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Deliverable No. 10

Yield, Cost and Income Survey

Training and Management of 10,000 (5,000 per State) Out Growers in Dry Season Maize Value chain Development Project in Kaduna and KanoStates

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Subcontract No. 130

Deliverable No. 10

Economic Analysis Report

For

Dry season Maize Production in Kaduna and Kano States

(Sabon-Gari, Zaria, Ikara, Kubau, Kaduna-North, Kaduna-South & Bagwai, Garun Mallam, Tudun Wada, Bunkure, Dawakin Tofa, Kura, Makoda, Madobi, Gwarzo, Gabasawa)

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Executive Summary

The 2017 USAID MARKETS II Dry Season Maize Project targeting 5,000 maize out growers was conducted in both the two States of intervention, making a total of 10,000 farmers. The 2017 Economic analysis of the dry season maize projects in Kaduna and Kano States became important to compare costs with the associated benefits so as to determine their returns. The study was conducted using a pre-determined sample size of 133 farmers comprising 79 (both sexes) farmers and 54 (both sexes) farmers from Kaduna and Kano areas respectively. A questionnaire was designed purposely to draw data from the selected sample and about 10 Extension agents were duly assigned to administer the instrument. In terms of analysing the data, descriptive statistics such as percentages, frequency distribution and minimum-maximum values were used to determine the socio-economic characteristics of the respondents such as gender and farm size. The analytical techniques adopted for the survey include; profit determination and internal rate of return (IRR) were used to estimate returns to the farmers in cobs per hectare. The gender of the respondents in the project locations showed that there were 56 and 44 percent female and male respectively in Kaduna, while in Kano there were 39 and 61 percent female and male respondents respectively. The mean farm size were 0.62 and 0.61ha in Kaduna and Kano respectively. The minimum and maximum farm holding were the same 0.1 and 2.0ha for the two locations. The average total cost of production per hectare were N200,200 and N186,980 in Kaduna and Kano respectively.. The mean total output of maize per hectare were 62,000 and 64,000 cobs per hectare in Kaduna and Kano. The mean selling price of the maize was N25 and N15 per cob in Kaduna and Kano. The net profitability level was N1,349,800 and N773,020 per hectare in Kaduna and Kano. The IRR values were all greater than the discount rate and these suggest economic viability of the project. The farmers were observed to have ready markets for the irrigated maize as they sell in about three different markets in both the States. From the results of the study, it was noticed that there was increased cost of production per hectare compared to the previous year; the fuel price, inputs and labour but this has been taken care of by increased yield as well as market selling price, especially in Kaduna where the selling price per cob almost doubled. The farmers advocated that; the project has served as source of improved income generation and better livelihood for them and their families. The report also using profit determination and internal rate of return concluded that, the project in the two targeted locations are viable and sustainable.

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1.0 Introduction

1.1 Background

The USAID MARKETS II Dry Season Maize program in Kaduna and Kano States targeted 10,000 maize out-growers at 5,000 farmers per State for increased productivity in the maize value chain in selected locations. The project employed networking of farmers into groups, training of farmers on recommended improved practices in maize production, establishment of demonstration plots to showcase best practices together with farmers' plots, linkage to agro-input dealers and produce markets through up-takers schemes to achieve its project objective. The project locations include Sabon-Gari, Zaria, Ikara, Kubau, Kaduna-North, Kaduna-South & Bagwai, Garun Mallam, Tudun Wada, Bunkure, DawakinTofa, Kura, Makoda, Madobi, Gwarzo, Gabasawa in Kaduna and Kano States respectively. The project was implemented from September 2017 to June 2017.

Maize is one of the most important cereal crop in sub-Saharan Africa (SSA) and an important staple food for more than 1.2 billion people in SSA and Latin America. All parts of the crop can be used for food and non-food products. In industrialized countries, maize is largely used as livestock feed and as a raw material for industrial products. Maize accounts for 30−50% of low-income household expenditures in Eastern and Southern Africa. Worldwide annual production of maize is 785 million tons, with the largest producer being the United States of America, producing 42%. Africa produces 6.5%, with Nigeria producing nearly 8 million tons as the largest producer in the continent, followed by South Africa. Africa imports about 28% of its maize requirement from countries outside the continent, such as Brazil and Mexico. Most maize production in Africa is rain-fed, which is threatened by droughts (IITA, 2003; Iken & Amusa, 2004; Khawar, Zahid & Muhammad, 2007).

The 2017 Economic analysis or rather yield, cost and income survey of the dry season maize projects in Kaduna and Kano States became imperative to compare costs with the derived benefits so as to determine their appropriate incomes. The return or otherwise of the series of investment made will provide a basis for the required adjustments and as such, the costs and benefits of the project needs to be identified.

Once costs and benefits are known, they must be priced and their economic values determined. The study perceived the benefits and returns as a function of the major objective of farmers' participation in the project which include; maximizing gains to his family, his children education, increase in his income, increase in productivity as a result of use of new technology and improved practices. This analysis will reveal whether the project has contributed significantly to the development of the economy of the beneficiaries directly and the communities at large and to justify the investment on the project or otherwise.

1.2 Objectives of the study

The general objective of the analysis is to examine the economics of dry season maize production among small holder farmers under USAID-MARKETS II dry season maize intervention project sites in Kaduna and Kano States. The specific objectives are to:

i. To measure the cost and yield on the investments made by farmers during the 2017 USAID-MARKETS II Dry season project in the intervention areas;
ii. To analyse the contribution of the project on the farmers' income and livelihood in the project areas; and
iii. To measure the sustainability of the dry season maize production in the project areas.

2.0 Methodology

2.1 Method of data collection

This study was conducted in the two dry season maize production areas under USAID-MARKETS II project targeted locations, Kaduna and Kano States. The data was collected using structured questionnaire. The questionnaire was produced using simple language to enable better understanding and appropriate responses from the respondents. The questionnaire could be seen in appendix.

2.2 Farmer Sampling procedure

The study was conducted using a pre-determined sample size of a total of 133 sampled famers, comprising 79 famers (35 male and 44 female) from Kaduna and 54 farmers (33 male and 21 female) from Kano. It was determined by the USAID-MARKETS II in the above mandate.

2.3 Questionnaire administration

About 13 Extension Agents (EAs) were selected to administer the questionnaires; on the average of 10 questionnaires per Agent. This was mainly to enhance proper and accurate administration of the instruments. The questionnaires were duly administered in about 4 days by all the chosen extension agents.

2.4 Method of data analysis and reporting

Descriptive statistics such as percentages, frequency distribution were used to determine the socio-economic characteristics of the respondents such as gender, age and farm size. The analytical techniques used in the study include profit determination and internal rate of return (IRR) to estimate returns as well as sustainability of the project to the farmers.

3.0 Result and Discussion

3.1 Socio-Economic Characteristics

3.1.1 Sex of the Respondents

Table 1 reports the gender of the respondents in the two project locations and it shows that there were 56 percent female and 44 percent male respondents in Kaduna but with some variability compared to Kano, where the male percent takes the lead by 61 percent as against 39 percent female. But the overall distribution of the sample suggests very negligible difference between the male and female respondents in the two locations as shown in Table 1 below.

Table 1: Gender of the Respondents

Kaduna			Kano		
Sex	**Frequency**	**Percent**	**Sex**	**Frequency**	**Percent**

Male	35	44	Male	33	61
Female	44	56	Female	21	39
Total	**79**	**100.0**	**Total**	**54**	**100.0**

Source: Field Survey, 2017.

3.1.2 Average (Mean) Farm Size of the Respondents (Ha)

The mean farm size in the States are slightly the same both in terms of the minimum as well as the maximum farm size of the selected sample of the farmers. This is reported in table 2 below.

Table 2: Farm Size in Hectare (Ha) of the Respondents

	Kaduna			**Kano**		
	Minimum	**Maximum**	**Mean**	**Minimum**	**Maximum**	**Mean**
Size of farm used in maize dry season farming (HA)	0.1	2.0	0.62	0.1	2.0	0.61

Source: Field Survey, 2017.

3.2 Economic and production analysis

The economic and production analysis of the report considers the following: production cost, output and returns parameters, such as the total and average cost of production per hectare (ha); total Maize output produced in cobs; selling price of Maize per cob; type of selling market; total cost, total revenue and profit determination and The internal rate of return (IRR) of the project in the two States.

3.2.1 Average total cost of production (₦) per hectare

This sub-section forms the basis for the this economic analysis of the irrigated maize in the two locations or States, by providing the mean total costs and were accordingly obtained by summing all the costs involved in the dry season maize production starting with the cost of seed, labor (watering inclusive) to costs incurred during transportation, machine fuel, agro-chemicals, fertilizer etc (see Table 3). Some explanations, summaries and multiplications are provided where necessary for clarity in the table.

Table 3: Components of the average total cost of irrigated maize production per hectare per State

Activity/Materials Purchased & Paid	**Kaduna** **Average Cost (₦)**	**Kano** **Average Cost (₦)**
Cost of seed (20kg/ha * 375/350)	7,500	7,000
Cost of seed Dressing	2,000	2,500
Cost of fuelling pumping machine throughout the period (20litres*145*12/8litres*145*13)	35,000	15,080
Payment to the watering scheme	-	5,000
Cost for watering Machine Maintenance	5,000	6,000
Cost of payment to laborers for watering	20,000	20,500
Other cost incurred in relation to watering	2,000	2,500
Total cost of land preparation/Basin construction	15,000	18,000
Total cost of planting	5,500	6,000
Total cost of fertilizer application	8,000	10,000
Total cost of pesticide and herbicide purchase	8,200	8,000
Total labour cost of pesticide and herbicide application	3,000	4,000
Total cost for weeding	7,000	7,500
Total cost of harvesting	5,000	6,500
Other cost incurred by farmer (Transportation, Loading & Uploading)	10,000	10,000
Sub – Total	**133,200**	**128,580**
Cost of fertilizer • Urea (7,500/7,200/bag) * 2 bags/ha	15,000	14,400
• NPK (6,500/5,500/bag) * 8 bags/ha	52,000	44,000
Sub – Total	**67,000**	**58,400**
Average Grand Total cost	**200,200**	**186,980**

Source: Field Survey, 2017.

The table 3 reports the various cost components involved in the production of irrigated maize per hectare in the two States. The table exhibits some variability across the States in relation to some components but the major ones lie under watering schemes, where in Kaduna virtually all the farmers made use of wells compared to Kano that made use of both canals as well as wells. In the case of fertilizer and seed, the prices in Kaduna are relatively higher when compared to that of Kano. But in terms of cost of labor, Kano appears to have high cost of labour compared to Kaduna. The grand average total cost of the irrigated maize per hectare indicates a margin of about 5,000

naira between Kaduna and Kano; which is mainly attributable to high costs of seed and fertilizer on the approximate in Kaduna State.

Table 4: Average total output/yield in cobs per hectare (Ha)

	Kaduna			Kano		
	Minimum	**Maximum**	**Mean**	**Minimum**	**Maximum**	**Mean**
Total output per hectare	48,500	83,000	62,000	51,000	86,000	64,000

Source: Field Survey, 2017.

Table 4 reports the average yield per hectare of the irrigated maize in the two locations. The mean yield or output suggests that, 62,000 and 64,000 cobs of raw maize were produced during the project in Kaduna and Kano States respectively. The slight variation in the mean, minima and maxima values may be as a result of the watering process, where in Kano, the farmers utilized two sources of water (well and canals) compared to Kaduna or any other agronomical reason beyond capture of the survey.

Table 5: Average total cost or cost per cob

	Kaduna			Kano		
	(A) Total cost (N)	**(B) Total output (cobs)**	**(C)= (A)/(B) Cost per cob (N)**	**(A) Total cost (N)**	**(B) Total output (cobs)**	**(C)= (A)/(B) Cost per cob (N)**
Cost per cob	200,200	62,000	3.22	186,980	64,000	2.92

Table 5 reports the average cost of producing the irrigated maize per cob and it suggests that, where it costs 3.22 naira per cob in Kaduna and 2.92, almost 3 naira in Kano. The small cost in Kano is attributable to relatively lower costs of inputs compared to Kaduna State.

Table 6: Average selling price per cob (N)

	Kaduna			Kano		
	Minimum	**Maximum**	**Mean**	**Minimum**	**Maximum**	**Mean**
Selling price per cob	20	30	25	10	20	15

Source: Field Survey, 2017.

Table 6 focuses on the average selling price of the raw irrigated maize per cob and as can be seen, the average selling price in Kaduna is higher than that of Kano, with a 10

naira margin and this also is observable under minimum and maximum price respectively.

3.2.2 Profitability analysis

Table 7: Average total cost, revenue and profit analysis for the 2 States in cobs per hectare

Kaduna				
Variables	**Quantity (Q)**	**Cost(₦) (C)**	**Price(₦) (P)**	**Total (₦)**
Total Cost (TC) = (C*Q)	62,000	3.22	-	200,200
Total Revenue (TR) = (P*Q)	62,000	-	25	1,550,000
Profit (ɳ) = (TR-TC)				**1,349,800**
Kano				
Variables	**Quantity (Q)**	**Cost (₦) (C)**	**Price (₦) (P)**	**Total (₦)**
Total Cost (C*Q)	64,000	2.92	-	186,980
Total Revenue (P*Q)	64,000	-	15	960,000
Profit (ɳ) = (TC-TR)				**773,020**

Source: Field Survey, 2017.

From table 7, the dry season maize production showed a remarkable profit margin determined using the Total Revenue – Total Cost approach. From the table, though the output level in Kano outweighs that of Kaduna by 2,000 cobs, the profit margin in Kaduna was nearly double of that of Kano. But the reason was mainly the tremendous increase in selling price per cob by about 96 percent in Kaduna, as it sells last year at 13 naira per cob but now 25 naira, while in Kano the increase was negligible, from average of 13 naira per cob last year to 15 naira now on the average (15 percent increase). Also the yield levels have increased in both States, following the use of improved farming methodologies funded by USAID-MARKETS II. The result also suggests that, the demand for raw irrigated maize in Kaduna may be higher than that of Kano, which may result in sharp increase in price or possibly, the supply in Kano is sufficient enough to keep the price relatively constant

3.2.3 Selling markets

Table 8: Selling markets for the irrigated Maize per State

Kaduna			Kano		
Response	**Frequency**	**Percent**	**Response**	**Frequency**	**Percent**
Farm gate	32	41	Farm gate	20	37
Temporary market	27	34	Temporary market	19	35
City / Big town market	20	25	City / Big town market	15	28
Total	**79**	**100.0**	**Total**	**54**	**100.0**

Source: Field Survey, 2017.

The study indicated that, in both States selling the produce at the farm gate take the highest percent, followed by temporary markets and city/big town markets and this is usually done by up-takers, not the farmers. This result indicated that, the farmers had markets for the dry season maize produced. The sale of the produce at the farm gate may be more economical as it does not include cost of transportation and other handling charges.

3.2.4 The Internal Rate of Return (IRR) of the projects in the States

The IRR represents the rate of return in economic prices that would be achieved on all expenditures of the project. It can be expressed as:

$$IRR = \frac{\text{Net Returns}}{\text{Total Cost}}$$

Where Net Returns = Total Revenue – Total Cost. The net returns per hectare in the location are N1,349,800 and N773,020 in Kaduna and Kano respectively. This can be seen in table 9 below:

Table 9: Internal rate return for the irrigated Maize per State

Kaduna	Kano
IRR= Net returns/Total cost	**IRR**
1,349,800/200,200 = 6.74	773,020/186,020 = 4.16

The decision rule under internal rate of return suggests that, accepts any project or subprojects with IRR value greater than the discount rate (discount rate is usually expressed in percentage and decimal say, 0.20, which represents 20% for example). We can further express IRR as measuring what every unit naira invested in to dry season maize production would generate. In Kaduna, the IRR is 6.74, while that of Kano, 4.17 and this suggests that, a single naira invested in the irrigated maize in Kaduna would generate 6.74 naira and 4.16 naira in Kano respectively.

3.3 Project Impact on the Farmers' Income and Family

According to the sampled farmers, both male and female, the project has served as a source of improved income generation to them. The mean net income or profit that accrue to the respondents per hectare after deducting all the costs of production per hectare was N1,349,800 and N773,020 in Kaduna and Kano States respectively. The farmers further explained that USAID-MARKETS II Dry season farming has certainly demonstrated to them the new approach to maize farming, they have learnt new methodologies. They all recorded increase in output and income making their purchasing power to grow strongly. They can now better afford for their families, choose food, education for their children, medication, gifts and savings among others.

3.4 The Economic viability and sustainability of the project in the States

The dry season maize production in the project areas could be said to be a positive improvement. The project was a viable one as the net returns are greater than the total costs as reported by the total cost – total revenue approach and the internal rate of return. The targeted farmers in the project areas promised to sustain and continue to produce maize in dry season periods considering the associated benefits.

4.0 Conclusions

From the findings of the study, it could be observed that, there was an increase in the cost of production per hectare compared to the previous year in both the States but the increase was slightly higher in Kaduna on the aggregate; the fuel price increased, inputs like fertilizer, seed, chemical, labour etc have also increased but the recorded high yield was able bid down the per unit cost of production analysis. The report also using profit determination and internal rate of return and benefit-cost ratio concluded that, the project in the targeted locations are viable and at the same time sustainable but with high returns in Kaduna following sharp increase in selling price. Farmers were found to comply with the improved technology including modern irrigation practices, seed variety and agronomic recommendations leading to appreciable increase in yield levels compared to previous periods.

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APPENDIX I

QUESTIONNIARE

FARMERS FIELD ECONOMIC ANALYSIS OF IRRIGATED MAIZE IN KADUNA AND KANOSTATES UNDER USAID-MARKETS II PROJECT, 2017

This questionnaire aims to collect data from some selected farmers of USAID-MARKETS II networked dry season maize farmers in Kaduna and Kano States. The information to be collected would strictly be used for the said purpose. Your cooperation is highly appreciated.

A. Background Information

Section 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS (Circle the appropriate response)		
1	Name of Household head	
2	Sex of Household head	1. Male ☐ 2. Female ☐
3	Age of Household head **(Full completed years)**	

B. Economic Indicators

1. What is the Size of your farm in ha
   a. 0.2
   b. 0.4
   c. 0.5
   d. 0.8
   e. 1.0
   f. Others Specify: _____

2. What is the number of stand/plant population in your farm?
   a. Less than 10,667
   b. 10,667 – 21,333
   c. 21,334 - 42,667
   d. 42,668 – 53,333
   e. 53,333 and Above
   f. Others Specify; _____

3. Number of harvested cobs in your farm----------
   a. Less than 10,000
   b. 10,300

c. 21,333
d. 42,666
e. 85,332
f. 106,666
g. Others Specify: _____

4. Fill the Table below with the cost of Irrigation incurred during the planting period

S/N	Activity	Cost (N)
1	Fuelling your Pumping Machine	
2	Payment for watering to the scheme	
3	Amortized cost for Water pumping machine	
4	Payment for watering to Laborers	
5	Other Cost in relation to watering (Specify)	

5. State the inputs you use in the dry season maize production

Fertilizer			Seed			Other Chemicals		
Type	**Quantity**	**Cost (N)**	**Type**	**Quantity**	**Cost (N)**	**Type**	**Quantity**	**Cost (N)**
Total								

Type of fertilizer; 1) NPK, 2) UREA, 3) SSP

Types of Seed; 1) Local, 2) Improved

Types of Chemicals; 1) Herbicides, 2) Pesticide, 3) Others

6. How much did you spend as labour cost in the following activities

Activity	Cost (N)
Land Preparation	
Planting	
Hand weeding/Earthen-up	
Herbicide	
Fertilizer Application	
Cost of Irrigation	
Harrowing & Ridging	
Harvesting	
Transportation	
Others	
Total	

7. What quantity of Maize did you produce during the dry season in cobs?
……..……
……..

8. Is there any change in the current yield level compared to the previous period?
   a. Yes, state quantity……..
   b. No, state reason……..

9. What is the selling price of dry season maize per cob?

……..……
……

10. Is there any difference between the previous selling price and the current selling price?
    a. Yes, state reason that may cause the change…….
    b. No, state reason……
    ……

11. Where do you sell your dry season maize?
    a. Farm-gate
    b. Local market
    c. Cooperative
    d. Farmer association
    e. Cereal Stock Exchange
    f. Tenders
    g. City/big town market
    h. Other; (specify.)
    …….

12. How many customers or markets do you have for the produced dry season maize?
……
…..……

13. Does your buyers have conditions for buying? A) Yes b) No

14. If yes, what are the conditions?
    …….

15. What makes them to buy your product?

……..……

……..……

16. Do you think the profit you make can keep you in the business?
    a. Yes
    b. No
17. If no, would you leave the dry season maize production or would continue anyway?

……

Thank You