Profitability analysis of cowpea production in rural areas of Zaria local government area of Kaduna state, Nigeria

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Abstract

The study examined profitability of cowpea production in Zaria local government of Kaduna state. The primary data for the study were obtained using structured questionnaire administered randomly to 95 sampled farmers in the study area. Descriptive statistics such as frequencies and percentages and inferential statistics such as Farm budgeting model and multiple regressions were used to analyze the data. The results also showed that the estimated average variable cost, fixed cost, gross margin, net farm income and returns on naira invested were ₦27,000.84, ₦5, 351.29, ₦60, 339.42, ₦27, 987.29 and 2.2 respectively. The result of the semi-log functional form best fit the data sets which revealed that the value of coefficient of determinant (R^2) as 0.8136. All the variables included in the regression model were statistically significant at various degrees of probability. The significant explanatory variables includes, Farm size (X_1), family labour (X_2), hired labour (X_3), quantities of seed (X_4), fertilizer (X_5), agrochemicals (X_6) and capital inputs (X_7) . The Farmers major constraints were pest and diseases, drought, lack of credit facilities. It is therefore recommended that farmers should be provided with farm inputs especially credit facilities, improved seed varieties and agrochemicals. Based on these findings, it can be concluded that, the area has a great potential to increase cowpea production and farmers income. Efforts should be made to encourage farmers to form cooperatives so that they can pool their resources together to increase their scale of operation.

Keywords: Profitability; cowpea and input

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1. Introduction

Nigeria agriculture is dominanted by small-scale farms which constitute an important and invaluable component of the Nigerian economy. Food consumption expenditures accounts for a high proportion of total households' expenditure in Nigeria and food demand has been growing at the rate of 3.5% per annum with food production growing at a rate of 2% per annum in recent years, while, the annual rate of population growth has been as high as 2.9 percent, thereby, creating a serious food deficit (Shaib *et al.*, 1999 and Baiyegunhi *et al.*, 2010). The ability of Nigeria agriculture to perform its role in development has been declining thus creating wide gap between the demand for and supply of food (Alabi *et al.,* 2006). It is the desire of most countries (Nigeria inclusive) to be self-sufficient especially in food production. The country has potentials for production of different cereal and legume crops which include cowpea.

Cowpea is an important grain legume (Singh *et al.,* 2002) and the crop is also an important companion crop in most cereal-legume cropping systems because of the benefit from its nitrogen fixing ability and the residual nitrogen originating from the decay of its leaf litter, roots and root nodules (Okereke *et al.,* 2006). Cowpea is gradually attaining economic importance in Nigeria, particularly in the southern states of Nigeria, even though the bulk of the production is done in the semi arid zone of northern Nigeria (PetuIbikunle and Smith, 2008).The crop therefore has a great potential in contributing to alleviation of malnutrition among resource-poor farmers.

Cowpea plays several key roles in the nutrition and economic life of many people in the developing world. According to a report by Thomas Jefferson Agricultural Institute (TJAI, 2009), cowpea has a protein content of about 23 % making it good source of plant protein. This has an implication in its ability to cover the gap created by the inadequacy of animal protein in the diet of common people in Nigeria due to the shortage of supply and low level of income of most people in the region.

However, cowpea is generally produced by small-scale farmers using rudimentary implements. The average land holding is less than two hectares for most farmers; family labour remains the essential input. Ownership of land is on communal basis, inherited or rented; cases of outright purchase of land are rare. Capital is a major limitation in agriculture, only few farmers have access to rural credit. Therefore, the main objective of this study is to analysis the profitability of cowpea production among rural farmers in Zaria Local Government Area, Kaduna State, Nigeria; while the specific objectives are to estimate the costs and returns associated with cowpea production in the study area; determine the factors influencing the production of cowpea in the study area; and identify the constraints to cowpea production in the study area.

2. Methodology

2.1. The study area

The study was conducted in Zaria Local Government Area of Kaduna state. Zaria is situated on a plateau, at a height of about 700m above sea level in the centre of northern guinea savannah zone. The Local Government

Area (L.G.A) is located on longitude $7^0 42^`$ east and at latitude $11^0 04^`$ north and covers an area of about 11,120sqkm with population of 408,198 inhabitants (FRN, 2007). The mean annual temperature is 34^0 c with hottest month starting from March to April (40^0c) and the coldest period (13.2^0c) is between December and January. The area has a typical tropical climate and the Agricultural activities in the L.G.A are influenced by the two distinct climatic seasons which are the rainy and dry seasons with a Thomas Jefferson Agricultural Institute rainfall of about 110mm which lasts between March to October i.e about 150-200days (KSADP, 1994) while the dry season is from November to February. This is intervened by harmattan between November and February (Barje *et al.*, 1995). Zaria is one of the 25 L.G.A's of Kaduna state. Farming is traditional in nature and is the major occupation of the people in the study area; crops grown include cowpea, maize, sorghum, other principal crops such as rice, pepper, onion, lettuce etc. Another major occupation of the people is livestock farming due to the predominance of grasses and shrubs with a large number of civil servants and traders.

2.2. Data collection and technique

Zaria LGA was purposively chosen based on the long history of cowpea farming. The respondents were selected using simple random sampling techniques. The second stage of sampling involved random selection of five (5) villages from each district of the local Government Area, because of the concentration of cowpea farmers in the area. The villages are; Bizara, Dambo, Dumbi, Dakacci and Rafin fa. Random sampling was used to select Twenty(20) respondents from Bizara, twenty-five (25) respondent from Dambo, fifteen (15) respondents from Dumbi, twenty(20) from Dakacci and fifteen (15) respondents from Rafin fa. The inequality in the number of farmers sampled is as a result of heterogeneous nature of the population. In all ninety-five (95) cowpea farmers were randomly selected. Cross-sectional data was obtained with the help of questionnaires and scheduled interview.

3. Method of data analysis

3.1. Profitability of cowpea production

Farm budgeting (gross margin and net farm income) was used to estimate the profitability of cowpea production. Costs and returns analysis forms the basis for farm profitability assessment. There are two types of cost involved in farm production i.e fixed and variable costs. Gross margin is therefore, the difference between Gross Farm Income (GFI) and the Total Variable Cost (TVC) (Olukosi and Erhabor, 1988).The gross margin was estimated as presented in equation 1.

$$GM = GFI - TVC \qquad\qquad (1)$$

where, GM = Gross Margin, GFI = Gross Farm Income, TVC = Total Variable Cost

$$\text{Net Farm Income (NFI)} = \text{Gross Margin (GM)} - \text{Total Fixed Cost (TFC)} \quad (2)$$

Gross ratio of the farm is a profitability ratio that measures the overall success of the farm business. The lower the ratio, the higher the return per the amount of money invested.

$$GR = \frac{TC}{GFI} \tag{3}$$

where, GR = Gross Ratio, TC = Total Cost and GFI = Gross Farm Income.

Operating ratio of the farm is directly related to the farm variable input usage; the lower the ratio the higher the profitability of the farm business. The ratio was estimated as presented in equation 4.

$$OR = \frac{TVC}{GFI} \tag{4}$$

where, OR = Operating Ratio, TOC = Total Operating Cost, and GFI = Gross Farm Income

Return on capital Invested is written as gross margin divided by Total Variable Cost as showed in equation 5.

$$RI = \frac{GM}{TVC} \tag{5}$$

where, RI = Return on capital Invested, GM = Gross Margin and TVC Total Variable Cost

3.2. Multiple Regression Analysis

This was used to determine the various factors influencing the production of cowpea in the study area. Mathematically the model used in the study is presented in implicit form as adopted by Oke *et al.,* 2007.

$$Y = f(x_1, x_2, x_3, x_4, x_5, x_6, x_7) \tag{6}$$

where,

Y   =   Total output of Cowpea (kg)

X_1 =   Farm size (ha)

X_2 =   Family labour (man-days)

X_3 =   Hired labour (man-days)

X_4 =   Seeds (kg)

X_5 =   Fertilizer (kg)

X_6 =   Agrochemical (litre)

X_7 =   Capital inputs e.g. depreciation on fixed capital items, rent on land, interest charges on borrowed capital etc (N)

e   =   error term which is assumed to be normally and independently disturbed with zero mean and constant variance

Various functional forms such as the linear, semi-log, exponential and double log were tried and on the basis of the R^2, t-ratio, magnitude of estimated coefficient, conformity of signs with a priority to expectation and the F-ratio, the lead equation was used for further discussion. The semi logarithm functional form was chosen as the lead equation .The explicit form of the lead equation is as follows.

Semi-logarithm function

$$Y = b_0 + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + b_6 \log x_6 + b_7 \log x_7 + e \qquad (7)$$

4. Results and discussion

4.1. Costs and returns of cowpea production

The total cost of production, as indicated in table 1 was ₦32, 352.13/hectare and variable cost accounted for 83.46% of the total cost of production, while the fixed cost accounted for less than 17%. Labour constitute 60.24% of total cost of production, followed by cost of agrochemicals 16.20%, rent on land 8.68%, interest on borrowed capital 5.63%, cost of fertilizer3.89%, cost of seeds 2.60%, Depreciation on farm tools, machineries and implement 2.23% and cost of seed dressing chemical 0.53% respectively. In any production process, costs are incurred in producing output and income or returns are earned from the sales of such outputs produced. The net farm income was ₦27, 987.29/hectare, the rate of return on investment was 2.2, which means that for every ₦2.00 invested a return of 20 k was realized, while gross ratio and operating ratio were 0.37 and 0.31respectively. All the ratios were less than 1 this indicates that cowpea farming is highly profitable and has great potential for increasing rural income.

4.2. Production input–output relationship

The result of the production function that was used in the determination of the factors affecting profitability of cowpea production in the study area is as presented in Table 2. The semi-log function was chosen as the lead equation based on the R^2 value, t-and f-values as well as the signs on the estimated coefficients.   About 81.3% of the variation in output of cowpea is explained by the factor inputs as indicated by the value of R^2. The regression coefficients of farm size (X_1), hired labour (X_3), fertilizer (X_5), agrochemicals (X_6) and capital input (X_7) were positive, which indicates that an increase in these inputs holding others constant will lead to an increase in output and variably profit. The regression coefficient of family labour (X_2) and seeds (X_4) were negative indicating that an increase in these inputs will lead to a decrease in the output. The implication of positive and significant hired labour and capital inputs is that the more access to credit a farmer has, there is the tendency for the farmer to be able to pay for hired labour and also expand his farm size which will result in increase in production and this will tend to increase their profit levels.

5. Constraints to cowpea production

The result revealed that pests and diseases (89.47%) was the most serious problem. This problem ranked first among all problems as the most serious problem. Another important problem confronting the farmers in the study area was drought (78.94%). Over 75% of the respondents complained of inadequate credit facilities; this must have been responsible for the small scale production by majority of them. Similarly, there are persistent problems of lack of storage facilities (51.57%) and lack market for product (47.36%). Other problems are high transportation cost; flood, insufficient research and promotion of value added product and theft of farm product on the field. The study also revealed that over 31% of the respondents in the study area complained of problem associated with land tenure system, (15.78%) of the respondents had no access to improved seeds.

6. Conclusion and recommendations

It can be concluded from this study that cowpea is profitable and the study area has great potential for increase cowpea production. Based on this the following recommendations were made:

- Farmers should be encouraged to adopt the use of improved seed varieties and agrochemicals.
- Farmers should be made encouraged to form cooperatives so that they can pool their resources together to increase their scale of operation.

Table 1. Cost and return associated with cowpea production (₦ /hectare)

Items	Cost	Percentage of Total cost
Seed	841.47	2.60
Fertilizer	1258.21	3.89
Agrochemicals	5242.24	16.20
Seed dressing chemical	171.54	0.53
Labour	19487.38	60.24
Total variable cost	27,000.84	
Fixed cost (FC)		
Depreciation on farm tools	720.40	2.23
Rent on land	2808.67	8.68
Interest on borrowed fund	1822.22	5.63
Total fixed cost	5351.29	16.54
Total cost (TC)	32,352.13	
Gross income (GI)	87340.26	
Gross margin	60, 339.42	
Net farm income	27987.29	
Gross ratio	0.37	
Operating ratio	0.31	
Return on capital invested	2.20	

Source: Field survey, 2012.

Table 2. Estimated Semi—log production function for cowpea

Variables	Regression coefficient	T-value
Constant	6.144668	81.36***
Farm size	3056079	7.18***
Family labour	-0.0039118	-2.08**
Hired labour	0.0046659	2.29**
Seed	-0.0134774	-3.98
Fertilizer	0.0001752	1.82*
Agrochemicals	0.0185927	2.30**
Capital input	0.00000132	2.52**
R^2	0.8136	
F- ratio	53.62	

Computed from field survey data, 2012

*** = significant at 1% level of probability;   * = significant at 5% level of probability

* = significant at 10% level of probability

Table 3. Constraints faced by Cowpea farmers

Constraints	Frequency	Percentage	Ranking
Pest and diseases	85	89.47	1st
Pilfering (Theft)	50	52.63	6th
Lack of credit facilities	72	75.78	3rd
No access to improved seed	15	15.78	15th
Drought problem	75	78.94	2nd
Flood problem	26	27.31	13th
Lack of storage facilities	49	51.57	7th
Transportation problem	55	57.89	5th
Insufficient research and promotion of value added products	25	26.31	12th
Lack of market for the product	45	47.36	9th
No access to extension agents	40	42.10	10th
No access to hired labour	57	60.00	4th
Lack of capital	20	21.05	14th
Problem of land tenure system	43	45.26	8th
Others	30	31.57	11th
Total	**661***		

Source: Field survey, 2012

References

Alabi, R.A. and Esobhawan, A.O. (2006), "Relative economic value of maize - okra intercrops in rainforest zone, Nigeria". *Journal of Central European Agriculture,* Vol.7 No. 3, pp. 433-438.

Baiyegunhi, L.J., Chikwendu, D.O. and Fraser, G.C.G. (2010), "Resource use efficiency in sorghum production in three villages of Kaduna state Nigeria", *African Journal of Agricultural Research,* Vol. 5 No. 3, pp.172-177.

Barje, T.B., Okosun, L.A and Mijindadi, N.B. (1995), "Agricultural Extension for Women: Rural Women Participation in Agriculture and Decision-making. Focus on Adamawa and Taraba States". *Nigerian Journal ofAgricultural Extension,* Vol 7 pp. 71-76.

Federal Republic of Nigeria (FRN, 2007), Federal Republic of Nigeria Official Gazette, Lagos 94 (24).

KADP (Kaduna state Agricultural project) (1994), Impact study final report. 128pp.

Oke, V.O., Farell, M.J and Ogundele, O.O. (2007), "Technical efficiency difference in cowpea production technologies in Nigeria", *World Journal of Agricultural sciences.* Vol. 3 No.5, pp. 53-58.

Okereke, G.U., Egwu, S.E. and Nnabude, P. (2006), "Effect of cowpea organic residues and fertilizer on soil fertility, growth and yield of upland rice". Proceedings of the Eighteenth World Congr. Soil Sci. Philadelphia, Pennsylvania, USA, July 9-15, 2006.

Olukosi, J.O. and Erhabor, P.O (1988), *Introduction to farm management principles and Applications.* AGITAB Publishers, Zaira -Samaru.

Patuibikunle, D.W and Smith M.H (2008), "An Economic study of Three villages in Zaria Province" to input and output study .Vol.l Samaru miscellaneous paper 37. Instidute of agricultural Research Zaria. Nigeria

Shaib, B.N., Adamu, A. and Bakshi, J.S.(1999), "*Nigeria Agricultural Research Strategy Plan* 1996 – 2010". Africa Book Builders Limited, Ibadan, Nigeria.

Singh, B.B., Ehlers, J.D., Sharma B. and Friere, F.R. (2002), "Recent progress in cowpea breeding" , In: Fatokun, C.A., Tarwali, S.A., Singh, B.B., Kormawa, P.M. and Tamo,M (eds), *challenges and opportunity for enhancing sustainable cowpea production.* Proceedings of world cowpea conference III held at IITA, Ibadan, Nigeria.

Thomas Jefferson Agricultural Institute (2009), A Versatile Legume for Hot, Dry Conditions. www.jefersoninstitute.org Retrieved 7th May 2009.