

Profitability of Soyabean Production by Small Holder Farmers in Nigeria: A Guide for Sustainable Food Security.

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ABSTRACT

The study assessed the costs and returns in soyabean production among small scale farmers in Central Agricultural Zone of Nigeria. The multi-stage sampling procedure was used to select 485 soyabean farmers. Three States, namely: Benue, Niger and Plateau, were purposively selected out of the eight States of the Zone, because of their high concentration of soyabean production. Respondents were then randomly selected from each of the States, based on the proportion of each State's soyabean farming population at 0.2 percent. Thus, 240, 125 and 120 respondents were selected from Benue, Niger and Plateau States, respectively. Data were collected from the respondents through administration of well structured questionnaire. The data collected were analyzed using simple descriptive statistics, gross margin analysis, t-test of mean difference and profitability test. Results showed that Benue State had the highest gross margin of N77,478.86/ha while Plateau State had the least of N10,966.98/ha. The mean gross margin for the Zone was found to be N35635.67/ha. Result of profitability test revealed that soyabean production in the Zone is profitable ($t= 52.504$). Major production constraints identified include: inadequate capital, soil infertility, poor extension services, high cost of inputs, inadequate marketing/storage facilities and high cost of transportation. It is recommended that government should create enabling environment for marketing of soyabean, which should include provision of market infrastructure such as good rural access roads and good storage facilities, to enable the farmers sell at the time they want and at a good price. This would lead to higher incomes and consequently motivate them to sustain production of the crop, not only as a food and cash crop but also as a vital contributor to sustainable food security of the country.

Keywords: Sustainable food security, soyabean production, constraints soyabean production, constraints, gross margin, profitability, sustainable food security, profitability test.

INTRODUCTION

Agriculture is of strategic importance in the fight against poverty and famine and ensuring food self-sufficiency. Nigeria had set a goal of self-sufficiency in basic food production by the year 2000 (Oyejide, 1986). However, chronic malnutrition is still widespread and the problem of food security, especially among rural households is prevalent in many areas across the country, as the gap between food demand and supply is still eminent (FAO, 2006; Babatunde et al., 2007). While population and aggregate incomes in the country have witnessed phenomenal increase, especially since 1970, domestic food and fibre production had lagged behind. Fan et al. (2008), reported that Nigeria's agriculture from 1970 to 2000 grew at 1.7 percent per annum relative to her population growth rate of 2.7, with fluctuating agricultural production levels leading to frequent annual negative growth rates. Thus, it has become difficult to feed the increasing number of people in the country. Nigeria's precarious food security situation is intimately linked to its economic development challenges, while effects of slow economic growth and macro economic problems on livelihood and food security are directly linked to poverty. The decline in the traditional role of agriculture to drive the Nigerian economy is so with increased demand for soyabean and with fluctuating soyabean production levels leading to frequent annual negative growth. Soyabean is one of the major crops in achieving the food security quest in Nigeria.

Soyabean (*Glycinemax* (L) Merr), 'the miracle seed', is the world's most important oil seed legume with respect to total production and international trade (Salunkhe et al., 1992). It is a versatile crop from which products like soyabean oil, soyabean milk, soyabean "fufu", soyabean "dadawa", livestock feed, soyasauce and baby foods such as Golden Morn, Babeena, Nutrend and cerelac are derived. The production figures for soyabean in Nigeria have been on steady increase since 1985 when over 114,000 metric tons were produced, mainly due to the realization of the potential of the crop as a source of protein to blend with carbohydrate sources, as a good substitute raw material for vegetable oil, and as concentrate supplement for poultry and other livestock feeds (OSAN, 2003). Researchers have developed from soyabean a wide range of recipes which blend with traditional food habits or various cultural settings in Nigeria. This has increased soyabean consumption among low income groups that naturally cannot afford the expensive sources of protein such as meat, fish and eggs.

Profit maximization, a motivating factor for production, is one of the important goals of farm firms. An estimate of the profitability of every farm enterprise is always based on cost-return analysis. This involves itemizing the costs and returns of production variables and using them to arrive at such estimates as the return to one unit of resources used, the gross margin as well as the net farm income. Profit generally is the difference between the total revenue and total costs (Olukosi and Ogungbile, 1989).

This study, therefore, examines the costs and returns in soyabean production in the Central Agricultural Zone of Nigeria. The test hypotheses for the study were that gross margin is not significantly different among the States and soyabean production is not profitable in the study area. The result of the study is expected to guide the implementers of food security programme to ensure continued and increased production of soyabean in Nigeria, and for sustenance of the gains of production of the crop as a major crop in achieving sustainable food security for the country.

MATERIALS AND METHODS

The study was conducted in Central Agricultural Zone of Nigeria, which covers: Benue, Kogi, Kwara, Niger, Nassarawa, Taraba and Plateau States as well as the Federal Capital Territory, Abuja. The Zone is situated between latitudes $6^{\circ}30'N$ - $11^{\circ}20'N$, it has 20.36 million people with the rural population constituting 77 percent (NPC, 2006). The Zone has a land area of 296, 898 Km² representing nearly 32 percent of the country's total land area and is the largest rice, groundnut and soyabean producer in the country, producing over 40 percent of rice and groundnut, and 64 percent of soyabean (Shaib et al., 1997). Farming is the predominant occupation of the people, majority of whom are small holders. The major cultivated crops are maize, rice, millet, sorghum, cowpea, yam, cassava, melon, soyabean, mango and citrus. The major constraints to agricultural development in the crop sub-sector include: the huge demand-supply gap for agricultural labour, accentuated by low literacy rates and the aging farm labour profile, shortage of good quality planting materials, lack of tools to improve labour productivity, generally low soil fertility, pests and weed infestation (Shaib et al., 1997).

The population of the study consists of all the small holder soyabean farmers in Central Agricultural Zone of Nigeria. As a result of the enormity of the population, a sample of the population was taken using multi-stage sampling technique. From eight the States that make up the Zone, three States (Benue, Niger and Plateau) were purposively selected, because they were the leading soyabean producing States in the Zone. Based on the population of soyabean farmers in each of the States, respondents were randomly selected at a proportion of 0.2 percent comprising 240, 125 and 120 from Benue, Niger and Plateau States, respectively, giving a total sample size of 485 respondents. Data were obtained through the use of structured questionnaires administered to the selected respondents.

The data collected were analyzed using descriptive statistics, gross margin analysis, profitability test and t-test. Adeyeye and Ditto (1988) noted that gross margin is the preferred method of determining the profitability of subsistence farm enterprises in which fixed capital is negligible. Under this assumption, the gross margin is considered as the net farm income (NFI). The gross margin is obtained by subtracting the total variable costs (TVC) from the total value product (TVP) or gross returns (GR) (Erhabor and Kalu, 1993). The difference between the two parameters is a measure of profit or loss for that period. The purpose of the model is, therefore to identify the costs, returns, profit or loss for the same period. The total value product or gross returns represent the volume of the yield of the crop multiplied by the unit price. Variable costs, also called specific costs, vary directly with the level of production and include expenditure on seeds, fertilizer, agrochemicals, hired and labour.

Gross margin analysis is expressed as:

$GM = TVP/GR - TVC$; GM= gross margin; and TVC= total variable costs

TVP/GR= total value product/gross revenue; That is, total revenue from soyabean production minus total variable costs.

RESULTS AND DISCUSSION

Profitability Analysis of Soyabean Production

The costs and returns of soyabean enterprise in the study area is summarized in Table 1, on the basis of States and pooled data, while figure 1 graphically compares the gross margin among the States. The result indicates that Benue State had the highest gross margin of N77,478.86, Niger State followed with N27,562.36 while Plateau State had the least of N10,966.98 per hectare. The mean gross margin for the pooled respondents (i.e for the Zone) was found to be N35,635.67. The gross income (revenue) was found to be an important factor in the profitability of soyabean. Plateau State was found to have the lowest gross revenue (N39,281.07) per hectare

compared with the other States. Benue and Niger States recorded average gross revenue of N112,799.03 and N62,346.48, respectively, per hectare of soyabean cultivated, while pooled gross revenue was N68,884.89 per hectare.

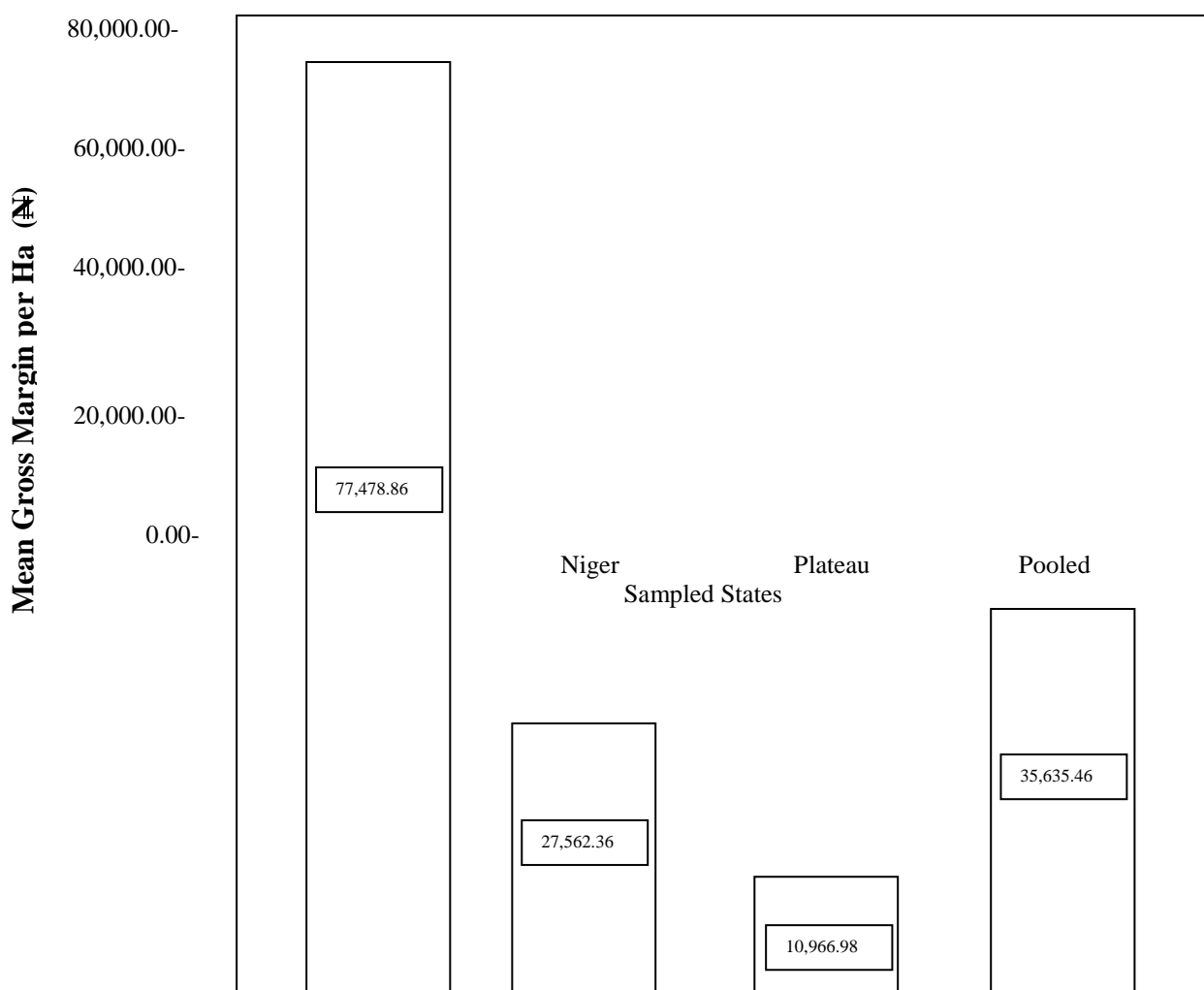
Analysis of total variable costs (TVC) of production shows that N33249.22 was the TVC per hectare incurred by soyabean farmers in the study area. The result further shows that average cost incurred on hired labour (N18,035.90 per hectare) constituted the highest proportion (54.2%) of the TVC of production of the crop. The predominance of labour as the most important cost item in soyabean cultivation manifested in all the States. The cost of hired labour per hectare was N19,661.11 (55.7%), N16,768.88 (48.2%) and N18,908.40 (66.8%) for Benue, Niger and Plateau States, respectively. This result agrees with the findings of Ani et al. (2010), that average cost incurred on hired labour constituted the highest proportion of the average total variable costs of production of leguminous crops in Benue State. Also, in another agricultural study, Tsue (2010) found out that labour is the most important component of fish farm enterprise in Benue State. It is, therefore, safe to conclude that labour to a large extent determines the viability and profitability of a farm enterprise.

Table 1: Descriptive Statistics of Costs and Return Variables in Soyabean Production in Central Agricultural Zone of Nigeria

States	Statistics	Revenue (₦/ha)	Total variable cost (₦/ha)	Cost of fertilizer (₦/ha)	Cost of agro chemicals (₦/ha)	Cost of Seed (₦/ha)	Cost of labour (₦/ha)	Gross Margin (₦/ha)
Benue	N	240	240	240	240	240	240	240
	Mean	112799.03	35320.17	1831.64	6450.00	7377.43	19661.11	77478.86
	Std deviation	75341.97	6.70139E4	4961.49	14191.67	15656.47	57774.87	74770.94
	Variance	5.676E9	4.491E9	2.462E7	2.014E8	2.451E8	3.338E9	5.591E9
Niger	Minimum	6666.67	2333.33	.00	.00	20.00	.00	-180400.0
	Maximum	600000.00	568000.00	30666.67	100000.00	150000.00	520000.00	367600.00
	N	120	120	120	120	120	120	120
	Mean	62346.48	34784.13	3675.12	10465.17	3874.96	16768.88	27562.36
Plateau	Std deviation	50933.04	2.319264	581.25	9631.02	3569.32	18468.50	53807.68
	Variance	2.594E9	5.379E8	3.459E7	9.276E7	1.274E7	3.411E8	2.895E9
	Minimum	4666.67	3383.33	.00	.00	58.33	.00	-87400.00
	Maximum	514285.71	194556.52	52631.58	78000.00	41000.00	156000.0	498869.75
Pooled Data	N	240	240	240	240	240	240	240
	Mean	39281.07	28314.08	1359.53	6303.90	1742.25	18908.40	10966.98
	Std deviation	17294.29	2.38045E4	2916.23	10624.38	2593.28	18834.94	27870.96
	Variance	2.991E8	5.667E8	85.4414.31	1.129E8	6725106.37	3.548E8	7.768E8
	Minimum	8400.00	3337.50	.00	.00	100.00	.00	-94200.00
	Maximum	93000.00	122200.00	21333.33	67000.00	20000.00	68000.00	82725.00
	N	485	485	485	485	485	485	485
	Mean	68884.89	33249.22	2622.20	8399.23	4191.88	18035.90	35635.67
	Std deviation	58982.61	3.90317E4	5140.80	11332.84	8508.70	32888.52	60223.35
	Variance	3.479E9	1.523E9	2.643E7	1.284E8	7.240E7	1.082E9	3.627E9
Minimum	4666.67	2333.33	.00	.00	20.00	.00	-180400.0	
Maximum	600000.00	568000.00	52631.58	100000.00	150000.00	520000.00	498869.75	

Source: Field data analysis, 2011

The result of analysis of variance (ANOVA) in Table 2 indicates that the mean gross margin across the States differ significantly ($F=50.040$; $P\leq 0.01$) implying that there are wide variations in gross margin between the States. The gross margin of Benue State is much higher than the other States while that of Plateau State is very low. The profitability test in Table 3 shows that there is a significant difference ($t= 52.503$; $P\leq 0.01$) between the total revenue and total variable costs. This result implies that the difference between the two variables is not by chance. Therefore, soyabean production can said to be profitable in the study area.



Source: Field data analysis, 2011.

Figure 1: Graphical Representation of Mean Gross Margin per Hectare of Soyabean Obtained by Farmers Across the States.

The result of the t-test of difference of mean presented in Table 4 shows the cultivation of soyabean in the study area to be moderately profitable since the mean gross margin is significantly different from zero ($t=11.096$; $P\leq 0.01$). Ayoola (2001) earlier observed that soyabean production is associated with modest financial gains, while Ani (2010) posited that apart from provision of food there must be other corollary benefits perceived by farmers before they take to the production of a particular crop. This result implies that, with moderate profitability of soyabean enterprise, farmers were encouraged to cultivate the crop not only for insurance against food insecurity but also for monetary gains.

Table 2: Test of Difference of Means (ANOVA) of the Gross Margin per Hectare of Soyabean Between the States

	Sum of Squares	Df	Mean square	F	Sig	Decision Rule
Between groups	3.018E11	2	1.509E11	50.040	.000	Reject Ho
Within groups	1.454E12	482	3.016E9			
Totals	1.755E12	484				

Source: Field data analysis, 2011

* Significant at 1 percent.

Table 3: Result of Profitability Test

Variables	Total Revenue	Total Variable Cost	Gross Margin (Ha)	Profitability test (t-test)	Sig. (2 Tailed)	Decision rule
t – value				52.504*	.000	Reject H ₀
Mean	68884.89	33249.22	35635.46			
Std. deviation	58982.61	3.90317E4	60223.35			
Variance	3.479E9	1.523E9	3.627E9			
Minimum	4666.67	2333.33	180400.00			
Maximum	6000000.00	560000.00	498869.75			

Source: Field data analysis, 2011.

* Significant at 1 percent.

Table 4: T-test of Difference of Gross Margin per Hectare of Soyabean Production.

Statistic	Mean	Std deviation	Mean difference	Df	t-value	Sig. (2-tailed)
Gross margin per hectare	35635.674	60223.35	35635.67	968	11.096	.000

Source: Field data analysis, 2011.

Constraints to Soyabean Production in Central Agricultural Zone of Nigeria.

Table 5 summarizes factors that constrain the production of soyabean in the study area. The major constraints include: inadequate capital, poor extension services, high cost of inputs, inadequate storage/marketing facilities and high cost of transportation. Inadequate capital was the most commonly experienced constraint indicated by 36.1 percent of the respondents. The implication of this result is that, acquisition of farm inputs such as improved seeds, fertilizer, agro-chemicals and farm expansion may be difficult for farmers, thereby endangering food security prospects for the nation with respect to soyabean crop. Soil infertility and inadequate/poor extension services ranked second by 26.2 percent of the respondents. They reported that most of the farm lands are low in soil fertility and as such soyabean does not grow well in such soils resulting in low yields without addition of fertilizer. Furthermore, the problem of erratic rainfall was reported by 21.2 percent of the respondents. The likely consequence of this problem is low germination and subsequent low yields which hamper the attainment and sustenance of food security. Inadequate/poor extension services makes it difficult for transmission of new technologies and techniques of production to farmers in the study area. Poor extension services lead to slower pace of achievement of goals due to low technology uptake. Poor extension services was found to manifest in farmer's low/inadequate modern knowledge (21.9%) and their farm practices being incompatible with modern technology (21.7%). The implication of this result is that farmers cannot maximize profits since their technical and allocative efficiency have not yet been achieved, which endangers sustainable food security of the nation.

High cost of inputs, especially labour and fertilizer, ranked third (24.5%). The respondents indication of lack of modern equipment (19.2%) means that most of soyabean farming activities are manually carried out, which requires a lot of labour and the high cost of labour increases total variable cost, which in turn reduces profit. The high cost of fertilizer makes the input unaffordable for farmers which results in low use of fertilizers and leads to low yields due to depleted fertility of the soil. Also fertilizer purchase increases cost of production thereby increasing total variable cost and reducing profit in the production of soyabean.

Inadequate marketing and storage facilities were reported by 22.5 percent of respondents. According to them, soyabean like most legumes, is prone to weevil attack when harvested, and this problem is complicated by inadequate storage facilities. Consequently, farmers are forced to sell at the same time (harvest period) leading to low prices (17.9%), which result in low revenues and low profit. This situation is further worsened by lack of market (glut) (19.6%) and poor market access roads (17.1%).

These findings are in line with Kamanga et al. (2003), who identified pest and diseases, lack of market for sale of produce, low soil fertility, inadequate finance and poor extension services as problems of legume farmers in Zimbabwe. Shaib et al. (1997) earlier identified shortage of good quality planting materials, generally low soil fertility and pests and diseases as constraints to crop production in the Central Agricultural Zone of Nigeria. Proffering solutions to the various constraints indicated by the farmers would enable them achieve higher levels of technical and allocative efficiencies which would lead to increased yields and lead to higher revenue generation and higher profits

Table 5: Constraints to Soyabean Production in Central Agricultural Zone of Nigeria.

Constraints	Benue state N=240		Niger State N=125		Plateau State N=120		Pooled Data N=485		Rank
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	
Inadequate capital	72	30.0	60	48.0	43	35.8	175	36.1	1
Soil infertility/low yield	60	25.0	44	35.2	25	20.8	129	26.6	2
Inadequate ext. services	69	29.0	35	28.0	25	20.8	129	26.6	2
High cost of inputs	67	28.0	40	32.0	10	8.3	117	24.5	3
High transportation cost	48	20.0	38	30.4	23	19.2	109	22.5	4
Inadequate marketing/ storage infrastructure	65	27.0	22	17.6	22	18.3	109	22.5	4
Inadequate modern knowledge	70	69.2	22	17.6	14	11.7	106	21.9	5
Incompatibility with modern technology	43	17.9	46	36.8	16	13.3	105	21.7	6
Erratic rainfall	51	21.3	34	27.2	19	15.8	104	21.2	7
Risks and uncertainties	59	24.6	36	28.8	8	6.7	103	21.2	7
Unfavourable govt. policies	57	23.8		27.2	9	7.5	100	20.6	8
Lack of market	44	18.3	46	36.8	5	4.2	95	19.6	10
Inadequate modern equipment	43	17.9	39	31.2	11	9.2	93	19.2	11
Low prices	36	15.0	41	32.8	10	8.3	87	17.9	11
Poor access roads	38	15.8	28	22.4	17	14.2	83	17.1	12
Lack of credit facilities	37	15.4	29	23.2	8	6.7	74	15.3	13
Inadequate supply of farm inputs	28	11.7	38	30.4	8	6.7	74	15.3	14

Source: Field data analysis, 2011.

Note: responses add up to more than 100 percent due to multiple responses.

CONCLUSION AND RECOMMENDATIONS

Apart from the provision of high quality protein to humans and animal feed, soyabean provides a good source of income to farmers. Since the gross margin of soyabean production differs significantly from zero and the profitability test shows that production of the crop is profitable, the farmers could be encouraged to continue cultivating the crop for sustainable food security of the country. In proffering solutions to the identified constraints to soyabean production in the study area, opportunities for marketing of soyabean should be created, which should include provision of market infrastructure such as good rural access roads and good storage facilities to facilitate easy access to markets and maintain good quality produce, which would enable the farmers

sell at the time they want at good prices, which would lead to higher income and consequently motivate and encourage them to sustain production of the crop not only as a food and cash crop but also as a vital contributor to sustainable food security of the country. Also, policy that would reduce the cost of soyabean production inputs would enhance profitability and consequently increased soyabean production for sustainable food security of the country.

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