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RESEARCH ARTICLE

FARMERS' HEALTH AND TECHNICAL EFFICIENCY IN OSUN STATE, NIGERIA

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ABSTRACT

The agricultural sector is a major contributor to Nigeria Gross Domestic Product (GDP). However, the increasing incidence and spread of disease infections in rural Nigeria threatens the farming households' efficiency and output. Therefore, this study examined the effects and relationship between farmers' health and technical efficiency in Nigeria. Structured questionnaires were administered to one hundred and twenty (120) farmers using multistage random sampling technique. Data were collected on health status and production characteristics of the farmers and analyzed using the Maximum Likelihood Estimation Method of Stochastic Production Frontier model. The result of the effect of ill-health on technical efficiency of the farmers showed that land, labour, fertilizer and insecticides were positively related to output while seed was inversely related to output. The average technical efficiency of the farmer was 0.56, that is, the farmers still have 44 percent potential to be on the frontier. In the inefficiency model, adverse health, educational level, age, household size and farming experience have positive effects on inefficiency of the farmers. It could be concluded that it is possible to increase productivity through improvement on the stock of health status of the farmers. It is therefore, recommended that extension workers should work hand in hand with community health workers to improve general health conditions of the farmers by educating them on health tips through health talks and seminars. Also, Government should make the services of health workers available to the rural farmers in order to reduce incidence of diseases.

INTRODUCTION

The importance of good health cannot be overemphasized because the sustainability and viability of a nation's economic and social growth depend largely on its vibrant health sector (Orabuchi, 2005). Health has been defined as the complete physical, social, mental, and physiological well-being of an individual, and not merely the absence of disease or infirmity (FAO/WHO, 1992). Sswanyana *et al.* (2004) viewed health as a key component of human capital development and a capital good, which influences the supply of labour in any sector of the economy. Health as a form of human capital can either improve or reduce efficiency therefore good health and productive agriculture are important in the economy of any nation especially in the fight against poverty. According to Grossman (1999), in analysis of the demand for health, health is viewed as a durable capital stock that yields an output of healthy time. Individuals are endowed with an initial amount of this stock that depreciates over time and can be increased by investment. By investing in health, a household expects to increase the stock of available healthy time, which will increase the amount of time available for earning income through producing goods and offering of services. Indeed, improvements in health care increase the productivity of labour, especially if people move from low to high productivity jobs as their health improves (Ulimwengu, 2009). Good health as related to labour output or better production organization (since people of good health generally have better intellectual capacities), can enhance farmer's income and economic growth. As pointed out by Hawks and Ruel (2006), in agricultural communities, poor health reduces income; efficiency and productivity, further decreasing people's ability to address health problems inhibit economic development. Health affects agricultural systems by affecting the health of the farm principal operators. Poor health results in loss of work days or decreases workers capacity, decrease innovation ability and ability to explore diverse farming practices and by such makes farmers to capitalize on farm specific knowledge. Clifford *et al.*(2006), Donald (2006) and Bradley (2002) opined that health capital is affected by a number of preventable diseases such as malaria fever, musculoskeletal disorders, HIV/AIDS, farm injuries, yellow fever, typhoid fever, schistosomiasis, diarrhea, respiratory diseases and skin disorders etc. These diseases, according to Nganbeki and Ikpi (1982), make farmers not to utilize fully all inputs at their disposal and debilitates physical performance and equally impacts negatively on the farm profit levels. Apart from being unable to meet its revenue targets, the cost of recovery has a detrimental effect on consumers, especially the poor and it has also induced different types of behaviour in them (Asenso-Okyere *et al.,* 1997). These behaviours include delays in reporting sickness to health care providers,

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consultation at drug stores, partial purchase of prescribed drugs and sharing of prescription drugs with other household members. Amidst the alarming report of effects of diseases on farmers, Nigerian subsistence farmers spend as much as 13% of total household expenditure on treatment of malaria alone (Ajani and Ugwu, 2008). This gives enough evidence that the cost of combating diseases and health problem by farmers is quite enormous, considering the frequency and prevalence of diseases among Nigerian farmers. Recent studies estimated the economic cost (both direct and opportunity cost) of a farmer becoming sick once to be ₦29, 225,53. Adewale *et al*. (1997) valued the opportunity cost of guinea worm infection on the farmer at ₦9,566 per bag of potential cocoa output lost due to ineffective supervision of farms occasioned by ill health. The farmer loses on the average 22 working days when incapacitated by one sickness or the other per time (Ugwu 2006 and Ashagidigbi 2004). Good health enhances work effectiveness, efficiency and productivity of an individual through increases in physical and mental capacities. It is therefore extremely difficult to separate efficiency in agriculture from the agricultural producer and health stock (Ajani and Ugwu, 2008).

Health raises physical capacities like strength and endurance, mentalcapacities and reasoning abilities. These enhance worke rs' productivity (FAO/WHO, 1992) and having a great impact on the number of hours worked by humans everywhere (Currie and Madrian, 1999). Developing countries need good health and productive agriculture to fight against poverty because, lowered productivity by agricultural workers due to poor health, affects their income and further deepens the incidence of poverty and ill health (IFPRI, 2007). Despite this finding, previous studies failed to adopt a holistic approach to the problem of farmers' health status and efficiency. Most of the health studies were monovalent and disease specific, this approach undermined or limited the usefulness of the results when assessing the health status of the farmers or people in the study area (Ugwu, 2006). Most previous studies on health and agriculture were centered on occupational health in medical field. Medical surveillance and reporting system of agricultural occupational illnesses leaves much to be desired compared to other sectors. It makes it quite impossible to track the trends, determine accurate numbers of those with illnesses that are consequences of agricultural exposure. The economic impact of agriculture related ill health and injuries, arising from agricultural work, need to be properly assessed. According to IFPRI, (2007), poor and unhealthy producer is disabled to work. This affects both productivity and income of the farmer, thus perpetuating a downward spiral into ill health and poverty in a vicious cycle; which will further jeopardize food security and economic development for the wider population. However, it is reasonable to think that there is a link between health and farmers' efficiency and productivity.

METHODOLOGY

Study Area: The study was carried out in Osun state in the south western part of Nigeria. Osun state is bounded by Kwara state to the North, Ekiti and Ondo states to the East, Ondo and Ogun states to the south and Oyo state to the West. It has 30 local government areas and a population of 3, 423,536 with a population density of 243 per square kilometer (NPC 2006). According to Osun state population and development programme (2002), the population is predominantly Yoruba ethnic group which make up of about 96% of the entire population. The state has a total land area of 8802km^2. The people are predominantly peasant farmers cultivating mostly food crops. They also embark on livestock production such as rearing of goats, sheep, pigs, rabbits and poultry as well as marketing of their products.

Source and Method of Data Collection: The data for this study were obtained mainly from primary source. The tool for collecting the data was a well structured questionnaire. The information collected in the survey included data on: the sicknesses prevalent in the area, sickness that affected any member of household in the last one year, days stayed off the farm due to illness, the kind of health care services in the study area, the major constraints in seeking health care, age, total number of years spent in school, marital status, sex of the respondents, household size, occupations (primary and secondary occupation). Questionnaires were distributed mainly to household heads except in cases where such heads were not available.

Data Analysis

Descriptive Analysis: Frequency, mean, percentages and tables were used to capture the major illness of the farmers as well as socio-economic characteristics of the farmers.

The Analysis of Ill-Health on Technical Efficiency Using Stochastic Production Frontier Model

The study made use of the stochastic production function in particular, Cobb-Douglas functional form to estimate the coefficients of the parameters of the production function and also to predict technical efficiencies of the farmers. The choice of this model is because this model allows for the presence of technical inefficiency while accepting that random shocks (weather or disease) beyond the control of the farmer can affect output. The model specifies output (Y) as a function of a set of inputs (X_s) and a disturbance term (e_i). That is

$Y_i = f(x_i,\beta) + e_i$ ------ (1)

Where:

Y_i = Output of the ith farm (in grain equivalent)

X_i = Vector of actual input quantities used by the ith farm

β = Vector of parameters to be estimated

e_i = composite error term denoted as e_i

$e_i = v_i - u_i$ - - - - - - (2) Coelli and Batesse (1996)

v_i = Decomposed error term measuring technical efficiency of the ith farm.,

u_i = The inefficiency component of the error term

The symmetric component (v_i) represents the variation in output due to factors (weather or disease attack) beyond the farmer's control. This symmetric component of the error term is independently and normally distributed as N(0, δv^2). A one sided component (U_i>0) shows technical inefficiency relative to the stochastic frontier. Hence, if U_i=0, production lies below the frontier and U_i is assumed to be independently and identically distributed and truncated at zero with the variance δV^2 (N0, δV^2). The parameter estimators (β) and the variance parameters were obtained by the maximum likelihood estimation method.

$\delta^2 = \delta u^2 + \delta v^2$ - - - - - - - - - - - - (3)

$\gamma = \frac{\delta u^2}{\delta v^2}$ – – – – – – – – – – –(4)

Where:

1 - γ = inefficiency

γ = The variance ratio parameter (Gamma) and by Batesse and Corra (1977), $o \le \gamma \le 1$.

The variance ratio parameter (γ) has two important characteristics. First, when δv^2 tends to zero, u_i is the predominant error term in equation (1) implying that the output of the sample farmers differs from the maximum output mainly because of the difference in technical efficiency. Second, when δv^2 tends to zero, v_i is the predominant error term in equation(1) and so γ tends to zero, thus differences between farmers output and the efficient output can be determined based on the valve of γ (Kalirajan, 1981).
The empirical model of the stochastic production frontier function is specified as follows:

$LnY_i = \beta_0 + \beta_1 Inx_1 + \beta_2 Inx_2 + \beta_3 Inx_3 + \beta_4 Inx_4\ \beta_5 Inx_5 + V_i - U_i$ -------- (5)

Where Y_i = Value of output of the crop farmers (in grain equivalent)

X_1 = Land area cultivated measured in hectares.
X_2 = Labour used measured in man days
X_3 = Quantity of fertilizer used in kg
X_4 = Quantity of seed used in kg
X_5 = Quantity of insecticides used in litres
V_i – Ui = as defined in equation (2)
$\beta_0 + \beta_1$ = Parameter estimates
i = 1,2,3----------n, farms.

The technical efficiency for individual farm was computed as an index and the average technical efficiency for the production system determined. Based on a number of socio-economic factors identified to be influencing the technical efficiency of the farms, the Coelli and Battese (1996) inefficiency model was employed to estimate the parameters of the variables. The model assumes that the inefficiency effect u_i is independently distributed with mean U_i and variance δ^2. The model is specified as:

$u_i = d_o + d_1z_1 + d_2z_2 + d_3z_3 + d_4z_4 + d5z_5 + d_6z_6 + e_i$ ----------(6)

Where

Z_1 = Actual age of respondents in years
Z_2 = Household size
Z_3 = Education level of farmer (dummy variable 1 for formal education and 0 if otherwise)
Z_4 = Farming experience measure in years
Z_5 = Health status of the farmer (measured as days of incapacitation due to illness)
Z_6 = Sex of the farmer (dummy variable 1 for male and 0 for female)
Z_7 = Marital status (dummy variable 1 for married and 0 for otherwise)
d_o - d_6 = Regression estimates
e_i = a random disturbance following half normal distribution.

β, δ, δ^2 (Sigma squared) and γ (gamma) are unknown parameters to be estimated. δ^2 and γ coefficients are diagnostic statistics that indicates the relevance of use of the stochastic production frontier function and the correctness of the assumptions of the disturbance of the error term. The gamma (γ) indicates that the symmetric influence, that are not explained by the production function are the dominant sources of random errors. The statistical significance of gamma (γ) shows that in the specified model, there is the presence of a one-sided error component (v_i). This implies that the traditional OLS regression model cannot adequately represent the data and hence the use of stochastic production frontier function estimated by the maximum likelihood estimation method is appropriate. The computer programme frontier version 4.1 of (Coelli. 1994) was used to run the maximum likelihood analysis.

RESULTS AND DISCUSSION

The Socio-Economic Characteristics of the Farmers

Sex of Farmers

83 per cent of the respondents were male while 17 percent were female. This means that most of the farming households were headed by males. Also, average number of days ill for the male farmers (38.23) was higher than that of female farmers (29.10). This implies that male farmers engaged in most tedious farm operations such as ridging, stumping, pruning etc, all these exposed them to farm accident and musculoskeletal disorder. Average technical efficiency of male was 0.77 and average technical efficiency of female was 0.81. This shows that female farmers are more efficient than male farmers in the study area.

Marital Status

13.3 per cent of the respondents were single, 50 per cent of respondents were married monogamous, 33.3 percent of respondents were married polygamous 1.7 percent of respondent were separated and 1.7 percent of respondents were widowed. Average number of days ill of never married respondents was 19.19 and average technical efficiency was 0.51. Average number of days ill of married monogamous respondents was 26.92 and average technical efficiency was 0.57. Average number of days ill of married polygamous respondents was 24.53 and average technical efficiency was 0.58. Average number of days ill of separated respondents was 17.00 and average technical efficiency was 0.33. Average number of days ill of widowed respondents was 46.50 and average technical efficiency was 0.50. It means that married monogamous farmers were most productive farmers with 26.92 average numbers of day's ill and average efficiency of 0.57.

Level of Education

36.1 per cent attained tertiary education, 17.7 percent and 32.7 percent attained primary and secondary level of education respectively while only 13.5 percent had no formal education. This implies that 68.8 percent of the farmers were literate. Consequently, their productivity will be affected as they attain higher education; they would be tempted to shift from farming

Table 1. The Socio-Economic Characteristics of the Farmers Sex of Farmers

Variable	Frequency	Percentage	Average number of days ill	Average technical efficiency
Sex				
Male	99	82.5	38.23	0.77
Female	21	17.5	29.10	0.81
Total	120	100		
Marital Status				
Never married	16	13.3	19.19	0.51
Married monogamous	60	50.0	26.92	0.57
Married polygamous	40	33.3	24.53	0.58
Separated	2	1.7	17.00	0.33
Widowed	2	1.7	46.50	0.50
Total	120	100		
Levels of education attained				
No formal education	17	13.5	35.24	0.5049
Primary	21	17.7	23.33	0.56
Secondary	39	32.7	16.39	0.58
Tertiary	43	36.1	41.19	0.60
Total	120	100		
Age of Farmers				
20-29	13	10.83	33.00	0.52
30-39	33	27.50	21.58	0.59
40-49	39	32.50	23.64	0.55
50-59	20	16.67	25.14	0.57
60-69	12	10.00	56.17	0.50
Total	120	100		
Farm size in Hectares				
1-5.5	60	50.0	25.58	0.57
5.6 – 10.5	42	35.0	26.85	0.57
10.6 – 15.5	9	7.5	22.50	0.57
15.6 – 20.5	6	5.0	23.20	0.50
20.6 – 20.5	1	0.83	13.00	0.11
$\geq$ 25.6	2	1.67	8.00	0.38

Table 2: Distribution of Farmers by their Total Health Expenditure

Cost ranges	Frequency	Percentage	Average number of days ill	Average technical efficiency
5,000 – 10,000	58	48.3	18.65	0.57
10,100 – 20,000	42	35.0	23.73	0.56
20,100 – 30,000	7	5.9	35.79	0.63
30,100 – 40,000	9	7.5	16.39	0.58
40,100 – 50,000	4	3.3	58.75	0.60
TOTAL	120	100.0		

Table 3: Distribution of Farmers by the Health Care Provider

Health care providers	Frequency	Percent	Average number of days ill	Average technical efficiency
Self medication	63	54.3	35.79	0.63
Traditional healers	13	11.2	25.14	0.56
Government clinics	31	26.7	25.24	0.49
Private clinics	9	7.8	18.07	0.57
TOTAL	116	100.0		

Table 4: Distribution of Farmers by the constraints face in seeking health care

Constraint	Frequency	Percentage
Waiting time	28	26.4
Money	47	44.3
Transport	16	15.1
Drugs	11	10.4
Facilities	4	3.8
TOTAL	106	100.0

Table 5: Maximum Likelihood Estimated and inefficiency function using the stochastic production frontier

Variable production inputs	Parameters	Coefficients	Standard error	t-ratio
Constant	b_0	10.307	0.930	11.080*
Land size (hectares)	b_1	0.539	0.867	6.219*
Labour (man days)	b_2	0.058	0.162	0.362
Fertilizer used (kg)	b_3	0.746	0.241	3.039**
Seed used (kg)	b_4	-0.110	0.114	-0.094
Insecticides (liter)	b_5	0.068	0.090	0.755
INEFFICIENCY MODEL				
Constant	d_0	0.594	0.126	4.707*
Age	d_1	0.019	0.025	0.076
Household size	d_2	0.041	0.038	1.050
Education	d_3	-0.035	0.015	-2.384**
Farming experience	d_4	-0.001	0.002	-0.574
Days of incapacitation	d_5	0.212	0.082	2.571**
Sex	d_6	-0.009	0.046	-0.216
Marital status	d_7	0.044	0.036	1.223
DIAGNOSTIC STATISTICS				
Sigma Squared	δ^2	0.890	0.840	10.710
Gamma	γ	0.830	0.121	2.790
Log likelihood		-103.885		
Average technical efficiency		0.560		
LR test		19.599		

*, ** significant level at 1% and 5% respectively.

Table 6: Distribution of Respondents by the Technical Efficiency of production

Efficiency ranges	Interpretation	Frequency	Percentage
0.20 – 0.29	Not efficient	15	12.50
0.30 – 0.39	Not efficient	5	4.16
0.40 – 0.49	Not efficient	9	7.50
0.50 – 0.59	Less efficient	20	16.67
0.60 – 0.69	Efficient	40	33.33
0.70 – 0.79	Efficient	23	19.17
0.80 – 0.89	Sufficiently efficient	8	6.67
TOTAL		120	100

business in the rural to urban center. Also, average number of days ill of farmers that have no formal education was 33.24 days per year and average technical efficiency was 0.49. Average number of days ill of farmers that have primary education was 23.33 days in a year and average technical of efficiency was 0.56. Average number of days ill of secondary education farmers was 16.39 days and average technical efficiency was 0.58. Average number of days ill of farmers that attained tertiary education was 41.19 and average technical efficiency was 0.60. Farmers that attained tertiary education have high technical efficiency. This could be due to the fact that farmers with higher education are expected to have technical-know-how and better understanding on the use of farm inputs such as tractor, herbicide etc. this agrees with the findings of Obwona (2006). Their number of days ill was higher because farmers that have higher education may refuse to use traditional medicine in the rural area where there are inadequate health facilities.

10.83 percent of the farmers were within the age of 26-29 years while farmers within the range of 30-39 years constituted 27.50 percent, 32.50 percent were within the range of 40-49 years while 16.67 percent of the farmers were within the range of 50-59 years, 10.00 percent were within the range of 60-69 years. This shows that most of the farmers were in the productive age. Average number of days ill was 33.00 for the farmers within the age of 26-29 and average technical efficiency was 0.52. Farmers within the age of 30-39 have average number of days ill of 21.58 and average technical efficiency of 0.59. Farmers within the age of 40-49 have average number of days ill of 23.64 and average technical efficiency of 0.55. Average number of days ill of the farmers within the age of 50-59 years was 25.14 and average technical efficiency of 0.57. Farmers within the age of 60-69 years have average number of days ill of 56.17 and average technical efficiency of 0.50. This implies that farmers within the age of 30-39 have low average number of days ill among others and more productive with average technical efficiency of 0.59.

Farm Size

There is an indication that land cultivated by farmers is still within small scale and medium scale farming which largely affects their productivity in the face of impaired health situation. The average number of days ill of the farmers within the range of 1-5.5 hectares of farm land was 25.58 and average technical efficiency of 0.57. Farmers within the range of 5.6-10.5 hectares of farm land have average number of days ill to be 26.85 and average technical efficiency of 0.57. Farmers within the range of 10.6-15.5 hectares of farm land have average number of days ill of 22.50; average labour productivity of 4750.42 and average technical efficiency of

0.57. Farmers within the range of 15.6-20.5 have average number of days ill of 23.20 average labour productivity of 9303.11 and average technical efficiency of 0.50. It means that farmers within the range of 15.6-20.5 hectares of land have average number of days ill of 23.20 were more productive with technical efficiency of 0.50.

Health Characteristics of Farmers

Factors influencing health status of the farmers were examined and these include total money spent on health within a year, health care provider, and constraints being faced by the farmers in seeking health care. As indicated in Table 2, 51.7 per cent of respondents have their health expenditure for treating one disease or the other range from N5,000 – N10,000, 45 per cent was within the range of N10,000 – 20,000, 6.7 per cent incurred health cost within the range of N20,000 – 30,000 while 8.3 percent and 3.3 percent were within the range of N30,100 – 40,000 and N40,100 – 50,000 respectively. This shows that the farmer incurred high health cost in treating different diseases that affect him which will consequently affect the productivity. Average number of days ill of the farmers within the range of N5,000 – N 10,000 was 18.65 with average technical efficiency of 0.57. Farmers whose range was within N10,100 – N 20.000 health expenditure have average number of days ill of 23.73 and average technical efficiency of 0.56. Farmers within N 20,100 – N 30,000 range of health expenditure have average number of days ill of 35.79 and average technical efficiency of 0.63. Average number of days ill for the farmers within the range of N30,100 – N40,000 health expenditure was 16.39 and average technical efficiency was 0.58. Farmers within the range of N40,100 – 50,000 health expenditure have average number of days ill of 58.75 and technical efficiency of 0.60. It shows that farmers within the range of N30,100 – N 40,000 health expenditure were most productive group of farmers with low average number of days ill (16.39) and average technical efficiency of 0.58

54.3 per cent of the respondents had access self medication, 26.7 percent had access to Government clinics while 11.2 percent and 7.8 percent had access to traditional healers and private clinic respectively (Table 3). Average number of days ill of farmers that have access to self medication was 35.79 with average technical efficiency of 0.63. Farmers that have access to traditional healers have average number of days ill to be 25.14 and average technical efficiency of 0.56. Average numbers of days ill of farmers that have access to government clinics was 25.24 and average technical efficiency is 0.49. Average number of days ill for the farmers that have access to private clinics was 18.07 and average technical efficiency was 0.57. This shows that, farmers that have access to traditional healers were the most productive group of farmers in the study area with average number of days ill of 25.14 and average technical efficiency of 0.56. It also implies that most of the farmers in the study area could not access government Clinic whenever they were sick which made them to be incapacitated for a long period of time. About 44 per cent of the respondents had money as the constraint in seeking for good health, 26 of respondents have to wait for long time before treatment (Table 4). This probably may be due to inadequate number of health personnel in most clinics; 15 per cent had to travel long distance in order to visit hospital because most of the hospitals are built in the urban area; 10 per cent and 3 per cent claimed that inadequate supply of drugs and other facilities were the major constraints in seeking good health care service (Table 4).

The Effect of Ill Health on Technical Efficiency

The effects of ill health showed the presence of technical inefficiency of the farmers in the study area. This was confirmed by the large and significant value of the gamma coefficient (γ). The gamma value of 0.83 indicated that about 83% variation in the output of the farmers would be attributed to technical inefficiency effects alone while only 17% was due to random effects and average technical efficiency was 0.56 (Table 5). A negative sign of the parameters in the inefficiency model indicated that the associated variable have a positive effect on technical efficiency and vice versa. The result obtained from the stochastic production function indicated that the efficiency of the farmers was affected not only by the traditional input variables: land, labour and capital (fertilizer, seed and insecticides) but equally by socio – economic factors: age, experience, health, sex, education and marital status.

The signs of the estimated coefficients were as expected. Thus, the elasticity of land, labour, fertilizer and insecticides were positive while seed was negative. This implies that increasing any of these inputs would increase output while increasing seed quantity would decrease output. Fertilizer elasticity was 0.746 and significant at $P \leq 0.5$ meaning that fertilizer has the largest impact on the output of the farmers in the study area. If quantity of fertilizer used on the farm increased by 1 percent; output will increase appreciably by 75 percent. Also, land has large coefficient 0.539 which was significant at $P \leq 0.1$. This implies that 1 percent increase in land size would lead to 54 percent increase in output. The coefficient of seed variable was 0.110 but inversely related to output. A unit increase in seed quantity used would lead to 11 percent decrease in output. It is worthy to note that the health variable which was measured as days lost to incapacitation due to illness has a positive sign and significant at $P \leq 0.5$. This follows a prior expectation that ill health has negative effect on technical efficiency of the farmers. From the result, the health coefficient of 0.212 implies that one percent improvement in the health condition of the farmers will increase efficiency by 21 percent (Table 5).

Technical Efficiency of Farmers

The individual farmer's technical efficiency obtained using the estimated stochastic frontier is presented in Table 5. The predicted technical efficiency differs substantially among farmers as it ranges from 0.20 – 0.89 with a mean technical efficiency of 0.56. The implication of this is that, there is a potential of about 44 percent to improve the output of the farmers if health and production conditions are improved. This finding is supported by the findings of a study carried out by Ulimwengu, (2009) on farmers' health and agricultural productivity in rural Ethiopia. Out of the entire variables specified in the inefficiency model, health status of the farmers has the largest coefficient. This implies that health is an important variable for farm productivity and as such has a greater share in the in efficiency of farmers in the study area. This is in line with the report from the study conducted by

Antle and Pingali, (1994) on pesticides, productivity, and farmer health. Their result showed that farmer health has a positive effect on productivity.

Conclusion

This study contributed to the importance of health capital as one of the major production inputs variable. The study sets to assess the effect of health on technical efficiency and conclude that it is possible to increase productivity through improvement on the stock of health capital of the farmer. Among the identified key factors which influence the stock of health of the farmer are age, sex, marital status, education, and household size. Also, the health status implies that one percent improvement in the health condition of the farmers will increase efficiency by 21 percent. Therefore, it could be concluded that improvement in the health stock of the farmer has a positive effect on technical efficiency of the farmers. It is recommended that government at all levels and stakeholders in health ministry consider critically ways to improve the health conditions of the people in the rural areas where the bulk of food consumed are produced in Nigeria.

REFERENCES

Adewale, B; Mafe, M.A; Suleiman, M.A. (1997): Impact of Guinea Worm Disease on Agricultural Productivity in Owo L.G.A., Ondo State, Nigeria. *West African Journal of Medicine* Vol 16 (2): 75-79.

Ajani and Ugwu (2008): Impact of Adverse Health on Agricultural productivity of farmers in Kanji Basin North central Nigeria using a stochastic production frontier Approach.

Antle, J. M., and P. L. Pingali, (1994): “Pesticides, Productivity, and Farmer Health: A Philippine Case Study.” *American Journal of Agricultural Economics,* 76:418-430.

Asenso-Okyere K.W, J.A. Dzator and I. Osei-Akoto (1997): The Behavior Towards malaria Care-A Multinomial Logit Approach. *Social Indicators Reaserch,* 39(2): 167-186.

Ashagidigbi, W.M., (2004): Effect of Malaria on Rural Household Productivity in Ido Local Government Area of Oyo state. M.Sc. project, (Unpublished) University of Ibadan, Ibadan Nigeria.

Batesse, G.E. and G.S. Corra, (1977): Estimation of Production Frontier Model with Application to Pastoral Zone of Eastern Australian. *Journal Agriculture Economics*, 21:67-179.

Bradley, K.R., (2002): Health hazards in agriculture: An Emerging Issue. A publication of NASD, Department of Agriculture, United States.

Clifford, M., M.M. McCarney and E. Boelee, (2006): Understanding the links between agriculture and health agriculture malaria. Water Associated Diseases, Brief 6 of 16.

Coelli, T.J. and G. Battese, (1996): Identification of factors which influence the technical inefficiency of Indian farmers. Australian Journal Agriculture Economics, 40:103-128.

Currie, J. and B.C. Madrian (1999). *Health insurance and The Labor Market.* New York: Elsevier Science.

Donald, C., (2006): Understanding the links between agriculture and health food, agriculture and the environment. Occupational health hazards of agriculture focus 13, Brief 8 of 16.

Food and Agricultural Organization/World Health Organization (1992): International Conference on Nutrition and Development. A Global Assessment, pp.3-46.

Grossman, M. (1999): The Human Capital Model. *In Handbook of Health Economics,* Ed. A.J. Culyer and J.P. newhouse. Amsterdam: Elsevier.

Hawks, C. and M.T. Ruel (2006): Understanding the links between Agriculture and Health. A

paper published by 2020 vision for good agriculture and environment. *International food policy Research Institute.* Focus 13 brief 1 of 16. http://www.ci.refer.org/psa/d4.ht.http://www.kwenu.com.

International Food and Policy Research Institute Bulletin, (2007): Last accessed February, 2008 from http://www.fpri.org.

National Population Commission (2006): Nigeria population figure.

Ngambeki, D.S. and A.E. Ikpi, (1982): Rural Farmer Productivity in the Tropics. *Journal Agriculture Economics*. 30: 297-318.

Obwona, M. (2006): Determinants of Technical Efficiency Differentials amongst Small- and

Medium-scale Farmers in Uganda: A Case of Tobacco Growers. *African Economic Research Consortium Research Paper 152* Nairobi, Kenya

Orabuci, A (2005). *Nigeria and the challenges of Millennium Development Goals.* http://www.kwenu.com.

Osun State Population and Development Programme (2002)

Ssewanyana S, Nabyonga, J, kasirye I., and Lawson, D (2004). *Demand for health care services in Uganda: Implications for poverty reduction*. Munich Personal RePEc Archive Working Paper No. 8558.

Ugwu, P.C., (2006): Effect of Farmers Health on the Agricultural Productivity of the Principal Farm Operator in Borgu Iga of Niger State. M.Sc. project, (Unpublished) University of Ibadan, Ibadan, Nigeria.

Ulimwengu, J. (2009): Farmers’ Health and Agricultural Productivity in Rural Ethiopia.

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