

Original Research Paper

***ECONOMIC ANALYSIS OF MAIZE-
COWPEA INTERCROPS IN AKKO
LOCAL GOVERNMENT AREA, GOMBE
STATE, NIGERIA***

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ABSTRACT

The study was conducted in Akko Local Government Area, Gombe state, Nigeria to examine the cost and return analysis of maize-cowpea intercrop enterprise. Data were collected using a structured questionnaire administered to 50 respondents on their socio economic characteristics, inputs and output, cost incurred and the revenue realized for the 2013 production season using random sampling techniques. Descriptive statistics, gross margin analysis and regression analysis were the analytical tools used in analyzing the data. The result showed that majority of the sampled farmers (74.6%) was within the age bracket of 31-50 years with (88.9%) that had one form of education or the other. Fertilizer constituted the bulk (47.6%) of the total cost of production. The gross margin, net farm income and return per naira invested were found to be ₦21245, ₦20608, N0. 93 per hectare respectively. Double-log model was chosen as the lead equation, the result further indicated that age, seeds and fertilizer are positively significant at $p > 0.05$ with R^2 of 55.4% while educational level hired labor and insecticides gave a negative elasticity of their respective coefficients. Insufficient credit facilities, high cost of inputs pest and diseases and use of manual operation are the major constraints in the study area. Therefore it is recommended that credit delivery from lending agencies, inputs early and resistant varieties and labor saving techniques should be made readily available and affordable to farmers to improve their production with the generation of optimum profit.

KEYWORDS

Maize-cowpea, Elasticity, Gross margin

INTRODUCTION

MAIZE (*Zea Mays*)

Maize-cowpea intercrop is currently receiving attention because of its unique importance in the world agriculture. Maize-cowpea production is of vital importance on socio economic and food security as far as Nigerian is concern, Maize is one of the most important food crop in the world. It is the highest yielding crop with multiple uses for food and industrial purposes. Maize is one of the most important crops in Nigeria. Owing to the suitability of the northern guinea savannah ecological zone of Nigeria, there has been rapid expansion in the production of maize and its uses are equally increasing just as its uses are equally increasing (odojuma 1990)

Maize has been put to a wider range of uses than any other cereal in West African countries. Maize is use for human consumption as well as animals. In recent year's utilization of maize by food processing industries in the production of breakfast cereals, baby food baked food, beverages and starch product is increasing there by increasing the diverse market for the commodity.

Cowpea (*Vigna sinensis*)

However, on the other hand Cowpea (*vigna sinensis*) production is also increasing in Nigeria and the substantial part of production comes from the drier region of the northern part of the countries (Sigh, 1997). An estimated 1.85 million tones was produced in 1996 and this has increase by about 2.26 million in 2000 (cbn, 2003). The bulk of production of cowpea is produce in Sudan savannah belt (Federal Ministry Agriculture Water Resources & Rural Development 1989). The main cowpea producing state in the north mainly are Kano, katsina, bauchi, gombe, borno, taraba and adamawa states, It has been reported that the basic problems emanates from low yield due to low level of technology, low returns to labor and other resources attributed to low farm price for products. Bearing in mind the rapid population growth there is an imperative need to meet the grain requirement with domestic production. This however, calls for production mixture expansion strategies which are better based on proper assessment of the present growing condition as provided for by a study on economic analysis of maize-cowpea intercrop this will serve as basis for determining the contribution made to output by various resources used by the farmers. Safa 2005) had also reported that farm size, family size and education significantly influence the profitability of farm product in Yemen. Similarly Enete & Okum, 2010; and Fasoranti 2008 had also reported that farmers socio economic factors such as farm size, level of education, years of farming experience, technological and institutional also affect the net returns of farmers production activities base on their location.

OBJECTIVES OF THE STUDY

The broad objective of this study is to evaluate the economics of maize-cowpea intercrops while the specific objectives are to:

- * Determine the socio economic characteristic of the maize cowpea farmers

Identify their sources of funds

- * Identify cost and returns of maize cowpea production in the study area
- * Identify the input –output relationship of maize-cowpea intercrop
- * Identify their major constraints to production

METHODOLOGY

Study Area

Akko Local Government Area is one of the eleven Local government of Gombe state. Akko Local Government Area lies between latitude 10° and $12^{\circ} 50'$ E and longitude 11 and 12 N of the equator. The area falls within the northern guinea savannah zone of Nigeria.(G.S.A.D.A.P,1998). Generally, it is bordered on the north by Kwami and Gombe local government area respectively, on the east by Yamaltu-deba, west by Billiri and Kaltungo local government area respectively. The major tribes in study area are: Fulani, Tangale, Jukun, Tera, Bolewa and few Kanuris (NPC, 1996). Agriculture is directly the largest employer of labor in the study area. Akko Local Government area was selected because they are the largest producer of this companion crop in the state.

Sampling and Data Collection Procedure

Primary data were collected using a structured questionnaire administered to the respondents for the study. Multi-stage random sampling technique was used in data collection. The local government consists of three districts Kumo, Pindiga and Gona. The first stage involved listing of all the villages in the local government area in which ten villages were randomly selected. The villages are Shabbal, Garko, Tumfure, Lawanti, Akko, Tulmi, Kashere, Gona, Tumu, Pindiga respectively. Six respondents were randomly selected which give a total of sixty respondents used for the study. Akko Local Government Area was however selected because it is the leading producer of this companion crops in the state and the climatic condition is also suitable for the crops.

Data Analysis

Data were analyzed using descriptive statistics, farm budgeting technique and regression analysis

Descriptive statistic

Descriptive statistics was used to summarize the data obtained from the field in terms of percentages. Farm budgeting technique enable the estimation of the total expense(cost) as well as various receipt (revenue) within the production period (Olukosi and Erhabor,1988).The farm budgeting model was used to achieve specific objectives (3).The model can be specified as follows:

$$GM = TR - TVC.....(1)$$

Where GM = Gross Margin

TR = Total Returns in ₦/ha

TVC =Total variable cost in ₦/ha

$$\text{Operating Ratio (OR)} = TVC/TR(2)$$

Where: OR = Operating Ratio

TVC = Total variable cost

TR =Total Revenue

$$RNI = GM/TC.....(3)$$

RNI = Return per naira invested

GM = Gross margin

TC –Total cost of production

The gross margin was used under the assumption that fixed cost is negligible (Ibrahim, A., Ihanacho, A.C and Abdullahi, A.B, 2005) while descriptive statistics was use to determine the socio economic characteristics of the farmers, their sources of capital and problems associated with sweet potato production to achieve objectives (1),(2) and (4)

Regression Analysis

An econometric model was used to analyze the effect of input on maize-cowpea output. The econometric model is explicitly expressed as follows:

$$Y=a+b_1x_1+b_2x_2+b_3x_3+b_4x_4+b_5x_5+b_6x_6+b_7x_7+b_8x_8+b_9x_9+b_{10}x_{10}+b_{11}x_{11}+b_{12}x_{12}+u$$

Where: Y=Maize-cowpea output

a-constant factor

x1-age

x2-education

x3 –farm size

x4-hiusehold size

x5-seeds

x6-fertilizer

x7-family labour

x8-hired labour

x9-herbicides

x10-insecticides

x11-transportation

x12-repair of farm tools

u-An error term measuring the variation in maize-cowpea output un accounted for by the independent variables.

RESULT AND DISCUSSION

Socio Economic Characteristics of the Respondents

Among the socio economic characteristic considered are gender, age, family size, marital status, educational attainment and years of farming experience (Table 1).The sex of the respondents is presented in table 1 revealed that 77.8% of maize-cowpea farmers were male, while 22.2% were females, Table 1 further shows that 71.4% of the samples farmer fall within the age group of 31-50 years indicating that a good number of them where within their active age. This finding agreed with work of Adesehinwa & Bolorunduro (2007); and Oyegbami (2010). However, size of the family help to boost family labor. The result showed that 87.3% were married. In addition to that education attainment has positive effect on the adoption of farming techniques because it enable farmer to perceive and implement skill acquired from friends or extension agents. Analysis of educational level of the respondents shows that 54% had formal education, 36% had Quranic education with only a small percentage of 3.17% that have never been to school. Okpukpura (2005) stated that education enhances level of understanding of saving; Nasiru (2005) stressed that attendance to formal education is a prerequisite for getting a secure or a regular employment which lead a more stable income from which marginal propensity to save increase. However, 71.4% of the respondents had more than 10 years of farming experience.

Table 1.Socio economic characteristics of maize cowpea farmers

Variable	Maize-cowpea farmer's	Percentages (%)
Gender		
Male	49	77.8
Female	14	22.2
Total	63	100
Age		
<20	00	00
21-30	07	11.1
31-40	21	33.3
41-50	24	38.1
>50	11	17.5

Total	63	100
Marital status		
Married	55	87.3
Single	08	12.7
Total		100
Educational level		
Primary	11	17.5
Secondary	14	22.2
Tertiary	09	14.3
Never been to school	02	3.17
Quranic education	23	36.5
Total	63	100
Years of farming experience		
<10	17	26.9
11-20	25	39.7
21-30	15	23.8
31-40	05	7.9
>40	01	1.6
Total	63	100

Source: Field Survey, 2013

Result on Table 2 shows the respondents distribution based on their sources of fund.65% of the sample farmer obtained the capital based on their personal saving while the remaining fraction got their saving from family and friends, agricultural banks cooperatives and local money lenders respectively. These findings agreed with Ayoola (2001) which stated that it could be attributed to the stringent policy measures use by local money lenders in recovering their money.

Table 2: Source of funds of maize-cowpea farmers in Akko Local Government Area

Source of funds	No. of respondents	Percentages (%)
Personal saving	41	65
Family and friends	07	11.11
Agricultural Bank	13	20.63
Cooperatives	1	1.59
Local money lenders	1	1.59
Total	63	100

Source: Field Survey, 2013

Table3: Respondents distribution according to farm size

The entry shows that majority of the sample maize cowpea farmers had less than or equal to 5 hectares. This is an indication of pure subsistence nature of maize cowpea farming in the study area. Bzugu (1999) observed a significant relationship between farm size and farmers productivity in small holder farmers In Girei Local Government Area of Adamawa state. He also stressed that farm size determine labor requirement and other quantities of input used.

Table 3: Distribution of respondents based on farm size (Hectares)

Interval	Maize-cowpea Farmers	Percentages (%)
1-5	41	65
6-10	21	33.33
>10	01	1.59
Total	63	100

Source: Field Survey, 2013

Distribution of the respondents based on family size and labor availability. The size of the household help to boost family labor. The result showed that 55.56% of maize cowpea farmers in the study area had family size of between 1-10 person per house hold, while 39.68%, and 4.76% had 11-20 and 21-30 person per house hold respectively.

Table 4: Distribution of the respondents based on family size and labor availability

House hold size (persons)	Maize-cowpea farmers	Percentages (%)
<10	35	55.56
11-20	25	39.68
21-30	03	4.76
>30	00	00.00

Source: Field Survey, 2013

Table 5 shows the cost and return analysis of maize–cowpea farmers

Based on the data on table 5 indicated that cost of fertilizer has the highest proportion with 47.63% of the total variable cost while transportation has the lowest proportion of 0.20%. This implies that most of the variable incurred on fertilizer as maize cowpea combination require

fertilizer In the study area. The total cost-per hectare (TC) was found to be ₦22, 135.85 and the total returns per hectare (TR) was ₦42, 743 .93.The net return (NR) was therefore estimated to be ₦20605.09.Return per naira invested was 0.93 for every naira invested there will be a gain of 93 kobo which indicated that maize cowpea cropping mixture in the study area is a profitable venture. The financial ratio shows the ability of a business to survive within the short run. The gross margin was 0.51 which implies that not many resources were used while fixed and operating ratio were 0.01 and 0.50 respectively. All these financial ratios are preferred because they are less than one which signifies that the business will thrive within the short run.

Table 5: Enterprise budget per hectare for maize –cowpea cropping mixture in Akko Local Government Area

Variable	Value (₦)	Percentages (%)
1. Variable cost		
(a) Maize seed	203.44	1.37
(b) Cowpea	348.36	1.57
(c) Fertilizer	10,543.50	47.63
(d) Herbicides	899.78	4.06
(e) Insecticides	1099.33	4.97
(f) Post harvest treatment	282.60	1.27
(g) Rent on land	1025.00	4.63
(i) Labor	6383.33	28.84
(j) Repair of tools	669.44	3.02
(k) Transportation	44.11	0.20
Total variable cost	21,498.90	97.12
2. Fixed cost		
Depreciation on farm tools	636.95	2.88
Total cost of production	22,135.85	100
3. Revenue		
1. Maize	17,989.38	
2. Cowpea	24,754.56	
Total Revenue	42,743.94	
Operating Ratio	0.50	
Fixed Ratio	0.01	
Gross Ratio	0.51	
Return per naira invested 0.93		

Source: field survey, 2013

The result of the estimated production function for maize-cowpea is presented in table 6, Based on econometric, statistical, economic criteria and apriori expectation of the sign of the coefficient the linear function was selected with the coefficient of determination as 53%. This means that 53% variation in the dependent variable (output) is explained by variation in the explanatory variable included in the models. The result further revealed that age, seeds and fertilizer were significant at 5%. This conform to apriori expectation. The positive significant of seed and fertilizer implies the more the quantity of seeds and fertilizer were used the higher the output. However, farm size, household size, hired labor, herbicide, repair tools and transportation were not significant but had appositve coefficient, indicating a direct relationship between each of them. In addition educational level, family labor and use of insecticides had an inverse or negative relationship between the revenue and the production components .implying that one unit increase in the variable would bring about a decrease in absolute productivity by the respective value of the coefficients, while the F-value (4.70) indicated that all the explanatory variable taken together have a significant effect on the dependent variable (Y) at $p < 0.001$.

Table 6: Co-efficient of multiple regression of maize-cowpea production

Predictor	coefficient	st-deviation	t-ratio
Constant	-38543	45.76	0.84
Age x1	2034.5	859.8	2.37
Educational level x2	-1611	5207	-0.31
Farm size, x3	1339	3087	0.43
Household size, x4	1415	1104	1.21
Seeds, x5	1641.2	647.9	2.53
Fertilizer, x5	2428	1110	2.19
Family labor, x7	-245.5	215.3	-1.14
Hires labor, x8	15.8	328.7	0.05
Herbicides, x9	3.563	2.451	1.45
Insecticides, x10	-5.482	3.581	-1.55
Transportation, x11	4.903	3.167	1.55
Repair of tools, x12	12.773	7.271	1.76
S=45587	R-sq=53%	R-sq(adj)41.1%	
F=ratio 4.70			

Source: Field Survey, 2013

significant@ $p < 0.001$

significant@ $p < 0.05$

NS Not significant

Constraints associated with maize-cowpea intercrops

Table 7 revealed the problems associated with maize-cowpea farmer in the study area in decreasing magnitude of importance. Small holder agriculture is characterized by over reliance on household resources farmer in the study are faced with problem of lack of capital to purchase production inputs and hired labor lack of capital rank first 65.% followed by high cost of input 50% ,poor marketing outlet 33.3%, storage facilities 31.7% and pest and diseases 26.9% respectively.

Table 7: Constraints faced by Maize-cowpea farmers in Akko L.G.A

Constraints	frequency	percentages (%)
Lack of capital	41 65	
High cost of input	32	50
Poor marketing outlet	21	33.3
Poor storage facilities	20	31.7
Pest and diseases	1726.9	
Total	131	206.9

Field Survey, 2013

* Percentages greater than 100% multiple responses recorded. Source:???

CONCLUSION AND RECOMMENDATION

The study has shown that maize-cowpea cropping mixture in the study area is found to be a lucrative business with an average maize-cowpea farmer earning a gross margin of ₦20,608.09 per hectare in the study area despite the problem faced by the farmers. Fertilizer and labor accounted for about 47.63% and 28.84% respectively of the total variable cost. Furthermore it was also revealed that maize –cowpea cropping mixture are dominated by the men folk with one form of education or the other. The positive significant of seed and fertilizer implies the more the quantity of seeds and fertilizer were used the higher the output. However, farm size, household size, hired labor, herbicide, repair tools and transportation were not significant but had appositve coefficient, indicating a direct relationship between each of them.

To overcome the problem associated with maize cowpea production in the study area the following recommendation are made:

Farmers should be encouraged to use disease resistance variety as well as good management practices on their farm this ultimately assist farmers to improve their production. It is recommended that use of simple labor saving technology that could reduce manual labor will also save the cost of labor. Credit delivery from lending agencies is also suggested at a minimum interest rate to the farmer to encourage them produce more and improve their productivity. Farmers find it very difficult to procure their farm input like fertilizer at a subsidized rate. There is needed to form cooperatives by the farmers so as to help themselves.

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