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Economics of cowpea production under small-scale cowpea enterprise in Agricultural Zone I of Niger State, Nigeria.

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Abstract: *This paper analyses the economics of small-scale cowpea farmers in agricultural zone 1of Niger State. A sample of 158 farm households selected using simple random sampling technique were used to generate primary data. Results show that most (87%) of the farmers were male and within the active age of 20 and above. About 47% of them had no formal education, while 53% have one form of education or the other. The average farm size was 2.8ha while the average yield was 5,041.47 kg/ha. The average variable cost, average fixed cost and average net farm income per hectare were ₦28,839.30, ₦3,160.45 and ₦30,463.10,* ***respectively.*** *The results of production function analysis revealed that, farm size, labour, agro-chemical and capital were important in explaining the variation in output of cowpea production in the study area. Pests and diseases, non-passable roads and inadequate finance were the major problems militating against cowpea production. Based on these findings, it can be concluded that, the study area had great potential to increase cowpea production and farmer's income, if efforts are made for the widespread adoption of new technologies and identified constraints are addressed. However, effort should be made to mobilize and encourage farmers to form cooperatives so that they can pool their resources together to increase their scale of operation. Also government should make production inputs like improved seeds and agro-chemicals available to farmers at the right time at subsidized rates because production inputs were some of the important limiting resources that adversely affected cowpea production in the study area.*

I. Introduction

Agriculture is a major sector of Nigeria's economy, it provides food and processed products for the populace as well as raw materials for agro-allied industries (Odebode, 2007). Adesina (1991) reported that the role of agriculture is to provide adequate output to ensure global food security and enhance economic development, nevertheless agricultural development in Nigeria has suffered a lot of setback due to the shift of emphasis and manpower development to petroleum sector. However, to ensure food sufficiency, priority must be given to small holder farmers who constitute about 95% of farming household in Nigeria and produced most of the food crops consumed in the country.

According to Gulati (2000), Nigeria from 1970's has witnessed a considerable decline in food production and a widening gap in the supply - demand which is brought about by a high population growth of 3.5% per annum relative to food production growth of about 1.5% per annum. This problem is attributed to rapid urbanization, low per capita income, poor storage, inadequate transportation and poor marketing facilities as well as shift of emphasis from agricultural sector to the oil sector of the national economy and the non challeant attitude to agriculture by the farmers. Khan (2002) stressed that Nigeria's agricultural production is much lower than many other countries of the world, and that there is a big gap between actual yield and attainable potential yield of crops. Different categories of food substance are needed for human existence, such as carbohydrate and protein. Cowpea is one of the cheapest non- animal protein sources of food that is required for proper human growth.

Cowpea (*vigna unguiculata*) (L) walp) is a native of tropical Africa and is one of the most important legume in the world. It is also the most widely distributed crop, occupying double the area of any other crop. Cowpea is a legume that is extensively grown throughout the sub-Saharan Africa. It is a subsistence crop often intercropped with sorghum, maize and millet. Cowpea is cultivated for its leaves green pods, grains stover and mature pods. The young leaves and immature pods are used as vegetables while snacks and main dishes are prepared from grains, as it is one of the cheapest sources of plant protein to a majority of people in Nigeria. Cowpea has great potential and can play a crucial role in contributing to food and nutritional security and poverty reduction, income generation and socio-economic growth of West Africa (Nigeria in particular). The demand for cowpea in Nigeria and other parts of West Africa is increasing because of high population growth from Urban Centers and also because of poverty and the demand for low-cost food. Nigeria is the largest producer and consumer of cowpea in West Africa and the world at large, accounting for over two million metric tons which is about 50% of the world output and 53% of production in Africa, yet Nigeria with high population

growth rate imports cowpea from neighboring countries (Singh.,Ehlers., Sharma., Freire, Filho, 2002 and FAOSTAT, 2006; FAO, 2011).

FAOSTAT (2000), reported that the world cowpea production was estimated at 3,319,375 MT and 75% of that production is from Africa. The principal cowpea producing countries in West Africa are Nigeria, Niger, Senegal, Ghana, Mali and Burkina Faso. However, among these countries, Nigeria and Niger are the leading producers accounting for 2,099,000 and 641,000MT respectively in 1999. Nigeria with a population of over 140, million people is the largest producer of cowpea in West Africa, also has the highest level of consumption with a per capita consumption of 23 kg per year with the domestic deficit of 518,400MT per year. This deficit is partly met by importation from neighboring countries like Niger.

Cowpea is a very important crop grown in many parts of Nigeria. It provides protein to rural as well as urban dwellers as a substitute for the animal protein. Production is primarily by small scale farmers with average farm sizes of 2-4 hectares. Average yield of cowpea in Nigeria is 417kg per hectare. (Singh *et al*, 2002).This is yield is below an achievable yield of between 1500-3000kg/ha (Dzemo.,Niba and Asiwe, 2010). This is also low when compared with 2,666kg/ha and 687kg/ha obtained in place like Egypt and Malawi respectively (FAOSTAT, 2010). This notwithstanding, Nigeria lags far behind in its ability to grow enough food to feed its ever increasing population. This revealed that Nigeria is not food secured and food insecurity is the most profound physical expression of absolute poverty (World Bank, 1992; FAOSTAT, 2000). Fasasi (2007) reported that despite increasing land area been put in to food production; Nigeria has not been able to attain self-sufficiency in food production. One way small-scale farmers can achieve sustainable agricultural development is to raise the productivity of their farm by improving efficiency within the limits of the existing resource base and available technology. In the same vein, Harwood (1987) was of the opinion that efficient use of various inputs is an important part of sustainability which implies either fewer inputs to produce the same level of output or higher output at the same level of inputs. An increase in efficiency in food crop production could invariably lead consequently to a reduction in the welfare of farmers and consequently a reduction in their poverty level and food insecurity.

The limited capacity of the Nigeria cowpea sector to meet the domestic demand has raised a number of pertinent questions both in policy circles and among researchers. Some of these questions have to do with whether farmers are allocating resources efficiently in cowpea production or whether they are receiving remunerative profits in cowpea production.

In this study, therefore, an attempt has been made to examine the economics of cowpea production under small-scale cowpea enterprise in Agricultural Zone I of Niger State. The specific objectives are to:

i. describe the personal and socio-economic characteristics of sampled farmers in the area;
ii. evaluate the level of resource use among small-scale cowpea farmers in the study area;
iii. determine the profitability of small-scale cowpea production in the study area.
iv. examine the factors that affect profitability of cowpea production;
v. determine the technical relationship between input and output realized in cowpea production and
vi. determine the resource use efficiency in cowpea production in the studies area.

II. Methodology

The study was conducted in 2013 cropping season in selected Local Government Areas in agricultural zone1of Niger State**.** The State is located in the Guinea Savanna vegetation zone in the north central part of Nigeria between latitudes 3º20 -7º 4'N and longitude 8º- 11º3'E. The area receives an annual rainfall of 1,200mm which is steady and is evenly distributed falling usually between mid April and November, peaking in August with the average monthly temperature ranging from 23^0C to 37^0C (NSADP, 2012). Niger State covers a land area of 92,800 square kilometers which is about 10% of the total land area of Nigeria. About 85% of this land area is arable. Niger State has a population of three million nine hundred and fifty thousand two hundred and forty nine people (3,950,249) (NPC, 2006). The State is endowed with fadama lands found along the plains of the River Kaduna and River Niger (NSADP, 2006). The State has large area of Fadama and fertile arable land, which support cowpea production. Farming is the primary occupation of 85 percent of the State's population. However, agriculture in Niger State is predominantly in the hands of rural dwellers who work small holdings. It has been estimated that there are over 100,000 farm families in the State. The major crops grown include cowpea, sugar cane, maize, millet, melon, rice, yam, groundnut, sorghum and cowpea (NSADP, 1999).

Sampling Procedure: In order to obtain a representative sample, a total of 158 cowpea farmers were sampled from three purposively selected local government areas (LGAs) in agricultural zone 1 of Niger State, including Edati, Lavun and mokwa. This is because of high concentration of cowpea farmers in these LGAs. From each LGA, two districts were randomly selected and from each district five villages were selected. In each village, simple random sampling technique was used in the selection ten and eleven farm families. Data were collected on levels of inputs and output, their prices and socio-economic characteristics of the farmers.

Data Collection: Data collected for the study was achieved by the use of a well-structured questionnaire administered to the respondents and complemented with personal interview.Data collected on the socio-economic characteristic of the farmers, farm size (ha), quantity of cowpea seed (kg), labour (man-day) herbicides (litre) and output (kg) realized

Analytical Techniques: Collected data were analyzed using descriptive statistics, farm budgeting techniques, Multiple regression analysis and as well as production function analysis.

Descriptive Statistics: Descriptive statistic such as tabulations, means, frequency distribution and percentages were used to analyzed the socio-economic characteristics of the farmers, evaluate the level of resource use among farmers and identify the problems associated with cowpea farmers.

Farm Budgeting Model: Farm Budgeting Tool was used to analyzed the profitability of cowpea production. The farm budgeting tool is widely used in farm management and production economics studies. The farm budgeting tool is an operation leading to the determination of cost and revenue for a given production period (Olayide and Heady, 1982). GM is expressed as:

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

TR = Quantity of output (Q_i) X price (P_i)

TVC = Quantity of input (X_j) X price (P_j)

$GM = \sum_{i=1} P_i Q_i - \sum_{j=1} P_j X_j$ ---------- (2)

Where GM = gross margin (₦/ha)

P_i = average price of output i (₦/kg)

Q_i = average quantity of output j (kg/ha)

P_j = average price of input j (₦/kg)

X_j = quantity of input j used (kg/ha)

$GM = \sum_{i=1} P_i Q_i - \sum_{j=1} P_j X_j$ ----------(3)

Where i is the number of observations (i = 1, 2, 3, 4, ----- 158)

$P_iQ_i = Pc_i\ Qc_i$ ----------(4)

Pc_i = average price of cowpea sold (₦/ha)

Qc_i = average quantity of cowpea sold (kg/ha)

$P_j X_j = Cc_j\ Qc_j + L_j + Cf_j + Qf_j + Ca_j + Qa_j$ ---------- (5)

Cc_j = average cost of cowpea seed used for planting (₦/kg)

Qc_j = average quantity of cowpea seed used for planting (kg/ha)\

L_j = average cost of labour used for all farm operation (₦)

Ca_j = average cost of agrochemicals used (₦/litre)

Qa_j = average quantity of agrochemicals used (litre/ha)

Gross Ratio: This is a profitability ratio that measures the overall success of the farm and the Lower the ratio, the higher the return per naira.

$$GR = \frac{TFE}{GI}$$ ---------- (6)

where GR = Gross Ratio, TFE = Total Farm Expenses and GI = Gross Income.

Operating Ratio: The operating ratio is directly related to the farm variable input usage. The lower the ratio, the higher the profitability of the farm business.

$$OR = \frac{TOC}{GI}$$ …… ……..... (7)

Where OR = operating Ratio, TOC = Total Operating Cost and GI = Gross Income.

Return on Capital Invested: This is defined as gross margin divided by total variable cost.

$$RI = \frac{GM}{TVC}$$ ----------(8)

Where RI = Return on Capital Invested, GM = Gross Margin, and TVC = Total Variable Cost.

Multiple Regression Model: Multiple Regression Analysis was used to analysed factors affecting the profitability of cowpea production. Regression is the general process of predicting one variable from another by statistical means using previous data (Levin, 1984).
Mathematically the model for this study is specified in general form as:
$Y = F (X_1, X_2, X_3, X_4, X_5 X_6, X_7, X_8, X_9, X_{10})$ ----------(9)
Where,
Y = Profit (₦),
X_1 = Farm size (ha),
X_2 = Labour (₦),
X_3 = Capital (₦),
X_4 = Fertilizer (₦),
X_5 = Seed (₦)
The functional forms of the model estimated are specified as follows
Linear Function
$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_4 8 + b_9X_9 + b_{10}X_{10} + e$ -----(10)
Semi – log Function
$Y = a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + b_8 \log X_8 + b_9 \log X_9 + b_{10} \log X_{10} + e$ ----------(11)
Quadratic Function
$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X^2_7 + b_8X + b_9X^2_2 + b_{10}X^2_3 + b_{11}X^2_4 + b_{12}X^2_5 + e.$ ----------(12)
Cobb-Douglas model 2
$\text{Log}Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + e$ ----------(13)
Where
a = intercept
$b_1 – b_6$ = regression coefficients estimated
e = Error term

Production Function Analysis: Production function model was used to analyzed the technical relationship between input and output of cowpea realized. For the analysis, the linear function, semi-log, quadratic and cob-Douglass will be tried and a lead equation will be chosen base on economic criterion.

Mathematically the model for this study is specified in general forms as: -

$Y = F (X_1, X_2, X_3, X_4, X_5)$
Where
Y = Yield of cowpea (kg)
X_1 = Farm Size (ha)
X_2 = Quantity of seed (kg)
X_3 = Capital (₦)
X_4 = labour (Man-days)
X_5 = Agro-chemicals (Litres)
U = Error term
The functional form of the model are specified as follows:
$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + U_i$ (Linear)
$Y = a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + U_i$ (Semi-log)
$\ln Y = a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + U_i$ (double log)
$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X^2_7 + b_8X_2 + b_9X^2_2 + b_{10}X^3_3 + b_{11}X^2_4 + b_{12}X^2_5 + U_i$

Resource use efficiency was computed as follows:-

$$\frac{MVP}{MFC} = r$$

Where:
r = efficiency ratio.
If r = 1, efficient utilization
r > 1, under utilization
r < 1, over utilization of resource
MVP = Marginal value product
MFC = Marginal factor cost

III. Results and Discussion

Socio-Economic Characteristics of the respondents

Several indicators were used in this study to identify the socio-economic status of cowpea farmers in the study area. The variable analysed in this study include age, marital status, mode of land acquisition, years of farming experience, level of education and household size .Table 1 revealed that 81.70% of the sampled farmers were within the age bracket of 21-50 years. This reveals that majority of the sampled farmers were of middle age. This implies that the farmers are still in their economically active age, which could result in a positive effect on production, and because cowpea production is surrounded by risks and uncertainties, such as theft, diseases and pests among others, it therefore requires people who are able and willing to take risks in expectation of profit. The result agrees with the findings of Obeta and Nwagbo (1999) who noted that younger farmers are more amenable to new ideas and risk; they are expected to adopt innovation more readily than older ones.

About 53.80% of the sampled farmers had one form of formal education or the other. Njoku (1991) and Roger and Shoemaker (2001) in their separate study observed that education is not only an important determinant of adoption of innovations but also an instrument for successful implementation of innovation for profitability. They also stressed that farmers who have attained some level of formal education are likely to raise their productivity through wise use of credit. Furthermore, over 82 % of the respondents acquired their land through inheritance. The remaining 13% was either through, rent or borrowing. It would appear that dependence mainly on inheritance has caused fragmentation of land holdings. As majority (87%) of the respondents in the study area owned between two to four plots. The system of land tenure by inheritance encourages fragmentation and sub-division of land holdings. The principal economic effect of this, as reported by Araka (1990), is a potential reduction of efficiency of labour due to movement from one plot to another. Also, land improvement and conservation may be hampered owing to the need for cooperation among neighbours. Fragmented small holdings also deny the farmers benefits of scale economies. Similarly, most (94.50%) of the farm families had been in cowpea farming for 6 years and above. The years of farming experience had a direct relationship with the age of the household head. Their long years of farming experience will enable them to overcome constraints faced in cowpea production and this also depicts good signal for high productivity. Also, about 93 percent of the respondents in the study area were married couples, and this is an indication of their chances of getting family labour for use on their cowpea farms. The respondents in the study area had family sizes ranging from 1-20 with mean of 9. The implication is that farmers with large family size will however; also need to increase their productivity to meet up with the consumption need of the family. The implication of the large family size in the area is that family expenditure tends to draw more on family income so that only a meager sum is saved and invested eventually in farming. However, the large family size may imply a probable greater farm output for the farmers.

Table 1 : Socio-economic characteristics of the cowpea farmers

Variables	Frequency	Percentage
Age in year		
21 – 30	29	18.40
31 – 40	49	31.00
41 – 50	51	32.30
Over 50	29	18.40
Level of education		
Adult	02	01.30
Primary	03	1.90
Secondary	40	25.30
Tertiary	45	28.50
Non-formal	68	43.00
Mode of land acquisition		
Inheritance	130	82.30
Rented	11	07.60
Community owned	16	10.10

Year of farming experience		
1 – 5	08	05.70
6 – 10	07	04.40
11 – 15	90	57.00
Over 15	53	33.60
Marital status		
Married	149	94.30
Single	09	05.70
Family size		
1 – 5	49	31.00
6 – 10	71	44.90
11 – 15	35	22.20
Over 15	03	01.90
Total	**158**	**100.00**

Source: Field survey, 2013.

Level of Resource Use

Land

The distribution of respondents based on the size of their farm holding is shown in Table 2. which shows that majority (94.31 %) of the farm family in the study area had small farm holdings of 2.5 ha or less. The size of farm determines the extent to which other resources (capital, labour etc) are used for optimum productivity. According to Alamu *et al.* (2002), farmers with more resources including land area are more likely to take advantage of a new technology. The analysis of land use reveals that a total of 342 ha were cultivated by all the respondents and individual plot sizes ranged from 0.10ha to 4 ha with a mean of 1.80 ha. This indicates that majority of the farmers in the study area were small holders. This situation where many farmers cultivated only small plots of land will not promote agricultural production beyond subsistence level.

Table 2 Distribution of respondents according to farm size.

Farm size(Ha)	Frequency	Percentage
0.1-1.5	102	64.56
1.6-2.5	47	29.75
2.6-3.5	06	03.80
3.5-4.5	03	0 1.89
Total	158	100.00

Source: Field survey, 2013

Labour Utilization in Cowpea Production.

Farmers in the study area utilized both family and hired labour. The level of labour input use according to farm operations presented in Table 3 reveals that a total of 945.41 manday/ha of labour was used. Family labour use was most prevalent in the area, accounting for over 78.94 % of the total labour used, while hired labour accounted for 21.06 % of total labour requirement. However, the fact that up to 21.06 % of labour input was hired, shows the potential of cowpea production in generating employment in the area.

This is very important in terms of income generation and commercial activities in the area, a a result of its multiplier effects. Those who get their income either as farmers or labourers will spend such income, which will constitute income to others who will also spend it, and so on. The results further show that, over 25% of the total labour in cowpea production is absorbed by land preparation; follow by weeding (23.35%) and harvesting (19.03%). The implication is that more than 67% of labour utilized in cowpea production is absorbed by these three operations. .

Capital Inputs in cowpea Production

Results further show that farmers used both durable and non-durable capital assets. The durable capital include pumps, cutlasses, hoes, axes, sickles and calabashes while the non-durable capital inputs employed include fertilizer, seed and agro-chemical. The study also reveals that about 13% of the respondents in the study area obtained credit from the formal sources. Farmers in the area

finance cowpea production from their savings. Only 13 % had access to formal credit provided by their cooperatives. In Nigeria, generally, efforts have been made to reach farmers with formal credit. However, the small-scale farmers have largely been by-passed because, among other problems, they lack the collateral demanded by financial institutions. These categories of farmers are therefore left to their own devices in overcoming capital shortage in their farming operations. Seed used for planting was obtained locally from the market or neighbors. Only few of the respondents used improved variety of planting materials. The study revealed that, the average seed rate used by the farmers in the study area was 17.81 kg/ha which is less than 20-25 kg/ha recommended for cowpea production system (Wilson and Wilson, 1994). The use of improved seeds could increase yield and returns in the area. Table 5 shows the distribution of farmers according to agrochemical use. As depicted in the table, almost 73.41 % of the respondents used 2 liters of agrochemical per hectare or less, while the remaining used more than 2 liters/ha. Again most of the farmers used agrochemical to control weeds and pest on their farms. The quantities used, however, were generally inadequate. For instance, the average application of agro-chemicals was 1.68 liters/ha which fall short of the recommended 3-4 liters/ha of Weedoff, Sarosite, paraforce, combat, uppercotte and lavaforce respectively, for cowpea (NSADP, 1999). The farmers attributed this problem to the high cost of the chemicals. Most of the weeding was done manually using hoes.

Table 3: **Family and non-family labour inputs by operations (man-days / ha).**

Operation	**Family man –day**	**Percentage**	**Hired man-day**	**percentage**	**Total man-day**	**percentage**
Land prep	177.25	23.75	60.75	27.04	238.00	25.17
Planting	50.30	6.73	46.00	20.48	70.78	7.49
Chem App	56.25	7.54	19.75	8.79	76.00	8.04
Weeding	180.75	24.22	40.00	17.81	220.75	23.35
Harvesting	151.75	20.33	28.13	12.52	179.88	19.03
Threshing	130.00	17.43	30.00	13.36	160.00	16.93
Total	**746.30**	**100.00**	**224.63**	**100.00**	**945.41**	**100.00**

Source: field survey, 2013

Table 4: Distribution of farmers according to level of seed use (kg/ ha).

Level of Seed	**Frequency**	**Percentage**
01-10	48	30.38
11-20	76	48.10
21-30	14	08.86
31-40	09	05.70
41 and above	11	0.83
Total	158	100.00

Source: Field survey, 2013

Table 5: Distribution of farmers according to level of agro-chemical use (kg/ ha)

Level of Agro-chemical	**Frequency**	**Percentage**
01-2	116	73.41
3- 4	24	15.19
5 and above	18	11.39
Total	158	100.00

Source: Field survey, 2013

Profitability of cowpea production

The total cost of production, as indicated in Table 6, was N56, 989.58/ha. The table further reveals that variable cost accounted for 97.31% of the cost of production, while the fixed cost accounted for less than 3 %. This finding agrees with those of Baba *et al*. (1998), Abduiiahi *et al*. (2010) and Ojo *et al* .(2008) who in their separate studies found variable costs accounting for 99%, 90.12% and 92.55% of the total cost, respectively. That fixed costs accounted for such small proportion of total cost confirms that fixed capital investment in the study area is low. This is expected since the farmers have limited access to credit which would have enabled them to acquire fixed capital inputs for farm expansion. Hence they rely on their savings which are low because of the low incomes. Consequently, they are able to afford only rudimentary tools such as hoes, cutlasses, sickles and the like which are cheap but which could not be relied upon for the needed expansion in cowpea production.

Among the variable costs, the cost of labour input alone constituted 50 percent in cowpea production. The cost of labour was however, dominated by the imputed cost of unpaid family labour which accounted for 53.11% of the total labour cost (see Table 4). The cost of family labour, although not directly incurred by the farmers was imputed on the assumption that if the farmer and his family had not worked on his farm, they could

have hired out their labour to other farmers at the prevailing wage rate in the study area. This again, is in agreement with the findings of Baba *et al.* (1998). In their study in Sokoto State, Nigeria, they reported high level of labour utilization (77% of total cost of production).

The net farm income in the study area was high N91,361.28/ha, with the rate of return on investment reaching 2.60 which implied that for every N 1 spent by farmer on cowpea production 60 kobo was realized as profit while gross ratio, operating ratio and fixed ratio were 0.61, 0.60 and 0.02 respectively. The entire ratios were less than 1 this indicates that cowpea farming is highly profitable and has great potential for increasing rural income. The high NFI recorded in the area is not only because of effective exploitation of available human and material resources but also because of better marketing prospects of cowpea. This finding is in line with those of Abdullahi *et al*. (2010), Omonona *et al*. (2005), Abba (2005), Ojo *et al* (2008) and Edeh and Igberi (2009) Omolehin *et al*. (2011) who recorded a high positive financial returns to arable farming .

Table 6: Cost and returns associated with cowpea production (₦/ha).

Item	Cost	Percentage	Returns
Gross Revenue (GR)			**148,350.86**
Variable costs (VC)	**55,458.38**	**97.31**	
Seeds	2,600.66	4.56	
Agrochemical	12,329.12	21.63	
Family labour (opportunity cost)	19,377.40	34.00	
Hired labour	15,222,70	26.71	
Rent on land	1,500.00	2.63	
Maintenance/repairs	978.50	1.72	
Marketing/transp cost	3,450	6.05	
Fixed cost (FC)	**1,531.20**	**2.69**	
Depreciation on farm tools	1,531.20	2.69	
Total cost (TC)	**56,989.58**		
Gross Margin			**92,892.48**
Net Farm Income (NFI)			**91,361.28**
Gross ratio			**0.51**
Operation ratio			**0.46**
Fixed ratio			**0.05**
Return on capital investment			**2.60**

Source: Field survey, 2013

Factors Affecting Profitability of Cowpea Production.

The results of the regression analysis that was used in the determination of the factors that affect profitability of cowpea production in the study area are presented in Table 7. Exponential function was chosen as the leading equation on the basis of R^2 value, t – value, F – value as well as the signs on the estimated parameters. The result gave an R^2 value of 0.81%. This implies that 81% of variation in profitability of rice production was explained by the variables included in the model.

Table 7 Regression analysis results of cowpea.

Variable	Coefficient	T-Value
Constant	6.848229	11.77***
Farm size (X_1)	0.9936196	13.32***
Labour (X_2)	-0.1201845	-0.96^{NS}
Capital (X_3)	0.1122579	2.91^{***}
Seed cost (X_4)	-0.2022276	-2.91^{***}
Agro-chemical (X_5)	0.1661571	2.46**
R2	0.81	
F-Value	131.59***	

Note ***, ** and NS implies statistically significant at 1%, 5% levels and Not Significant, respectively.
Source: Field survey (2013).

The coefficient of agro-chemical was significant at (P<0.05), farm size and capital and seed were significant at (P< 0.01) respectively while the coefficient of labour was negative and not significant indicating the input do

not significantly influence profit level of the farmers. Moreover, the negative and significant coefficients of the variable seed imply that increase in the quantities of these inputs would result in decrease profitability of the farm enterprise. implication of positive and significant coefficient of farm size and capital and agro-chemical is that, farmers with high capital base have ability or tendency to afford or purchase production input like agro-chemical and also expand their farm size which could result in increase in production and this will tend to increase their profit level. This result is in agreement with that of Abduiiahi *et al.* (2010) who observed that amount of capital inputs per farm determines the level of investment in such a farm.

IV. Production function Analysis

The production function that was used to determine the nature of inputs – output relationship in cowpea production is presented in Table 8 (Double log production function as the lead equation). The value of coefficient of determinations (R^2) indicated that 66% of the variation in output of cowpea production was explained by the inputs included in the production model. The regression coefficients of land size (X_1), labour (X_2), capital (X_3) and agro-chemical (X_5) were positive indicating that an increase in these inputs, holding others constant will lead to an increase in the gross output. The result also showed that land size (X_1), capital (X_3) and agro-chemical (X_5) were significant at 1%, level of probability while labour (X_2) was significant at 5% level of probability. But the coefficient of seed (X_4) was negative and not significant.

Table 8 Estimate of Cobb-douglas production function for maize production

Variable	Coefficient	T-Value
Constant	10.3286	68.35***
Land (X_1)	0.7713114	8.88***
Labour (X_2)	0.0000397	2.10**
capital (X_3)	0.0000907	2.64^{***}
Seed (X_4)	-0.000033	-1.38^{NS}
Agro-chemical (X_5)	0.0001159	2.69***
R2	0.66	
F-Value	58.88***	

Note ***, ** and NS implies statistically significant at 1%, 5% levels and Not Significant, respectively.
Source: Field survey (2013).

Efficiency of resource used in cowpea production.

The result of the economic efficiency of resource use based on the ratios of marginal value product (MVP) to marginal factor cost (MFC) showed that land (X_1), labour (X_2),capital (X_3) and agro-chemical (X_4) were underutilized (Table 9). The marginal value products (MVPS) of the entire variable were positive implying that using more of those resources would increase the total value product. The MVP for land was ₦1870.12 implying that increasing land by 1 unit would increase total value product (TVP) by ₦1870.12, if other inputs are held constant. The marginal factor cost (MFC) for land was ₦780.5, which was lower than the MVP. Hence, land was being used below economic optimum level. Therefore, increasing the area cultivated would increase profit. .With respect to labour, the MVP was ₦2165. Implying that increasing labour input by 1 man-day would increase TVP by ₦2165, if other inputs are held constant. The MFC of labour was ₦1300 which was lower than the MVP. This implies that labour input was being used below economic optimum level. Therefore, cowpea farmers could increase their level of profit by increasing labour. Also for capital, the MVP was ₦1802.18. Implying that increasing capital input by 1 unit would increase TVP by ₦1802.18, if other inputs are held at constant. The MFC of capital was ₦1620 which was lower than the MVP, which implies that capital input was being used below economic optimum level. Therefore, cowpea farmers could increase their level of profit by increasing capital.

The MVP for agro-chemical was ₦1119.3, which implies that increasing agro-chemical by 1 liter would increase TVP by ₦1119.3, if other inputs are held constant. The MFC of agro-chemical was ₦900, which was lower than the MVP. This implies that agro-chemical input was being used below economic optimum level. Therefore the cowpea farmers could increase profit by increasing agro-chemical input So, increasing the quantities of the four inputs in cowpea production in Agricultural zone 1 will increase cowpea output and in turn increase cowpea revenue in the study area. This finding is in agreement with those of Abdullahi *et al*. (2010) and Ojo *et al.* (2008) who in separate studies found that resources like land, Labour, seed and fertilizer are underutilized, so increase in quantity of these inputs would lead to increase in revenue status of the farmers.

Table 9 Efficiency of resource use in cowpea production

Variables	MPP	MVP	MFC	Efficiency ratio
Land (X_1)	20,779.12	1870,12	780	2.40
Labour (X_2)	4.33	2165	1300	1,67
Capital (X_3)	3,59	1802.18	1620	1.11
Agro-chem (X_5)	3.731	1119.3	900	1,24

Source: field survey, 2013

V. Conclusion

The study revealed that inspite of the abundant potentials of cowpea production in the study area, available resources were not fully tapped. The respondents in the area were generally small-scale farmers that depended on small but scattered plots they acquire through inheritance. Land, labour, capital and purchased inputs like seeds and agro-chemicals were the main production factors influencing cowpea production in the study area; cowpea producers in the study area possess a lot of agricultural know-how, skill and expertise in farming under difficult conditions and constraints.

The study also showed that cowpea production in the study area was profitable. This means that the area has great potential to increase cowpea production and farmer's income, if effort are made for the widespread adoption of new technologies and identified constraint are addressed. The study showed that farm size, capital and agro-chemical were important in explaining the variation in profitability of cowpea producers in the study area. The findings also revealed that the marginal value product for the inputs was more than their marginal factor cost signifying that they are used below economic optimum level

VI. Policy Implications

In view of the current global effort in achieving the Millennium Development Goals (MDGs), Nigeria as a part of this effort should as a matter of fact integrate within the present presidential initiatives on agriculture transformation agenda, a food policy measure that will strategically ensure that cowpea farmers follow appropriate farm practices in the course of technology adoption. In this regard, a more realistic package that will increase the ratio of the number of farmer to extension contact should be encouraged as a vital step towards increased cowpea production in Niger State in particular and in Nigeria at large. Similarly, the Farmers in the study area need to form cooperatives to improve accessibility to improved inputs such as improved seed, agro-chemicals and institutional credit. The adoption of such inputs could be further encouraged through a more effective extension services. There is urgent need for feeder roads to facilitate transportation of product to the market from rural areas. Also this will ensure efficient dissemination and utilization of the technology at the grassroot level.

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