

## Fadama Maize Production in Nigeria: Case Study from Kwara State

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**Abstract:** Against the background of the recently launched second Fadama Development Project, this paper examines the economics of fadama maize production in Kwara state, north-central Nigeria. Sample survey data were collected in 2006, from 120 randomly selected fadama farmers in the state. We found that the average gross margin was 75707 naira per hectare (US \$ 631) and 1676 naira per man-day (US \$ 14). This suggests high profitability of fadama maize production. Purchased inputs and labour are the major determinants of fadama maize output. To achieve the objective of the second Fadama Development Project of increasing food production in Nigeria, it is recommended that, in addition to providing loan for fadama farmers to procure other necessary inputs, purchased inputs-like seed, agrochemicals and fertilizer, should be given to them to boost their output. Adaptable, simple and low-cost fadama production technology should be developed for fadama farmers to reduce the current level of labour inefficiency.

**Key words:** Fadama development project, fadama farmer, maize, gross margin, Nigeria

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### INTRODUCTION

Maize (*Zea mays* L.) is a major staple cereal crop of great importance in many countries of sub-Saharan Africa (SSA). Its production in west and central Africa has witnessed a phenomenal increase in the last two decades. This according to IITA<sup>[7]</sup>, is as a result of the introduction of high-yielding, drought-tolerant and early maturing varieties coupled with the activities of several collaborative research in the region. For instance, its annual production growth rate in the region for the period 1983-1992 was 4.1% while it was 0.9% in eastern and southern Africa for the same period. Land area planted to maize has also increased on the average by 2.7% annually in west and central Africa.

Maize has been in the diet of Nigerians for centuries. It is the third most important cereal crop after sorghum and millet<sup>[13]</sup>. The cultivation of maize was formerly for subsistence purpose, but it has gradually become an important commercial crop on which many agro-allied industries depend on as the raw material<sup>[8]</sup>. The total land area planted to maize in 2003 in Nigeria was about 4.7 million hectares with an estimated output of about 5.2 million metric tonnes<sup>[4]</sup>. The output increased by 14.5% to 5.9 million metric tonnes in 2005 (Table 1). Until recently, the bulk of the maize grain produced in Nigeria was from the south-western zone. Ogunbodede and Olakojo<sup>[11]</sup>,

reported that 50% of maize output is from the south-western zone while the remaining 50% is shared between the northern and the eastern zones. Though a larger proportion of green maize is still produce from the south-western zone, the dry grain production has shifted dramatically to the northern guinea savannah, which is now regarded as the maize belt of Nigeria<sup>[8]</sup>. Reasons for this shift include among others, increased demand and government partial ban on the importation of some cereal crop, which geared up local production.

Maize is important as a food security crop-it meet the consumption and income needs of the households, and as an important component of livestock feeds. Its production is therefore important in meeting the food need of the poor rural households in particular and Nigeria in general. The production of maize has always been under the rain fed system, but this has proven to be insufficient in meeting the need of the population especially during the dry season. Additionally, the demand for all-year-round green maize can not be met under the rain fed cropping system. Large-scale irrigation production is highly capital intensive and small-scale farmer often lack the ability to operate and manage irrigation systems. Because of these reasons, production of maize under the fadama system has been receiving increased attention following the introduction of the first National Fadama Development Project (NFDP) in the early

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**Table 1:** Output of major cereal crop in Nigeria, 1990 – 2005 (1000 metric tonnes)

Year	Sorghum	Millet	Maize	Rice	Wheat
1990	4185	5136	5768	2500	50
1991	5367	4109	5810	3226	60
1992	5909	4501	5840	3260	40
1993	6051	4602	6290	3065	32.6
1994	6197	4757	6902	2427	35.2
1995	6997	5563	6931	2920	43.6
1996	7084	5681	5667	3122	47
1997	7297	5902	5254	3268	66
1998	7516	5956	5127	3275	98
1999	7520	5960	5476	3277	101
2000	7711	6105	4107	3298	73
2001	7081	5530	4596	2752	51
2002	7534	5884	4890	2928	54
2003	8016	6260	5203	3116	58
2004	8578	6699	5567	3334	62
2005	9178	7168	5957	3567	66

Source: FAO, 2006a

1990s. One of the goals of the fadama project is to enable farmers to produce food throughout the year. Fadama farming does not require large capital input or specific management skills and these make it more adaptable by small-scale farmers.

The objective of this paper is to contribute to the understanding of maize production under the fadama cropping system. Specifically, the study will examine the socioeconomic characteristics of fadama farmers, assess the profitability and identify the factors affecting fadama maize production in Nigeria, using Kwara state as a case study. The remainder of the paper is divided into four sections. Section 2 gives an overview of the food security situation and the fadama development project in Nigeria. Section 3 describes the data and socioeconomic characteristics of fadama farmers, section 4 discusses the result while section 5 concludes the paper with policy recommendations.

**Food Security Situation and National Fadama Development Project:** In Nigeria, despite the fact that average dietary calorie intake has increased over the past two decades, it is believed that over 40% of the population are still living below the minimum dietary calorie intake. Average per capita calorie intake increased from 2050 kcal in 1979 to 2430 kcal in 1989 and further increased to 2700 kcal in 2003. As a result of this, the proportion of chronically undernourished people fell from 13% in 1992 to 9% in 2005<sup>[5]</sup>. It is generally believed that agriculture is the mainstay of the Nigerian economy and that it provides over 80% of the food needs of the country. The neglect of the agricultural sector by successive government has led to a decline in per capita domestic food production, thereby creating a gap between national food supply and demand. Food importation has been increasing and this has created a lot of concern with regards to increased share of food import bill in total Gross Domestic Product (GDP).

Nigerian agriculture is mainly rain fed and is characterized by low land and labour productivity. There are two main cropping seasons based on early and late rainfall periods<sup>[2]</sup>. Nigeria has a great potential for the production of high-value vegetables and cereals during the dry season. This is because the country is endowed in underground water reserves. Given the need to utilize this potential resource and ensure continuous cultivation to generate the dry season farm income, government initiated the first National Fadama Development Project in the early 1990s. The project was to develop small-scale, simple, low-cost, farmer-managed irrigation scheme under the World Bank financing. The development of the fadama project also came from the realization that supplementary dry season irrigation farming is essential to meet the food need of the growing Nigerian population.

Fadama is a local name for low-lying flood plains usually with easily accessible shallow groundwater. Blench and Ingawa<sup>[3]</sup>, define it as flood plains and lowly areas underlined by shallow aquifers and found along Nigeria's river systems. Fadama have been a source of income to many users such as farmers, pastoralists, fishermen, and hunters etc, who depend directly or indirectly on the fadama resources for their livelihood<sup>[1]</sup>. The first fadama development project (Fadama I), which was implemented between 1993 and 1999, was executed in seven core states of Bauchi, Gombe, Jigawa, Kano, Kebbi, Sokoto and Zamfara. Following the widespread adoption of the fadama technology, farmers realized income increases of up to 65% for vegetables, 334% for wheat and 497% for rice. The economic rate of return at completion was 40% compared to an estimated 24% envisaged at conception level. Evaluation of fadama I show that non-involvement of the farmers in project planning, non-consideration of marketing and processing and ignoring of other fadama resource users were the major limitations to the achievement of the full potentials.

Impressed by the achievement of Fadama I, government approached the African Development Fund and the World Bank for financial support towards the second Fadama Development Project (Fadama II). The ADF approved a credit facility of UA 22 million (US \$ 30.8 million) in December 2003 and the Fadama II commenced in June 2004 in six states of Borno, Jigawa, Katsina, Kogi, Kwara and Plateau. The project duration is six years and the participating states were selected based on several criteria such as; a written proposal for both upstream and downstream post-harvest activities, commitment for regular payment of counterpart funding to be deducted at source, evidence of project management team and operational and active fadama resources user group and a record of Fadama I loan recovery rate of at least 75%, among others.

The Fadama II objective is to sustainably increase the incomes of fadama users—those who depend directly or indirectly on fadama resources (farmers, pastoralists, fishers, hunters, gatherers, and service providers) through empowering communities to take charge of their own development agenda, and by reducing conflict between fadama users. The project has three components—capacity building and advisory services, community infrastructure development and project coordination and management. The main features include, empowering the farmers, supporting the provision of market infrastructure, improving the conflict resolution mechanism, supporting rural and non-farm enterprises, focussing on the contribution of women and supporting increased food production and efficient management of fadama resources<sup>[6]</sup>. The implementation is to be carried out through the bottom-top approach—individual farmer are coordinated by the community level project implementation committee, who are themselves coordinated by the local government level project implementation committee. The local government level project implementation committee is coordinated by the state level project implementation committee, while the state committee is coordinated by the federal level project implementation committee. The take off of the Fadama II represents one of the ambitious step by the government to achieve the goals of reducing hunger in the country, however, achieving the stated objectives will not only require good execution and management but also the avoidance of factors that caused the failure of similar projects in the past.

## MATERIAL AND METHOD

**Data:** Data for this paper was collected from fadama farmers selected from Kwara state, north-central zone of Nigeria. Kwara is one of the six states selected for the implementation of the second Fadama Development Project. Kwara state is the gateway between the northern and southern zones of Nigeria and the nationwide living standard measurement survey (LSMS) conducted in 2004 shows that the state is among the six poorest in Nigeria<sup>[10]</sup>. The State has a total population of about 2.4 million people, out of which 70% can be classified as peasant farmers. The farming system in the state is characterized by low quality but surplus land, low population density and cereal-based cropping pattern. Farm enterprises are generally small in size, so that – in spite of own production – most households are net buyers of food, at least seasonally<sup>[9]</sup>. Kwara state has a large lowland areas that are often flooded and water-logged during the rainy season but retain enough moisture during the dry season for fadama production. Though crops such as rice,

vegetables are also grown, maize is the predominant crop under farming farming in the state. Fadama maize farming constitutes an important income source as well as a risk-minimizing option for farmers especially in years of poor rainfall.

Our sample, which consists of 120 fadama farmers, was randomly selected from the list of participating fadama farmers in the state. Out of the sixteen local government areas in the state, only ten is currently participating in the Fadama II scheme and of these ten local government areas, the project is operational only in Oyun and Moro local government areas at the time of this study. Data on input, output, socioeconomic characteristics and production constraints were collected using structured questionnaire and interview schedule. Descriptive, gross margin and regression analyses were carried out and the results are presented in the following sections.

**Characteristics of Fadama Farmers:** The characteristics of sampled fadama maize farmers are presented in table 2. The average household size of ten is higher than the national average but more surprisingly is that, majority of the households (41%) have between ten to fourteen people in their household. About 5% of the households are headed by women. Only about one-fifth of the farmers have secondary school education and above, while more than 60% of the farmers have no formal education. Majority have less than 10 years of experience in fadama maize farming, while about 21% have more than 19 years of experience. The average farm size of 1.41 ha is quite high in the area, though about half of the farmer have fadama farm that is less than one hectare. Approximately 90% of the farmers use either family or community land for growing maize. The scarcity of labour limited majority of the farmers to using family labour, only about 10% used hired labour in addition to family labour.

Yam and maize crop combination is the most popular cropping system in fadama production. This is probably because the two crops are in high demand. Maize/cassava combination is the second most popular cropping system. The major problems of fadama maize farming are flooding and pest infestation. Other problems are land acquisition problem, conflicts among farmers and pastoralists and inaccessible road for transporting farm produce.

## RESULTS AND DISCUSSION

**Profitability of Fadama Maize Farming:** The average cost-benefit analysis of fadama maize production, disaggregated between the two selected local government areas is shown in table 3. The result

**Table 2:** Household characteristics

Characteristics	Percentage
<i>Gender of household head</i>	
Male	95.0
Female	5.0
<i>Household size</i>	
1 – 4	15.8
5 – 9	22.5
10 – 14	40.8
More than 14	20.9
<i>Age of household head (year)</i>	
21 - 34	13.3
35 - 44	26.6
45 - 54	42.5
More than 54	17.5
<i>Education of household head</i>	
No formal education	63.3
Primary education	17.5
Secondary education	10.8
Postsecondary education	8.3
<i>Farming experience (year)</i>	
1-9	73.3
10-19	5.8
More than 19	20.8
<i>Farm size (ha)</i>	
Less than 1	52.8
1 – 2	41.4
More than 2	5.8
<i>Method of land acquisition</i>	
Family land	33.3
Rented land	9.2
Communal land	57.5
<i>Sources of labour</i>	
Family labour	71.7
Hired labour	5.0
Communal labour	12.5
Family and hired labour	10.8
<i>Crop combination</i>	
Maize only	14.2
Maize and cassava	23.3
Maize and yam	39.2
Maize and vegetable	8.3
Maize, cassava, yam and vegetable	15.0
<i>Production constraints</i>	
Damage by pests and flood	40.0
Inadequate fund	20.8
Labour shortage	8.3
Other problems	30.9

Source: field survey, 2006.

**Table 3:** Economics of fadama maize production<sup>a</sup>

	Oyun (N = 50)	Moro (N = 70)	Overall (N = 120)
Farm size cultivated (ha)	2.03	0.97	1.41
Labour input (man-days) <sup>b</sup>	84.4	48.9	63.7
Gross revenue (naira)	145285.0	100725.0	119291.7
Gross cost (naira)	8404.2	15502.6	12544.9
Gross margin (naira)	136880.8	85222.4	106746.8
Gross margin/hectare	67428.9	87858.1	75706.9
Gross margin/man-day	1621.0	1742.1	1675.8

Source: computed from survey data, 2006.

Note: Official exchange rate in 2006: 1 US dollar = 120 naira.

(a) the figure shown are average for the sample farmers

(b) labour input was calculated by converting all labour input to man-day equivalent and that is why we have decimal numbers instead of round figure

indicates that on the average 64 man-days of labour was used on the fadama maize farm per year with an average farm size of 1.41 ha. Total gross margin was 75707 naira (US \$ 631) per ha or 1676 naira (US \$ 14) per man-day. This shows that fadama farming is highly profitable than the convectional rain fed agriculture. For instance Omonona<sup>[14]</sup>, found that the gross margin for maize production under the rain fed agriculture in Osun state was 13670 naira (US \$ 114) per ha.

Our result also shows that the cost of labour accounts for the largest share of total cost of production. The result, which is not shown on the table, indicates that imputed cost of family labour account for over 60% of the total cost of production. This result is consistent with other similar studies that have found labour accounting for the largest share of total cost in farm production<sup>[12]</sup>. Furthermore, we found that the maize/vegetable crop combination is the most profitable among the different crop combinations. This is probably because of the high value attached to dry season vegetable and maize among urban dwellers, who are the major consumers of fadama produce.

With regards to the area under cultivation, we found that the largest area is devoted to the cultivation of yam/maize crop combination in the study area. This makes sense because green maize easily finds market among urban dwellers, while yam could be transported after harvest to several northern cities and even neighbouring countries for sale. Considering the profitability of fadama maize farming, we found that, though smaller area is under cultivation in Moro, maize production is more profitable in Moro than Oyun local government area in terms of gross margin per ha and per man-day. The implication of this is that, there is need for intensification of fadama farming in Moro, to exploit the full potential of the higher profitability.

**Determinants of Fadama Output:** To assess the determinants of fadama maize output, we carry out a regression analysis to model the value of maize output in naira, as a function of several independent variables. The result of the regression estimate is presented in table 4. The result shows that about 81% of the variation in output is accounted for by the inputs included in the model. The regression F-value of 86.3 also suggests that the model is adequate. Regression estimates show that irrigation water, farm size, capital, purchased inputs and labour have positive relationship with output. However, only purchased inputs and labour are significantly related to maize output. When other factors are constant, a 1% increase in value of purchased input use will increase value of output by 2.8%. Similarly, a 4.3% increase in output would result from a 1% increase in labour input, other things remaining constant.

**Table 4:** Determinants of fadama maize output (OLS estimate,  $N = 120$ )

Independent variables	Coefficient	t-value
Irrigation water (ha cm <sup>3</sup> )	36.3	1.63
Farm size (ha)	9.69	0.53
Capital (naira)	1.03	0.34
Purchased inputs (naira) <sup>a</sup>	2.77	6.36***
Labour (man-day)	4.31	17.7***
Constant	9401.2	0.33
R <sup>2</sup>	0.81	
F-value	86.3	

Dependent variable is log of the value of maize output in naira from fadama farming

\*\*\*, indicate coefficient significant at 1% level.

(a) purchased inputs include agrochemicals, seeds and fertilizer

Analysis of efficiency of resource use indicates that the marginal value productivity (MVP) of purchased inputs is higher than its average market price, implying that purchased input is under-utilized by the fadama farmers. One of the reasons for this could be the high cost of farm inputs notably agrochemicals and fertilizer. On the other hand, the MVP of labour is lower than the average market wage of labour, indicating that labour is over-utilized in fadama farming. This result agrees with other similar studies, which have found excessive utilization of labour in subsistence agriculture. The over-utilization could be as a result of excessive reliance on abundant family labour that is usually neither valued nor compensated.

**Conclusion:** Against the background of the recently launched second National Fadama Development Project, this paper examined the economics of fadama maize production in Kwara state, north-central Nigeria. Survey data were collected in 2006 from 120 randomly selected fadama farmers in two local government areas of the state. Result shows that majority of the farmers are male and with no formal education. Average farm size is about 1.41 ha and majority have relatively short years of experience in fadama farming. Nearly all the farmers are using either family or community land and they rely largely on family labour for fadama production. The cost-benefit analysis indicates that fadama farming is generally profitable with higher land and labour productivity compared to rain fed agriculture in the area. However, purchased inputs and labour resources are not been use efficiently at present and this implies that profit could still be increased if the use of these resources are brought to optimal level. The implication of this study for increased food production in Nigeria is that for fadama farmers to realise increased yield that would meet the objectives of the National Fadama Development Project, there is need to supply them with seeds, agrochemicals and fertilizer free or at reduced cost. They should also be train through the extension service system on how to

use these inputs efficiently in order to avoid over or under-utilization. Secondly, adaptable, simple and low-cost fadama production technology should be developed for fadama farmers to reduce the current level of labour inefficiency. Finally, government should help fadama farmers to remove the production constraints of flooding and inadequate fund, by putting in place good water management practices and provision of a revolving loan to individual fadama farmers.

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