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Impact of Extension Services and Input Consultants' Activities on Crop Yields of Fadama III Additional Financing Farmers in Nigeria

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Abstract

The study examined the impact of the Advisory Services and Input Consultants (ASICs) activities on the crop yield of farmers under Fadama III AF. Multi-stage sampling procedure was used to select 800 respondents to whom questionnaires were administered, but 687 of the copies of the questionnaire were used. Data analysis was done using mean, frequencies, percentages and t-tests. Findings revealed that adoption and continuous use of quality pest and disease management technology were high among all the categories of farmers with 94.0%, 93.5%, 98.0% and 94.7% of the rice, cassava, sorghum and tomato farmers, respectively. Furthermore, the average crop yield per hectare for the enterprises was rice ($\bar{x}$=11.2 tons)*, cassava* ($\bar{x}$=29.1 tons)*, sorghum* ($\bar{x}$=1.33 tons) *and tomatoes* ($\bar{x}$=9.7 tons). *Meanwhile, inadequate funding/credit facility to implement knowledge gained* (188 points) *was the most severe constraint affecting adequate participation in ASIC activities. In addition, cassava* ($\bar{x}$=40,888.01) *and sorghum* ($\bar{x}$=1,658.37) *yields of the funded farmers were significantly higher than those of the non-funded farmers* ($\bar{x}$=15,322.47 *and* $\bar{x}$=426.67, respectively)*. ASIC activities improved crop yield of the farmers. Therefore, the ASIC approach to technologies dissemination should be sustained by the Fadama management team.*

Introduction

Nigerian Agriculture and the Fadama Project

The agricultural sector contributes immensely to Nigeria's Gross Domestic Product (GDP). It equally accounts for a sizeable number of jobs in the country. According to Akinnagbe, Ejiga and Akinbobola (2024) the sector contributes to the nation's economy through GDP increase, employment generation and food security attainment, while Lokpobiri (2019) noted that

subsequent governments, based on their understanding of the importance of the sector in reducing hunger, improving productivity and ensuring rural development, have launched different agricultural intervention programmes.

Furthermore, Ajulor and Etim (2019) observed that a nation's capability to fully utilise its agricultural production potential depends on the innovativeness of actors in the agricultural sector. This invariably implies that farmers' ability to improve and increase their productivity along the agricultural value chain is subject to availability, accessibility, affordability, adoption and utilisation of technologies.
Some years back, the Federal Government of Nigeria, through the pooled World Bank credit, came up with another rural development project called "Fadama". Fadama is a Hausa word meaning "irrigable land", "floodable plains" or "Akuro" in Yoruba Language. Fadama are low lying lands subject to seasonal flooding or water logging along the banks of streams and rivers or depressions (Sanusi, 2019). The successful implementation of Fadama I, II and III eventually gave birth to Fadama III Additional Financing (AF) I which became disbursement effective on February 11, 2014 and was designed to end in 2017.The main objective of the Fadama III AF was to increase the incomes of users of rural lands and water resources within the Fadama areas in a sustainable manner (World Bank, 2020).

Fadama III AF used bottom-up, Community-Driven Development (CDD), and value chain approaches which focused on improving farm productivity performance of clusters of farmers engaged in priority food staples (rice, cassava, sorghum and tomatoes) with export potential within the six core states comprising Anambra, Enugu, Kano, Kogi, Lagos, and Niger states (World Bank, 2020). Other production cluster states include Abia, Adamawa, Akwa Ibom, Bauchi, Benue, Cross River, Delta, Ebonyi, Edo, Ekiti, FCT, Gombe, Imo, Jigawa, Kaduna, Katsina, Kebbi, Kwara, Ogun, Ondo, Osun, Oyo, Plateau, Rivers, Sokoto, Taraba and Zamfara States in the country. However, Fadama III AF arranged its beneficiaries as Production Clusters (PCs) and Production Groups (PGs) instead of Fadama Community Association (FCAs) and Fadama User Groups (FUGs) as used in Fadama II, and III.

According to World Bank (2020), one of the six main components of Fadama III AF is Advisory Services and Input Support (ASIS). Advisory Services is a sub-component of ASIS which supports the transfer of know-how on proper utilisation of factors of production (fertilizers, improved seeds and agricultural machinery) including advice on the associated downstream activities. One of the strategies used in the implementation of the sub-component was the engagement of Advisory Services and Inputs Consultants (ASIC). The main duty of an ASIC was to provide hands-on support to beneficiaries on the use of best agronomic practices, within a maximum of 45 days during the cropping cycle of a specific priority staple, to boost agricultural productivity.

Fadama projects have generally been well studied and a number of studies have been carried out on Fadama III AF on state-wide basis. For instance, Mustapha, Abdullahi and Yusuf (2018) assessed Fadama III AF's impact on income and food security status in Sokoto State. Also, Nwoye and Nwalieji (2019) examined gender participation in the implementation of Fadama III AF. However, the impact of the activities of ASIC on actual yield of Fadama III AF farmers has not been adequately researched on a national scale.

Objectives of the study
This study was designed to investigate the impact of ASIC activities on the yield of Fadama III AF farmers in Nigeria.

The specific objectives of the study were to:
1. ascertain the technologies adopted by Fadama III AF farmers,
2. determine the yields of funded and non-funded Fadama III AF farmers; and
3. investigate the constraints affecting Fadama III AF farmers' participation in ASIC activities.

Hypothesis of the study

1. There is no significant difference in the yields of funded and non-funded Fadama III AF farmers.

Methodology

This study was carried out in Nigeria. Nigeria is between latitude 4^{o} and 14^{o} North of the equator, and longitude 3^{o} and 14^{o} East of the Greenwich Meridian. Nigeria has been divided into six geo-political zones; North central, Northeast, Northwest, Southeast, South-south and Southwest and further divided into 36 states in addition to the Federal Capital Territory (FCT). The economy in most states of Nigeria is mainly agrarian, perhaps because the soil is fertile, rich and suitable for agriculture.

The population of this study was all Fadama III users in Nigeria, while a quasi-experimental research design using the "after with control" type was adopted for the study. Funded Fadama III AF beneficiaries served as the treatment group, while non-funded beneficiaries served as the control group.

A multi-stage sampling procedure was used in selecting respondents from 12 (six core and six cluster) states within Nigeria. The first stage involved the purposive selection of Lagos, Kano, Kogi, Anambra, Enugu and Niger states because they are the core states of Fadama III Additional Financing Project in the country and random sampling of another six 'states', comprising a state each from five geo-political zones (apart from North central) and the FCT to represent the cluster states for the study since Kogi and Niger had already taken care of the North central zone. Therefore, Akwa-Ibom, Bauchi, Ebonyi, Kaduna and Osun states were randomly selected from South-south, Northeast, Southeast, Northwest and Southwest zones, respectively.

The second stage involved a random selection of 10 Production Clusters (PCs) comprising five funded and five yet-to-be-funded PCs from each state using a stratified sampling technique. This amounted to a total of 120 Production Clusters from 12 States in Nigeria. Lastly, seven respondents were randomly sampled from each PC from 10 out of the 12 states, while five respondents were randomly drawn from each of the 10 selected clusters in states where all clusters were funded (Niger and Bauchi). Therefore, 70 respondents each were therefore, sampled across enterprises from 10 out of the 12 states, while 50 respondents each were drawn from Bauchi and Niger states. Hence, a total of 800 copies of the questionnaire were administered. Meanwhile, after data cleaning, a total of 687 were found worthy for analysis.

Production Clusters/Groups' continuous use of adopted new technologies introduced to them was measured with a list of 25 newly introduced technologies. Response options of "not adopted", "adopted but discontinued" and "adopted and still using" were presented and assigned scores of 0, 1 and 2, respectively.

The yield for each of the different types of agricultural enterprises which include rice, cassava, sorghum and tomatoes was determined as the actual quantity of produce harvested per hectare. Thereafter, the mean yield of each type of agricultural enterprise was generated.

Constraints encountered in participating in ASIC under Fadama III AF were determined by providing respondents with 13 constraint items. They were asked to tick as many as were applicable to them. The number of ticked responses was later aggregated as points and ranked from the first to the thirteenth.

Data were analysed using frequency and percentages, mean, standard deviation and T-test at a 5% level of significance.

Results and Discussion

New Technologies Adopted and Used Continuously

As shown in Table 1, respondents were introduced to different technologies by the ASICs. Generally, the adoption and continuous use of quality pest and disease management practices was high among all the enterprises with rice (99.0%), cassava (93.5%), sorghum (98.0%) and tomatoes (94.7%). The adoption and continuous use were equally high for the four crops in respect of timely weeding. Improved varieties of cultivars were mostly adopted by cassava (97.8%) and rice farmers (80.9%). Meanwhile, there was moderate adoption of the same by sorghum farmers (59.2%).

Calibration of tractors was adopted and continuously used by all the cassava farmers (100.0%). In addition, ploughing across slopes to tackle erosion was more adopted by the cassava farmers as well (96.8%) compared to respondents from other enterprises. The same proportion of respondents also adopted the cultivation of cassava stems not over one year old as well as the use of environmentally friendly cassava production techniques, adherence to number of 5-6 nodes per stem cutting, adherence to appropriate application of fertilizer to crop and safe use of agrochemicals and pesticides. Safe and effective use of agrochemicals and pesticides also recorded a large number of adopters among rice (90.9%) and sorghum (98.0%) farmers. Plant spacing also recorded a large number of adopters among rice farmers (95.6%). The use of improved processing methods was high among rice (82.2%) and sorghum (98.0%) farmers, just like the use of pallets for stored products (92.0 and 98.0% respectively). The use of pallets for stored products was also high among tomato farmers (89.5%)

Nursery establishment was also adopted by the majority of the respondents for enterprises like rice (74.8%), sorghum (71.4%) and tomatoes (100.0%). Meanwhile, the use of lime to reduce acidity recorded high adoption among sorghum (79.6%) and tomatoes (100.0%) farmers, while moderate adoption was recorded among rice farmers (52.7%), just like the use of organic fertilizer (91.8, 100.0 and 57.4% respectively) was high among tomatoes. The use of liquid fertilizer however had a slightly different mode of adoption with sorghum, tomatoes and cassava farmers having 87.8, 94.7 and 70.0% respectively. Varietal trials recorded high adoption among rice (70.5%), sorghum (89.8%) and tomatoes (94.7%) farmers, while water management only recorded high adoption among rice (71.7%) and sorghum (77.6%) farmers. The adoption of the false bottom processing technique also recorded high adoption (86.6%) among rice farmers. It is therefore expected that the level of adoption of the new technologies would trigger impactful yields. This corroborates the findings of Madu (2019) which revealed that improved seeds, spacing for planting and improved storage were some of the technologies adopted by Fadama III women farmers.

Table 1: New technologies adopted and being used

Items	Still Using			
	Rice (n=298)	Cassava (n=93)	Sorghum (n=49)	Tomato (n=19)
Improved varieties – TME 419, TMS 30572, Sawah and Faro 44 etc.	80.9	97.8	59.2	0.0
Calibration of tractor ridgers (implement) to 90cm apart along the rows.	NA	100.0	NA	NA
Ploughing across the slope to prevent erosion.	31.2	96.8	53.1	5.3
Proper cassava plant spacing at 90cm x 75cm.	NA	96.8	NA	NA
Adoption of cassava stems not over one year old.	NA	96.8	NA	NA
Environmentally friendly cassava production and use of personal protective equipment.	NA	96.8	NA	NA
Mechanical planting of cassava stems.	NA	44.1	NA	NA
Adherence to number of 5-6 nodes per stem cutting.	NA	96.8	NA	NA
erence to appropriate application of fertilizer to crop.	64.4	96.8	22.4	0.0
Planting of rice at 1ft x 1ft spacing at regulated seed rate per hole instead of broadcasting.	95.6	NA	NA	NA
Safe and effective use of agrochemicals.	90.9	96.8	98.0	5.3
Use of improved processing method to conform with best practices – stainless steel equipment.	82.2	25.8	98.0	0.0
Use of pallets for stored products.	92.3	40.9	98.0	89.5
Quality pest and disease management.	99.0	93.5	98.0	94.7
Timely weeding.	97.0	71.0	71.4	100.0
Nursery establishment.	74.8	NA	71.4	100.0
Use of lime to reduce soil acidity.	52.7	24.7	79.6	100.0
Use of organic fertilizer.	57.4	44.1	91.8	100.0
Use of liquid fertilizer.	47.0	70.0	87.8	94.7
Varietal trials.	70.5	53.8	89.8	94.7
Water management.	71.1	48.4	77.6	5.3
Sheaf harvesting.	47.7	NA	55.1	NA
Quality processing via false bottom.	86.6	NA	NA	NA
Bird scaring.	48.7	NA	42.9	NA
Storage and storage methods	11.7	0.0	18.4	0.0
Adherence to cropping calendar	12.1	0.0	18.4	0.0

Source: Field survey. ***NA = Not Applicable**

Crop Yield Across Enterprise

Table 2 shows that the mean current yield of rice was about 11.2 tons per hectare, while that of cassava was 29.1 tons per hectare. In the same vein, sorghum recorded 1.33 tons per hectare, while tomatoes recorded 9.7 tons per hectare. In comparison with yields in other climes, the rice and tomatoes farmers performed better than those of the rice and tomatoes farmers in China and Ethiopia who had 8.8 tons and 9.4 tons per hectare respectively as stated by Deng, Grassimi and Peng (2019) on rice and Brasesco, Asgedom and Casari (2019) on tomatoes. However, the yields of the cassava and sorghum farmers was lower than 34 tons and 3.3 tons per hectare recorded in Thailand and South Africa respectively as reported by Peuo, Mimgratok, Chimliang, Kenjiro, Chaikul and Peuo (2020) for cassava and Esterhuizen (2020) for sorghum. Therefore, the rice and tomato farmers' global competitiveness was strong, while it was low for cassava and sorghum farmers

Table 2: Crop yield across enterprises

Enterprise	Yield categories in KG	Non-funded	Funded	Total	Mean
Rice	Less than 1, 000 kg	31 (7.8)	14 (3.5)	45 (11.3)	11,236.90± 77,854.39
	1,000 - 50,000 kg	69 (17.3)	282 (70.5)	351 (87.8)	
	50,001 - 100,000 kg	1 (0.3)	0 (0.0)	1 (0.3)	
	100,001 - 150,000 kg	1 (0.3)	0 (0.0)	1 (0.3)	
	150,000 Kg and above	0 (0.0)	2 (0.5)	2 (0.5)	
	Total	**102 (25.5)**	**298 (74.5)**	**400 (100.0)**	
Cassava	Less than 1, 000 kg	29 (14.4)	37 (18.4)	66 (32.8)	29,059.18± 45,227.35
	1,000 - 50,000 kg	51 (25.4)	55 (27.3)	106 (52.7)	
	50,001 - 100,000 kg	17 (8.5)	1 (0.5)	18 (9.0)	
	100,001 - 150,000 kg	5 (2.5)	0 (0.0)	5 (2.5)	
	150,000 Kg and above	6 (3.0)	0 (0.0)	6 (3.0)	
	Total	**108 (53.7)**	**93 (46.3)**	**201 (100.0)**	
Sorghum	Less than 100 kg	12 (17.9)	4 (6.0)	16 (23.9)	1327.47± 1093.26
	101 - 1,000 kg	3 (4.5)	9 (13.4)	12 (17.9)	
	1,001 - 2,000 kg	3 (4.5)	21 (31.3)	24 (35.8)	
	2001 - 3000 kg	0 (0.0)	12 (17.9)	12 (17.9)	
	3,001 Kg and above	0 (0.0)	3 (4.5)	3 (4.5)	
	Total	**18 (26.9)**	**49 (73.1)**	**67 (100.0)**	
Tomatoes	Less than 1, 000 kg	0 (0.0)	12 (63.2)	12 (63.2)	9,715.79± 9,892.25
	10,001 - 20,000 kg	0 (0.0)	4 (21.1)	4 (21.1)	
	20,001 - 30,000 kg	0 (0.0)	3 (15.8)	3 (15.8)	
	Total	**0 (0.0)**	**19 (100.0)**	**19 (100.0)**	

Source: Field survey

Constraints to Full Participation in ASIC Activities Under Fadama III AF Project

Table 3 shows that inadequate funding/credit facility to implement knowledge gained (188 points), late supply of farm inputs (177 points) and non-payment of counterpart funds by state and LGAs (170 points) were the three highest-ranking constraints to the full participation of the beneficiaries in enjoying ASIC services. This implies that the beneficiaries still require advisory services in the area of linkage to credit sources. In addition, the timely delivery of inputs by input suppliers and the required support from state and local government administrators especially in terms of counterpart funding constitute serious bottlenecks in the adequate participation of the farmers in ASIC activities. Similarly, Nwoye and Nwalieji (2019) identified an untimely supply of inputs as a serious constraint to the participation of male and female farmers in the implementation of Fadama III AF project.

Table 3: Constraints to participation in ASIC activities

Constraints	Frequency
Inadequate funding/credit facility to implement knowledge gained	188
Late supply of farm inputs	177
Non-payment of counterpart funds by state and LGAs	170
High cost of transportation to access support	169
Administrative bottlenecks and bureaucracy in release of capital funds	153
Inadequate extension service	145
Inadequate land for experimenting learned techniques	132
Inability to pay beneficiary contribution	106
Inadequate training and retraining of participating food crop farmers	103
Inadequate improved seeds for planting	78
Lack of information about the project	72
Poor quality of agricultural inputs	60
Ineffective leadership of PC and PG	51
Herdsmen invasion of farmland	14

Source: Field survey

Impact of ASIC on Crop Yield Across Enterprise

Table 4 shows that there were significant differences in the yields of funded and unfunded cassava (t=4.16) and sorghum farmers' (t=4.69) whereas, there was no significant difference in funded and unfunded rice farmers' yields (t=0.697). The results indicate that ASIC intervention had an impact on the yields of cassava and sorghum farmers in the study area. The results imply that ASIC activities impacted the yields of crops across the enterprises. The findings align with that of Yitayew, Abdulai and Yigezu (2023) that advisory services and technology channeling had positive and significant effects on crop yields in a similar study in Ethiopia,

Table 4: Difference in crop yield of funded and not funded respondents

Enterprise	Mean		Df	t-value
	Unfunded	Funded		
Rice farmers' yield	6593.73	12826.16	398	0.697
Cassava farmers' yield	15322.47	40888.01	199	4.16**
Sorghum farmers' yield	426.67	1658.37	65	4.69**

****P≤0.05**

Conclusion and Recommendations

Production clusters and groups were able to adopt various technologies such as quality pest and disease management, improved varieties of cultivars and other best agronomic practices on a continuous basis. Although, the farmers faced serious challenges in their participation in ASIC activities which included inadequate funding/credit facility to implement knowledge gained, late supply of farm inputs and non-payment of counterpart funds by state and LGAs, the ASIC activities directly impacted the levels of yield of cassava and sorghum, while there were substantial improvements in the yields of rice and tomatoes.

Therefore, practical approaches to extension delivery used by the ASICs should be sustained. Also, the ASICs should channel more efforts in advisory services that will facilitate the linkage of farmers to credit sources. Furthermore, all the stakeholders in Fadama III AF project should ensure that input suppliers deliver to time. Lastly, the Project Implementation Units should engage in more advocacy to make state and local government administrators live up to their responsibilities, especially in the provision of counterpart funding for projects.

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