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Modern Technologies and Wetland Farming in Edo State, Nigeria

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Abstract

The objective of this paper is to investigate how farmers in wetland (FADAMA) farmer areas in Edo State respond to modern technologies. Data were sourced from both primary and secondary sources and analyzed using frequency tables, percentages and mean statistical technologies. The results of the analyses reveal that the farmers are disposed to adopt FADAMA technologies based in there with literacy rate. FADAMA projects represent a more recent approach of Federal Government to increase agricultural production in the country. The objectives of the FADAMA project include the provision of support for water management systems is low lying flood plains so that farming activities can go on, particularly in the season, improve output and enhance farmers' income.

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1. INTRODUCTION

Over the last decade, Nigeria's domestic production has consistently lagged behind national food demand. The increasing pattern of annual shortfall is a dangerous pointer to the fact the nation may be on the threshold of food insecurity (**Okolo, 2006**). It has been reported that about 60.8% Nigerians are malnourished (**FAO. 2007**). According to **Esobhawan (2009)**, Nigerians consume 9.3gms of animals' protein per person per day on against the recommended minimum daily requirement of 34gms.

Many institutional programmes in agriculture have been undertaken to solve the food crisis and increase agricultural intensification in Nigeria. Some of these were the National Accelerated Food Production Programmes (NAFPP) in 1872, River Basin Development Authority (RBDA) in 1974, Operation Feed the Nation (OFN) in1976, Rural Integrated Agricultural Development Programme (ADP) in 1976, Green Revolution, (GR) in 1980. Many of these efforts failed, for various reasons, to provide enough food for the teeming population of the country. Some of the reasons include poor funding leading to poor performance of many of the institutional reforms, misapplication of funds, under-investment in the sector and multiple political considerations in otherwise technical agricultural issues (**Aghanenu, 1990**). FADAMA projects represent a more recent approach of Federal Government to increase agricultural production in the country. The objectives of the FADAMA project include the provision of support for water management systems is low lying flood plains so that farming activities can go on, particularly in the season, improve output and enhance farmers' income (**Onemolease and Omoregbee, 2004**; **FAO, 2007**). The programme was implemented in phases. Phase 1 started in 1993 and ended in 1999, while Phase II commenced in January 2004 and ended in December 2009.

Despite the operation of the FADAMA scheme, doubts have been expressed about its income potential. While **Adewumi *et al.* (2005)** claimed that the farming system is a profitable enterprise capable of raising farmers' livelihood NFDP (nd.) raises objections to its economic prospect giving the peculiar problems associated with the system such as technical constraints in the areas of drilling and credit.

Despite the potential of FADAMA in Edo State it did not participate in FADAMA phase I and II. (World Bank, 2007; FADAMA III Workshop, 2007). For a successful implementation of FADAMA III, base line data such as level of response to technology, credit sources and acquisition, production constraints will be required by the government.

The prospect of FADAMA farming in the country generally will greatly depend on farmers' willingness to adopt recommended technologies as well as their access to capital/credit. Such technologies are capable of raising productivity and increasing farmer's income (**Tarhule and Woo, 1997**). Past adoption studies have shown that farmers; response to agricultural technologies has been relatively slow or selectively (**Ayanwale and Alimi, 2004**). This paper therefore seeks to investigate how farmers in the FADAMA area in Edo state respond to FADAMA technologies. The paper is structured into five sections. Section one is the introduction while section two look at the literature. Sections three and four centered on materials and methods as well as results and discussions. Section five gaps it up with the conclusion and recommendations.

2. LITERATURE REVIEW

In recent times, different studies have been conducted on FADAMA farming in Nigeria. For instance, **Okunlola (2005)** studied the factors affecting FADAMA system in Ondo and Osun

States of South Western Nigeria. His results using Pearson correlation showed that seasonality of market, availability of input, credit and availability of land positively influence the level of FADAMA production in the study area.

A study by **Agwu and Edun (2007)** in Ogun State on the influence of farmers demographic characteristics on their knowledge gap of recommended FADAMA technologies in llara agricultural zone of Ogun State, showed that years spent in school (formal education), number of farmers' cooperative organizations belonged to and gender had a negative on knowledge gap of farmers. Multiple regressions was used for the analysis.

Adewumi *et al.*, (2005) examined the economics of irrigation farming in Nigeria with emphasis on tomato based farming in Sokoto State. The average net income obtained from a sample of 120 farming households was #77,599.80 and a gross margin of N87,543.00 per hectare with a rate of return of investment greater than hundred percent. Returns to owner's labour and management in the area was #15,924.50 per hectare. Small-scale tomato production in the area was thus deemed profitable.

Onyemauwa *et al*, (2006) studied the determinants of revenue and productivity of FADAMA farmers in Imo State. The regression results showed that the relationship between each of the inputs and the net revenue was inelastic. However, labour, farm size, planting materials, cost of fertilizer and amount of water used significantly influenced net revenue of the farmers. The result further showed that maize was the most productive planting material while land clearing was the most productive labour used by the farmers. Farm size was found to be most allocative efficient resources while water was most inefficient resource of the farmers. It was also identified that four out of the six inputs used in production were used above their economic optimum levels. The major constraints of farmers were high cost of production, poor irrigation facilities and small farm size.

Agwu (2005) investigated the attitude of farmers in Okigwe agricultural zone of Imo State towards the National FADAMA Development Project (NFDP). Factor analysis was used to analyses the data collected. The findings of the study indicated that majority of the farmers had strong positive attitude towards the project. It was observed that majority of the adult males performed the following activities-application of herbicides, application of insecticides, land acquisition and field establishment in the FADAMA farms while adult females and children dominated in sowing and transplanting of seedlings, watering, weeding, harvesting, processing and market of produce. Farmers' level of participation was high in three technologies, namely, use of improved varieties, optimum plant population and timely planting of crops. The results further showed that the major constraint to the implementation of the project as perceived by the farmers was finance and governance problem.

Haruna (2005) studied the prospects and problems of production under irrigation in FADAMA areas of Bauchi State, Nigeria. The study sampled 120 vegetable farmers. Tools for data analysis used were descriptive statistics and Ginni Concentration Ratio (GRC). The result showed that the per capita land increased from 0.05ha for below 1.0ha farmers. There was tremendous increase in the yield of vegetables from 1991 to 1999. the vegetable growers also acquired many assets due to farming in the FADAMA areas. The important problems identified to be affecting vegetable

production include inadequate credit, high cost of farm inputs and inadequate marking outlets among others.

A study of characteristics and use of shallow wells in a stream side FADAMA was done by **Tarhule and Woo (1997).** The paper examined the occurrence and use of shallow wells in a typical FADAMA. The interplay of hydrologic and social considerations governing the location and use of seasonal, hand-dug wells in the FADAMA were also examined. Contrary to popular conception, children, women and men were found to be equally involved in the search for water, although large differences existed between ethnic and religious group. It showed that traditional patterns of water withdrawal were designed to accommodate the diverse interests of different groups and minimize the possibility of conflict. New technologies and policies when strengthened the water abstraction capacity of one group over other disrupted existing pattern and intensified discord between groups.

Profitability of vegetable farming under rainy and dry season production in Southern Nigeria was studied by **Bamire and Oke (2003)**. The study focused on land management practices as they affect profitability of vegetable producers in the dry and rainy seasons in Osun State. Data were analyzed using descriptive statistics and enterprise budget analysis. Producers were mostly stallholders owning 0.5ha to 2ha of land. Yield was higher in the rainy season while higher total revenue was obtained under the dry season conditions. Dry season proved to be more efficient.

Apantaku (2007) assessed community empowerment and women involvement components in National FADAMA II Project (NFDP II) in Ogun State. A sample of 240 FADAMA II beneficiaries was selected using a combination of purposive and random sampling methods. Data were collected by a structured interview schedule and focus group discussion. The study concluded that the NFDP II in Obafemi-Owode LGA successfully achieved the community empowerment and women involvement components of CDD in its implementation. Involvement of beneficiaries and especially women in the project was high and NFDP II had impacted on the level of income of members and contributed to community development. Some of the constraints facing the participants were long bureaucracy, delay in releasing funds, frequent and long meetings and insect pest attack.

Adesoji *et al* 2006 determined factors influencing the training needs of FADAMA farmers and drew implications for extension work in Osun State Primary data were collected from 150 FADAMA farmers while the data were analyzed using regression and factor analytical techniques. Six factors were isolated from the 26 variables with 66.22% contributes to training needs of FADAMA farmers. These included socio-economic, information, credit, resources, culture and training related factors. The result showed that while training factors had the lowest contribution (5.01%), socio-economic factors contributed the highest (21.48%) to the training needs among the factors. Also two important variables-level of education (b=1.701) and formal training attended (b=1.57) – were positively significant to the training needs of FADAMA farmers.

3. MATERIALS AND METHOD

3.1 Scope of the Study

The study covered the three senatorial districts or agricultural zones of the state namely, Edo North, Central and South. It is limited scope to areas with potentials for FADAMA farming. The

issues covered include socio-economic characteristics respondents, FADAMA land used pattern, credit, FADAMA technology, production revenue and constraints, problems associated with FADAMA farming and income of respondents.

3.2 Sample Technique

The Edo State Agricultural Development Programnme (EDADP) delineated the state into zone and identified the FADAMA communities in each zone, as shown in Table 3.1. Other areas equally identified by the researcher to have FADAMA potentials are noted in the table. In all, ten (10) communities were identified as FADAMA areas in Edo North zone, spread across five (5) Local Government Areas. In Edo South, eleven (11) FADAMA communities were identified spread six (6) Local Government Areas and in Edo Central, only two (2) communities were identified in one local government area. The total number of communities with FADAMA potentials is therefore 23. All the communities were purposively selected because they are few.
Using snow-ball sampling technique, fourteen (14) farmers involved in FADAMA farming were selected in each community, giving a total of 322 respondents. All the communities were selected to give the study a wide coverage.

3.3 Source of Data

Data analyzed in the study were collected from primary and secondary sources i.e. from the farmers and the ADP document respectively.

3.4 Data Collection Instrument

Two instruments (questionnaire and structural interview schedule) were used to collected data from the respondents. While questionnaire was used for the literate farmers, interview schedule was used for the illiterate farmers. Both open and close-ended formats were use in the instrument. The instrument was divided into seven (7) sections. Section 1 dealt with the socio-economic characteristics of the respondents; section 2 land use pattern; section 3 credit related issues; section 4 technology adoption; section 5 problems associated with FADAMA farming; section 6 extension related issues and section 7 income respondents.

3.5 Data Analysis Technique

Data were analyzed using frequency tables, percentages and mean while multiple regression was used to test hypotheses of the study. The Statistical Package for the Social Sciences (SPSS) version 15 was used to analyze the data.

4. RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Respondents

The socio-economic characteristics of the farmers studied are presented in Table 4.1 and discussed as follows:

4.1.1 Age of Respondents

Majority of the farmers sampled (38.5%) fell within the age bracket of 41-50 years. The mean age was 43 years, indicating that young and able-bodied men and women were the one engaged in FADAMA farming. In terms of age therefore, FADAMA farming has a bright future as it is not in the hands of old men. Only 6.0% were above 60 years. This finding may not be peculiar to Edo

State as studies carried out by Apantaku (2007), at Ogun State, and Adesoji, *et al.,* (2006) at Osun State show that men and women in their productive and active years of life (3-8 years) were involved in FADAMA farming.

4.1.2 Educational Level

The educational level of the respondents shows that 23.3% of them lacked formal education and so were illiterate. The bulk of them (41.5%) had primary education, 23.6% had secondary education while 11.6% had tertiary education. If literacy is defined as ability to read and write, it follows that as high as 76.7% of the respondents were literate. This goes to show that persons involved in FADAMA farming are literate and contrasts with the general perception and finding farmers in the rain-fed system (non-FADAMA farmers) are illiterate. A study carried out by Oladoja et al., (2006) at Lagos State recorded a literacy rate of 87.5% among FADAMA farmers, corroborating the high level of literacy found out in this study.

Sample 4.1 socio-economic characteristics of respondents

		Frequency	Percentage	Mean
Age (years)	20 & below	6	2.0	
	21-30	34	11.3	
	31-40	70	23.3	
	41-50	116	38.5	
	51-60	57	18.9	
	>60	18	6.0	
	Total	301	100.0	43
Educational level	No formal education	70	23.3	
	Primary education	125	41.5	
	Secondary education	71	216	
	Tertiary education	35	11.6	
	Total	301	100.0	7
Gender	Female	83	30.9	
	Male	208	69.1	
	Total	301	100.0	
FADAMA farming experience (years)	<6	102	33..9	
	6-11	76	25.2	
	12-17	52	17.3	
	18-23	26	8.6	
	24-29	19	6.3	
	30-35	16	5.3	
	>35	10	3.3	
	Total	301	100.0	12
Marital status	Married	242	80.4	
	Single	15	5.0	

	Divorce	8	2.7	
	Widow/widower	36	12.0	
	Total	301	100.0	
Family size	5 & bellow	118	39.2	
	6-9	126	41.9	
	10-14	47	15.6	
	15 & above	10	3.3	
	Total	301	100.0	7
major occupation (FADAMA farming)	No	143	47.5	
	Yes	158	52.5	
	Total	301	100.0	
Other occupation	Upland farming	106	35.2	
	Civil servant	30	10.0	
	Trading/business	88	29.2	
	Self employed	77	25.6	
	Total	301	100.0	
Income #	<50,000	114	37.9	
	100,001 – 150,000	74	24.6	
	150,001 – 200,000	26	8.6	
	200,001 – 250,000	9	3.0	
	>250,000	78	33.9	
	Total	301	100.00	291,400.28
Farm size (ha)	0.5 – 1.0	32	44.9	
	1.1 – 1.5	135	19.9	
	1.6 – 2.0	60	14.6	
	2.2 – 2.5	44	10.0	
	>2.5	3.0	10.0	
	Total	301	100.0	1.59

Source: *Author's Computation*

Being literate, it is expected that the respondents are disposed to adopt FADAMA technologies as it has been observed by researchers that literacy aids adoption (Onemolease 2004, Pkunlola, 2005).

4.1.3 Gender Distribution

The table also shows that both males and females participate in FADAMA farming. However, with 69.1% of the, being males and only 30.9% females, it is clear that men dominate thus system of farming. This aggress with the findings of Oladoja *et al.,* (2006). The male dominance in FADAMA farming could be predicated on two factors, namely, the fact that in a patrilineal

society like ours, males have right to land to the exclusion of females and the fact engage in other activities e.g processing and marketing.

4.1.4 Fadama Farming Experience

An analysis of the data concerning respondents' FADAMA farming experience shows that 33.9% of them had been practicing FADAMA farming for less than six years, 25.2% had been farming for 6-11 years, 17.3% for 12-17 years, 8.6% for 18-23 years, 6.3% for 24-29 years, 5.3% for 30-35 years and 3.3% for more than 35 years. The mean is 12 years. This indicates that the respondents were experienced in this system of farming. This average aggress with the 11 years average farming experienced reported by Oladoja, *et al.,* (2006) in their study of FADAMA farmers in Lagos State in 2006.

4.1.5 Materials Status

The marital status of the farmers shows that 80.4% married, 5.0% were single, 2.7% were divorced while the widows and widowers, constituted 12.0%. Majority (80.4%) of the farmers were married. The couples practiced FADAMA farming in addition to their rain-fed agriculture so that they could meet their family demands. In his research work, **Apantaku (2007)** observed the same trend as 75.0% of his respondents in FADAMA farming were married **Adesoji *et al.*, (2006)** opined that married farmers could utilize family labour both in the production and marketing of FADAMA crops.

4.1.6 Family Size

The data on the family size of the farmers indicates that 39.2% had a family size of 5 and below, 41.9% had between six 6-9, 15.6% had between 10 and 14 while 3.3% had 15 and above. The mean was seven (7). This suggests that the farmers had the work force to cope with FADAMA work. This situation reduces dependence on hired labour thus marketing the venture more profitable. **Apantaku (2007)** registered similar family size with a mean of eight.

4.1.7 Occupational Status

In distributing the farmers according to "nature of occupation" it was observed that 52.5% had FADAMA farming as their major occupation while 47.5% had other businesses. These other income generating activities included upland (rain-fed) farming (35.2%), civil service work (10.o%). Trading (29.2%) and self-employed activities, (25.6%). Majority (35.2%) were engaged in rain-fed agriculture in addition to FADAMA farming. This is a very healthy practice as the farmers would be occupied all the year round raising food for the family and additional income, instead of idling away in the slack period of the year. This promotes self-sufficiency in food production making food available throughout the year (**Adams 1986, Okunlola, 2005**)

4.1.8 Income

The income of the FADAMA farmers was very low. As many as 114 respondents (37.9%) earned less than #50,000 per annum. The mean was #291,400.25. The low income per annum was as result of concentration of food crops on small size farms (less than one hectare) and not planting high income yielding crops like sugar cane and rice and engaging in fish farming.

4.1.9 Farm Size

An analysis of the farm size of respondents shows that 10.6% of the FADAMA farmers farm on between 0.5-1.0ha, 44.9% had 1.1-1.5ha, 19.9% had 1.6-2.0ha, 14.6% farmed on between 2.1-2.5ha, and 10% farmed on over 2.5ha. The mean was 1.58ha. The farm size indicates that the respondents were peasant farmers operating on small farm sizes (Adesoji, *et al* 2006).

4.2 Source of Fadama Land

The sources of land used by the respondents are shown in Table 4.2. As many as 48.8% of the farmers got their Fadama land from family land, 29.6% rented their land, 14.3% farmed on community land, 5% on government land while 2.3% purchased the land they farmed on.

Table 4.2 Respondents' source of Fadama land

	Frequency	Percent
Family land	147	48.8
Rented	89	29.6
Community	43	14.3
Government land	15	5.0
Purchases	7	2.3
Total	301	100.0

Source: *Author's Computation*

Majority (48.8%) of the farmers used family land. This implies that conflict in its use would not be experienced (Mafimisebi and Mafimisebi., 2008) if they have to FADAMA resource of interest to others. It also means that they would not spend money in renting land, thus reducing production cost. Farmers would be able to plan how and when to use the land and what to use it for. Land purchased by 2.3% of the farmers would be subject to the above advantages. It thereby follows that only 48.9% of the farmers are likely to experience conflict, especially in the land (these farmers used rented, community or government land).

4.3 Fadama Land Use Pattern

Table 4.3 shows the types of farming that are carried out on the FADAMA land by the respondents. Majority (79.1%) of them engaged in crop farming. 7.6% in fish farming, 7.3% in both crop and fish farming, 7.0% in hunting, 5.6% in snail picking while 4.7% engaged in herb collection.

Table 4.3: Fadama land use pattern.

Farming Patterns	Frequency	Percentage
Crop farming	238	79.1
Fish farming	23	7.6
Crop/fish farming	22	7.3
Hunting	21	7.0
Snail picking	17	5.6
Herb collection	14	4.7

Source: *Author's computation*

As many 79.1% of the farmers engaged in (arable) crop farming. This trend was expected a farmers' first attraction is the planting of food crops to provide enough food for the family. This is in agreement with Haruna's finding (2005), which noted that farmers tend to allocate more land for food crops. It is interesting to note that some (4.7%) of the farmers reserve the land for herbs. Apantaku (2007) recorded either that farmers gather snails from FADAMA resource.
Other areas where farmers used credit were transportation of farm produce (51.7%), renting of land (44.8%), purchase of irrigation equipment (30.8%),buying of fingerlings (13.4%), installation of tube wells and wash bores (7.0%) and construction of fish pond (5.2%).

4.4 Fadama Technologies Adopted By Respondents

Table 4.11 shows the FADAMA technologies adopted by the respondents. Fertilizer was adopted by 61.5% of the farmers, 8.0% of them had discontinued the use of fertilizer while 30.5% of them never practiced the technology. The use of herbicides was adopted by 56.1% of the farmers, 5.3% had adopted using it, while 38.5% said they never used the technology. Insecticides were being used by 50.2% of the farmers, 3.7% of them no longer practiced it and 46.2% never adopted it. Improved varieties were adopted by 49.2% of the farmers, 2.3% have discontinued its use while 48.5% used local varieties.

Table 4.4: Technologies adopted by Respondents

	Adoption no longer using				**Never adopted**	
	Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**
fertilizers	185	61.5	24	8.0	92	30.5
herbicides	169	56.1	16	5.3	116	38.5
insecticides	151	50.2	11	3.7	139	46.2
improved varieties	148	49.2	7	2.3	146	48.5
control of flood water into farm	79	26.2	7	2.3	215	71.4
motorized pump	78	25.9	18	6.0	205	68.1
tube wells/wash bores	68	22.6	21	7.0	212	70.4
construction of irrigation channels	30	10.0	39	13.0	232	77.1

Source: Author's computation

Control of flood water into the farm was being practiced by 26.2% of the farmers, 2.3% had discontinued with the technology, while 71.4% never adopted it. Motorized pump was being used by 25.9% of the respondents, 6.0% had stopped its use, while 68.1% never used the technology. The used of tube wells and wash bores was adopted by 22.6% of the farmers, 7.0% of them had discontinued its use while 70.4% did not adopted it. Construction of irrigation channels was practiced by 10.0% of the respondents, 13.0% stopped using the technology while 77.1% never practiced it at all. In each of the cases above farmers discontinued the use of the technologies because of high cost.

4.5 Constraints of Adoption

Table 4.12 looks at the constraints to adoption experienced by the respondents. The constraints are costliness of the technology with a mean of 2.13, complexity of the technology with a mean of 1.88, non-availability with a mean of 1.37 and lack of interest with a mean of 1.7.

Table 4.5: Constraints of Technology Adopted by Respondents

Constraint	Mean	Std deviation
They are too costly	2.13*	0.879
They are complex to use	1.88	0.943
They are not available	1.37	0.879
Lack of interest	1.17	0.487

Source: Author's computation

The most serious constraints is the cost of the technologies with a mean of 2.13. Affordability of technology promotes its adoption. Once a technology is expensive, its adoption is low (**Ekong, 2003**; **Nwachukwu *et al*, 2005**).

It can be safely assumed that those respondents who discontinued the use of or never adopted some of the technologies were constrained by cost factor, Mafimisebi and Mafimisebi, (2008) in their work on FADAMA sugarcane in Southwestern Nigeria had similar finding where they observed that expensiveness of inputs caused non-adoption of technologies. Examples of these inputs are tubewells and washbores, construction of fish pounds and irrigation channels.

5. CONCLUSION AND RECOMMENDATIONS

The broad objective of the study was to examine the prospects of FADAMA farming in Edo State. It sought to understand how farmers in the FADAMA areas responded to FADAMA technologies, ascertain the credit acquisition and utilization pattern as well as their land use pattern including revenue. To achieve these objectives, data were collected from 301 FADAMA farmers sampled from 23 communities in the three senatorial districts in the State. The data collected were analyzed using frequency tables, percentages and mean while multiple regression was used to test the hypotheses of the study.

It was found out that majority (77.3%) of the respondents used personal saving for their FADAMA farming operations. High interest rate with a mean of 3.62 was the major cause of disincentive for borrowing from institutionalized credit sources by the farmers.

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