

ECONOMIC ANALYSIS OF SOYBEAN FARMING IN NORTHERN NIGERIA

IFEANYI A. OJIAKO^{1*}, V.M. MANYONG², A.E. IKPI³

¹ International Institute of tropical Agriculture (IITA), Ibadan. Email: i.ojiako@cgiar.org or iojiako2000@yahoo.co.uk

² International Institute of Tropical Agriculture, Tanzania. Email: v.manyong@cgiar.org

³ Department of Agricultural Economics, University of Ibadan, Ibadan, Nigeria. Email: a.ikpi@comcast.net

* Correspondence to: Ifeanyi A. Ojiako

ABSTRACT

The variations in soybean farmers' output and income were investigated alongside their improved soybean adoption status and other socio-economic factors. Data from 307 farmers randomly selected from two states in northern Nigeria were analysed using descriptive statistics and regression models. Results show that the lower-income farmers cultivated smaller farm sizes and incurred higher production costs than the higher-income farmers. Adopters incur higher production costs but receive commensurate higher returns per hectare than non-adopters for all income categories. Hectarage ($t=11.92$), farming experience ($t=4.15$), yield ($t=4.43$), adoption status ($t=2.39$) and own farm-gate price ($t=2.19$) have positive and significant influence on output while farm-gate price of beans ($t=3.26$) has significant negative effect. Moreover, hectarage ($t=15.05$), farming experience ($t=2.67$) and adoption status ($t=2.27$) have positive and significant effects on income. The findings have among other things, underscored the benefit of improved technology and its adoption in promoting well-being of rural soybean farmers. Notwithstanding the additional cost involvement, investment in improved soybean technology is worthwhile since through higher yield, output and income farmers' welfare is enhanced. Easing farmers' access to credits will encourage willing farmers to invest in farmlands and improved technology while adequate training workshops and Field Days would help to update them on the appropriate use of new technologies and build up their knowledge and experience.

Keywords: Soybean, improved technology adoption, output, yield, income, farming experience, northern Nigeria.

INTRODUCTION

The production of soybean [*Glycine max.* (L.) Merrill] is expanding in Nigeria but the growth rate has been fluctuating. From 58000 tonnes in 1970, the output rose by 41.38% to 82000 tonnes in 1982 (CBN 2000). It however dropped by 48.78% to 42000 tonnes in 1983 before picking up again. The Nigeria's 1985 national soybean output of 60000 tonnes, which although reflected a 42.85% growth over the 1983 level, was lower than the level achieved in 1982. Between 1986 and 1989 soybean output increased by 200%, from 100000 tonnes to 300000 tonnes, but had to drop further by 52% to 145000 tonnes in 1991 (CBN 2003). By 2000, the output had increased to 372000 tonnes, representing a 156.5% increase over the 1991 level (CBN 2003; FAO 2005).

The improvements recorded in national production of soybean were instigated by several factors. The first is the increase in domestic utilization and consumption of soybean resulting from its use in place of locust bean (*Parkia clappertonia*) by producers of *dawadawa*, popular local food seasoning in the late 1970s (Manyong et al. 1996). The second is changes in government policy, especially the introduction of the Structural Adjustment Programme (SAP) in 1986, which led to the devaluation of the local currency (the Naira) by 75% and ban on importation of edible oil and soybean meal (IITA 1992). The third reason is the intensification of research efforts, culminating in the introduction of improved soybean varieties that were high-yielding, short duration, non-shattering and resistant to pests and diseases.

In addition to increase in production, these developments contributed immensely to increases in yield and farmers' productivity as well as producer prices. Figure 1 shows that from 0.29 tonnes per hectare in 1985, the physical yield of soybean rose by 62% to 0.47 tonnes per hectare in 1995 and by 152% to 0.73 tonnes per hectare in 2001. Similarly, from mere ₦500 per tonne in 1985 the producer price of soybean rose by 3665% to ₦18827 per tonne in 1995 and by over 9000% to ₦45810 per tonne in 2001 (FAO 2005).

Further on the introduction of improved varieties, the efforts were aimed at stimulating soybean production, raising farmers' incomes, promoting food and nutrition security, and reducing poverty among low-income soybean farmers. The objective of this study is to evaluate the influence of improved soybean adoption and other socio-economic variables on soybean farmers' output and income and by extension on the general welfare of soybean farmers in northern Nigeria.

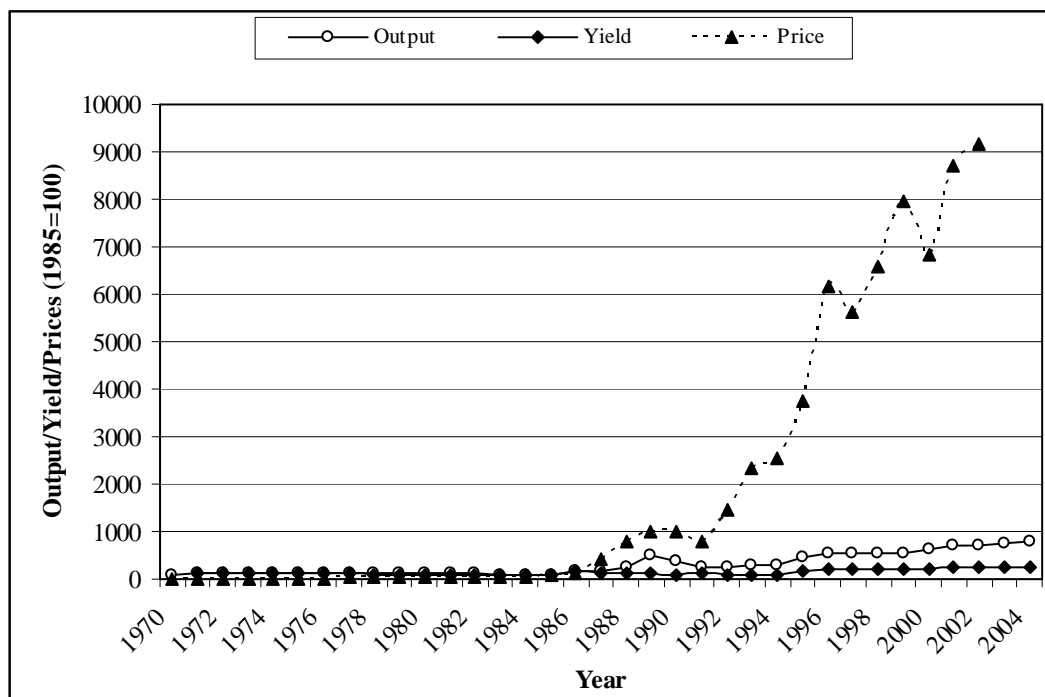


Figure 1: Real output, yield and producers' prices of soybean in Nigeria, 1970-2004 (1985=100)

Source: CBN (2000; 2003), FAO (2005).

METHODOLOGY

The study area

The survey was carried out between July and October 2003 in five randomly selected soybean-growing villages in northern Nigeria. Three of the villages are in Kaduna State while the remaining two are in Kano State. Kaduna lies between latitudes $9^{\circ} 04'$ to $11^{\circ} 50'$ N and longitude $6^{\circ} 09'$ to $10^{\circ} 41'$ E. It has the guinea savannah ecology with 600-1200 mm annual rainfall range. Kano lies between latitudes $10^{\circ} 33'$ to $12^{\circ} 37'$ N and longitude $7^{\circ} 34'$ to $9^{\circ} 25'$. The ecology is Sudan savannah with 300-600 mm annual rainfall range. Rainfall is unimodally distributed in both ecologies. The length of growing period (LGP) is 150-200 days in the guinea savannah and 90-150 days in the Sudan savannah. The farming systems in the zone are generally cereal-based with small-scale farmers producing the bulk of the total output.

The sampling procedure

Aside the initial choice of Kano and Kaduna States, where the technologies were introduced and which had existing baseline information following previous IITA and ILRI characterization studies (Manyong et al. 1999; Okike et al. 2001), a multi-stage probability sampling design was used to draw the respondents for this study. Selection at each stage was based on a proportionality factor. In the first stage of the sampling, two Local Government Areas (LGAs) were randomly selected from a list of 20 soybean-growing LGAs obtained for each state from ADP records. In the second stage, five villages, three from Kaduna and two from Kano, were selected from the listed soybean-growing communities in the selected LGAs proportionate to size. In the third stage the selection of households was made. To sample the households, household listing of soybean growers was carried out with the members of staff of the Project Monitoring and Evaluation (PME) units of the Agricultural Development Programme (ADP) in the two states covered in the study. Following Cogill (2003) this study defines a household as either single persons, who had made provision to live with no assistance, or multi-persons, who are related or unrelated, or a combination of both.

Random sampling procedure was used to draw study sample proportion to size of soybean-growing households listed for each of the five villages. A comprehensive household listing of soybean-growing farmers was carried out by the members of staff of the Agricultural Development Programmes in the two states – the Kaduna State Agricultural Development Programme (KADP) for Kaduna state and the Kano State Agriculture and Rural development Agency (KNARDA) for Kano State. A proportionality factor was employed to determine the number of households to be included in each village. The number was selected to reflect the ratio of the households listed for each village to the total size of households listed for all five villages. Initially, a total of 320 households, 210 from Kaduna State and 110 from Kano State were drawn and interviewed using household

questionnaires. However, thirteen of the questionnaires could not be used due to observed inconsistencies and mix-ups in information supplied by respondents.

A total of 307 respondents, comprising of 201 from Kaduna and 106 from Kano villages, were used in the study. Sixty-one percent of these are adopters of the improved technology. Adopters were defined in this study as soybean farmers who had accepted the improved varieties, and had on the average devoted up to 10% of their soybean farm fields to it persistently for at least three years including 2003, the year of the study. Non-adopters were defined as those who had not used the improved varieties at all, or had used them sometime but later stopped, or who, although were growing them at the time of survey had not on the average persistently devoted up to 10% of their soybean fields to them for at least three years, including 2003, the of the survey (Ojiako 2006). Structured questionnaire was used to collect data from farmers.

Theoretical Framework

The multiple regression studies involve the nature of the relationship between a dependent variable and two or more explanatory variables. The techniques produce estimators of the standard error of multiple regression and coefficient of multiple determinations. In implicit form, the statement that a particular variable of interest (y_i) is associated with a set of the other variables (x_i) is given as:

$$y_i = f(x_1, x_2, \dots, x_k) \quad (1)$$

where y_i is the dependent variable, and $x_1 \dots x_k$ is a set of k explanatory variables.

The coefficient of multiple determination measures the relative amount of variation in the dependent variable (y_i) explained by the regression relationship between y and the explanatory variables (x_i). The F-statistics tests the significance of the coefficients of the explanatory variables as a group. It tests the null hypothesis of no evidence of significant statistical regression relationship between y_i and the x_i s against the alternative hypothesis of evidence of significant statistical relationship. The critical F-value has n and $n-k-1$ degrees of freedom, where n is the number of respondents and k is the number of explanatory variables.

The standard error of regression coefficients is the measure of error about the regression coefficients. The z-statistics is used in testing the null hypothesis that the parameter estimates are statistically equal to zero against the alternative hypothesis that that the parameter estimates are statistically different from zero. If the computed z-value exceeds the critical value, we reject the null hypothesis and conclude that the parameter estimates differ significantly from zero.

The nature of the relationship between an outcome variable (y_i) and a set of explanatory variables (x_i) can be modelled using different functional forms. The four commonly used algebraic (functional) forms are: linear, log-linear or semi-log, linear-log, and power or double-log. The first functional form is the linear function expressed as:

$$y_i = b_0 + b_1x_1 + b_2x_2 + \dots + b_kx_k + e_i \quad (2)$$

where the b_i s are the parameters to be estimated and e_i is the stochastic error term. The elasticity estimates of the linear function are given as $b_i\bar{x}_i / \bar{y}_i$, where \bar{x}_i and \bar{y}_i are mean values of x_i and y_i . The second functional form is the log-linear or semi-log function expressed as:

$$y_i = \exp\{b_0 + b_1x_1 + \dots + b_kx_k + e_i\} \quad (3)$$

By taking the logarithm of both sides the function of expression (3) can be linearized as follows:

$$\ln y_i = b_0 + b_1x_1 + b_2x_2 + \dots + b_kx_k + e_i \quad (4)$$

where e is the error term. The coefficient of elasticity is given by $b_k\bar{x}_k$

The third form is the linear-log function expressed as:

$$\exp(y_i) = \exp(b_0 + e_i)[x_1^{b_1}x_2^{b_2} \dots x_k^{b_k}] \quad (5)$$

If linearized by taking the log of both sides, the above function will become:

$$y_i = b_0 + b_1 \ln x_1 + b_2 \ln x_2 + \dots + b_k \ln x_k + e_i \quad (6)$$

The elasticity of the linear-log function is calculated as b_k / \bar{y}_i . The fourth functional form is the power or double-log function expressed as:

$$y_i = b_0x_1^{b_1}x_2^{b_2} \dots x_k^{b_k} \exp\{e_i\} \quad (7)$$

By taking the log of both sides the power function of expression (7) can be linearized as follows:

$$\ln y_i = b_0 + b_1 \ln x_1 + b_2 \ln x_2 + \dots + b_k \ln x_k + e_i \quad (8)$$

The elasticity coefficient of the power function is defined as the beta-values of the explanatory variables, $b_k s$.

Empirical multiple regression models

In this study, the multiple regression analysis technique was used for the empirical modelling of the influence of identified explanatory variables on farmer's output of soybean on the one hand and on income realized from the crop on the other. The four commonly-used functional forms were fitted but the power function was analyzed due to its unique characteristics, which have made it very useful in empirical analyses (Olayide and Heady 1982). These include that its partial elasticities are equal to each of the parameter estimates (b_i) and that when linearized in log, the function becomes easy to fit and the coefficients are direct elasticities. The power functions of the models were expressed as follows:

Soybean Output Analysis

The empirical output model is specified as

$$\ln q_i = b_0 + b_1 \ln x_1 + b_2 \ln x_2 + \dots + b_9 \ln x_9 + e_i \quad (9)$$

where q_i is the output or quantity harvested of soybean by farmer i during the 2002 farming season, measured in tonnes; output entered the empirical model as a dependent variable. The explanatory variables are:

x_1 = Hectarage cultivated of soybean by farmer i during the 2002 farming;

x_2 = Cost incurred by farmer i in soybean production during the 2002 season, expressed in Nigerian Naira;

x_3 = Soybean farming experience of farmer i , measured in years;

x_4 = Average farm-gate price of soybean measured in Naira per kilogram;

x_5 = Age of the farmer i , measured in years;

x_6 = Farmer's level of education attainment defined as 1, if farmer had no formal education; 2, if farmer had only primary education; 3, if farmer had secondary education; 4, if farmer had tertiary education;

x_7 = Farmer's improved soybean adoption status (2=adopter, 1 = non-adopter);

x_8 = Average farm-gate price of cowpea, soybean's very close alternative legume crop, expressed in naira per kg;

x_9 = Yield of soybean, measured in tonnes per hectare; and

e = the stochastic error term.

The a priori hypothesized signs of the explanatory variables are: $b_1 > 0$, $b_2 > 0$, $b_3 > 0$, $b_4 > 0$, $b_5 > 0$ or $b_5 < 0$, $b_6 > 0$, $b_7 > 0$, $b_8 < 0$ and $b_9 > 0$.

Soybean Income Analysis

The income model is specified as

$$\ln y_i = b_0 + b_1 \ln x_1 + b_2 \ln x_2 + \dots + b_8 \ln x_8 + e_i \quad (10)$$

where, y_i , the dependent variable is the income earned by individual farmer i from the sale of soybean during the 2003 season, expressed in Nigerian naira; The explanatory variables are:

x_1 = Hectarage cultivated of soybean by farmer i during the 2002 farming season;

x_2 = Cost incurred by farmer i in soybean production during the 2002 season, expressed in Nigerian Naira;

x_3 = Soybean farming experience of farmer i , measured in years;

x_4 = Average farm-gate price of soybean for farmer i measured in Naira per kilogram;

x_5 = Age of the farmer i , measured in years;

x_6 = Farmer's level of education attainment defined as 1, if farmer had no formal education; 2, if farmer had only primary education; 3, if farmer had secondary education; 4, if farmer had tertiary education;

x_7 = Farmer's improved soybean adoption status (2=adopter, 1 = non-adopter);

x_8 = Farm-gate price of cowpea, soybean's very close alternative legume crop, expressed in naira per kg; and

e = the stochastic error term.

The a priori expected signs of the explanatory variables are $b_1 > 0$, $b_2 > 0$, $b_3 > 0$, $b_4 > 0$, $b_5 > 0$ or $b_5 < 0$, $b_6 > 0$, $b_7 > 0$ and $b_8 < 0$.

RESULTS

Descriptive statistics

The descriptive statistics of the variables included in the empirical models are presented in Table 1. The average cultivated farmland is 1.23 hectares for all farmers, 1.42 hectares for adopters and 0.95 hectares for non-adopters. The differences between the adopters' and non-adopters are statistically significant at one percent. Similar significant differences in mean values are found between the adopters and non-adopters with respect to physical yield of soybean, income from soybean, production costs, farming experience and level of education at one percent.

The descriptive information on the used variables is presented in Table 1.

Cost and returns of soybean production by income categories

The analysis of costs of production was based on the average costs derived from the study. The respondents were grouped by income categories. Areas of farm fields cultivated to soybean, which were standardized to allow for derivation of per hectare share of incomes, costs of and returns from soybean production were also included. For all farmers, Table 2 shows that the lowest income category of farmers (those returning less than ₦10000 per year) grow fewer areas of farmland (average of 0.3 hectares) but incurred the highest production costs per hectare (₦3000 per annum). The trend was the same for the adopters (Table 3) and non-adopters (Table 4) within the same income category. Costs of production per hectare were lowest for the richest category of all farmers and adopters and non-adopters. The returns per capita from soybean production were highest for the large income category of farmers. However, production costs per hectare were higher for adopters than non-adopters, reflecting the additional cost of procuring improved seeds and labour services. Expectedly also, returns per hectare were higher for adopters when compared with non-adopters in each income category.

Determinants of farmers' output of soybean

The effect of adoption and other variables on the soybean farmers' output was analyzed using the power function of the multivariate regression model. The regression result is presented below with the values in parentheses representing the standard errors.

$$\begin{aligned} \ln q = & 4.583 + 1.509 * \ln x_1 + 0.001 * \ln x_2 \\ & + 0.497 * \ln x_3 + 0.698 * \ln x_4 + 0.284 * \ln x_5 \\ & (2.209)** (0.126)*** (0.017)(0.120)*** \\ & (0.318)** (0.198) \\ & - 0.070 * \ln x_6 + 0.773 * \ln x_7 - 1.547 * \ln x_8 \\ & + 1.836 * \ln x_9 + e \\ & (0.163)(0.323)** (0.474)*** (0.380)*** \\ R^2 = & 0.516; \quad F = 35.09; \quad P(F) = 0.000 \end{aligned}$$

The result has shown that hectarage (x_1), farming experience (x_3), farm-gate price of soybean (x_4), adoption status (x_7), and yield (x_9) have positive and significant effect while farm-gate price of beans (x_8) have negative and significant effect on soybean output. Hectarage ($t=11.92$), farming experience ($t=4.15$) and yield ($t=4.43$) are significant at $p<0.01$ level, but soybean's own farm-gate price ($t=2.19$) and adoption status ($t=2.39$) are significant at $p<0.05$ level. Contrarily, the farm-gate price of beans ($t=-3.26$) is equally significant at $p<0.01$ level. The signs of the significant and other included variables conform to the a priori expectations. The estimated output model has good fit ($R^2=0.516$; $F=15.29$, $P<0.01$), implying that the included variables explained 51.6% of the variations in output. Following from the estimated output equation, the significant variables and their associated elasticity coefficients are: hectarage (1.51), farming experience (0.49), farm gate price of soybean (0.69), adoption status (0.773), farm gate price of beans (1.54) and yield (1.84).

Table 1: Descriptive statistics of the used variables

Variable	All farmers (n=307)		Adopters (n=187)		Non-adopters (n=120)		Mean Diff.	t-value
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.		
Hectarage Cultivated	1.234	1.588	1.42	1.88	0.95	0.91	0.468***	2.91
Yield of Soybean (tons/ha)	1.107	0.257	1.152	0.24	1.04	.275	0.116***	3.95
Soybean Income (₦/year)	58325.	96305.	69422	114179.	41031.7	54561	28390.9	2.92
Production Cost (₦/year)	20	23	.6	8	1	.1	3***	
Soybean Price (N/kg)	3531.3	6834.1	5220.	8278.56	898.58	1225.	4322.32*	7.02
	9	2	90			61	**	
Age of farmer (yrs)	44.233	5.868	44.80	5.32	43.34	6.56	1.469**	2.05
			7					
Farming Experience (yrs)	43.592	13.489	43.63	12.37	43.53	15.12	9.768E-0 ^{NS}	0.06
Level of Education	8.638	5.405	9.459	4.58	7.36	6.29	2.101***	3.38
Cowpea Price (N/kg)	1.640	1.090	1.796	1.21	1.39	0.81	0.401***	3.48
	38.493	3.840	38.55	3.84	38.39	3.86	0.162 ^{NS}	0.36

*** =Significant at 1%, ** =Significant at 5%; ^{NS} =Not significant

Determinants of soybean farmers' income

The result of the regression model fitted to determine the factors that influence the soybean farmers' earnings from quantity produced of the crop is given below. The figures in parenthesis are the standard errors of the beta coefficients.

$$\ln Y = 13.60^{***} + 3.31^{***} \ln X_1 + 0.03 \ln X_2 + 0.32^{***} \ln X_3 - 0.56 \ln X_4 - 0.09 \ln X_5 + 0.05 \ln X_6 + 0.41^{**} \ln X_7 - 0.80 \ln X_8 + e$$

(2.16) (0.22) (0.05) (0.12) (0.30) (0.19) (0.15) (0.18) (0.45)

$$R^2 = 0.59; \quad F = 54.49; \quad P(F) = 0.000$$

The result shows that hectarage of soybean cultivated (x_1); soybean-farming experience (x_3) and adoption status of farmers (x_7) significantly influence the farmers' income from soybean. Hectarage cultivated ($t=15.05$) and soybean-farming experience ($t=2.67$) are significant at 1%

level while adoption status ($t=2.27$) is significant at 5% level. All three variables have positive signs reflecting their direct relationship with soybean income of farmers. The elasticity coefficients are 3.31 for hectarage cultivated, 0.32 for farming experience and 0.41 for improved soybean adoption status of farmers. Together the included variables explained 59% of the variations in the model, which also has a good fit ($F=54.59$, $P<0.01$).

DISCUSSION OF FINDINGS

This study finds that the lower-income farmers cultivated smaller farm sizes and incurred relatively higher production costs per hectare than their counterparts in the higher income category. This implies that the higher income farmers enjoy economies of size and large-scale production. Due to this advantage, the richer farmers post higher returns per capita from soybean production and sales. The adopters incurred relatively higher production costs than non-adopters. This reflects the additional cost of the improved technology, in the form of procuring improved seeds and chemicals, paying for additional labour services requirements and other production inputs, transportation and extension services. The adoption of new technology requires higher investment on the expectation of higher returns. The results confirm that the returns per hectare of cultivated farmland were higher for adopters than non-adopters in each of the income groups, suggesting the influence of use of improved technology in enhancing output and income of farmers. Also, significant differences are found in mean yield, and by extension output, and income for adopters and non-adopters, suggesting the benefits of improved soybean adoption on the welfare of soybean farmers. This finding is further corroborated by the regression results, which reveal that similar set of variables, including farm area, years of experience and adoption

Table 2: Analysis of costs and returns in soybean production by income categories for all farmers (n=307)

Income Category (N'000/year)	Number of farmers (a)	Percentage	Area cultivated (hectare)		Soybean Income (N'000)			Cost incurred (N'000)*			Returns (N'000)		
			Total (b)	Per capita (c)	Total (d)	Per capita (e)	Per hectare (f)	Total (g)	Per capita (h)	Per hectare (i)	Total (j) = (d-g)	Per capita (k) = (d-h)	Per hectare (l) = (d-i)
Less than 10	55	17.9	18.9	0.3	255.0	4.6	13.5	56.9	1.0	3.0	311.9	5.7	16.5
10 – 19,999	66	21.5	40.4	0.6	846.0	12.8	20.9	82.4	1.3	2.0	763.6	11.6	18.9
20 – 29,999	31	10.1	27.6	0.9	678.5	21.9	24.6	76.8	2.5	2.8	601.7	19.4	21.8
30 – 39,999	32	10.4	40.2	1.3	1054.2	32.9	26.2	109.5	3.4	2.7	944.7	29.5	23.5
40 & Above	123	40.1	455.3	3.7	13871.0	112.8	30.5	758.4	6.2	1.7	13112.6	106.6	28.8

* Costs include costs of labour, seeds and other inputs.

Source: Analysis of 2003 Field Survey Data.

Table 3: Analysis of costs and returns in soybean production by income category for adopters (n=187)

Income Category (N'000/year)	Number of farmers (a)	Percentage (e)	Area cultivated (hectare)		Soybean Income (N'000)			Cost incurred (N'000)			Returns (N'000)		
			Total (b)	Per capita (c) = (b/a)	Total (d)	Per capita (e) = (d/a)	Per hectare (f) = (d/b)	Total (g)	Per capita (h) = (g/a)	Per hectare (i) = (g/b)	Total (j) = (d-g)	Per capita (k) = (j/a)	Per hectare (l) = (j/b)
Less than 10	12	6.4	6.5	0.5	142.6	11.9	21.9	28.2	2.4	4.4	114.4	9.5	17.6
10 – 19.999	40	21.4	24.6	0.6	553.6	13.8	22.5	58.2	1.5	2.4	495.4	12.4	20.2
20 – 29.999	24	12.8	21.3	0.9	538.4	22.4	25.2	72.4	3.0	3.4	466.0	19.4	21.8
30 – 39.999	30	16.1	36.8	1.2	985.8	32.9	26.8	108.5	3.6	2.9	877.3	29.3	23.9
Above 40	81	43.3	339.3	4.2	10833.0	133.7	31.9	708.9	8.8	2.1	10124.1	125.0	29.8

Source: Analysis of 2003 Field Survey Data.

Table 4: Analysis of costs and returns in soybean production by income category for non-adopters (n=120)

Income Category (N'000/year)	Number of farmers (a)	Percentage (e)	Area cultivated (hectare)		Soybean Income (N'000)			Cost incurred (N'000)			Returns (N'000)		
			Total (b)	Per capita (c) = (b/a)	Total (d)	Per capita (e) = (d/a)	Per hectare (f) = (d/b)	Total (g)	Per capita (h) = (g/a)	Per hectare (i) = (g/b)	Total (j) = (d-g)	Per capita (k) = (j/a)	Per hectare (l) = (j/b)
Less than 10	43	35.8	12.5	0.3	221.8	5.2	17.8	28.7	0.7	2.3	193.1	4.5	15.5
10 – 19.999	26	21.7	15.8	0.6	342.9	13.2	21.7	55.3	2.1	3.5	287.6	11.1	18.2
20 – 29.999	7	5.8	6.3	0.9	166.9	23.8	26.5	30.2	4.3	4.8	136.7	19.6	21.7
30 – 39.999	2	1.7	3.4	1.7	94.8	47.4	27.9	7.8	3.9	2.3	75.1	37.6	22.1
Above 40	42	35.0	116.1	2.8	3097.8	72.0	26.7	49.5	1.2	0.4	3048.3	72.6	26.3

Source: Analysis of 2003 Field Survey Data

status, positively influence variations in both output and income. Growth in output and income are measures of increasing welfare, meaning that these variables are relevant in explaining changes in the well-being of soybean farming households in the area. The identified contribution of improved technology adoption in promoting rural livelihoods of soybean growers substantiates the initial finding that that notwithstanding the additional cost of the new technology, investment thereunto is worthwhile since through higher yield, output and income the accruing benefit to the adopter is enormous. Besides, other technology-specific attributes of the improved seed, like superior grain size and colour, make them attractive and in high demand in the market.

CONCLUSION

Increases in welfare of soybean farmers can be achieved by increasing their access to cultivatable farmlands, fostering their improved technology adoption status, and ensuring that soybean farming operations are attractive to ensure continuity and acquisition of more experience by farmers. These would require huge financial capital investment since both acquisitions of farm land and new technology are capital intensive. Consequently, there is need to ease the farmers' access to investment funds from the formal sources. Interests' charges on these funds should be made more attractive to farmers that need loans to acquire farmlands or for investment in new technology. There is also need to frequently update the skills and knowledge base of the extension services staff through trainings and retraining courses, while similar opportunities should be provided for training of the farmers on the new technology package through workshops and Field Days to enable them grow in knowledge and experience.

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