Send Orders for Reprints to reprints@benthamscience.ae

BENTHAM OPEN

CrossMark

The Open Agriculture Journal

Content list available at: www.benthamopen.com/TOASJ/

DOI: 10.2174/1874331501812010174, 2018, *12*, 174-184

RESEARCH ARTICLE

Assessing the Impact of Rice Sector Policy Reforms on the Income Mobility of Rural Households in Nigeria

Henry Okodua*

Department of Economics and Development Studies, College of Business and Social Sciences, Covenant University, Ota, Nigeria

Received: May 22, 2018 Revised: July 31, 2018 Accepted: August 17, 2018

Abstract:

Introduction:

The Nigerian government recently introduced a number of policy initiatives under its Agricultural Transformation Agenda to address the issue of over-dependency of the economy on imported rice and achieve the government's goal of rice self-sufficiency. This paper provides an empirical assessment of the potential impact of the rice policy reforms on income mobility of households in Nigeria.

Statement of the problem:

Nigeria's rice production has been primarily undertaken by small-scale farmers and is characterized by low productivity owing to inefficient production systems and the country's aging farming population. The study probes into the potential of the new policy on rice production to produce considerable employment gains for rural households in Nigeria given that local rice production will displace imported rice.

Methodology:

The study employed a static Computable General Equilibrium (CGE) framework to investigate the potential additional income benefits or losses for Nigerian households stemming from the government's current initiative of increased domestic rice production.

Results:

The findings reveal that the implementation of the new policy on domestic rice production will produce considerable employment gains for all households and for most sectors of the economy. The policy will also result in an overall income gain for both rural and urban households, although these gains will be larger for rural households.

Conclusion:

The study adds to the literature by quantifying on sectoral basis, the potential income and employment gains or losses that will stem from the implementation of the rice policy reforms.

Keywords: Agricultural Policy, Agricultural Transformation, Rice Production, Smallholder Farmers, Computable General Equilibrium, Household Incomes.

1. INTRODUCTION

Nigeria's agricultural policy has evolved considerably since the country gained political independence in 1960. The priority at that time was to boost domestic production, particularly of cash crops, and the country has had good results to show for these efforts [1]. Nigeria was the world's top producer of rubber, groundnuts, and palm oil and the second-

* Address correspondence to this author at the Department of Economics and Development Studies, College of Business and Social Sciences, Covenant University, Ota, Nigeria, Tel: +234 803 865 6218; E-mails: henry.okodua@covenantuniversity.edu.ng; okodua@gmail.com

largest producer of cocoa during the period between 1960 and 1970. The 1970s and the early 1980s saw a surge in government revenues from enormous exports of crude oil and a neglect of domestic production. As a consequence, there was a rapid increase in the country's dependence on imported foodstuffs [1].

Nwanze *et al*. observes that domestic demand for rice has been growing at a rapid pace in many African countries due to changing consumer preferences, rising incomes, and growing urban populations [2]. Nigeria is no different, with rice gaining increased importance among consumers [3], cited in [4], notes that Nigeria has a rich history of rice production and consumption, as indigenous rice species (local rice) have been grown in the country for more than 300 years. According to [3], over time, rice has developed into a major staple crop in the Nigerian diet, with a demand profile cutting across all regions and socioeconomic groups. The UN Comtrade online database [5] shows that Nigeria's total rice (paddy, broken, semi-milled or wholly milled) imports was 0.478 million metric tons in 2012 and 0.752 million metric tons in 2014. Nigeria unfortunately has remained a notable global net rice importer [6 - 8].

Nigeria's rice production is primarily undertaken by small-scale producers and is characterized by low productivity owing to the inefficient production systems and the country's aging farming population [9, 10]. Thus, local production of rice has not been able to meet the country's growing appetite for the crop. This discrepancy has brought about an increasing dependence on rice imports, despite the risk this poses to the economy and the increased exposure of Nigeria's citizens to the problem of food insecurity [11].

The perceived risks of import dependency have motivated the Nigerian government to introduce a number of initiatives under its Agricultural Transformation Agenda (ATA) to address the problems surrounding domestic rice production. The overall goals of the ATA are to re-define agriculture as a business [12]. The strategy for doing this is to promote private sector investment in agriculture, to encourage the development of private sector-driven marketing organizations, and to promote Incentive-based Risk Sharing for Agricultural Lending. The government has used a combination of import restrictions and input policy and institutional reforms, as well as direct investments to improve rice output and quality [4]. Adesina *et al*. reports that about 210,000 metric tons of additional rice capacity (representing 10 percent of current imports) was produced locally between 2011 and 2012, a very good sign that the government's new rice policies have been paying off, with improved rice output [12].

According to Adesina *et al*., the Federal Government of Nigeria's new policy on agriculture provides fiscal incentives to encourage domestic import substitution and private sector investment in the agricultural sector [12]. These incentives include: Removal of restrictions on areas of investment and maximum equity ownership in investment by foreign investors; no currency exchange controls, meaning the free transfer of capital, profits, and dividends; constitutional guarantees against nationalization/expropriation of investments; zero percent (0%) duty on agricultural machinery and equipment imports; a pioneer tax holiday for agricultural investments; and duty waivers and other industry-related incentives (*e.g.*, based on use of local raw materials, export orientation, *etc*.). These policy incentives have induced additional private investors into the rice sector. According to [12], some of the major investors that have either invested or have indicated interest in doing so include: Flour Mills of Nigeria (Bidda-Badeggi, Niger State); Ebony Rice, Ebonyi Govt., UNDP, SME'S (Ikwo, Ebonyi State); and Dominion Farms (Gassol, Taraba State). In August 2014, the Dangote Industries Limited signed a Memorandum of Understanding (MoU) with the Federal Government of Nigeria for a US$1 billion investment in commercial rice farming and modern integrated rice mills.

The Nigerian government's current policy initiative aims at promoting the overall performance of the domestic rice sector and is comprised of two key strategies. The first has to do with the use of import barriers/tariffs in order to enhance the competitiveness (in terms of relative price) of domestic rice. The second has to do with the expansion of paddy production and the processing of premium-quality rice, with the long-run objective of replacing rice imports with domestic production and expanding market opportunities for all rice farmers in the country. These strategies are embedded in the government's Rice Transformation Agenda (RTA). The final goal of the RTA is to reduce the country's rice import bill and make Nigeria self-sufficient within a 5-year timeframe. It is also expected that the RTA will promote inclusive wealth creation and employment generation in the country [4]. Of course, an improvement in the local rice quality will be needed to make the local product a viable alternative to current imports.

The foregoing description of the rice policy environment gives the impression of a policy with great potential to succeed. However, looking back in time, a number of previous similar initiatives by Nigeria to become self-sufficient in rice production were not very successful [13]. The 1999 Presidential Initiative on Rice and the 2001 National Program for Food Security are recent examples of such initiatives. These initiatives included import barrier policies and other incentives to stimulate local production and achieve self-sufficiency in rice production. However, the initiatives clearly

failed to achieve their defined goals, as Nigeria remains heavily dependent on rice imports for its consumption needs [4].

The current rice policy initiative faces several risks that call for further study. First, it is possible that the RTA could displace smallholder rice farmers of rice. According to [4], "While meeting the demand for higher quality premium rice in the short run is only feasible through the use of large scale millers as the government is already promoting, it will not lead to job creation and wealth in rural areas nor will it help poorer consumers who have to spend a higher proportion of their income on food". Second, the potential of the current initiative to promote local milled and parboiled rice production and increase its competitiveness with imported rice also demands further examination. For example, what is really new or different in this current initiative that will make it succeed where previous attempts have failed? What will be the additional income benefits to rural households from the current initiative of tariff barriers on imported rice and increased domestic rice production and consumption? Will there be considerable employment gains for rural households, supposing that locally produced rice does in fact displace imported rice?

The goal of this study is to assess the impact of the current rice policy initiative on the income mobility of rural households in Nigeria, using a framework of policy experimentation. It is hoped that the findings will provide additional insights to guide policymakers in the implementation of the current rice production initiative. The rest of the paper is organized as follows. Section two provides a review of the related literature on the Nigerian rice economy; section three comprises the distribution of rice production by major rice producers in West Africa. Section four addresses the methodology and data. Section five provides a description of the Nigerian economy using [14]. Section six presents the simulation results and discussions, while section seven concludes.

2. REVIEW OF THE RELATED LITERATURE ON THE NIGERIAN RICE ECONOMY

2.1. Rice Production and Preferences of Consumers in Nigeria

The average rice consumer in Nigeria prefers parboiled rice, which can be either imported or locally produced. Nigeria has the largest market for parboiled rice in West Africa; other West African countries demonstrate a preference for regular milled white rice [15]. Overall, imported rice is preferred to locally grown semi-milled rice, due to the imported product's superior quality [16]. Domestic rice is normally semi-milled brown rice that is de-hulled and not polished; it has great color variation and can contain different varieties in the same bag. Alternatively, imported rice is generally processed milled rice. Foreign rice consumed in Nigeria is mainly imported from Thailand, Brazil, India, USA, UAE over the period 2006-2010 [9]. Domestic rice is normally 20-30 percent less expensive than imported rice. The main determinants of this price difference include the appearance, cleanliness, swelling capacity, taste, fragrance, colour and homogeneity of imported rice [17 - 19].

According to [20], self-sufficiency in rice production has remained one of the Nigerian government's political-economic goals to end hunger, reduce poverty, and ameliorate the country's food security. It is also a developmental strategy aimed at reducing foreign exchange disequilibrium arising from rice imports. However, rice ranks first among all staple food items in Nigeria in terms of expenditures and second only to cassava in terms of quantity consumed [21].

2.2. Government Quest for Self-Sufficiency in Domestic Rice Production

The Nigerian government placed a ban on rice importation during the period 1986 -1995. During the ban on rice period, it was prohibited to import rice into the country though illegal importation through the country's porous borders increased [20]. As a consequence, Nigeria's rice import bills remained heavy [22]. Data from the FAO online database also suggest an estimated 500 percent rise in the foreign exchange expenditure on rice imports over the eleven year period between 1990 and 2001. The values rose from 224,000 metric tons of rice, valued at US 60 million dollars, in 1990 to 345,000 metric tons in 1996, with a value of US130 million dollars. Nigeria's rice imports increased to 1.51 million metric tons, valued at US288.1 million dollars, by 2001 [23]. Johnson *et al*. reports that cross-border trade flows with neighboring countries such as Benin represent a significant source of unrecorded rice imports to Nigeria with Benin reporting re-exporting virtually all of its 600,000 tons of imported rice to Nigeria in 2010 alone [4]. Oryza *et al*. also reports that about 8,000 bags of rice (at 50 kg/bag) are smuggled into the country every day through waterways between Nigeria and Benin [24].

2.3. Inconsistencies and Lack of Continuity in Agricultural Policies

Inconsistencies and a lack of continuity in agricultural policies have been blamed in the literature as an impediment

to domestic rice production and a constraint on poor rice farmers' welfare [10, 22, 9, 25]. While the figures above are largely indicative of the damage done by inappropriate government policies, it is important to note also that government policies alone may not be effective in stimulating local rice production of the desired quantity and quality. A good understanding of the factors driving rice demand in the country, as well as accurate timing of policies, also matter. Moreover, private economic agents engaged in rice production activities are very sensitive to government policies and must be included in the policy making process.

3. DISTRIBUTION OF RICE PRODUCTION BY MAJOR RICE PRODUCERS IN WEST AFRICA

3.1. Share of Top Five Rice Producers in West Africa

Historically, rice is cultivated in most West African countries. Nigeria has been the dominant producer of rice in the sub-region. Table **1** shows that Nigeria remains on the top in absolute terms (with production range of 4472520 – 6070813 tons) on annual basis between 2010 and 2016, followed by Mali, Guinea, Cote d'Ivoire, and Serra Leone. One striking observation here is that there is a sluggish growth in annual rice production across the five top rice-producing countries over the reference period.

Table 1. Production share of top five rice producers in west africa.

	Total Annual Output (Tons)							
Country	2010	2011	2012	2013	2014	2015	2016	Average
Nigeria	4472520	4612614	5432930	4823330	6002831	6256228	6070813	5381609
Mali	1296154	1741472	2076423	1977669	2166830	2331053	2780905	2052929
Guinea	1613730	1792801	1918841	2053359	1971000	1970515	1983133	1900483
Côte d'Ivoire	1206153	873016	1561905	1934154	2053520	2041212	1768121	1634012
Serra Leone	1026671	1129338	1141417	1255559	1204020	871693	1560363	1169866
Group Total	9615228	10149241	12131516	12044071	13398201	13470701	14163335	12138899
W. Africa Total	11894693	12181850	14388855	14601237	15797423	16287959	17079446	14604495

Source: Authors' calculations based on [26].

3.2. Percentage Share of Top Five Rice Producers in West Africa

Table **2** presents annual output of the top five rice producers in West Africa in percentages. The figures show that rice output in Nigeria has been a bit stable in relative importance. The country produced 37.60 percent of the sub-region's total rice output in 2010. It peaked in 2015 with approximately 38.41 percent of total rice. It is also interesting to note that average rice production in the top five west African countries strongly suggest stability in percentage terms. It is further interesting to observe that these top five rice producing countries also account for more than 80 percent of total rice production in a region comprising 15 countries.

Table 2. Percentage share of top five rice producers in west africa.

	Total Annual Output (%)							
Country	2010	2011	2012	2013	2014	2015	2016	Average
Nigeria	37.60	37.86	37.76	33.03	38.00	38.41	35.54	36.85
Mali	10.90	14.30	14.43	13.54	13.72	14.31	16.28	14.06
Guinea	13.57	14.72	13.34	14.06	12.48	12.10	11.61	13.01
Côte d'Ivoire	10.14	7.17	10.85	13.25	13.00	12.53	10.35	11.19
Serra Leone	8.63	9.27	7.93	8.60	7.62	5.35	9.14	8.01
Group Total (%)	80.84	83.31	84.31	82.49	84.81	82.70	82.93	83.12
West Africa Total (%)	100	100	100	100	100	100	100	100

Source: Authors' calculations based on [26].

3.3. Per capita Share of Top Five Rice Producers in West Africa

Table **3** shows the share of the top five rice producers in West Africa in per capita annual output. Ironically, Nigeria is at the bottom in terms of relative importance – the figures show that the country only produced approximately 28 kilograms of rice per capita in 2010 and this peaked in 2014 with a per capita rice output of 34.02 kilograms. The country also produced below the group average as well as the West African average in per capita terms throughout the reference period. Sierra Leone which remained at the bottom of the top five producers in absolute terms Tables **1** and **2**

is now far ahead of the four others in per capita terms. What this means is that Sierra Leone is actually performing better in rice production than any other country in West Africa.

Table 3. Per capita production of top five rice producers in west africa.

	Per Capita Annual Output (kg)							
Country	2010	2011	2012	2013	2014	2015	2016	Average
Sierra Leone	158.96	170.81	168.70	181.38	170.08	120.45	210.97	168.76
Guinea	149.50	162.46	170.09	177.99	166.96	162.97	159.98	164.28
Mali	85.98	112.06	129.72	120.02	127.74	133.45	154.54	123.36
Côte d'Ivoire	59.12	41.78	72.92	88.05	91.14	88.33	74.62	73.71
Nigeria	28.20	28.32	32.47	28.07	34.02	34.53	32.64	31.18
Group Average	45.50	46.78	54.46	52.66	57.05	55.87	57.23	52.79
W. Africa Average	39.11	38.97	44.79	44.23	46.58	46.75	47.72	44.02

Source: Authors' calculations based on [26, 27].

4. METHODOLOGY AND DATA

This study uses a Computable General Equilibrium (CGE) model to assess the impact of Nigeria's domestic rice production policy on the income changes of rural Nigerian households. A CGE model is formally defined as "A set of simultaneous equations relating variables, some of which are endogenous (determined within the model), the rest being exogenous" [28]. The advantages of using a CGE model as a methodological tool in an applied research work of this nature are well documented in the literature [29].

The PEP-1-1 (1 period – 1 country) model – version 2.1 [28] was adopted for this study. The PEP-1-1 model is a static Computable General Equilibrium (CGE) model designed for the study of a national economy. The principal characteristics of the PEP-1-1 model are described in [28]. The static model as applicable to the Nigerian economy is built on the assumption that a typical agent optimizes an objective function subject to some constraints. Calibration of the model parameters was carried out using the 2006 Social Accountability Matrix (SAM) developed for the Nigerian government by the International Food Policy Research Institute, (IFPRI). The structure of this SAM is described in [14].

4.1. Main Elements of the Re-aggregated 2006 Nigeria SAM

The re-aggregated 2006 Nigeria SAM comprises five sectors (rice, agriculture, industry, services, and public administration). It also considers two factors of production - labor (homogenous type) and capital (physical capital and land). The SAM includes four agents – a representative firm, households (12 in number, representing households in the rural South-South zone, South-East zone, South-West zone, North-Central, North-East zone, and North-West, zone as well as households in the urban South-South zone, South-East zone, South-West zone, North-Central, North-East zone, and North-West zone), government, and Rest of the World (ROW). The SAM covers six commodities - rice, food, agriculture, industry, services, and public administration. Only four of the commodities were exported – food, agriculture, industry, and services. There was no export of rice.

4.2. Description of the Static CGE Model

Lemelin *et al*. explains that the core of a CGE model consists of equations representing consumer- and producer-optimizing behavior and market equilibrium [28]. A model solution is a Walrasian competitive general equilibrium: all optimizing economic agents meet their (first-order) optimality conditions, subject to their budget constraints, and all markets are in equilibrium. Without money, the set of equations which constitutes the model is homogenous with degree zero in prices. The static CGE model used in this study has five building blocks – production, demand, income and savings/investment, equilibrium, and prices.

4.3. Simulation Scenarios

The study involves simulations of two agricultural trade policy scenarios:

- A 35 percent increase in import tariffs on rice accompanied by import substitution elasticity of 0.8 for rice (assuming locally produced rice is less competitive with imported rice in terms of price and quality) - SIM1. The assumption under SIM1 is based on a scenario of inefficiency in local rice production or policy ineffectiveness

- A 35 percent increase in import tariffs on rice, accompanied by import substitution elasticity of 4.0 for rice (assuming locally produced rice has become more competitive with imported rice in terms of price and quality) - SIM2. The assumption under SIM2 is based on a scenario of greater efficiency in local rice production or policy effectiveness.

5. DESCRIPTION OF THE NIGERIAN ECONOMY USING THE 2006 SAM

The description of the Nigerian economy using the 2006 Social Accounting Matrix (SAM) represents an effort to identify a number of key sectors of the economy during the base period of data utilized for this study. The sectors identified are considered key owing to their relative importance in terms of the magnitude of their contributions to the Nigerian economy.

5.1. Sectorial Contribution to Government Tax Revenue

Government tax revenue sources for 2006 by selected major sectors of the Nigerian economy are shown in Table **4**. Import taxes on rice were clearly the most important tax revenue source for the government during the year under review. Rice provided about 54 percent of the total tax revenue, amounting to ₦ 161, 379.82 million. These figures indicate the relative dominance of rice among all commodities that were subject to tax during the year under review.

Table 4. Sectorial contribution to government tax revenue (based on 2006 SAM).

Revenue Source	Sector	Amount (₦' Million)	Percent
Import Taxes	Rice	161379.82	54.37
Import Taxes	Industry	42705.60	14.39
Indirect Taxes	Agriculture	42135.46	14.20
Import Taxes	Other Cereals	20418.87	6.88
Import Taxes	Agriculture	15514.62	5.23
Indirect Taxes	Food	7799.09	2.63
Import Taxes	Food	5181.05	1.75
Indirect Taxes	Other Cereals	1665.45	0.56
Total		296799.96	100.00

Source: Author's computation from Nigerian SAM (2006).

5.2. Sectorial Contribution to GDP

The contributions of the different sectors of Nigeria's economy to the country's Gross Domestic Product (GDP) in 2006 are shown in Table **5**. The industry output of ₦ 9,374,177.64 million for 2006 was the highest contributor to the country's GDP for the year, amounting to about 34.89 percent of total GDP. Understandably, domestic rice production was just about 2.12 percent of total GDP for the year under review. This low share of rice production in total GDP clearly suggests a heavy dependence on imports.

Table 5. Sectorial contribution to GDP (based on 2006 SAM).

Sector	Output (₦' Million)	Percent
Industry	9374177.64	34.89
Services	6633696.96	24.69
Agriculture	6108250.09	22.73
Administration	3108960.07	11.57
Other Cereals	1073138.95	3.99
Rice	570166.03	2.12
Total	26868389.74	100

Source: Author's computation from Nigerian SAM (2006).

6. SIMULATION RESULTS AND DISCUSSIONS

6.1. Simulation Results

The results in Table **6** show imports of different commodities during the year under review (base period). The results also include variations in quantity of imported commodities that would occur under the two separate policy scenarios assumed in this study. Simulation 1 shows what would happen if a 35 percent import tariff were imposed on

imported rice. The import substitution elasticity for rice under this policy scenario is fixed at 0.8, in line with [30], suggesting that locally produced rice is not easily substituted for imported rice. For example, the value of imported rice will reduce by -13.95 percent following a 35 percent tariff imposition on imported rice. The value of other cereals imported into the country would expectedly increase slightly by about 0.1 percent, showing that some substitution will occur.

Table 6. Quantity of products imported.

Definition	Variable Symbol	Base Period Value	Sim1: ($tariff_{rice}$+35%) Sigma_M = 0.8	Sim2: ($tariff_{rice}$+35%) Sigma_M = 0.8 Sigma_M = 4
Rice	M_{rice}	71118.74	61197.53	37553.01
Variation (%)			-13.95	-47.19
Other Cereals	*M cereals*	144448.59	145888.65	152602.26
Variation (%)			0.99	5.64
Agriculture	M_{agr}	180155.89	150790.77	156319.90
Variation (%)			-16.30	-13.23
Services	*M ser*	1091371.84	1089720.66	1109524.99
Variation (%)			-0.15	1.66
Food	*M food*	92455.49	93833.31	97658.38
Variation (%)			1.49	5.63
Industry	M_{ind}	3387513.01	3425072.11	3419719.48
Variation (%)			1.11	0.95

Note: Sigma_M is the Import Substitution Elasticity for Rice Source: Author's computation using GAMS 24.1.3.

In terms of the quantity and quality of domestically produced rice, suppose that rice production in the domestic sector becomes more efficient following the implementation of the new policy and the subsequent involvement of large-scale producers. This situation will be aptly captured by an increase in the import substitution elasticity for rice, meaning that consumers will become more indifferent in their preferences for imported or locally produced rice. For simulation 2 in Table **6**, if the import tariff on rice is increased by 35 percent and the import substitution elasticity for rice is assumed to be 4.0, the value of imported rice will fall by -47.19 percent. Imports of other cereals will increase by 5.64 percent, suggesting that consumption preferences will shift slightly to other cereals that are close substitutes for rice.

Table **7** shows what the level of domestic production of various commodities would be if a 35 percent tariff was imposed on imported rice and if the import substitution elasticity for rice were 0.8 (simulation 1) and 4.0 (simulation 2). In both policy simulation scenarios, domestic rice production will trend upward: by 2.97 percent in simulation 1 and 18.43 percent in simulation 2. This indicates greater substitutability of domestic rice for imported rice. Understandably, the combined forces of an increased tariff on imported rice and the efficiency spillover from the domestic rice production sector will drive an increase in production in many other sectors of the economy as well.

Table 7. Industry j production of commodity i.

Definition	Variable Symbol	Base Period Value	Sim1: ($tariff_{rice}$+35%) Sigma_M = 0.8	Sim2: ($tariff_{rice}$+35%) Sigma_M = 4
Rice	*Qrice*	570166.03	587126.9461	675242.74
Variation (%)			2.97	18.43
Other Cereals	Qcereals	1073138.94	1095055.51	1090705.60
Variation (%)			2.04	1.64
Agriculture	Q_{agr}	2123709.22	1944020.38	1938616.17
Variation (%)			-8.46	-8.72
Food	*Q food*	3984540.86	4024572.94	4022536.39
Variation (%)			1.00	0.95
Industry	$tariff_{ind}$	9374177.64	9396768.06	9365638.88
Variation (%)			0.24	-0.09
Services	Q_{ser}	6633696.96	6707706.19	6657440.08

(Table 7) contd.....

Definition	Variable Symbol	Base Period Value	Sim1: ($tariff_{rice}$+35%) Sigma_M = 0.8	Sim2: ($tariff_{rice}$+35%) Sigma_M = 4
Variation (%)			1.12	0.36
Administration	*Qadmin*	3108960.07	3127861.54	3090243.17
Variation (%)			0.61	-0.60

Note: Sigma_M is the Import Substitution Elasticity for Rice Source: Author's computation using GAMS 24.1.3.

The question of what will happen to household income if a policy shock triggered by a 35 percent tariff imposition on imported rice is accompanied by an increase in import substitution elasticities for rice from 0.8 to 4.0 is addressed in Table **8**. Under simulation 1, the income of households in rural areas will fall by -1.30 percent, while that of households in urban areas will fall by -0.65 percent. However, given policy simulation 2 scenario, the income of households in rural areas will increase marginally by 1.04 percent and that of households in urban areas will increase marginally by 0.68 percent. Households in rural areas will experience a greater income (nominal) gain than households in urban areas (under simulation 2) because most of the rice farmers that will be integrated into the large-scale rice production process actually reside in rural areas.

Table 8. Total income of type h households.

Definition	Variable Symbol	Base Period Value	Sim1: ($tariff_{rice}$+35%) Sigma_M = 0.8	Sim2: ($tariff_{rice}$+35%) Sigma_M = 4
Rural HH	*YH rr*	6289097.01	6207134.05	6355109.44
Variation (%)			-1.30	1.05
Urban HH	*YH ur*	9164102.57	9104735.88	9226584.71
Variation (%)			-0.65	0.68

Note: Sigma_M is the Import Substitution Elasticity for Rice Source: Author's computation using GAMS 24.1.3.

Table **9** presents the changes in demand for labor (employment level) by industry "J" that occur in response to the policy shocks described by simulations 1 and 2. Expectedly, demand for labor will increase in all sectors except the agriculture sector under simulation 1. Demand for labor will also increase in all sectors except the agriculture, industry, and administration sectors under simulation 2. Demand for labor in the rice sector under both simulations will increase by 2.29 percent and 18.73 percentage points, respectively.

Table 9. Demand for labor by industry J.

Definition	Variable Symbol	Base Period Value	Sim1: ($tariff_{rice}$+35%) Sigma_M = 0.8 Variation (%)	Sim2: ($tariff_{rice}$+35%) Sigma_M = 4 Variation (%)
Rice	LD_{rice}+35%	312363.14	2.29	18.74
Other Cereals	*LDcereals*	617836.59	1.39	1.89
Agriculture	LD_{agr}	3028425.05	-2.64	-2.24
Industry	LD_{ind}	300773.42	1.85	-1.29
Services	LD_{ser}	3925373.41	1.35	0.18
Administration	*LDadmin*	914883.61	0.61	-0.60

Note: Sigma_M is the Import Substitution Elasticity for Rice Source: Author's computation using GAMS 24.1.3.

6.2. Discussion of Results

This study's findings have a number of policy implications. The use of tariff barriers (SIM1) as opposed to a policy aimed at improving the competitiveness of locally produced rice (SIM2) in Nigeria's domestic market have varying implications for the Nigerian economy. Although the imposition of import tariffs is generally tantamount to a loss of welfare, evidence from this study shows that a tariff policy of up to 35 percent on imported rice, accompanied by an improvement in the quality and quantity of home grown rice, will help the domestic product to compete freely with imported rice. This policy will also translate into some marginal income gains for households in both rural and urban areas. At the same time, the policy will produce significant employment gains in all sectors except agriculture, industry, and administration, which are expected to suffer slight decreases in employment levels.

The evidence of expected employment gains in the rice sector due to implementation of the new rice policy

initiative failed to support the findings in [4]. The likely reason for a loss of employment in the other agriculture sector and an increase in employment in the rice sector is that the expected boom in domestic rice production is likely to attract farmers away from the other agriculture sector. The other observed benefits of an increased tariff on imported rice will be in terms of a reduction in the quantity of imported rice, a reduction in the burden on the nation's foreign reserve, and an increase in production of locally produced rice. The finding that value of imported rice will reduce by -13.95 percent following a 35 percent tariff imposition on imported rice is also an interesting result. What it strongly suggests is that the average consumer of rice in Nigeria is less concerned about the origin of rice but more concerned about the cost and quality of the rice s/he consumes.

CONCLUSION

The study evaluates the economy-wide impact of the Nigerian government's rice transformation policy under its Agricultural Transformation Agenda. The main thrust of the current rice transformation policy initiative is a combination of tariff barriers on imported rice and increased domestic rice production through collaboration with large-scale private producers. Evidence from this study reveals that the import burden on the Nigerian economy will be largely reduced in some sectors by the implementation of this policy. Domestic production of rice and other commodities (with the exception of other agricultural and industry products as well as administrative services) will also increase following the full and effective implementation of the rice production transformation policy. The implementation of the domestic rice production transformation policy is likely to result in overall income gains for both rural and urban households. Expectedly, the households in rural areas will experience greater income gain than the households in urban areas. The implementation of the new domestic rice production policy is also expected to produce considerable employment gains in all sectors of the economy except the agriculture, industry, and administration sectors. The potential gains inherent in the current domestic rice cultivation, processing, and consumption policy makes it critical that the current federal administration retain and sustain the policy.

Suggestion for Further Research

The study results would have been more informative if the productive factors and the representative household groups could be further disaggregated to effectively capture the income distribution among the various household groups. While the required disaggregation could be easily accomplished for the representative household groups based on available information from the 2006 SAM for Nigeria, data for the productive factors proved elusive, as this data is highly aggregated in the SAM. One way of getting around this challenge would be to rely on any relevant 2006 survey information from other sources in order to split the aggregated data on productive factors in the 2006 Nigerian SAM on a pro-rata basis. This may effectively serve as the subject of a future study.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No Animals/Humans were used for studies that are base of this research.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTEREST

The author (Henry Okodua, PhD) hereby declares no conflict of interest, financial or otherwise. The author received funding for this research under the AGRODEP 2015 Seed Fund Grants. The research was undertaken as part of, and partially funded by, the CGIAR Research Program on Policies, Institutions, and Markets (PIM), which is led by IFPRI and funded by the CGIAR Fund Donors.

ACKNOWLEDGEMENTS

The author acknowledges **Ismael Fofana** and **Fousseini Traore** for qualitative mentoring during the study. The *Work in Progress* version of the Paper is currently published under the AGRODEP Working Paper Series as **Paper 0039** and is available online at: http://www.agrodep.org/sites/default/ files/AGRODEPWP0039_0.pdf .

REFERENCES

[1] Douillet M. Nigeria's agricultural policy: Seeking coherence within strategic frameworks 2011, imprimer Available from 2011.http://www.inter-reseaux.org/revue-grain-de-sel/51-special-issuenigeria/article/nigeria-s-agricultural-policy cited 2014 July 23

[2] Nwanze KF, Mohapatra S, Kormawa P, Keya S, Bruce-Oliver S. Rice development in sub-saharan africa Journal of the Science of Food and Agriculture 2006; 86(5): 675-7.
[http://dx.doi.org/10.1002/jsfa.2415]

[3] Akinbile LA. Determinants of productivity level among rice farmers in ogun state, nigeria. African crop science society conferences. Proceedings, 8th African Crop Science Conference. El-Minia, Egypt. 2007; pp. 1339-44.

[4] Johnson M, Takeshima H, Gyimah-Brempong K. Assessing the Potential and Policy Alternatives for Achieving Rice Competitiveness and Growth in Nigeria 2013 [IFPRI Discussion Paper 01301]. Washington DC: The International Food Policy Research Institute (IFPRI).

[5] United Nations. UN Comtrade Online Database United Nations Statistics Division Available from: http://data.un.org/Data.aspx?d=ComTrade&f=_l1Code%3a11 cited 2018 May 11

[6] Bello A. Nigeria Imported $US700 million Rice in 2003: Federal Minister of Agriculture and Rural Development, Tribune Newspaper, Monday July 7, 2004.

[7] Nasko G. Food Self-sufficiency in Nigeria: A Review of Federal Government Programme. 1989. Federal Civil Service Forum. N.I.I.A. Victoria Island Lagos, Nigeria.

[8] Omotola KM, Ikechukwu A. Rice Milling in nigeria, a report on development of agriculture in sub-saharan africa Available from: 2006.www.ricenigeria.com cited 2016 June 11

[9] Cadoni P, Angelucci F. Analysis of Incentives and Disincentives for Rice in Nigeria Technical Notes Series, Monitoring African Food and Agricultural Policies (MAFAP). Rome: FAO 2013.

[10] Daramola B. Government policies and competitiveness of nigerian rice economy. Paper presented at the workshop on rice policy & food security in sub-saharan africa' organized by WARDA, Cotonou, republic of benin, November 07- 09, 2005.

[11] Ugwu DS. Agricultural extension practice in nigeria. In: Akubuilo CJC, Umebali EE, Mgbada JU, Ugwu DS, Egwu WE, Awoke MU, Eds. Readings in Agricultural Economics and Extension. 2007.

[12] Adesina A. Agricultural Transformation Agenda: Repositioning Agriculture to drive Nigeria's Economy. Abuja: Federal Ministry of Agriculture and Rural Development 2012.http://queenscompany.weebly.com/uploads/3/8/2/5/38251671/agric_nigeria.pdf monograph on the internet cited 2016 November 23

[13] Iwuchukwu JC, Igbokwe EM. Lessons from agricultural policies and programmes in nigeria. Journal of Law, Policy and Globalization 2012; 5

[14] Nwafor M, Diao X, Alpuerto VA. 2006 social accounting matrix for nigeria: Methodology and results. Nigeria Strategy Support Program (NSSP) Report No NSSP007, 2010 2010. Washington DC: IFPRI.

[15] United States Department of Agriculture Foreign Agricultural Service Grain Report Nigeria, Grain and Feed, Rice Imports, 2010. Washington, DC: USDA 2010.

[16] Bamba I, Diagne A, Manful J, Ajayi O. Historic opportunities for rice growers in nigeria. Inter-réseaux Special Report No 51 2010.http://inter-reseaux.org/IMG/pdf/p19-20_Rice.pdf July – September 2010; cited 2016 November 23. Available from:

[17] Ogadinma HA. Consumer preference for imported rice in nigeria – perceived quality differences of habit persistence 2010 MS Thesis. : Michigan State University Publication Number 1493385

[18] Bamidele FS, Abayomi OO, Esther OA. Economic analysis of rice consumption patterns in nigeria. J Agric Sci Technol 2010; 12(1): 1-11.

[19] Lançon F, Erenstein O, Akande SO, Titilola SS, Akpokodje G, Ogundele OO. Rice Processing in Nigeria: A Survey 2003. Abidjan, Côte d'Ivoire: West Africa Rice Development Association (WARDA).

[20] Ogazi CG. Rice output supply response to the changes in real prices in nigeria: An autoregressive distributed lag model approach. J Sustain Dev Afr 2009; 11(4)

[21] Ayanwale AOS, Akinyosoye VO, Yusuf SA, Oni AO. 2011; Rice supply response in nigeria; whither changing policies and climate. World Rural Observations 2011; 3(4)http://www.sciencepub.net/rural cited 2014 July 23 Available from:

[22] Olayiwola WK, Osabuohien ESC, Okodua H, Ola-David OA. Economic Integration, Trade Facilitation and Agricultural Exports Performance in ECOWAS Sub Region. In: Regional Integration and Trade in Africa. Hampshire, England 2014. Palgrave Macmillan. Chapter 2.

[23] Pande HK, Van Tran D, Ton-that T. Higher Import Tariffs Spur More Rice Smuggling into Nigeria 2012 Available from. Food & Agriculture Org 1994.http://oryza.com/content/higher-import-tariffs-spur-more-rice-smuggling-nigeria cited 2014 July 16

[24] Oryza.com. Higher Import Tariffs Spur More Rice Smuggling into Nigeria 2012.http://oryza.com/content/higher-import-tariffs-spur- more-rice-smuggling-nigeria

[25] Ezedinma CI. Impact of Trade on Domestic Rice Production and the Challenge of Self- Sufficiency in Nigeria. Ibadan, Nigeria: International Institute of Tropical Agriculture 2005.

[26] Food and Agriculture Organization. FAOSTAT Online Statistical Service Available from 2018.http://www.fao.org/faostat/en/ #data/QC/metadata cited 2018 May 11

[27] World Bank. World Development Indicators Online Database Available at https://data.worldbank.org/products/wdi cited 2018 May 11

[28] Decaluwé B, Lemelin A, Robichaud V, Maisonnave H. PEP-1-1 The PEP Standard Single Country, Static Computable General Equilibrium Model Version 21 Partnership for Economic Policy (PEP). Research Network 2013.

[29] Hosny AS. Survey of Recent Literature on CGE Trade Models: with Special Reference to the Case of Egypt. Journal of World Economic Research 2013; 2: 9-19.
[http://dx.doi.org/10.11648/j.jwer.20130201.12]

[30] Zhang X, Verikios G. Armington Parameter Estimation for a Computable General Equilibrium Model: A Database Consistent Approach. 2006. Economics Discussion Working Papers No. 06–10, 2006. The University of Western Australia, Department of Economics.