variable loading were used; four factors were identified and named. Factor one (1) were economic related factors, (2). policy related factor; cultural related factors (3) and attitude related factors (4). Items that loaded high in factor 1, (economics related constraints), included Poor relationship between farmer/facilitator and

desk officers (agein value=.373); Poor monitoring and evaluation (agein value =.327); Difficulty in raising counterpart fund (agein value=.354); In ability to recoup 25% of the total harvest (agein value=.301); Farmers cum hersdmen clash (agein value = .302), High cost of false bottom (agein value=.486); Items that loaded high in factor 2, (policy related constraints), is Untimely delivery of inputs (agein value= .783). while for cultural related factors were; Transplanting is too tedious (agein value= .413); poor saving culture (agein values.335); while for attitude related factors are wide commutation gap between the famers and facilitators (agein values.796) and Liquid fertilizer not effective (agein values.460).

Table 4: Factors constraining adoption of FARO 44 technologies (0.30)

Variables	Factor 1	Factor 2	Factor 3	Factor 4	Rank
Business plan not in line with farmers demand	-	-	-.032	.025	D
Poor relationship between farmer/facilitator and desk officers	**.373***	.134	.242	.040	S
Poor monitoring and evaluation	.327*	.109	.282	.204	S
Wide Communication gap between the famers and facilitators	.149	.035	.065	.796*	S
Untimely delivery of inputs	.161	.783*	.039	.077	S
Germination percentage is low	-.431*	.041	.192	.042	S
Difficulty in raising counterpart fund	-.354*	**.**020	.204	**.**045	S
Liquid fertilizer not effective	-.079	.050	.045	.460*	S
Transplanting is too tedious	.164	.066	.413*	.158	S
Insufficient rain fall	-.066	-	-.126	-	D
Problem of qualee bird	.014	-	.163	-	D
Incidence of gall midge	.175	-	.168	-	D
Problem of iron toxicity	.290	.0665	.107	-.145	NS
In ability to recoup 25% of the total harvest	.301*	.261	.061	-.032	S
Low pricing by the off takers	.080	.049	.159	.007	NS
Language barrier	.025	.103	.060	.298	NS
Poor saving culture	.103	**.**055	**.**335*	-.137	S
Farmer cum herdsmen clash	.302*	.079	.078	.058	S
High cost of milling machine	-	.276	-	.007	D
High cost of threshers		.032	.717	-	D
Incidence of rodents in the store	.032	.297	.043	.014	NS
Wrong view of famers incapable of taking rational decision	.080	-.303	.065	.239	NS
High cost of false bottom	.486*	.0400	.163	.107	S

Key: D= Discarded, S=Significant NS= Not significant
Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
*Sig
Extraction
- overlap
Field Survey, 2017

Conclusion and Recommendations

It was concluded that male farmers attached more value to production technologies than processing technologies while female respondents adopted most of the processing technologies than production technologies. More so recommended spacing of 20cm by 20cm had the highest percentage (74%) of adoption from the male respondents while solito (post emergence herbicide) had the highest percentage (28%) of rejection from female respondents. It was concluded that majority of the technologies were at evaluation and trial stage for both male and female respondents. It was recommended that communication process needed to be strengthened.

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