Optimum Farm Plan for Food Security among Smallholder Farmers in Imo State, Nigeria

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Abstract

The paper determined optimum farm plan for food security among smallholder farmers in Imo State, Nigeria. Data were collected with structured and validated questionnaire from 180 smallholder crops farmers in Imo State. Data were analyzed using descriptive statistics (mean, frequency distribution and percentages), budgetary analysis and linear programming model. Results show that the mean age of the farmers was 41 years, mean household size was 9 persons, mean farm size was 1.25 hectares mean farming experience was 19years and mean level of education was 8.3 years. The enterprises that contributed greatly to the smallholder farmers' net return were food crops and cash crops with net returns per annum of N122666 and N116850 respectively. The profit lines as determined with the linear programming model were 6.8 and 4.9 for food crops and cash crops respectively, and this is the optimal feasible solution. **[Ohajianya, D. O et al. Optimum Farm Plan for Food Security among Smallholder Farmers in Imo State, Nigeria. International Journal of Agricultural Science, Research and Technology, 2011; 1(4):145-148].**
 Key words: Food security, optimum farm plan, smallholder farmers, Imo state

1. Introduction

Food security means access by all the people at all times to the food required for them to leave an active healthy and productive life (Footsteps, 1997). Food security is not synonymous with food sufficiency. Food security is possible without food sufficiency if there is adequate capacity to acquire additional food from external source to meet food requirement (Olayide, 1980; Alagba et al, 2009).Food is a major concern of every country. Various reasons have been given for the decline of food output in Nigeria, and they include the cultivation of low yielding crop varieties, the absence of low cost and adaptable technology (Olayide, 1975), lack of break through in agricultural investment, unwillingness of the entrepreneurial class to devote organizational ability to food production, and low status accorded to farmers in the society (Aderinola, 1989; Ezekiel et al, 2009).

Despite the fact that there has been concerted efforts on the part of government, donor agencies and farmers to accelerate the growth in food demand and supply, there is still short fall in food supply, which is further aggravated by the disparity between the estimated annual population growth of 3.5% compared to an estimated 2.0% annual rate of food production (Ojo et al, 1993). This shortfall in food production leads to massive food importation, which drains the country's foreign exchange reserves (Ezekiel, et al, 2009).

The research question Nigeria now is, how can food security be achieved? Attainment of food security is a matter of outmost concern at both the household and national levels. Hence, this paper is therefore designed to;

(1) examine the socioeconomic characteristics of the smallholder farmers in Imo state,

(2) determine the net returns earned by the farmers, and

(3) determine the best farm enterprise combination to achieve optimum level of production.

2. Materials and methods

This study was conducted in Imo state, Nigeria. The state comprises of three agricultural zones, namely; Owerri, Orlu and Okigwe, and subdivided into 27 Local Government Areas (LGAs). The state has land area of about 5,100.10 Square kilometers (Imo State Statistical Year Book, 2004) and estimated population of 3.7 million people (FGN, 2006). Agriculture is the major occupation of the people and food production is patterned by seasonal distribution of rainfall. Food scarcity as experienced by most house holds in Imo state.

2.1 Sample Selection

A representative sample was selected through a multistage sampling technique. Two LGAs were purposively selected from each agricultural zone, so as to ensure the selection of actual LGAs where crops production is dominant and to exclude urban LGAs. From each LGA, three communities were randomly selected making a total of 18 communities. The list of communities was got from the community development officer at the LGA Headquarters. The sampling frame was the list of registered crops farmers in the communities with the All Farmers Association of Nigeria (ALFAN) Owerri office. From this sampling frame totaling 205, 242 and 185 for owerri, Orlu and Okigwe Agricultural zones respectively, proportionate and random sampling techniques were employed to select 58,69 and 53 farmers from owerri, Orlu and Okigwe Agricultural zones respectively giving a sample size of 180 farmers for the study.

2.2 Data Collection

Data were collected mainly from primary source. The primary data were obtained through the use of structured and validated questionnaire supplemented with personal observation. Questionnaire were administered through cost route approach. Data were collected on variables such as socioeconomic characteristics of farmers such as age, household size, farm size, farming experience and level of education. Data collection lasted for 11 months, between February and December, 2010.

2.3 Data Analysis

Data were analyzed using descriptive statistics (mean, frequency distribution and percentages), budgetary analysis and basic linear programming model.

Descriptive statistics were used to analyze socio economic characteristics of the farmers.

Budgeting analysis was used to determine the net return of farmers for each enterprise in the study area.

The Budgetary or Net return model is specified as follows;

NR=   TR – TC

Where;

NR = Net Return

TR = Total Revenue

TC = Total Cost (TVC + TFC)

TVC = Total Variable Cost

TFC = Total Fixed Cost

The basic Linear Programming (LP) model was specified to maximize Total Gross Margin (TGM) for each of the enterprise to ascertain the most optimal enterprise combination and production levels within the limit of the resources constraint specified.

The model as used by Ezekiel et al (2009) is specified as;

$$\text{Maximize TGM} = \sum_{j=1}^{n} C_i X_j \qquad (1)$$

Subject to,

$$\sum_{j=1}^{n} a_{ij} X \leq b_i \qquad (2)$$
$$(i = 1,2,3,4)$$

$X_j \geq 0$ (non-negative constraint)

Where,

TGM = Total Gross Margin to be maximized

C_i = Gross margin of each enterprise (j)

X_j= size of each enterprise (Ha)

n= The number of enterprises (n= 1,2,3,4)

a_{ij} = The amount of ith resources available during the period of production.

The alternative enterprises (X) examined are;

X_1 = Cash Crops

X_2 = FoodCrops

X_3 = Fruits

X_4 = Vegetables

The constraints (bi) investigated are;

B_1 = land

β_2 = labour (Pre-planting and post planting)

β_3 = capital (equipment, tools, seeds, fertilizer, agro-chemicals, etc)

3. Results and discussion

Socioeconomic characteristics of small holder farmers

The socioeconomic characteristics of smallholder farmers are summarized in table 1. The table shows that the smallholder farmers had a mean age of 41 years. This implies that the farmers were within the economically active population and therefore constitute a good labour force in food production to enhance food security in the study area.

The mean household size was 9 persons which implies that the farmers had large household sizes which characterizes a developing country. The mean farm size was 1.25 hectares indicating the small scale nature of smallholder farming enterprise and this confirms the earlier findings that farmers in developing countries cultivate small plots and their farming system is subsistence in nature.

Table1. Summary of socioeconomic characteristics of farmers

Variable	Mean
Age (years)	41
Household size (No. of persons)	9
Farm size (Ha)	1.25
Farming experience (years)	19
Level of education (years)	8.3

Source: Field data, 2010

The mean farming experience of the smallholder farmers was 19 years, indicating that the small holder farmers have acquired enough experience to engage into profitable enterprises to improve food security. The mean level of education was 8.3 years, which implies that most of the farmers are literate enough to use improved farm practices and adopt recommended technologies to improve food security in the study area. Thes findings are similar to those of Ezekiel et al (2009) and Amao (2009).

Estimating Gross Margin and Net Return
The estimated gross margin and net returns for each of the enterprises is presented in Table 2.

The table shows that the average contribution of each enterprises to the smallholder farmers was ₦203,167 (33.04%) for cash crops, ₦190,305 (30.95%)for food crops, ₦ 142,016 (23.09%) for fruits, and ₦ 79,463 (12.92%) for vegetables.

This result indicates that the enterprises that contributed greatly to the smallholder farmers net return were the food crops and cash crops enterprises with net return per annum of N122666 and N166850 respectively.

Determination of the Best Farm Enterprise Combination
Linear programming was used to determine the optimum Gross Margin and profit line of the two enterprises (food crops and cash crops). The linear programming equation was subjected to three constraints; land, capital and labour. The profit line was found to be 6.8 and 4.9 for food crops and cash crops respectively, and this is the optimal feasible solution.

4. Conclusion and Recommendations
The study determined the optimum farm plan for food security among smallholder farmers in Imo State Nigeria. The enterprises that contributed immensely to the smallholder farmers' net return were food crops and cash crops with net return of N122666 and N166850 respectively. The profit line resulting from linear programming analysis were 6.8 and 4.9 for food crops and cash crops respectively, and this is the optimal feasible solution. It is therefore recommended that concerted effort should be made by both private and public stakeholders in agriculture to facilitate sustained food security status through more investment in food and cash crop production that have shown high profit margin.

Table 2. Estimated Gross Margin and Net return for each enterprise

Item	Cash Crops (₦)	Food Crops (₦)	Fruits (₦)	Vegetables (₦)
Total Revenue	203,167 (33.04%)	190,305 (30.95%)	142,016 (23.09%)	79,463 (12.92%)
Cost of hired labour	37,406	25,675	18,905	7,445
Imputed cost of family Labour	8,115	8,946	5,439	7,948
Cost of inputs	19,317	15,503	8,307	2,105
Total Variable Cost	64,838	50,124	32,651	17,498
Gross margin	138329	14081	109,365	61,965
Fixed cost				
Depreciation on capital Items	6014	5209	4516	3073
Interest on loan	15,465	12,306	9,075	7,115
Total FC	21,479	17,515	13,591	10,188
Total Cost	86,317	67,639	46,242	27,686
Net return	116850	122666	95774	51777

Source: field data, 2010

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