
Effects of HIV/AIDS on Agricultural Produce in Nassarawa Eggon Local Government Area Nigeria

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Received April 17, 2024; Revised May 20, 2024; Accepted June 03, 2024

Abstract: *This study investigated the effect of HIV/AIDS on agricultural output in the local government area of Nassarawa Eggon in the State of Nasarawa. Data were collected from 360 respondents and analysed using the Generalized Method of Moments regression model and descriptive statistics. The study found that HIV/AIDS reduced the output and income of affected farmers largely due to lost labour hours for agriculture due to HIV/AIDS and; labour costs wages due to HIV / AIDS; The study recommends that governments at state and local levels should design and implement financial inclusion programs and register vulnerable groups especially HIV/AIDS households. Finally, the study recommends that the government should resurrect measures that will stop the spread of the disease among Nassarawa Eggon farmers to reduce the farmers' lost working hours. This will increase the output and income level of affected farmers.*

Keywords: *hiv/aids, agriculture, government, nassarawa eggon, nigeria.*

INTRODUCTION

The Human Immune Deficiency Virus (HIV) epidemic is one of the biggest health problems facing the world today. The emergence of HIV is one of the most devastating events in human history. HIV puts the body's natural defense mechanisms out of action so that other viruses or bacteria can invade the body's systems leading to a full-blown pandemic stage referred to as Acquired Immune Deficiency Syndrome (AIDS). The consensus now is that AIDS is a profound human tragedy, which has gone beyond mere health problems, but a real threat to economic growth and development [1]-[3].

According to the UN Joint Programme on HIV/AIDS, the HIV/AIDS epidemic has hurt every aspect of the development agenda [4]. The economic and social impact of the HIV/AIDS epidemic in sub-Saharan Africa has attracted much attention [5]. Households affected by HIV/AIDS may reduce non-health-related expenses, and children's nutritional status and educational attainment may suffer; Household members can also reallocate their efforts from income-generating activities to caregiving [6]. When large expenditures are used for care and funerals, caregiving responsibilities increase and income is lost due to premature death and morbidity among young adults, wage earners, and households may not be able to cope with financial shocks. These effects are exacerbated if drugs for AIDS treatment are expensive, if public subsidies for treatment are limited, or if health insurance is not available. There are also psychic costs associated with the death and illness of family members, or the stigma associated with HIV [7].

Agriculture remains the main source of export revenue in Nigeria. More than 88% of the workforce is employed by this sector, and it makes up more than 77% of the labour force. Farmers comprise most of the population in rural areas of Nigeria, where poverty is particularly

pronounced. The only tool farmers have to combat this poverty is agriculture [8]. The key to eradicating poverty in rural areas is improving the efficiency of agricultural output [9], [10].

Very little research has been done on the actual sectoral and industrial impacts of HIV as opposed to its possible consequences. Much applied work needs to be done to fill large gaps in understanding and to identify the scale and scope of policy responses. This study attempts to quantify the impact of HIV/AIDS on agricultural yields and farm household income by estimating and calculating the economic efficiency index [11], [12].

It was reported by the Nasarawa State Action Committee on Aids (NASACA) that the prevalence rate of HIV/AIDS increased in the Nassarawa Eggon Local Government Area starting from 2021/2022. The figure increased from 1.4% to 1.7% in 2021 and from 1.7% to 1.9% in 2022 [13]. This growth rate of HIV/AIDS infection poses major problems and challenges for the economic development of local governments. In addition, HIV/AIDS affects the most economically productive sectors of the population. The rising rate of HIV/AIDS infection also demands an urgent need to assess the impact of the pandemic on local government farmers' agricultural output.

The health status of people in any country is an important element in its economic growth and an important factor in the overall quality of life. In the state of Nasarawa, particularly Agriculture of the Nassarawa Local Government Area Eggon is the dominant industry; High rates of HIV/AIDS infection can lead to stagnation of the sector. Recent studies by the National Agency for AIDS Control [14], have revealed that the prevalence of HIV/AIDS among the population, especially young people is increasingly problematic.

Studies over the years have shown that the status and incidence of HIV/AIDS in the state of Nasarawa, especially Nassarawa Eggon has increased. For example, the United Nations Human Development Report (2018) and the National Bureau of Statistics (NBS) (2012) found that the HIV/AIDS scenario since it was discovered more than two decades ago is considered place-threatening as a major infectious disease causing death worldwide, especially developing countries.

In Nigeria, the first case was discovered in 1986, and since then, there have been HIV/AIDS prevalence rates varying from state to state. For example, in 2022, the rate in Akwa Ibom is 5.6%, Benue 4.9%, Gombe 1.2, Yobe 0.4 and Nasarawa 1.9%. As a result of the rapid increase in the spread of the disease, governments at all levels—federal, state, and local—as well as non-governmental organizations, including faith-based and community-based organizations, have made significant efforts between 2006 and 2022 to reduce new HIV/AIDS infections among the state of Nasarawa and the residents of Nassarawa Eggon. These efforts include using free tests for HIV / AIDS, distribution of preventive measures such as sterile gadgets and condoms at no cost, the release of free anti-retroviral drugs to patients, and the creation of sensitization campaigns against the scourge, among others. All these efforts are being made to mitigate the consequential impact of HIV/AIDS on the general health of the community and agricultural workforce particularly in Nassarawa, Eggon, L.G.A, and Nasarawa state.

Despite the efforts of governments and non-governmental organizations to combat the spread of the virus, the results obtained are still far below expectations due to people's reluctance to adapt to the 'new way of life', especially condom use among rural farming households. Evidence and Existing Disparities suggest few studies have investigated the impact of HIV/AIDS on agriculture in a variety of contexts, there is a need for more local and context-specific research at Nasarawa Eggon LGA. The available evidence often focuses on broader regional or national scales and may not capture the unique dynamics of local agricultural systems.

The broad aim of the study was to analyze the effects of HIV/AIDS on the agricultural output of affected farmers in Nasarawa Eggon LGA of Nasarawa State. Specific objectives are:

Examining the effects of HIV/AIDS infection on the agricultural output of affected farmers in Nassarawa Eggon LGA State Nassarawa.

To ascertain the impact of HIV/AIDS on the incomes of affected farmers in Nassarawa Eggon LGA Nasarawa State.

LITERATURE REVIEW

Cecil conducted a study to determine the impact of HIV/AIDS on farm income and food production in communal farms in the Kavango region [15]. A representative agricultural model of communal farming for each of the two most common agricultural systems in the Kavango region was developed. A non-linear programming model is used and run in GAMS to determine income and production levels for each scenario. Two representative models were used, one each for the Mashare and the Mile 30 ADC. The agricultural system in the Kavango region differs in terms of income earned and sources, crop mix, and household size. Riverline farming systems have more diversity in activities and sources of income than terrestrial farming systems. When scenarios were applied to the model, responses showed similar trends, but different magnitudes with riverine farming systems reporting greater income losses than inland. More income and output are lost when men are sick than when women are sick. The results also show the importance of remittances and social grants such as pensions as they remain as a source of income when other sources are depleted or no longer available.

Hanatu analyzed the effects of HIV/AIDS among male, female, and youth outcomes in crop production in Jama'a and Giwa Local Government Areas in Kaduna state, Nigeria. Structured questionnaires are used to obtain relevant data from respondents. Percentage and variance analysis (ANOVA) was used to analyze the data [16]. They showed that men and women 41.8% and youth 58.2%, and 73.0% had secondary education status, about 70% of respondents earned between N1,000.00 – N15,000.00 per month with an average income of N12,595.1. About 51% of respondents use family labor while 46% have a family size of 6-10 members, about 69% are married and 40% have a farm size of less than one hectare with about 28% having 6-10 years of farming experience. In addition, about 71% of respondents do not have access to credit facilities. It concluded that HIV/AIDS had significant economic effects on respondents' crop yields and incomes implying that there may have been attention, time, and money diverted to caring for HIV/AIDS patients and burial or burial services rather than on crop production. Therefore, it is recommended that poverty alleviation strategies or measures need to be taken seriously and given priority e.g., microcredit facilities for loans and sustainable income creation for people affected by HIV/AIDS.

Saliu, Adejoh, and Orisagbemi conducted a study on the spread of HIV/AIDS among Rural Farmers in Dekina LGA of Kogi State. This study evaluated the implications of disease on extension services at Dekina LGA. They identified HIV/AIDS prevalence rates by collecting secondary data on HIV/AIDS rates from 2000 to 2005 from medical centres in the city. The study also examined farmers' perceptions of HIV/AIDS using an average score from the 5-point Likert scale on which one hundred and sixty contact farmers were interviewed. The results showed that farmers had the highest HIV/AIDS infection with 50.6% and 8.19% respectively in 2001 and 2005. While the estimated HIV/AIDS infection of farmers in 2010 was 1,972. The findings also showed that HIV/AIDS was detrimental to farmers' health (average score of 3.88), while 4.13 indicated that respondents liked the statement that stigmatization and the frightening nature of AIDS prevented them from taking HIV/AIDS tests. About 20% of extension workers claim that infected farmers negatively affect the delivery of their extension jobs in some way [17].

Iheke, Okezie, and Onyekanma conducted research on HIV/AIDS and the productivity of agricultural households in Abia State, Nigeria. By using descriptive and stochastic frontier methods in analyzing the impact of various entities and their relationship to HIV/AIDS morbidity and mortality. The stochastic border method is used for efficiency analysis [18]. Border package 4.1 was used to estimate the estimated maximum likelihood and coefficients of socio-economic determinants of HIV-positive inefficiencies, and all farmers were combined. Research shows that farming households regardless of their HIV status is highly inefficient. The coefficient of elasticity of land input for HIV-infected households (0.04) is lower than for HIV-

positive households (1.112), implying that HIV-negative households do not have the potential to increase agricultural land. The inefficiency model revealed that households with HIV infection had higher inefficiencies, indicating that the average economic efficiency index for HIV-positive households, HIV-negative households, and both households reached 12.24, 84.21, and 84.41, respectively. The highest efficiency rates of 93.1% and 90.585% were obtained for households with HIV infection and households without infection. Chow test statistics confirm the negative impact of HIV/AIDS on households without farm-related infections.

Sede and Ahuru examined the impact of the HIV/AIDS burden on agricultural output for eleven countries in sub-Saharan Africa (SSA) for the period 2001/2011. The collected data was obtained from the World Bank database and balanced panel estimation techniques were used. Findings from this study reveal that HIV/AIDS is a constraint on agricultural output for selected countries for the selected period [19].

Adeoti researched the impact of HIV/AIDS on agricultural Production Efficiency in Benue State, Nigeria. Primary data were collected from 155 agricultural households consisting of 55 households infected with HIV/AIDS and related diseases and 100 uninfected households. To analyze the impact of HIV/AIDS on agricultural productivity, the study analyzed data collected with the help of descriptive statistics, budget analysis, and production frontier functions. Budget analysis is used to measure agricultural income [20]. Gross margins are estimated for agricultural households with and without HIV/AIDS. The total income earned for each farm is calculated from output data and output prices. The variable costs incurred in the production of this output are estimated. The results showed that HIV/AIDS has led to a decrease in farm size and a reduction in crop varieties cultivated in HIV farming. Average gross income, average gross margin, and farm profit on non-HIV farms are higher than on HIV farms. The average gross margin for the two farmer groups is statistically different at a rate of one per cent. Significant variables affecting output levels on HIV farms are farm size, wage labour, and fertilizer. In non-HIV forms, output levels are influenced by farm size, family labour, and fertilizer. Technical efficiency for the two farmer groups was statistically different at the rate of one per cent. In general, non-HIV farms are more technically efficient with an average of 0.70 compared to 0.52 on HIV farms. Researchers concluded that increased school years reduced agricultural technical inefficiencies in both groups.

Tambi studied the factors influencing the prevalence of HIV/AIDS in agricultural production in Cameroon. The 2007 household consumption survey was used as a data source along with other variables imported into the survey data from the Ministry responsible for public health and agriculture [21]. The estimation was obtained using instrumental variables of the two-stage least squares regression method. The results showed that the prevalence of the HIV/AIDS pandemic in Cameroon was strongly influenced by education level, age, occupation, and environmental characteristics, while the main results showed that HIV/AIDS prevalence was negatively correlated with agricultural production.

Michael, Ibrahim, Shani, and Laah examined the effects of HIV/AIDS on cash crop growers in Giwa LGA Kaduna state. Primary data were used to analyze using descriptive statistics and variance analysis was used to test the significance of the mean between groups. The results showed that there was a significant difference in group output between men, women, and youth [22].

Abu and Kotur studied the impact of HIV/AIDS on agricultural productivity in Benue State, Nigeria. The study compared the labour force and productivity of infected and uninfected agricultural households in the study area. Questionnaires are used to collect data. 120 HIV/AIDS-infected farmers and 180 uninfected farmers were selected using a multi-stage sampling technique. Multiple regression and average scores are used. The results showed that the wage labour coefficient used (0.9171) was positive and statistically significant at the level of one per cent for HIV-infected farmers, while for HIV-uninfected farmers, the farm size showed a positive and significant coefficient (2.96) at the level of significance of one per cent and family labour showed a positive and significant coefficient. Infected households had an average

labour productivity of 2302.042kg/workday ($t=8.612$), while uninfected households had 3898.972kg/workday ($t=10.631$).

Labor Productivity Theory

One of the leading proponents of the theory of labour productivity is the classical economist Adam Smith. In his work, "The Wealth of Nations," published in 1776, Smith discussed the importance of division of labour and specialization in increasing productivity. He argues that by breaking down production into specific tasks and allowing workers to focus on specific skills, overall productivity can increase significantly. The concept of labour productivity is a fundamental aspect of economic theory and has no single supporter. Labour productivity refers to output per unit of labour input and is a central theme in various economic theories and discussions. Economists throughout history, including classical economists such as Adam Smith and David Ricardo, have discussed the concept of labour productivity in the context of understanding economic growth and efficiency. In more contemporary economics, scholars such as Paul Romer and Robert Solow have contributed to a theory of economic growth that incorporates considerations of labour productivity [23]–[26].

In the specific context of health and labour productivity, the relationship between health status (including the impact of diseases such as HIV/AIDS) and productivity has been explored by health economists and researchers. Gary S. Becker, who developed the Theory of Human Capital, also alluded to the relationship between health and productivity [27], [28].

The theory of labour productivity, which is a basic concept in economics and management, operates on several key assumptions: Resource Allocation Efficiency: This theory assumes that labour is a valuable resource that contributes to the production of goods and services. This suggests that firms are trying to allocate labour efficiently to maximize output while minimizing input costs [29].

Technology and Capital: Labor productivity theory assumes that labour productivity is affected by the level of technology and capital available to workers. Advanced technology and adequate capital investment can improve labour efficiency and effectiveness, leading to higher levels of productivity [29].

Skills and Human Resources: This theory recognizes the importance of skills, education, and human capital in determining labour productivity. Workers with higher levels of education, training, and skill are generally more productive than those with lower skill levels [30].

Labour productivity theory assumes that the division of labour, in which tasks are divided and assigned to different workers based on their skills and abilities, can lead to increased efficiency and productivity in organizations [31].

There is not a single proponent of the "*Labor Productivity theory*," as it is a concept embedded in broader economic theories and discussions about efficiency, growth, and human capital. Criticisms of this theory include:

Inequality Concerns: Some critics argue that an exclusive focus on labour productivity can lead to increased income inequality. As productivity increases, the benefits may not be evenly distributed among all members of society, potentially widening the gap between the rich and the less fortunate [32].

Human Well-being: Critics also question whether the relentless pursuit of higher labour productivity aligns with overall human well-being. The theory's emphasis on efficiency and output may not necessarily contribute to a more fulfilling and balanced life for workers, and it can lead to problems such as work stress and burnout [33].

METHODOLOGY

Research Fields

The field of work of this research is Nassarawa Eggon LGA of Nasarawa State. The local government is located in the middle belt region of Nigeria. It borders the Doma Local Government to the southwest, the Lafia Local Government Area to the south, the Akwanga Local Government Area to the North, and the Keffi Local Government Area to the West. It has a land mass of 1237.42 square km with a population of 149,129 people (NPC, projected population 2016) [34]. Of this population, according to the State Ministry of Agriculture (2018), about 64% are farmers living in rural areas of Local Government [35].

Data Sources and Types

The data for this study are primary data obtained from sample respondents. A total of 365 copies of the questionnaire were distributed to respondents and 360 were taken for analysis in this work. This represented 1.37% of questionnaire mortality and 98.63% of questionnaires valid for analysis.

Data Analysis Techniques

A multivariate regression model was used in this study to account for the cause-and-effect relationship between the HIV/AIDS status of affected farmers and their output and income in the study area.

Model Specifications

The model specifications in this study follow theoretical postulates, namely human capital theory, labour productivity theory, and knowledge transfer theory. The model determined the goal by purpose in this study.

For the first purpose aimed at investigating the effects of HIV/AIDS on the agricultural output of affected farmers, postulates of the theory of labour productivity were invoked in the modelling process. First, the theory states that output depends on human productive capacity. This means that the health status of the workforce determines the level of output. Arising from this, diseases such as HIV/AIDS can affect the productive capacity of the workforce and consequently the level of output. This can be mathematically expressed as:

$$\text{Output} = f(\text{Health Status}) \dots\dots\dots 1$$

Health status in the context of HIV/AIDS can be proxied by the following proxies: farm man-hours lost due to HIV/AIDS-related diseases, out-of-pocket expenditure for treatment of HIV/AIDS-related diseases to be used for agricultural purposes, costs incurred for hired labour for farms due to HIV/AIDS-related diseases, and reduction in farm size due to HIV/AIDS-related challenges. Thus, these variables now enter model 1 as follows:

$$\text{Output} = f(\text{MHL, ope, Cohl, fas}) \dots\dots\dots 2$$

Where the output is the agricultural products of farmers affected by HIV / AIDS (in naira N).

MHL is agricultural working hours lost due to HIV/AIDS-related illnesses (on a standard day).

ope is an out-of-pocket expenditure for the treatment of HIV/AIDS-related diseases to be used for agricultural purposes (in naira N).

cohl is the cost incurred for hired labour for agriculture due to HIV/AIDS-related diseases (in naira N), and

FAS reduced farm size due to HIV/AIDS-related challenges (in hectares).

Other factors affecting agriculture such as seedlings, fertilizers, herbicides, family size, years of farm experience, and education level were included in the model as control variables. Therefore, model 2 becomes:

$$\text{Output} = f(\text{mhl}, \text{ope}, \text{Cohl}, \text{fas}, \text{sdg}, \text{fert}, \text{hercid}, \text{faz}, \text{yofe}, \text{loe}) \dots\dots\dots 3$$

Where fas are the size of the farm, sdg is the seed, fert is fertilizer, hercid is herbicide, faz is family size, yofe is years of farming experience and loe is education level. All other variables are as defined earlier.

The stochastic shape of model 2 can be expressed as follows:

$$\text{Output} = \beta_0 + \beta_1 \text{mhl} + \beta_2 \text{ope} + \beta_3 \text{cohl} + \beta_4 \text{fas} + \beta_5 \text{fert} + \beta_6 \text{hercid} + \beta_7 \text{faz} + \beta_8 \text{yofe} + \beta_9 \text{loe} + \mu \dots\dots\dots 4$$

Where:

β_0 = production rate

$\beta_1 - \beta_9$ = Approximate parameters of the production function.

μ = model error term.

For the second purpose i.e. to investigate the effect of HIV/AIDS on the incomes of affected farmers, postulates of human capital theory, labour productivity theory, and knowledge transfer and skill development theory are invoked in the modelling process. Thus, the model is determined as follows: First, the income of affected farmers is a function of reduced agricultural output due to HIV/AIDS; That is:

$$\text{Income} = f(\text{output}) \dots\dots\dots 5$$

Where income is the income of farmers affected by HIV/AIDS; and output is the reduced output of farmers affected due to HIV/AIDS. Other control variables such as the average price of agricultural products, the cost of transporting goods to market, years of farming experience, and education level were included in the model. Thus, model 5 was expanded as:

$$\text{Income} = f(\text{output}, \text{a price}, \text{transport}, \text{yofe}, \text{loe}) \dots\dots\dots 6$$

Where price is the average price of agricultural products, transportation is the cost of transportation to move agricultural products to market, yofe is years of farming experience and loe is the level of education. All other variables are as defined earlier.

Therefore, the stochastic form 4.7 is given as:

$$\text{Income} = \alpha_0 + \alpha_1 \text{output} + \alpha_2 \text{aprice} + \alpha_3 \text{transcost} + \alpha_4 \text{yofe} + \alpha_5 \text{loe} + \epsilon \dots\dots\dots 7$$

Where α_0 is the model intercept, $\alpha_1 - \alpha_5$ is the parameter to be estimated and ϵ is the error term.

RESULTS AND DISCUSSION

Conceptual Clarification. Acquired Immune Deficiency Syndrome (AIDS)

AIDS is caused by the Human Immune Deficiency Virus (HIV), which weakens the immune system by making it vulnerable and unable to revive and recover from other disorders. The study defined HIV as a virus that damages the immune system. The immune system helps the body fight infection. Over time, as HIV kills more Cluster of Differentiation 4 (CD4) cells, the body is more likely to get various diseases and cancers [36], [37].

Agriculture: "Agriculture is the practice of growing crops, raising livestock, and managing other natural resources to produce food, fiber, fuel, and other products to sustain human life and meet the various needs of society. It involves a variety of activities including planting, caring for, and harvesting crops; breeding and maintenance of animals; managing soil fertility; controlling pests and diseases; and utilizing technology and machinery to increase efficiency and productivity.

Agricultural Products

It is calculated as the production-to-input ratio of agriculture. Agricultural produce is usually valued based on the weight of a particular item or crop. However, evaluating farm work is challenging due to product variations. As a result, the market value of finished products is the standard unit of measurement for agricultural productivity. Similarities between this productivity and various inputs, such as labour or land, exist. A partial measure of productivity is what is referred to as such a comparison [38]. Agricultural output is influenced by a variety of factors including climate, soil fertility, technology, agricultural practices, government policies, market demand, and trade dynamics. It is a key indicator of the performance of the agricultural sector and its contribution to the economy. Increasing agricultural output is often a goal for policymakers, as it can lead to greater food security, economic growth, and improved livelihoods for farmers and rural communities.

Affected Households

According to Mutangadura and Webb, a household is "an economic unit consisting of a group of people living in the same house and eating together for, at least, 3 of the 12 months of the year" [39]. This definition considers the household only as a unit of consumption. Also, Wolde saw the household as "an economic unit consisting of one person, or a group of people living together, dependent on a common income, and within the limits of that income, exercising choices in meeting a specific purpose [40]." The study adopts the latter definition, which sees a household as an economic unit consisting of a group of people who live in the same house and eat together for at least 3 out of 12 months. Thus, affected households are households that have suffered premature adult death and chronic diseases associated with HIV/AIDS-related conditions. These households have self-identified orphans or HIV-positive adults.

Estimation

Table 1. Estimates of Common Methods of Output Moments of Affected Farmers.

Variable	Coefficient	Std. Error	t-Statistic	Prob
MHL	-5.6454	1.77534	-3.1799	0.002
OPE	-0.0045	0.00037	-12.295	0.000
COHL	-0.1251	0.04118	-3.0381	0.002
MOROCCO	6.3311	1.0723	5.9041	0.000
SDG	2.9730	0.7311	4.0664	0.000
FERT	927.08	15973.4	0.0580	0.953
HERCID	1976.0	14473.9	0.1365	0.891
It does	168.60	3202.29	0.0526	0.958
YOFE	3417.4	5310.4	0.6435	0.520
LOE	8495.19	11553.0	0.7353	0.462
C	328430	62903.5	5.2211	0.000
R-squared	0.6200	Mean dependent var		378398
Adjusted R-squared	0.5945	S.D. dependent var		194361
Durbin-Watson sta	1.5910	J-statistic		36.6124
Instrument rank		Prob(J-statistic)		0.00000

Source: Author's Estimation using E-views 10

GMM model estimates in Table 1.0 have shown that the output of affected HIV/AIDS farmers has a positive and statistically significant influence on the income of affected farmers in the study area. This means that a 1% decrease in farmers' output due to HIV/AIDS-related

issues would reduce incomes by 0.30%. Also, the average price of agricultural products has a positive and statistically significant influence on the income of affected farmers. This suggests that a 1% increase in the average price of agricultural products would increase agricultural income by 0.16% in the study area.

Similarly, the cost of transporting agricultural products to market had a negative but statistically insignificant influence on the incomes of affected farmers. This means that the cost of transporting agricultural products has the potential to reduce the income of affected farmers in the study area.

In addition, years of farming experience (YOFE) and farmer education level (LOE) all had positive but statistically insignificant associations with the incomes of affected farmers.

An R-squared adjustment value of 0.695 indicates that the explanatory variables included in the model have explained the variation in the output of affected farmers by 69.5%. Also, J-Statistics that tested the combined effect of the explanatory variable on the dependent variable had a value of 21.10 and a probability value of 0.0000, which showed that the co-effect of the explanatory variables included in the model on the income of affected farmers was very strong. Finally, a Durbin-Watson statistical value of 2.1 indicates the absence of autocorrelation in the model. The implication is that successive errors in the model do not correlate with each other.

Table 2. Estimates of Common Methods of Income Moments of Affected Farmers.

Variable	Coefficient	Std. Error	t-Statistic	Probability
OUTPUT	0.3014	0.0296	10.179	0.0000
APRICE	0.1603	0.0349	4.5892	0.0000
TRANSCOST	-0.2379	0.1475	-1.6131	0.1070
YOFE	0.0042	0.0165	0.2588	0.7950
LOE	0.0221	0.0473	0.4672	0.6400
C	3.6900	1.2515	2.9482	0.0000
R-squared	0.7189	Mean dependent var		5.7206
Adjusted R-square	0.6950	S.D. dependent var		0.6446
Durbin-Watson sta	2.0990	J-statistic		21.102
Instrument rank		Prob(J-statistic)		0.0000

Source: Author's Estimation using E-views 10

GMM model estimates in Table 2.0 have shown that the output of affected HIV/AIDS farmers has a positive and statistically significant influence on the income of affected farmers in the study area. This means that a 1% decrease in farmers' output due to HIV/AIDS-related issues would reduce incomes by 0.30%. Also, the average price of agricultural products has a positive and statistically significant influence on the income of affected farmers. This suggests that a 1% increase in the average price of agricultural products would increase agricultural income by 0.16% in the study area.

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explanatory variables included in the model on the income of affected farmers was very strong. Finally, a Durbin-Watson statistical value of 2.1 indicates the absence of autocorrelation in the model. The implication is that successive errors in the model do not correlate with each other.

CONCLUSION

The study examined the effects of HIV/AIDS on agricultural output and incomes of affected households in the Nassarawa Eggon local government area in the state of Nasarawa. This study used regression analysis to ascertain the impact of HIV/AIDS on the output and income of affected farmers in the study area. The study found that lost man-hours to agriculture (MHL) due to HIV/AIDS were negatively and statistically significantly associated with the output of affected farmers in the study area. Also, the study found that wage labour costs due to HIV/AIDS (COHL) were negatively and statistically related to the output of affected farmers' output. That is, increased wage labour costs by affected farmers due to HIV/AIDS-related problems will reduce output in the study area. Again, the farm size (FAS) of affected farmers had a positive and statistically significant relationship with their output. That is, an increase in the size of the farm will increase research output. However, HIV/AIDS has caused the size of affected farms' farms to be somewhat reduced. Similarly, seeds (SDGs) have a statistically positive and significant influence on the output of affected farmers' output. This means that the increase in seedlings will increase the yield of affected farmers. However, HIV/AIDS has caused the seeds of affected farmers to be somewhat reduced thereby reducing the yields of affected farmers in the study area. Again, the study found that the output of affected HIV/AIDS farmers had a positive and statistically significant effect on the income of affected farmers in the study area. This means that a decrease in farmers' yields due to HIV/AIDS-related issues will reduce incomes. Thus, given that HIV/AIDS has led to a decrease in the yield of affected farmers due to lost working hours for agriculture due to HIV/AIDS; wage labour costs due to HIV/AIDS; out-of-pocket spending on HIV/AIDS and reducing farm size due to HIV/AIDS-related issues. Based on the results of this study, the study recommends that governments at the state and local levels should design and implement financial inclusion programs and register vulnerable groups, especially HIV/AIDS households. The scheme will leverage affected farmers' access to more concession-level credit facilities from financial institutions in the Nassarawa Eggon local government area in Nasarawa State to be able to employ more workers. Also, the government should resurrect measures that will stop the spread of the disease among Nassarawa Eggon farmers to reduce farmers' lost working hours, this will increase their output and income.

Acknowledgements

I express my deepest gratitude and appreciation to all parties who have contributed in one way or another to the publication of this research, hopefully, it can be a good deed received by God Almighty.

Author Contribution

The author has contributed greatly to the success of this paper, therefore, the author has read and approved the final paper, and the author declares no conflict of interest.

Conflicts of Interest

The author declares no conflict of interest.

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