

Optimization Plan for Agricultural Enterprises among the Military Personnel

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Abstract

Agriculture is the only form of enterprise military personnel are officially allowed to embark on in addition to defending the Nation and ensuring its national security. While the military are engage in different agricultural enterprises, there is insufficient empirical information on the returns to agricultural enterprises among the personnel. The aim of the study was to investigate economic analysis of agricultural production enterprises among the Nigerian military personnel. The objectives were to: (i) assess the level of capacity for implementing optimal plan for agricultural enterprises; and (ii) determine the optimal plan for the enterprises. Based on survey as the research design, 275 military personnel from 10 out of all military formations across Nigeria used were selected through a two-stage sampling technique. A structured questionnaire with a reliability coefficient of 0.86 was used for the study. Descriptive statistics, linear programming, and logistic regression were used for data analysis. Tests of significance were carried out at 0.05 alpha level. The results shows that optimal plan for crop production was 3.25ha of yam/ maize enterprise with a total gross margin of ₦811,040.00 per season, that of livestock was 12.53 tropical livestock unit (tlu) of cattle and 2.728 tlu of layers, giving a total gross margin of ₦1,173,070.00 per annum; Commissioning status, marital status, and farming experience were the factors that affect the capacity to implement optimal plan for crop production while farming experience and farm income were the factors that affect the capacity to implement optimal plan for livestock production.

Keywords: Optimization Plan; Agricultural Enterprises; Nigerian Military Personnel.

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1. Background to the Study

The agricultural sector is the main employer of labour and driver of development in rural regions. According to Reference [6], some 1.3 billion people work in agriculture around the world ranging from farm labour to other aspects of agriculture, 97 percent of them in developing countries. Depending on the region, 30 to 50 percent of household income in rural regions is generated directly through farming [7]. The Nigerian military personnel have an important role in sustainable agricultural development in Nigeria as they can contribute immensely to agricultural [8]. Food security is an integral part of national security. The Nigerian military whose mandate is to provide national security, therefore, has an important role in agriculture. Active participation of the military in agricultural production should not be seen as an incursion into an unfamiliar ground but a step in the direction that agrees in principle with one of its core mandates, which is ensuring peace [9]. The armed forces are one of the most critical elements among all the institutions of government for the agriculture and economic development of Nigeria. This is because Nigerian military authorities allow military officers and their family members to invest in agriculture [10]. The duty of the Nigerian army is not just to ensure national security, but to also contribute to providing food to ensure growing the economy of the country. This is in line with the desire of the military to contribute to agriculture and food security by taking part in agricultural production while in service and even in retirement [1]. The military as an institution as well as the military officers have unique contributions to make so as to help strengthen the agricultural development in Nigeria. Their involvement in agriculture will also help in promoting civil-military relationships through the employment of civilians in military officers' farms and also interact with civilians in other agricultural production processes [3].

1.1. Statement of the Research Problem

Nigeria is one of the major African countries that are susceptible to insecurity and terrorism. This has the effect of threatening the territorial integrity, stability and security of the nation. One way to keep the peace and stability of the country is to improve access to food as a basic human need. Improvement in the food security status of the population is the most effective means of improving the security of lives and property of the citizens. Agriculture is the only form of enterprise military personnel are officially allowed to embark on outside defending the nation and ensuring national security [4]. However, there is no empirical information on the agricultural enterprises that military officers are engaged in and their contribution to agriculture in Nigeria has not been given the required attention. While the military personnel must be given special consideration in the area of agricultural support programmes of the government, the lack of information on their participation in agricultural production enterprises may make it difficult for the policy makers to include the military personnel in the agricultural support programmes of the government.

Though it is expected that military personnel carry out agricultural production activities to make profit, the general notion that officers are to provide security often takes precedence over the business interest of the military officers. Little is therefore known about their economic structure in agricultural production, lack of information on profitability would make it difficult for the military personnel to make appropriate decisions on their agricultural enterprises. Besides, inadequate information on the financial structure of the farms might be a major reason why they are not well integrated into many of the support programmes designed for the farmers.

To improve the productivity and contribution of the military personnel involved in agriculture to the Nigerian economy, there is the need for improved utilisation of available resources. The level of optimal usage of available resources determines the extent of the contribution of Nigerian agriculture to the economy. Lack of empirical information on level of capacity for implementing optimal plan for agricultural enterprises would however hamper the effectiveness of any policy that might be targeted at improving agricultural productivity. Besides, several socioeconomic circumstances may hinder the optimal usage of available resources.

2. Methodology

2.1. Study Area

This is an exploratory research so no work has been published on the economic analysis of agricultural production enterprises among the Nigerian military personnel which made it impossible to draw broad conclusions from the literature. However, by compiling lists of agricultural enterprises among the personnel few of such studies have been undertaken in other parts of the world. This study was carried out in Nigeria across all locations with military formations across all the zones in Nigeria. The Nigerian military personnel primary responsibilities are to ensure national security, to protect the country against external foes and non-state elements. Crop production has been seen as a major enterprise among the Nigerian military personnel, the officers were engaging in other forms of agricultural enterprises such as poultry, cattle and fish production. Although the military personnel are faced with different constraints, these forms of enterprises are still considered highly profitable among the military personnel. Their farm locations were mainly in the northern part of Nigeria and a lesser percentage in the south.

2.2. Sources and Types of Data

Primary data using a well-structured questionnaire was collected and used for this study. The questionnaire was pre-tested for appropriateness propriety and revised based on the pre-test feedbacks before it was administered to the sampled respondents. Information collected includes those relating to demographic and socio-economic characteristics, farm-level inputs and outputs, cost of production and revenue, and constraints to agricultural production among the Nigerian military personnel.

2.3. Sampling Procedure

The population for the study comprised all Nigerian military personnel involved in agricultural production. A two-stage sampling techniques was used to select respondents for this study. First was purposive selection of 10 out of all the military formations in Nigeria that comprise the three services, namely, Army, Navy and the Airforce. The three services formations were Defence Industrial Corporation of Nigeria, Kaduna, Kaduna; Nigeria Defence Academy, Kaduna, Kaduna; Armed Forces Command and Staff College, Jaji, Kaduna; National Defence College, Abuja, FCT; Defence Intelligence Agency, Abuja, FCT; Nigeria Military Pension Board, Abuja, FCT; Mogadishu catonement, Abuja FCT; Ushafa Barracks, Abuja, FCT; Niger Barracks, Abuja, FCT; Nigeria Armed Force Resettlement Centre, Oshodi, Lagos; Defence Headquarters, Abuja, FCT and Armed forces complex Abuja, FCT. The Military formations selected for this study were located within Abuja,

Kaduna and Lagos. The second stage was proportionate sampling of military personnel across the three military services. The military personnel involved in agricultural production was identified with the assistance of the military authorities. Several means of reaching out to the respondents were used. These include the use of durbar, during durbar the researcher informed the commander ahead of time then permission was granted and questionnaire were administered. Another means of reaching out to respondents was by informing the Commandants and Commanders ahead of the interview. Also walk in by the researcher into some of the formations. A total of 300 respondents were selected for the study and questionnaires were distributed accordingly. A follow-up was carried out by the researcher to validate the responses provided in the questionnaire. After each visitation, a review was carried out to check for disparities, where required phone calls and revisits were made and some were discarded. At the end of this process, a total of 275 representing about 92% of the total 300 pieces questionnaire were used for use for the study.

2.4. Analytical Techniques

This section describes the analytical tools employed for analysis of the stated objectives with STATA 16 as the statistical package of analysis. The tools used were Logit model and linear programming model.

2.5. The Logit Model

Logit model in this study was used to access the level of capacity for implementing optimal plan for the enterprises engaged in by the Nigerian military personnel. Also the vector X are set of factors e.g. socio-economic characteristics, land, labour and capital. The use of binary variables. This model was run in SPSS (Statistical Package for Social Scientists) under the maximum likelihood method conditions.

$$Y_1 \text{ or } Y_2 = f(g_1, g_2, g_3, g_4, g_5, g_6, g_7, g_1, g_2, g_4, g_4, g_5)$$

Where:

$Y_1 = 1$ if land ≥ 3.25 ha, 0 otherwise for personnel involved in crop production

$Y_2 = 1$ if TLU ≥ 15.266 TLU, 0 otherwise for personnel involved in livestock production

g_1 = age in years

g_2 = farming experience

g_3 = household size in numbers

g_4 = labour in man day

g_5 = capital in naira

g_6 = amount of credit in naira

d_1 = type of enterprise (0 = crop only, 1 = crop and others).

d_2 = Commissioning status (0 = Non Commissioned Officers, 1 = Commissioned Officers)

d_3 = gender (0 = female, 1 = male)

d_4 = marital status (0 = non married, 1 = married),

3. Results and Discussion

3.1. Optimal Plan for Agricultural Production Enterprise

Crop and livestock production are the major agricultural production enterprise engaged in by the Nigerian military personnel. Crop combinations and livestock production choices are thus expected to be influenced by the personnel perception of farm gross margin and income. Given that the annual gross margin as a major determinant of income generation through agricultural production among the Nigerian military personnel and increased gross margin will probably increase level of involvement in agricultural production. Optimal resources allocation among the military personnel was analysed using linear programming model. Table 3 presents the summary of linear programming analysis. Crop production enterprises which used up to average land size of 3.25ha and livestock production enterprises that had at least average tropical livestock unit (tlu) of 15.266 were used in the analysis. A total of crop and livestock valued used for the analysis is as shown below:

The following crop production enterprises were analysed for linear programming

x_1 = millet, sorghum and soyabean

x_2 = maize, rice and yam

x_3 = maize and yam

x_4 = cassava and yam

x_5 = cassava and maize

x_6 = onions

x_7 - groundnut

x_8 - maize

Linear Regression Model is estimated as the objective function is:

$$\text{Max } z = 49605.4 x_1 + 249551 x_2 + 94346.6 x_3 + 72788.3 x_4 + 190289 x_5 + 48732.3 x_6 + 98280 x_7 + 160323 x_8$$

Subject to

$$\text{Land: } 1x_1 + 1x_2 + 1x_3 + 1x_4 + 1x_5 + 1x_6 + 1x_7 + 1x_8 \leq 3.25$$

$$\text{Labour: } 2.1919x_1 + 114.641x_2 + 17.324x_3 + 278.15x_4 + 122.408x_5 + 39.1625x_6 + 218.356x_7 + 296.292x_8 \leq 1003.5$$

$$\text{Capital: } 8113.5x_1 + 112138x_2 + 178588x_3 + 120192x_4 + 168217x_5 + 59465.5x_6 + 216375x_7 + 332208x_8 \leq 903,656$$

Table 1: Summary of Linear Programming for crop enterprises

Crop enterprises	Solution	Opportunity cost
x_1	0	+199945.61
x_2	0	+155204.41
x_3	+3.25	0
x_4	0	+176762.72
x_5	0	+59262
x_6	0	+200018.70
x_7	0	+151271.00
x_8	0	+89220

Maximised obj = ~~N~~811,848.8

Field Survey, 2020

As shown in table 1, only maize/yam should be carried out at 3.25 ha. The maximum gross margin from such programme is estimated at ~~N~~811,848, also shows that an additional unit of land will increase the value of programme by ~~N~~249,551.

The following livestock production enterprises were analysed for linear programming

L_1 – cattle

L_2 – layers

L_3 – broiler chicken

L_4 – aquaculture

Linear Regression Model is estimated as Max z

$$= 65000L_1 + 31560.98L_2 + 31560.98L_3 + 34141.7L_4$$

Subject to

$$\text{TLU: } 1L_1 + 1L_2 + 1L_3 + 1L_4 \leq 15.266$$

$$\text{Labour: } 21L_1 + 237.4194L_2 + 57.07317L_3 + 138.565L_4 \leq 911$$

$$\text{Capital: } 15000L_1 + 135129L_2 + 130089.4L_3 + 142547.1L_4 \leq \text{N}1,668,429$$

Table 2: Summary of Linear Programming for Livestock Enterprises

Livestock enterprise	Solution	Opportunity cost
L1	+12.5378	0
L2	+2.7281	0
L3	0	+76045.297
L4	0	+69436.430

Maximised obj – ~~N~~1,173,070

Field Survey, 2020

As shown in table 2, the two production enterprises namely cattle and layers should be carried out at 12.5378tlu and 2.7281tlu respectively. The maximum gross margin from such programme is estimated was ~~N~~1,173,070.

3.2. Level of Capacity for Implementing Optimal Plan for Agricultural Enterprises among the Nigerian Military Personnel

Table 3: Determinants of the level of capacity for embarking on optimal plan for agricultural production

	Coeff	Std. Err	Z	P{>}	[95% conf.	Interval
Crops						
Ranks	1.6639	.4655	3.57	0.000*	.7516	2.5762
Sex	-1.3540	.7667	-1.77	0.077	-2.8556	.1486
Age	.1217	.0676	1.80	0.072	-.0107	.2542
Marital status	-2.0961	.9903	-2.12	0.034*	-4.0370	-.1552
Yrs in agric	.4781	.1131	4.23	0.000*	.2565	.6997
Total hhsiz	-.0961	.1089	-0.91	0.365	-.3121	.1149
Cons	-7.4836	2.1335	-3.51	0.000	-11.6652	-3.3020
P Livestock						
Age	.3416	.0218	1.56	0.118	-.0866	.7698
Yrs in agric	.4226	.1716	2.46	0.014*	.8620	.7591
Total farm income	1.4600	5.1700	2.82	0.005*	4.4700	2.4700
Total hhsiz	.9877	.1803	0.55	0.584	-.2547	.4523
Cons	-27.3377	10.2087	-2.68	0.007	-47.3452	--7.3288
PseudoR ² =0.5961						

Field Survey, 2020 Significant level = 5%

seudo R² = 0.4987

Table 3 shows the factors that determine the level of capacity for embarking on optimal plan for crop and livestock production. The dependent variable is the optimal plan for agricultural production enterprises while the independent variables include Sex, Age, Marital status, Years in agriculture, and Total farm income. Average. Pseudo R-Squared value were 0.4987 and 0.5961 for crop and livestock respectively which implies that the dependent variable for crop and livestock is being explained up to about 49% and 60% respectively by the independent variables.

Commissioning status, marital status, and farming experience were the factors that affect the capacity to implement optimal plan for crop production while years of experience and farm income were the factors that affect the capacity to implement optimal plan for livestock production. These factors however contributed positively to the Nigerian military personnel capacity for achieving optimal plan for agricultural production enterprises. Regarding variables that affect the level of capacity to implement optimal plan for crop production commissioning status is positively significant, the positive and significant coefficient of the commissioning status revealed that the commissioned officer are the personnel with the higher level of capacity to implement

optimal plan for crop production. This implies that the commissioned officers have higher level of capacity for embarking on optimal plan for crop production than the non commissioned officers which might be due to the high cost of production. Besides, the commissioned officers are the high ranking officers who from the study have the biggest set of agricultural enterprises which requires higher cost of production.

The negative and significant coefficient of marital status revealed that the married personnel have the lower level of capacity for embarking on optimal plan for crop production than the non commissioned officers which might be due to the high cost of production. This implies that the married personnel was found to have a negative influence on the level of capacity for embarking on optimal plan for crop production than the non commissioned officers which might be due to the high cost of production. This is in line with the study of [10], optimal crop production is negatively impacted by marriage due to the distraction caused by family engagements. The positive and significant coefficient of years in agriculture showed that the higher the years in agriculture the higher the level of capacity for optimal plan for crop and livestock production. This indicates that an increase in the years of agriculture will result in a higher level of capacity for embarking on optimal plan for crop and livestock production. This could be because the higher the rank of the commissioned officers, the higher their level of income to invest early in agriculture, commissioned officers have more income to invest in agriculture at early stage of their career compare to non commission officers who earn lesser income at the beginning of their career in the military. [2], confirmed that the higher the rank of officer, the higher their ability to invest in agriculture.

4. Conclusion

In view of the resource constraints to their production, the military personnel are required to implement the optimal plan for crop and livestock production. While the majority of the personnel have the capacity to implement optimal plan, the level of their capacity to implement the plan for is affected by their socioeconomic characteristics.

5. Recommendations

Non-commissioned officers who generally earn lesser income than the commissioned officer but interested in agricultural production should be supported with adequate access to credit and soft loan.

Candidates who possess relevant qualification in agriculture should be allowed into the Direct Short Service Course of the Nigerian military. In addition, agricultural courses should be incorporated into the courses being studied at Nigeria Defence Academy. Therefore, policy relating to incentive for training on agriculture and capacity building for Nigerian military personnel on improved agricultural production should be designed and implemented by the government.

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