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DOES ACCESS TO HEALTH CARE SERVICES AFFECT FARM-LEVEL PRODUCTIVITY?

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ABSTRACT

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This paper examines the impact of farmers' access to orthodox health care on their agricultural productivity. Employing data obtained from in farming communities in Akwa Ibom State, Nigeria, findings from regression analysis revealed that access to health care services positively impact on farm output. Farm size (land) and planting materials were found to significantly impact on the output of farmers with access to health facilities while these and labour and fertilizer had positive impact on the output of farmers without access to modern medical facilities. However, both groups of farmers were found to be technically efficient in the use of labour, fertilizer and planting materials but inefficient in the utilization of land. These inputs accounted for 59% and 90% of the variation in the outputs of farmers accessing and those not accessing health services, respectively. Accessibility dummy was found to improve the explanatory power of the variables from 67% to 70%.

INTRODUCTION

A substantial literature exists on the impact of a person's health on his or her productivity. Information on this subject can be found in Barlow (1979), Salkever, 1982; Pitt and Rosenzweig, 1990; World Bank (1993) and, Goodman *et al*, (2000). These studies documented existence of correlation between ill health and time, as well as productivity and labour participation of caregivers. Empirical studies of the impact of health on productivity in Nigeria are recent and mostly concentrate on macroeconomic variables and non farm/agricultural sector as a whole (see Leighton, *et al* 1993; Ibok, 2000; Alaba and Alaba, 2003).

Inaccessibility to health services has a lot of implications for various sectors of a nation's economy including agriculture. This is particularly so for the agricultural sector. According to IFPRI (2006), agriculture is tied to human health at the most basic level. Agriculture produces food, fiber, and medicine and provides livelihoods to millions of farmers so that they can purchase other necessities of life that contribute to their good health. The chain of cause and effect goes both ways. Good health affects agriculture by boosting people's capacity for work and thus increasing how much they can produce. It enhances their ability to take risks with new crops or farming method- risks that might pay off with better production and income. On the other hand, when unhealthy farmers are unable to produce enough agricultural goods to earn a decent livelihood, their poverty and consequent malnutrition further worsen their health. A study by UNICEF (1987) further underlines the devastating effect of this lack of access. The study shows that guinea worm diseases alone temporarily incapacitated 2.5 million people, mostly farmers. The study also revealed that apart from shortages of financing for agricultural activities due to diversion of fund to the treatment and probable eradication of guinea worm, the disease has over the years constituted a major impediment to not only sustenance but a rise in output. It estimated the loss to rice production alone from the disease at US 50million dollars in the 1980s.

From the 1980 decade to 2000, there have been several interventions in the health sector in Nigeria, aimed at enhancing peoples' access to quality health services, the ultimate aim being to improve their health and productivity for national development. Evidence to peoples' access to medicare in the country is rather scanty. Where data are available, they are rather aggregate and macro in nature. Such aggregation may fail to reveal the situation of some important sectors, moreso when such sector is peculiar to a particular as agriculture is to rural areas. Nonetheless, it needs to be emphasized that agriculture plays a crucial role in the Nigerian economy. It employs up to 60% of the population, is the second foreign exchange earner (after petroleum) in addition to providing food for the teeming population of the country and raw materials for related industries. Given the importance of agricultural sector to the Nigerian economy and the crucial role of the health of the farmers to its performance, this study attempts to assess the impact of farmers' access to health services on their farm productivity. The specific objectives of the study are to:

- (1) Identify the type of health care services and facilities available in the study area and characterize the rural farming population in relation to the healthcare services available to them.
- (2) Examine farmers' access to healthcare services and the impact on farm output.
- (3) Estimate and compare the productivity of farmers with and without access to healthcare services.

Theoretical underpinnings

The interaction between health and economic development have for long been an important but neglected issue in the development literature. The early classical economists greatly embraced accumulation of physical capital but failed to acknowledge the interaction between human capital and economic growth in their contributions to the development theories (Meier and Baldwin; 1957). The basic Malthusian theory in its own case sees disease only as a natural means of checking population explosion (Malthus; 1826). However, the emergence of the Neo-classicals brought the importance of health to the fore of development literature.

The impact of ill-health is grave: that healthy men provide more (not that they can, but they actually do) is logical but it has only been proved in a small number of limited situations (Davies; 1968, Barlow; 1979). It is a physiological fact that the productive potential of the sick diminishes with intensity of illness, this reflects on output per hour of work, holding constant the stock of capital and natural resources (Baldwin and Weisbrod; 1974). Individuals with poor health status have a tendency to generate very low returns to investment due to the associated forced reduction in effectiveness if they endure to work at all. Good health therefore permits more hours into the labour market indicating a rightward shift of the labour supply curve which theoretically often translates into lower market earnings per productive hour based on the operation of market mechanisms. This, however, can be neutralized by improved physical strength and better cognitive initiatives resulting from good health which can be translated into greater efficiency and production methods.

The relationship between health and economic development is so crucial and sometimes so complex that a well-focused and definitive study is needed in reconciling the causality between health status and economic development. Good or bad health can influence the optimal level of acquired skill. An individual with poor health may only attract low returns on a particular investment. This may come as result of reduction in time spent in the labour force or because of the restriction in the set of market activities he/she can participate in. Poor health can also increase the cost of financing or the cost of production of a particular investment. This is because households may need to hire additional labour to be able to fill in the gaps generated by illness. Some sickness may even wipeout particular skills that an individual possess. Healthy individuals however can be more productive on their jobs, do better at school and earn more than those who are unhealthy.

Poole (2005) has noted that the driving force behind economic growth is productivity. Therefore, study hinges on the theory of economic growth. In the context of this paper access to health services and productivity will be analysed within the context of productive efficiency as propounded by Farrell (1957). According to Farrell, efficiency of a decision-making unit is made up of two components: *technical* and *allocative efficiency*. The combination of these components makes *economic efficiency*. *Technical efficiency* can be regarded as the ability of a decision making unit (household, in our case) to obtain the maximum output from a given set of inputs while *allocative efficiency* can be seen as the ability of a decision making unit to employ inputs in optimal proportions (optimal input combination), given their prices. In this study, we pay particular attention to *technical efficiency*.

Technical efficiency can be further split into two, viz, pure technical efficiency and scale efficiency particularly when the firm of interest is operating under a variable returns to scale (VRS) technology. In essence, pure technical efficiency relates to the ability of a firm to optimally use existing or available inputs to obtain maximum output under constant returns to scale (CRS) technology. Scale efficiency, on the other hand, could occur when the firm is operating at an optimal size and there are little or no constraints to production and distribution. Such a firm therefore, takes advantage of economies of scale and a fall in average production cost. It is to be noted that the joint effects of all forms of efficiency determine total factor productivity (TFP) growth.

Earlier approaches to productivity measurement were based upon partial productivity indices, typically land or labour productivity. This approach had the advantage of computational simplicity and feasibility, and provided insights into the efficiency of an input in the production process. However, partial productivity measures tend to mask many of the factors accounting for observed productivity growth (Ehui and Spencer, 1990). They were found to be very sensitive to both the composition of outputs and the relative intensity of various inputs. The use of TFP measures as in this study allows for accounting for the impacts of changes in the quantity and quality of all inputs on outputs.

Of recent, two approaches have become popular in measuring TFP. These are the Growth Accounting Approach (GAA) or Index Number Approach (INA) and the Econometric (ECM) or Parametric Method (PM). The GAA involves the development of indices of output and input and the computation of non-parametric factor productivity measures. The ECM is based on an econometric estimation of the production function or the underlying cost or profit function. In this study, the production function is used to measure the productivity (resource – use efficiency). From the production function, the conventional neoclassical test of economic efficiency is derived. The rule of this test is that the slope of the production function (MPP) should be equal to the inverse ratio of input price to output price, as the profit maximizing point, thus:

$$MPP = P_x/P_q$$

Where MPP is the marginal Physical Product; P_x is input price; and P_q is unit output price

RESEARCH METHODOLOGY

Data collection techniques

The data used in this research work were collected from farm households in Akwa Ibom State, Nigeria. The State is located on the south east corner of Nigeria and lying between latitude $7^{\circ}35'$ and $8^{\circ}25'$ East. The State has three sub agricultural ecological zones namely the coastal rainforest zone of the southern region, the flat hinterland of the central zone and the undulating land of the north. Though having three agricultural zones, the type of crops cultivated and farming calendar remain largely the same across the State. Common crops in all the zones include cassava, yam, cocoyam, vegetables (e.g fluted pumpkin, okra, water leaf), plantain/banana and oil palm tree. The latter is more in the coastal area than the other zones. In addition to all the crops mentioned, the northern agricultural zone also has rice and is popular known as the "food basket" of the State. The State comprises thirty one (31) Local Government Area, each of which as a General Hospital, some primary health centres/health posts. In the urban centres there are General Hospitals whose services are complemented by myriads private hospitals and clinics. Thus, there is a higher concentration of medicare facilities in the urban centres than rural areas.

Data were obtained through the use of a set of structured questionnaires and personal interview. A set of structured questionnaires which contained questions on demographic characteristics of the respondents, their health care service and agricultural production were administered on one hundred (100) farmers randomly selected from the urban and rural areas of the state. Households were selected through simple random procedure. Eighty-two (82) of the questionnaires were returned out of which two (2) were discarded for reasons of incomplete information and eighty were used for analysis.

Methods of data analysis

The data obtained were analysis using tables, frequency count and percentages. The relationship between health care accessibility and technical efficiency was estimated using the Cobb-Douglas production model. The generalized implicit form of the equation is:

$$Q = b_0 X^{b_1} X^{b_2} \dots X^{b_n} \quad (1)$$

The explicit form of the function in the number of inputs used in the study is given as:

$$Q = f(LA, LB, FE, PL, MG) \quad (2)$$

Where Q = Output of crops (in grains equivalent)

LA = Land Area (in hectares)

LB = Labour (in mandays)

FE = Quantity of fertilizer used (in kilogram)

PL = Planting materials (monetary value)

MG = Management (proxied by highest level of education attained).

e_i = Stochastic error term to be estimated.

Of the four functional forms, the Double-log was selected as the lead equation based on the following criteria high adjusted R-square value, least standard error value, the F-statistic value and the magnitude of the coefficients and their conformity to *a priori* expectation.

Four equations were estimated: These were:

Equation 1: For respondents with access to modern health care. The sample size for equation 1 was 53 respondents.

The linearize form of the function is;

$$\ln Q = b_0 + b_1 \ln LA + b_2 \ln LB + b_3 \ln FE + b_4 \ln PL + b_5 \ln MG + e_i \quad (3)$$

Equation 2: For respondents without access to modern health care. The sample for equation 2 was 27 respondents. The same variables as in equation 1 were included in the equation thus:

$$\ln Q = b_0 + b_1 \ln LA + b_2 \ln LB + b_3 \ln FE + b_4 \ln PL + b_5 \ln MG + e_i \quad (4)$$

Equation 3: For the third equation, the data on the respondents with access to health services and that of those without access were pooled together and the same equation and variables were employed. This attempt was aimed at ascertaining if there is any discerning improvement in the result that can be attributed to the quality of data or sample size. The equation is as follows:

$$\ln Q = b_0 + b_1 \ln LA + b_2 \ln LB + b_3 \ln FE + b_4 \ln PL + b_5 \ln MG + e_i \quad (5)$$

Where \ln is natural log; Q , LA, LB, FE, PL, and MG are as explained above. b_0 is the intercept, b_1 , b_2 , b_3 , b_4 , b_5 are the coefficients of the respective variable or input; e_i is the stochastic error term to be estimated.

Equation 4: For equation 4, a dummy variable was added to the pooled data. This was an attempt to ascertain if the variation in the result could be attributed to shift in the intercept.

$$\text{Ln}Q = b_0 + b_1\text{Ln}LA + b_2\text{Ln}LB + b_3\text{Ln}FE + b_4\text{Ln}PL + b_5\text{Ln}MG + b_6\text{DUM} + e_i \quad (6)$$

All the variables in equation (6) are as explained above, DUM is the dummy variable represented by 1, if respondent has access to medical cares and 0 otherwise. *A priori*, the coefficients of all the variables are expected to be positively signed.

RESULTS AND DISSCUSION

Type of Health Care Services Available To Farming Households

There are two broad types of health care services available to the farming households. These include the modern health care services (a general hospital, primary health centres and chemists) on one hand and the Traditional Health care services particularly herbalist, on the other. The former was the sole source of medication in most parts of the study area before the advent of orthodox medicine with the coming of the European in the colonial era. Findings from the study (Table 1) reveal that about 92 percent of the respondents have access to primary health care facility, 63.75 percent respondents have access to chemist facility while 33.75 percent the respondents claimed to have access to traditional medicine. From the result, some respondents identify more than one health care service as being available and accessible to them. That majority of the respondents have access to primary health facility is not unexpected since the study was conducted in rural communities. The focus in Nigeria is on the provision of primary health care facilities in the rural communities while the secondary and tertiary health institutions such as general hospitals and specialist/teaching hospitals are established mostly in the urban areas. In the study area, General Hospitals are only located in the Local Government Headquarters while the only Teaching Hospital – The University of Uyo Teaching Hospital is located in the State Capital – Uyo.

Nonetheless, that up to 60 percent of the respondents depends on the chemist shop for the medicare is instructive. It may imply that majority of the rural dwellers are indulging in self medication given that this source of medicare has no skills for diagnosis and prescription. The outcome of this could be fatal to the economy particularly that agrarian economy of the rural which stand to loose enormous manpower to concomitant drug abuse and possible death.

Table 1: Distribution of respondents by types of health care services used

Types of health care services available	No. of respondents*	Percentage*
General Hospital	1	1.25
Health Center	74	92.5
Chemist	51	63.75
Traditional Medicine	27	33.75

* There are cases of multiple access to health facilities. Therefore, the figures will not add up to 80 or 100%.

Source: Field survey.

Table 2: Distribution of respondents by their accessibility to modern¹ health care services

Regularity of access to modern medicare	No. of respondents	Percentage
Regular	24	30
Irregular	29	36.25
No access	27	33.75
Total	80	100

Sources: Field survey.

Level of Accessibility to Modern Health Care Services

The result on the level accessibility to health care is presented in Table 2. The level of accessibility to health care services was measured by how regular the respondents had access to health facilities. Thus, there is a group of respondents with regular access to health care services, those with irregular access and those without access to modern health care services. The respondents with regular access to health services made up 30 percent, 36.25 percent respondents had irregular access to modern health care services and over 33 percent of the respondents had no access to modern health care services. In all, it could be said the above 60% of the respondents have access to orthodox medicare (regularly and irregularly). This could be considered an encouraging situation and can be attributed to efforts by both government and international development agencies in making health care available to the people through provision of drugs and other assistance. Particular attention has been given in recent times to healthcare by children. Thus, primary health centres are set up in many rural communities to bring this facility nearer to the people.

Distribution of respondents by type of health care facilities used

Result reveals that 66.25 percent (53) of the respondents dominantly use modern health care facility and 33.75 percent (27) Of the respondents claimed to use traditional health facilities.

Demographic Characteristics and Health Care Accessibility

Sex: The male respondents were 72.5 percent (58) while 27.5 percent (22) of the respondents were female. The results in Table 4, reveals that 48.75 percent (39) male respondents have access to modern health care facilities while 23.75 percent (19) of the male respondents have access to traditional health care facilities. About 18 percent (14) female respondents have access to modern health care facilities as 10 percent (8) female respondents have access to traditional health care facilities. From the chi-square calculated which is 0.09 and chi-square tabulated at 5% level which is 3.84, it is evident that there is no significant difference in the accessibility of males and females to health care services in the areas.

Table 3: Distribution of respondents by sex and the type of health care services accessible to them

Sex	Modern health care services	Traditional health care services	Total
Male	39 (48.75)	19 (23.75)	58 (72.5)
Female	14 (17.5)	8 (10)	22 (27.5)
Total	53 (66.25)	27 (33.75)	80 (100)

* Percentage results are in parentheses, χ^2 cal = 0.09, χ^2 tab 0.05 = 3.84,

Source: Field Survey.

Table 4: Distribution of the respondents by age and the type of health care services accessible to them

Age	Modern health care services	Traditional health care services	Total
20 -30	4 (5)	2 (2.5)	6 (7.5)
31 -40	24 (30)	16 (20)	40 (50)
41 - 50	22 (27.5)	7 (8.75)	29 (36.25)
50 Above	3 (3.75)	2 (2.5)	5 (6.25)
Total	53 (66.25)	27 (33.75)	80 (100)

* Percentage results are in parentheses, χ^2 cal = 2.00, χ^2 tab 0.05 = 7.81

Source: Field Survey.

Age: The age distribution of the respondents and the type of health care services that they have access to is presented in Table 4. The result indicates that 7.5 percent of the respondents are between 20 -30 years, 50 percent are between 31 - 40 years and 6.25 percent of the respondents are above 50 years. From the result, the modal age group of the respondents is 31 -40 years.

From the table, of a total of 6 respondents between 20 - 30 years of age, only 5 percent have access to modern health care facilities. In the same vein, 30 percent the respondents between 31-40 years have access to modern health care facilities and 3.75 percent respondents above 50 claimed to have access to modern health care facilities. On the other hand, 2.5 percent of the respondents between 20 -30 years have access to traditional health care facilities, 20 percent of the respondents between 31 - 40 years have access to traditional health care facilities and above 2 percent respondents above 50 have access to traditional health care facilities. The chi-square statistics χ^2 cal = 2.00, χ^2 tab 0.05 = 7.81 confirm that there is no significant difference in the accessibility to health care service by the various age groups.

Marital Status: The respondents that were single made up 33.75 percent (27) while the married respondents were 66.25 percent (53). The results reveals that 25 percent (20) of the single respondents have access to modern health care facilities while 41.25 percent (33) married respondents have access to modern health care facilities. 8.75 percent (7) of the single respondent have access to traditional health care facilities and 25 percent (20) married respondents have access to traditional health facilities.

The chi-square calculated was 12.94 and that tabulated was 3.84. Since χ^2 calculated is greater than χ^2 tabulated, there exist significant difference in the accessibility of the married or unmarried respondents to health care services, whether modern or traditional.

Table 5: Distribution of respondents by marital status and the type of health care services accessible to them

Marital status	Modern health care services	Traditional health care services	Total
single	20 (25)	7 (8.75)	27 (33.75)
married	33 (41.25)	20 (25)	53 (66.25)
total	53 (66.25)	27 (33.75)	80 (100)

* Percentage results are in parentheses, χ^2 cal = 12.94, χ^2 tab 0.05 = 3.84

Source: Field Survey.

Education: Most of the farmers interviewed laid claims to formal education. Only a few said they had no formal education. This group of respondents makes up 22.5 percent of the respondents. About 9 percent claimed to have first school leaving certificate, 26.25 percent have the West African School Certificate or General Certificate of Education or Senior Secondary Certificate. About 4 percent have Higher Degree - Masters of Science or

Doctorate Degree (M.Sc / Ph.D). This result shows that most of the farmers interviewed were literate. This can be explained by the fact that many schools abound in the state.

The result further reveals that 17.5 percent of the respondents with no formal education have access to modern health care facilities, 3.75 percent of the respondents with First School Leaving Certificate said they have access to modern health care facilities, 12.5 percent with West African School Certificate or General Certificate of Education or Senior Secondary Certificate have access to modern health care facilities and 3.75 percent respondents with Higher Degree – Masters of Science or Doctorate Degree have access to modern health care facilities. 5 percent respondents with no formal education and First School Leaving Certificate holders each claimed to have access to traditional health care facilities and 13.75 percent of the respondents with West African School Certificate or General Certificate of Education or Senior Secondary Certificate have access to traditional health care facilities.

Chi-square calculated and tabulated were 8.67 and 11.07 at 5% level respectively. Therefore; there is no significant difference in the accessibility of the various educational groups to either modern or traditional health care service in the area of study.

Table 6: Distribution of respondents by educational qualification and the type of health care services accessible to them

Educational level	Modern health care services	Traditional health care services	Total
No Formal Education	14 (17.5)	4 (5)	18 (22.5)
FSLC	3 (3.75)	4 (5)	7 (8.75)
WAEC/GCE/SSCE	10 (12.5)	11 (13.75)	21 (26.25)
NCE/ND	11 (13.75)	3 (3.75)	14 (17.25)
HND/B.Sc	12 (15)	5 (6.25)	17 (21.25)
M.Sc/ Ph.D	3 (3.75)	0 (0)	3 (3.75)
Total	53 (66.25)	27 (33.75)	80 (100)

* Percentage results are in parentheses. χ^2 cal = 8.67 χ^2 tab 0.05 = 11.07

Source: Field Survey.

Household Size: The model household size in the area of the study is 7 to 9 persons. Up to 30 percent of the respondent falls within this household size. About 21 percent have household size greater than 10. The percentage of household size between 1-3 persons that have access to modern health care facilities is 12.5 percent, 18.75 percent respondents of household size between 4 to 6 persons have access to modern health care facilities.

The chi-square calculated and tabulated at 5% level were 4.92 and 7.81 respectively showing that there is no significant difference between households of their access to health care services.

Table 7: Distribution of respondents by household size and the type of health care service accessible to them

Household size	Modern health care services	Traditional health care service	Total
1 – 3	10 (12.5)	9 (11.25)	19 (23.75)
4 – 6	15 (18.75)	5 (6.25)	20 (25)
7 – 9	14 (17.5)	10 (12.5)	24 (30)
Above 10	14 (17.5)	3 (3.75)	17 (21.25)
Total	53 (66.25)	27 (33.75)	80 (100)

* Percentage results are in parenthesis. χ^2 cal = 4.92, χ^2 tab 0.05 = 7.81,

Source: Field Survey.

Income Level: The respondents with the lowest income level earned between ₦1,000 and ₦10,000. This class of income earners constitutes the bulk of the respondents (48.75 percent). Similarly 25 percent of the respondents earned between ₦11,000 and ₦ 20,000 and 3.75 percent of the respondent claimed to earn between ₦31,000 and ₦40, 000. 27.5 percent of the respondents who earn between N1,000 and N10,000 have access to modern health care facilities, 21.25 percent of the respondents who earn between ₦11,000 and ₦20, 000 have access to modern health care facilities and 2.5 percent of the respondents who earn between ₦31,000 and ₦40,000 have access to modern health care facilities, 21.25 of the respondents who earn between ₦1000 and ₦10,000 have access to traditional health care facilities, 3.75 percent of the respondent who earn between ₦11,000 and ₦20,000 have access to traditional health care facilities and 1.25 percent of the respondents who earn between ₦31,000 and ₦40,000 have access to traditional health care facilities.

The chi-square calculated and tabulated were 9.1 and 11.07 respectively showing that there is no significant difference between income levels of their access to health care services.

Table 8: Distribution of respondents by income level and the type of health care services accessible to them

Income Level	Modern health care services	Traditional health care services	Total
1,000 – 10,000	22(27.5)	17 (21.25)	39 (48.75)
11,000 – 20,000	17 (21.25)	3 (3.75)	20 (25)
21,000 – 30,000	9 (11.25)	5 (6.25)	14 (17.5)
31,000 – 40,000	2 (2.5)	1 (1.25)	3 (3.75)
Above 40,000	3 (3.75)	1 (1.25)	4 (5)
Total	53 (66.25)	27 (33.75)	80 (100)

* Percentage results are in parentheses. χ^2 cal = 9.1, χ^2 tab 0.05 = 11.07, Source: Field Survey.

Impact of health care accessibility on farm output

The impact of farmers' access to health services was estimated using the multiple regression analysis. The results are presented in Table 9. The regression results, presented in Table 9 shows that the include variables explain account for more variation in the outputs of farmers without access to modern health services than those without access. Comparing the adjusted R-square of the different groups of respondents, the group with no access to modern health care facilities has 0.88, while the adjusted R-square for the respondents with access to modern health is 0.53. This implies that all the independent variable explain 88 percent and 53 percent of the variation in agricultural outputs of the two groups respectively. The result further reveals that land and planting materials are important determinants of the output of farmers with access to modern medical services. They are significant at 10% and 1% levels respectively. On the other hand, land, labour, fertilizer and planting materials are the major determinants of outputs of farmers without access to modern health care facilities. They are significant at 1%, 10%, 1% and 5% levels respectively.

However, the result from the pooled data throws improvement in the explanatory power of the variables included in the model of farmers with access to modern health care services as compared to those without. This model confirms the importance of land, labour and planting materials on the quantity of output. Each is significant at 1% level. Introduction of a dummy, however, improved the explanatory power of the variables to 68 percent. This improvement simply shows that the difference observed in the model for the two groups of farmers is not by chance. The values of the F-statistics for the two groups were 11.26 and 49.82 for groups 1 and 2 respectively.

Table 9: Result of regression

Variables	Coefficients			
	For Farmers with Access to Modern Health Care	For Farmers without Access to Modern Health Care	Pooled Data Without Dummy	Pooled Data with Dummy
Constant	-1.116 (- 0.749)	2.554 (2.598)	1.556 (1.671)	0.764 (0.804)
Land	0.110 (1.796)*	0.139 (3.922)***	0.151 (4.206)***	0.120 (3.287)***
Labour	0.310 (1.559)	0.267 (1.717)*	0.339 (2.456)***	0.366 (2.740)***
Fertilizer	0.133 (-1.133)	0.143 (2.902)***	0.05356 (0.893)	0.03894 (0.669)
Planting materials(Cost)	1.170 (3.780)***	0.256 (1.987)**	0.455 (2.856)***	0.579 (3.591)***
Management	0.01687 (0.955)	0.0104 (-0.817)	0.01080 (0.863)	0.008816 (0.729)
Dummy				0.007197 (2.549)***
R ²	0.59	0.90	0.67	0.70
R ²	0.53	0.88	0.65	0.68
F-Value	11.260***	49.823***	30.592***	28.469***
n(number of sample)	53	27	80	80

*** = Significant at 1% probability level, ** = Significant at 5% probability level

* = Significant at 10% probability level.

Resource use efficiency/productivity

The resource use efficiency was assessed by first computing the marginal value product (MVP) of individual input and then comparing this with the marginal factor cost (MFC) or unit price of the input in question. The MVP was computed thus:

$$\text{MVP} = \text{MPP} \times P_y$$

Where: MVP = Marginal Value Product.

MPP = Marginal Physical Product

P_y = Price per Unit of Output (unit output price i.e. the unit price of grains equivalent). Marginal value product was calculated for two groups of respondents.

Group 1: Farmers with access to modern health care facilities.

Group 2: Farmers without access to modern health care facilities.

In accordance with the neoclassical postulation on resource productivity, a particular input was adjudged to be used efficiently when the marginal value product (MVP) is greater than marginal factor cost (MFC). The result from table 13 reveals that the respondents in group 1 were inefficient in their use of land as more is put in to get a little. The respondents in group 1 were efficient in their use of labour, fertilizer and planting materials.

Table 10: Estimates of efficiency parameters: APP, MPP, MVP, MFC of respondents with access to modern health care facilities

Resource	APP	MPP	MVP	MFC	MVP/MFC
Land	0.37	0.06	0.6	200	0.003
Labour	249.04	84.42	844.2	300	2.814
Fertilizer	104.35	5.59	55.9	20	2.795
Planting materials(Cost)	169.78	77.25	772.5	100	7.725

Unit output price = ₦10.00, Source: Field Survey

Estimates of efficiency parameters presented in Table 10 indicate that a change in the size of land will bring about a less than proportionate change crop output while there are more than proportionate change from the use of labour, fertilizer and planting materials. The ratio of marginal value product and marginal factor cost (i.e. the unit price of input)

From the result, it reveals that respondents in group 2, those who do not have access to modern health care facilities were not efficient in the use of land. However, they were efficient in the use of other resources; labour, fertilizer and planting materials.

Table 11: Estimate of productivity/efficiency Parameters: APP, MPP, MVP, MFC without access to modern health care facilities

Resource	APP	MPP	MVP	MFC	MVP/MFC
Land	0.34	0.05	0.5	200	0.0025
Labour	251.68	82.32	823.2	300	2.744
Fertilizer	106.25	56.95	569.5	20	28.475
Planting materials(Cost)	176.32	80.23	802.3	100	8.023

Unit output price = ₦10.00, Source: Field Survey.

Production elasticity

The double log function was found to be the lead equation for all the functional forms estimated. For the double log function, the coefficients are the direct elasticity. The values of elasticity estimates of the various inputs are presented in Table 12. They show the change in the dependent variable (output) that would result from a unit change in the individual input. For farmers with access to modern health care (Group I), the elasticity of each input except planting materials is less than unity. Fertilizer has negative elasticity. The result obtained implies that a unit increase in size of land, labour and managerial ability will lead to a less than proportionate increase in crop output. Further use of fertilizer will reduce output. This is indicated by the negative elasticity of fertilizer (-0.133). The elasticity of planting materials is greater than unity. The result could be interpreted to mean that a unit rise in the quantity of planting materials will result in increase in output by a factor of 1.17. For farmers without access to modern medical services (Group II), the elasticity of all the factors of production is less than unity. The scale coefficient, which shows the return to all the factors of production employed by the farmers, indicates that there is increasing return to scale to inputs used by farmers with access to modern health services (scale coefficient is 1.473). In the contrary, there is decreasing return to scale to inputs employed by farmers without access to modern health services. This, to some extent, is a reflection of the managerial ability of two groups of farmers. According Koutsoyiannis (1975), the most common cause of decreasing returns to scale is diminishing returns to

management. It is also her position that increasing returns to scale are due to "technical and/or managerial indivisibility". The result implies that access to modern health services can enhance the managerial ability of the farmers, translating to higher or increasing returns to changes in inputs.

Table12: Production elasticity estimates

Input	Group I	Group II
Land	0.110	0.139
Labour	0.310	0.127
Fertilizer	-0.133	0.143
Planting materials	1.170	0.256
Management	0.017	0.010
Scale Coefficient	1.473	0.419

Source: Extracted from regression result

IMPLICATIONS OF FINDINGS AND CONCLUSION

An analysis of productivity as is the case in this study is of fundamental importance to the national economy. This is because, among others, it helps to map out a strategy in accelerating the growth process of the nation. As evidence from the study, a large proportion of rural dwelling farm households do not have access to modern medical services. This has serious implications to the Nigerian economy. This is particularly so when considered in the light of the other findings of the study that there is increasing return to scale to inputs used by farmers with access to modern health care services while those without access record decreasing return to scale. Considering the importance of agriculture to the growth of the economy inaccessibility to modern health services and subsequent decreasing returns from this sector could negatively impact on all other sectors of the economy which depend on agriculture. These include agro-based industries, foreign earnings through agricultural export, the service sector (including public service and the military, even including the private sector) whose workers/members depend on the food from the agricultural sector. The results of this study calls for accelerated action on the provision of affordable modern health care facilities/services in agrarian community in order to raise farmers' productivity which ultimately would support national economic growth and development.

Footnote:

1. Modern health care services as used in this study refers orthodox or Western medicine excluding native (traditional) and Chinese medical services.

REFERENCES

- Andreano R. and T. Helminiak (1988), "Economics, Health and Tropical Disease: A Review" In A. N. Herrin and P.L. Rosenfield, eds., *Economics, Health and Tropical Diseases*. Manila: University of the Philippines, School of Economics.
- Akinyele, O. (1989), "Methods for Evaluating the Benefits of Public Expenditure for the Poor: 1 & 11, Benefit Incidence Analysis". A Ph.D Thesis Proposal. University of Ibadan.
- Baldwin, R. and D. Weisbrod (1974), "Adolescents in Farm Households: Their Nutrition, Education and Contributions to Family Welfare", International Food Policy Research Institute, Washington D.C Processed.
- Barlow, S. and T. Grobar (1976), "Costs and Benefits of Controlling Parasitic Diseases". *Population, Health and Nutrition Technical Note* 86 – 17. World Bank Population and Human Resource Department, Washington D.C Processed.
- Barlow, S. (1976), "Selective Primary Health Care: An Interim Strategy for Disease control in Developing Countries". *New England Journal Of Medicine*, 301: 967 – 74.
- Conly, G. N. (1975), "The Impact of Malaria on Economic Development: A Case Study". *Scientific Publication* 297. Washington, D.C: Pan American Health Organisation.
- Centro de Tecnologia Agricola (CTA) (1997), "Aids, a Hidden Threat to Agriculture", *SPORE*, 69. Pp. 1 – 3.
- Centro de Tecnologia Agricola (CTA) (1997), "Aids, and The – ribbon Symbol", *SPORE*, 82. Pp. 1 – 2.
- Davies, A. (1968), "The Economic Effects of Malaria Eradication". Ann Arbor: University of Michigan, Bureau of Public Health Economics.
- Decastro, B. (1985), "Development of Research – Training Project in Socio-economics of Malaria Eradication in Colombia". *Tropical Diseases Research*, World Health Organization, Geneva Processed.
- Denison, J. (1962), Personal Communication World Health Organization (WHO). Geneva.

- Ehui, S. K and D. S. C. Spencer (1990) Indices for Measuring the Sustainability and Economic Viability of Farming Systems. RCMP Research Monograph No. 3, International Institute for Tropical Agriculture, Ibadan 28p.
- Fein, I. (1958), *Epidemiology, Medicine and the Public's Health*. New York.
- Federal Ministry of Health Manual (1991) *Guidelines and Training Manual for the Development of Primary Health Care System in Nigeria*.
- Hammer, J. S. (1993) "The Economics of Malaria Control", *World Research Observer*, 8 (2): 1 – 22
- International Food Policy Research Institute (IFPRI) (2006) *Healthy Agriculture for Healthy People*, IFPRI Forum, March,
- Jorgenson, I and Grilliches, M (1976), "Primary Health Care", *Notes on the Literature and Annotated Bibliography*. Paper prepared for the World Bank.
- Malik, I. H. (1966), Economic Advantages of Anti-malaria Measures Amongst the Rural Population". Publication 137, Lahore, Pakistan: Board of Economic Inquiry.
- Mincer I. (1974), "Economic study of Malaria in Nepal: The Cost Effectiveness of Malaria Control Strategies". Evaluation and Planning Centre, London School of Hygiene and Tropical Medicine London. Processed.
- Mitchell, V. S. (1990), "Malaria: Obstacle and Opportunities". Published for the Institute of Medicine. Washington D. C., National Academy Press.
- Meier, A. and Baldwin, D. (1957), High Birth Rate and Low Level of Modern Method Use", *International Family Planning Perspective*, 19: 116 – 118
- Nanjundiah, K. (1952), "A Survey of the Economic Status of Villagers in Malarious Irrigated Tract in Mysore State, India, Before and After DDT Residual Insecticidal Spraying". *Indian Journal of Malariology*, 6: 355 – 65.
- Norton, A. (1995) "Poverty and Assessment in Ghana Using Qualitative and Participatory Research Methods", *Discussion Paper No. 83*, Poverty and Social Policy Department, World Bank.
- Olagoke, O. A. (1989), "Morbidity and Rural Household Productivity in Nigeria: A Case Study of Malaria." A Ph.D Thesis. University of Ibadan.
- Organisation of African Unity (OAU) (1997), "Education, Health and Behaviour". *World Health Forum*, 16 (2), 1997.
- Robert, I. and M. Oscar (1980,) "Human Development in Poor Countries: On the Roles of Private Incomes and Public Services". *Journal of Economic Perspectives* 7(1): 133 – 50
- Russell, P. F. and M.K. Menon (1942), "A Malario-Economic Survey in Rural South India". *Indian Medical Gazette* 77: 167 – 80.
- Stilglitz, J. (1976), "Consequences of Adult ill Health". In Richard G. A. Feachem, Tord Kjell Strom, Christopher J. I. Murray Mead Over and Margaret A. Philip, (eds). *The Health of Adults in the Developing World*. New York: Oxford University Press.
- Schlenker, H. (1968), "Nutrients: Impacts and Determinants". *The World Bank Economic Review*. 2(3): 299 – 320.
- United Nation International Children Emergency Fund (UNICEF) (1987), "Children and Aids: An Impending Calamity. New York.
- White, A. N. (1972), "Accessibility to Public facilities Location". *Economic Geography*, 55 (1): 18 – 35.
- Weisrod S. and Mushkim, I.(1964), "Community Financing of Health Care in Africa: An Evaluation of the B. I" *Social Science and Medicine* 36(11): 1383 – 95.
- World Bank (1980), "The Role of Women In Economic Development". World Bank, Washington D. C.
- World Health Organization (WHO) (1978), "The Implementation of the Global Strategy for Malaria Control". Report of a WHO study group on the implementation of the global plan of action for Malaria Control. *Technical Report Series*. No. 839. WHO Geneva.
- World Health Organization (WHO) (1987), "The Use of Essential Drugs". Fifth Report of the WHO Expert Committee. WHO, Geneva.
- World Health Organization (WHO) (1998), "Evaluation of Rural Health Services". *World Health Forum*, 19(3): 315 – 320.