Access to Healthcare through Renewable Energy on Female Agricultural Productivity in Nigeria

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Abstract. In low- and middle-income countries like Nigeria, agriculture is a vital component of development and poverty reduction. The native population of Nigeria suffers a slew of challenges that stymie agricultural productivity. One aspect is the low level of female agricultural productivity, which is likewise dependent on other factors. The present level of agricultural output in the Nigerian economy in line with the level of demand necessary to meet the desired expectation of the Nigerian populace will continually pose a threat to the United Nations (UN) Sustainable Development Goals (SDGs), especially, SDG-2 (achieve food security through agricultural productivity). This reflects the possible relationship that renewable energy especially in the area of healthcare can have on female agricultural productivity, as considered in this study, which can be a major component of the total agricultural productivity of the Nigerian economy. Therefore, an improvement in female access to healthcare through the input of renewable energy is a possible determinant for an increase in total female agricultural productivity. Using wave 4 (2018/2019) of the Living Standard Measurement Studies, Integrated Survey on Agriculture, the impact of female access to healthcare on female agricultural output in Nigeria was investigated in this study (LSMS-ISA). In addition to other tactics, the study employs the propensity score matching technique for the other specified aims. The estimation result reveals that in Nigeria, there is a significant and positive association between female healthcare access made possible by renewable energy provision and female agricultural production.

Keywords: Agriculture, Female farmers, Productivity, Economic growth

1. Introduction

The contributions of the agriculture, and services sectors to Nigeria's output (GDP) in 2020 were 21.2%, 52.01%, respectively [25]. He observed that the agricultural sector's contribution was still quite minimal when compared to the contribution of other sectors to the GDP. Previously, farm yields were equivalent

to jobs market successes. however, contemporary statistics show that the service sector's total efficiency has grown faster than that of other sectors. The contributions from the agricultural sector seem to be less compared to that of other sectors, even though the sector has the potential of being the largest source of total revenue and profits for enhanced international exchange. Hence, consistent efforts must be invested to enable the sector is resuscitated to full optimisation, strong enough to drastically reduce the current level of poverty and penury of citizens. This reflects how much the Nigerian economy works on disadvantages due to the lack of maximisation of the potentials of its agricultural sector.

The agriculture sector contributed the most to Nigeria's overall economic output level in the early 1960s. During the colonial era, government officials used profits from agricultural produce exchanged at the international trade level to execute major investment projects. During the 1940s and 1950s, agricultural produce engagement in the international trade and the accruing earnings were so massive that they had a contribution of about 75% to the yearly earnings of exports [12,20,22]. As the years passed, records revealed that the contributions of agricultural production and activities dominated that of the non-oil export trade, owning over 70% of the total output of the non-oil exports. Investment projects were also majorly aided by the use of agricultural export products earnings, such as cotton, rubber, cocoa, and groundnut, to promote efficient foreign earnings for the capital intensive projects needed for economic development. In the 1960s, Nigeria's agricultural export products constituted a large part of the main foreign trade. However, the introduction of petroleum into Nigeria's foreign trade in 1958 brought about a major change in the structure of operation and composition of foreign trade in the economy. This also led to an immediate increase in the economy's GDP, which grew by 1.8% in 2018, in contrast to its 0.8% growth in 2017[11].

Afterwards, leaders of developing countries like Nigeria made consistent efforts to revive their agricultural sector to deliver more value to the economy. Numerous programmes were introduced alongside enabling policies in the agricultural industry within the Nigerian economy to resuscitate its capacity to full potential. However, despite the countless efforts at improving the investment level and diversifications in export, the desired level of returns in dividends is yet to be achieved. Although several efforts have been put in place to restore the level of agricultural contribution to what it used to be, it is yet to get to the desired point. This is due to the fact that there are factors that constrain and restrain the agricultural sector from making its right contributions to the GDP.

2. Literature Review

[1] stated that if the agricultural sector of Nigeria will enhance itself to the highest level of its utility, then there is accelerating demand for value addition. Their findings confirmed that the said value addition increases farming household's production. [2] explained that with certain factors present in some areas of agriculture, farmers' participation level is either encouraged or discouraged for more production. As a result, it is suggested that insurance network operators give great support to make that the vast majority of people continue to participate in farm insurance. Agricultural inputs, according to [15], are woefully inadequate among farmers. Female farmers in the Southeast and Southwest zones, in particular, must employ more hired labor than their male colleagues. As a result, the labor productivity of female farmers on male grown plots is higher than female maintained hectares. Techniques and processes that will aid female landowners in performing their specific domestic duties in order to increase their farm's production level must be created and made available to them. These, among other things, will aid people in realizing their farming ambitions and raising their mental effort in order to increase agricultural output.

[21,18,4] identified women empowerment, land-right of female farmers, educational qualification, innovative programs, and finance, and culture, respectively, as major factors affecting female contributions to agriculture. Some previous studies have identified access to healthcare as a factor that affects female agricultural productivity especially using direct household characteristics of data selected from different parts of the Nigerian economy. But none have expressly considered the effect of an interaction between the educational attainment level of female farmers and their level of health access on their level of agricultural productivity.

With equal opportunity, female farmers have a better chance of outperforming their male counterparts in terms of output. As a result, relevant entities and linked public parastatals would be able to determine certain paths to focus on in terms of production proportion of their population for development chances with the Nigerian economy. [23] stated that every average group encountered, and the average man therein was much more educated compared with their female counterpart. This has given the male farmers an edge in available assets such as good lands, infrastructure, pieces of machinery, and operational knowledge, which lead to higher income for them compared with their female partners. Time spent by the female farmers providing basic care for their children also affects their production. This attests to the reality that the gender gap exists in agricultural labour participation and production with the male being dominant. To promote the agricultural production level of the Nigerian economy, it is important to have an established system that encourages a continual improvement of female farmers' education. This will enhance female farmers' access to assets and operational knowledge needed to thrive for higher agricultural production.

[5] studied how gender disparity affects female employment in 42 countries in Sub-Saharan Africa(SSA), from 2004 to 2014. The study found that inequality has a favorable impact on female unemployment, and that inequality invariably lowers female unemployment in these nations. Their findings suggest that, In order to enhance income equality in Africa, gender inclusion must be fostered within the structure of female engagement in the economy. [13] evaluated the level of employment levels in the agriculture sector of Inter African countries between 2010 and 2017. The study affirms that the seemingly low state of labour production still has the potential of being improved. Their finding also stated that between the period of 2010 and 2013, only 34.9% of the sub-Saharan Africa Countries had efficiently utilized their labour resources for productive use. This reflects the underutilisation of over 60%, hence, if this is well-considered, the labour employment could have an increased yield of 80% and above to the GDP of the respective economies. Also, explains that more female farmers adopt cassava production technology on a higher level than their male colleagues. Based on these findings, policies which will encourage both genders to be more compliant with technologies that support cassava production should be implemented in order to create more comfortable living conditions and increase production yields. Female farmers can be as technologically advanced as male farmers, thus they are entitled to the same technological benefits and opportunities that will help them increase their production.

3. Stylized Facts

Gender, or the culturally imposed relationships between men and women, is an organizing feature of current farming systems around the world, as well as a determinant component in continuing agricultural reconstruction. The Gross Domestic Products (GDP) in sub-Saharan Africa countries is heavily influenced by the output from the agricultural sector, which as well aids foreign currency exchange for the economy [6,7]. Agricultural production serves as a qualitative means of attending to the livelihood of citizens and also the main feature for economic growth. Rural women have a higher level of contributions to the volume of labour force in many African countries, hence deliberate efforts should be made to enable them to produce at the best of their agricultural capacity [6,14].

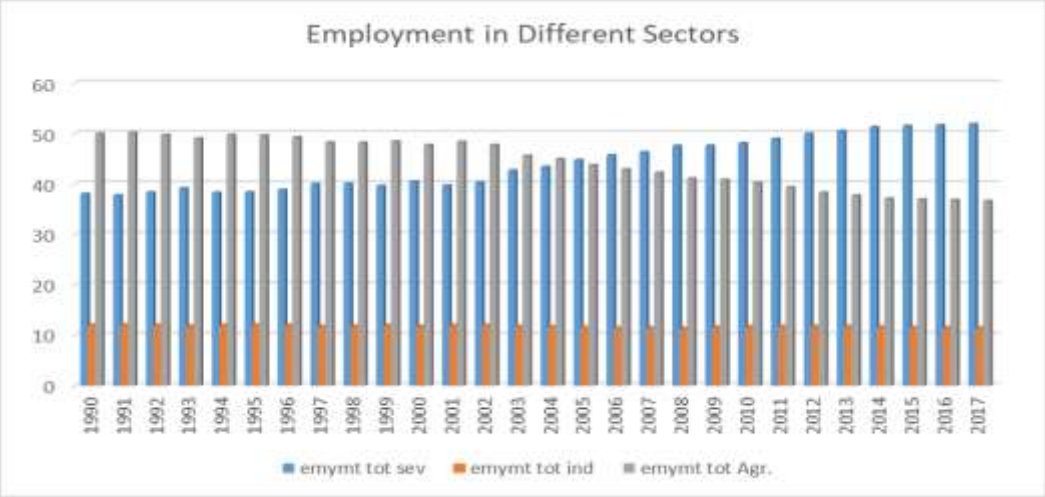

Figure 1. Relationship between Employments in Service, Industry & Agriculture

Figure 1 illustrates that, despite historically low female engagement in the construction sector, female employment in the service sector has increased in recent years. Manufacturing industry employment for women has remained continuously low over time, despite significant efforts to increase it. The female employment in Agriculture reflects a higher rate in later years as compared to its recent years' records. This reflects a decreasing decrease in the activities of females within the agricultural sector.

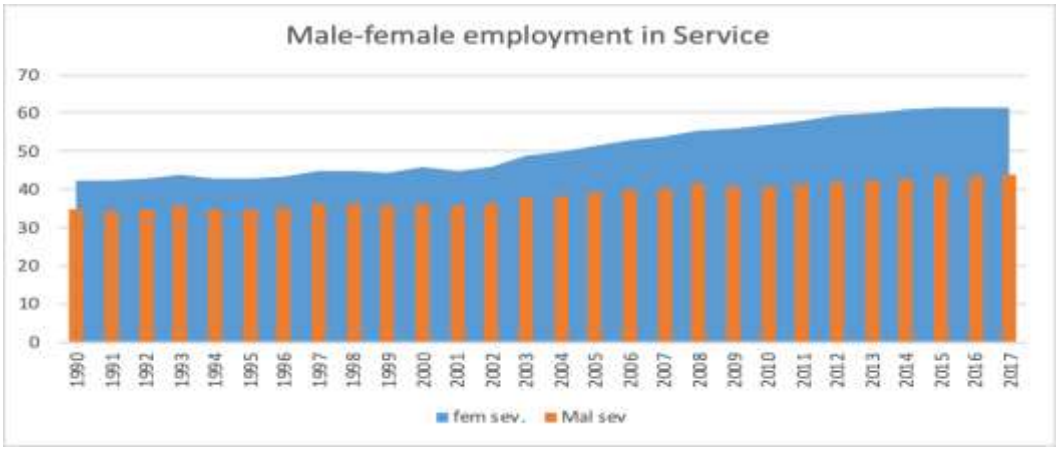

Figure 2. Relationship between Male and Female Employment in Service

Figure 2 reveals the statistical relationship between the employment of males and females in the service sector over a number of years. It can be explained that the employment of females has been consistently higher than that of the males in the service sector of the Nigerian economy over the years. Hence, if a sector within the Nigerian economy can attain this, then other sectors can also achieve a similar or greater feat in their respective sectors.

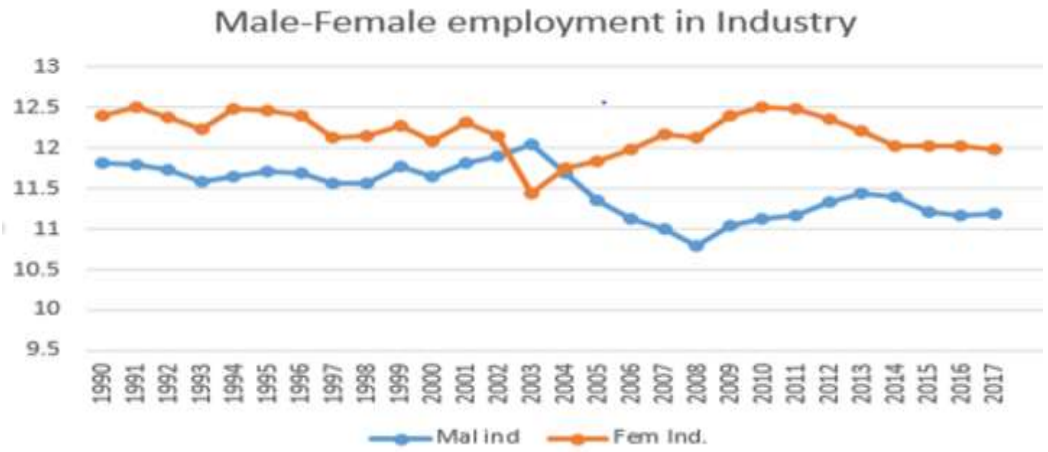

Figure 3. Relationship between Male and Female Employment in Industry

Figure 3 reveals the statistical relationship between the employment of males and females in the industrial sector over several years. It can be explained that the employment of females has been consistently higher than that of the males in the industrial sector of the Nigerian economy over the years. Hence, if a sector within the Nigerian economy can attain this, then other sectors can also achieve a similar or greater feat in their respective sectors.

4. Methodology

The Malmquist production economic indicators provide a theoretical foundation for separating technological and effectiveness changes in production growth. [17] was the first to use this approach in its non-parametric form to measure the production of Swedish hospitals. This study has described female agricultural achievements as a function of Education-in-Technology, Access to Healthcare, and the interaction between education and access to healthcare over the specified time period. [27] specifies agricultural sector production as a function of commercial bank lending to the farm credit guarantee plan fund, public spending on agriculture, and interest rate. The general form of the model of [27] was adapted for the present study below:

Total Agricultural Output (TAP) = f (FAP, MAP)

Female Agriculture Output (FAP) = f (Access to Healthcare, Education, Culture, and Access to Credit, Land-Right, and Innovation) such that:

FAP = f (AHC, EDUTEC, CUL, CRE, INN)…… (1)

5. Results and Discussion

The findings of the study reflect the type of relationship that exist between female accesses to healthcare through innovative renewable energy on the level of their agricultural productivity. As a result, there is still room for improvement, particularly in terms of female farmers' productivity, which can assist support long-term economic expansion. Hence, amidst the several factors identified in previous studies as militating factors for low agricultural productivity of female farmers', the study explains the inclusion of female healthcare as a major contributor to level of female farmers' productivity. As the study reflects a positive relationship between female farmers' healthcare and their level of agricultural productivity. Therefore, the higher female farmers' have access to improved healthcare, the higher will be the level at which their agricultural productivity will be enhanced. As [23] likewise explains that the existence to positive relationship between agricultural productivity and other significant dependent variables, paves an adequate path for improvement and growth in agricultural productivity, with specifics on female agricultural productivity in this study.

5.1 Logistic Regression on Determinants of Access to Healthcare Services Among the Female Farmers in Nigeria

Table 1. Logit Regression on Determinant of Access to Healthcare Facilities (Dependent variable)

Access to Healthcare	**Coef.**	**St.Err.**	**p-value**
Age	0.028	0.013	0.035**
Marital status	-0.824	0.153	0.000***
Household size	0.285	0.088	0.001***
Income	0.00	0.000	0.208
Consultation charge	0.00	0.000	0.595
Safety net	2.103	0.700	0.003***
Education and Tech.	1.07	0.303	0.000***
Credit access	0.21	0.45	0.648
Access to technology	-0.77	0.619	0.215
Remittance	0.540	0.425	0.204
Access to extension	2.351	0.742	0.002***
Constant	-10.59	2.219	0.000
Pseudo r-squared	**0.539**		

Source: Researcher's Computation using LSMS 2018/2019

The regression in the table reflects that significant variables that positively influence the level of female access to healthcare. These significant variables include age of female farmers, marital status, household size, availability of safety net, impact of education and technology in addition with access to extension services by female females in Nigeria. Each reflecting a positive and significant relationship with the extent at which female farmers get access to healthcare. This explains that as any of these factors increases or improves through investment or technological advancement the rate at which female farmers access healthcare will be increased leading to more relative healthy female farmers that will result in higher level of female agricultural productivity in Nigeria.

5.2 Impact of Access to Health Facility on Female Agricultural Productivity

This study employed the Propensity Scores Matching PSM in determining the impact of access to health care facility on the female agricultural productivity in Nigeria. Of all the matching methods used in PSM, the Kernel Based Matching KBM was used in this study, because of its sensitivity and robustness of its results. The most interesting and relevant estimate to us in this study is the Average Treatment effect on the Treated (ATT), which provided the impact of education on the female farmers productivity. The result gotten from KBM shows that productivity (output per hectare in kg/ha) of female farmers that have access to health care facility increased by 38868.7031; it implied that the productivity of farmers that has access to health facility is higher than that of female productivity farmers without access to health facility by 38868.7031kg/ha in Nigeria, an indication that access to health services has a way of impacting the agricultural productivity of the farmers.

The Average treatment effect of the program on the untreated (ATU) shows that if the farmers that had no access to health facility had accessed to it, the improvement in their agriculture productivity have been increased by -10013.8568 kg/ha, while Average Treatment Effect (ATE) shows that if a respondent was to be picked randomly, the productivity would increase by 2951.5602 kg/ha. Given that the ATT is lower than both the ATU and the ATE, it is reasonable to conclude that access to health facilities or services has a negative effect on agricultural productivity and Sustainability of the Nigerian economy. This result is plausible and justified by the poor and shameful state of basic amenities among rural households in Nigeria. Access to basic health services is one of the basic infrastructural facilities that are basically lacking in Nigeria, especially the rural areas [10, 13], and Africa in general.

Table 2. Impact of Access to Health Service on Female Agricultural Productivity

Kernel Based Matching (KBM)

Sample	**Treated (access to healthcare)**	**Controls (no access to healthcare)**	**Difference**	**S.E.**	**t-stat**
Unmatched	11.0576195	9.25007785	1.80754167	.099047182	18.25
ATT	11.0576195	9.2689686	1.78865091	.333975101	5.36*
ATU	9.25007785	9.00154521	.248532647		
ATE			.284933218		

Source: Researcher's Computation using LSMS 2018/2019

From table 1, The results from the kernel based matching and the nearest neighbour matching were compared, using the average treatment on the treated (ATT), the values of the means difference which are 1.78865091 (yield/ha, MT) for KBM, reflects consistently that females with access to healthcare we do much better in their level of agricultural production with respect to the respective values indicated, as compared to those with no access to healthcare.

Table 3. Nearest Neighbour Matching (NNM)

Sample	**Treated (access to healthcare)**	**Controls (no access to healthcare)**	**Mean Difference**	**Standard error**	**T-stat**
Unmatched	*11.0576195*	*9.25007785*	*1.80754167*	*.099047182*	*18.25*
ATT	*11.0576195*	*9.20409294*	*1.85352658*	*.664086263*	*2.79**
ATU	*9.25007785*	*8.76418106*	*.485896793*	-	-

ATE			*.126714921*	-	-

Source: Researcher's Computation using LSMS 2018/2019

From table 3, The results from the kernel based matching and the nearest neighbour matching were compared, using the average treatment on the treated (ATT), the values of the means difference which are 1.78865091 (yield/ha, MT) and *1.85352658* (yield/ha, MT), for KBM and NNM respectively, reflects consistently that females with access to healthcare we do much better in their level of agricultural production with respect to the respective values indicated, as compared to those with no access to healthcare.

5.3 Qualitative Data from Focus Group Discussions in Benue State

Benue State was visited as a representative for the highest agricultural producing states in the Nigeria economy. This represents a summary of responses from States in the Nigerian Economy that had relatively high level of agricultural production.

Table 4. Summary of Result from the Responses from Benue State

Key Variable	**Summary of Respondents Opinion View**
Education and Female Agricultural Productivity	Education positively contributes to agriculture productivity through i). majority of the educated believe that education helps them improve their level of productivity ii) less/non educated farmers stated that education would have help improved their crude strategies for greater productivity at least in little additional ways. iii) Some other farmers feel that education have no major role to play in agricultural practice. As an educated person without farming experience might not achieved as much as an experienced person would achieve.
Access to Healthcare and Female Agricultural Productivity	i). Some respondents argued that healthcare facilities are not usually accessible as at when due, due to a number of economic challenges like frequent outage of electricity, and it's also very un- affordable based of their level of income. They usually go through a lot of stress to the point of selling their farm produce at a time they will normally not want to do so just to pay their bills. They asked the government to assist in the provision of alternative forms of electricity, such as solar, diesel (from renewable energy), and so on, that can help serve as a substitute for providing a relatively stable power supply in healthcare facilities, as well as subsidizing medical bills for rural women in particular. ii). Some of the ailments that affect women in farming include waist pain, rheumatism, ulcer, serenity etc. The women also feel if they can be provided with some farm inputs such as herbicides, it will reduce the energy and time spent on the farms weeding manually. This will help elongate their life. iii) The women are calling for government attention in the provision of more healthcare facilities, improved staffing and equipping the available health facilities to ease them the stress of going very far in search of medical care.

6. Conclusion

In Nigeria, a strong and favorable association exists between female farmers' healthcare and their degree of agricultural output, according to this study. The high cost of visiting medical centers for individual members of families, as well as the difficulty in receiving health treatments owing to distance, in the

research area, have been identified as militating variables to female agricultural output. To that aim, the government at all levels should ensure that rural communities have fair access to healthcare by expanding healthcare facilities and sending more medical personnel. Rural development strategies should encourage the formation of an enabling environment that allows farmers, particularly female farmers, to participate in contemporary healthcare services within a 5-kilometer radius.

Household heads should be motivated to use modern healthcare facilities by organizing a sensitization program to raise awareness about the benefits of doing so. In the heart of rural communities, public health centers should be established. This will improve the proximity and accessibility of public health facilities to rural residents. If not adequately managed, the amount of patients to attend to one health official also impacts the waiting time, which can be depressing. The greater the accessibility to healthcare facilities, the fewer patients per health official. [8,9] found that the high usage of private healthcare is attributed to easy access, less wait times, longer or more flexible operating hours, better staff and drug availability, and better staff disposition.

The introduction and investment of the government in renewable energy and technology supplies in rural healthcare facilities, with the aim of providing alternative power supply for effectiveness and regular appliance usage in health facilities, which ill help increase access to healthcare as essential for improved female agricultural productivity in Nigeria.

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