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# Agricultural Export, Economic Growth And Welfare In Nigeria: A Dynamic Computable General Equilibrium Analysis

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***Abstract:***
*This study examined the impact of demand and price shocks in the agricultural and processed food sectors on the economy and welfare using a recursive-dynamic computable general equilibrium model and a 2020 SAM of Nigeria for a time period of 2020 to 2024. Increasing agricultural export by 10% and 20% will increase total output in the economy by 2.9% and 4.1% respectively. Total export will rise by 3.2% and 2.7% respectively while total import will rise lower than export by 0.5% and 1.7% leading to improved trade balance. Domestic supply of agricultural sector will rise by 2.5% and 3%in the corresponding scenarios suggesting that an agricultural export increase of up to 20% will not affect domestic food supply. Both poor and non poor households will enjoy higher income and consumption although the welfare of non poor households will be more impacted. The impact of export price shocks depends on the direction and magnitude of the shock. A 10% and 20% increase in export price of the two sectors will increase total output by 2.9% and 1.4% respectively while a 20% decrease in their export price will decrease total output by 4.1%. Government Policies that will encourage the export of processed food rather than raw agricultural products should be encouraged. There is need to ensure that local farmers are get a fair margin from the export value chain to boost their welfare. Price support policies are encouraged to protect exporters from the vulnerabilities of international export price fluctuations.*

***Key Word****: Computable General Equilibrium, Export, Social Accounting Matrix, Welfare, Trade*

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## I. Introduction

Agriculture plays a major role in global trade where it serves as a source of foreign exchange for many nations. Strong economic growth in emerging and developing economies has driven the demand for agricultural products globally with production increasing to meet demand while trade has expanded substantially. Although the contribution of agriculture to global trade has been modest, it has remained quite significant to economic growth in many countries. The monetary value of global agricultural exports in 2021 was 2.7 times higher in nominal terms than in 2005, while the share of agriculture in total merchandise trade value increased from 6.6 percent in 2005 to 7.9 percent in 2021 (FAO, 2022).

Before the advent of crude oil exploration in Nigeria, agriculture played a major role in the economy as the biggest contributor to GDP and the major foreign exchange earner for the country. Agricultural exports dominated international trade with exports accounting for about 90% of total foreign exchange (Azih, 2008) with Nigeria playing a key role in the export of major agricultural commodities like oil palm, groundnut, cocoa and rubber (Gbaiye *et al*., 2013).

The discovery of crude oil in the late fifties, however, changed the economic landscape. Not long after that, crude oil became Nigeria's major export commodity and, by extension, its major foreign exchange earner. Agricultural exports fell gradually while imports rose by more than 790% between 1990 and 2011 (Vaughan *et al*., 2014) leading to increased poverty with as much as 69% sliding below poverty line in 2010 (NBS, 2010).

The challenges notwithstanding, agricultural sector has consistently remained the second largest contributor to foreign exchange earnings and has been a major contributor to GDP. Growth rate of the sector has remained positive while export growth rate has risen faster than any other sector, rising by as much as 180% in 2016 alone (CBN, 2016). Despite the positive outlook, agricultural export from Nigeria has faced major challenges of low production growth and global price volatility which often results in market unpredictability, terms of trade uncertainties and poor business planning. Although several literature on agricultural export exists

(see Ojide *et al.* (2014), Adesoji and Sotubo (2013), Ovikuomagbe and Uduakobong (2013), Sanjuán-López and Dawson (2010), Alegwu *et al.* (2017, 2018)), their methodological approach has been unable to provide information on the economy wide impact of policy or economic shocks in terms of distributional and welfare effect at sectoral and household groups respectively.

The overall objective of this work, therefore, is to study the dynamics between agricultural export and economic growth and welfare. Specifically, the study seeks to:

- Describe the structure of the Nigerian economy in the base year of the study;
- study the impact of an increase in agricultural and processed food export on the economy of Nigeria;
- examine the impact of an increase or decrease in the price of world agricultural and processed food exports on the economy of Nigeria;
- examine the impact of demand and price shocks on agricultural and processed food exports on the welfare of household groups in Nigeria

## II. Methodology

***Data and Analysis Technique***

The main source of data for this work is the 2020 Social Accounting Matrix (SAM) of Nigeria, which is an aggregated version of the 46-sector 2- household SAM. The data is cross sectional in nature and depicts all transactions in the economy for the base year (2020). Activities are aggregated into five sectors; factors of production include labour and capital, while households are divided into representative groups of poor and non poor households. Data was analyzed using descriptive statistics, comparative static analysis and macroeconomic modeling. The macroeconomic modeling technique used for this study is the Recursive Dynamic Computable General Equilibrium (RD-CGE) which was solved using the General Algebraic Modeling System (GAMS) computer software.

**The Model and Calibration**

The model follows the one used by Aminu (2019) which outlines the various equations that make up the model. It is an open-economy, single-country, 5-sector, 2-inputs and 2-household (poor and non poor) model. The sectors are aggregates derived from the 46 sectors of the original model. The blocks of equations for the model are five. These are price, production and trade, institutional, system constraint, and dynamic equation blocks.

The neo classical assumptions of a competitive market economy were prices adjust to clear factor and product market and capital is fixed for each sector was adopted. Brief explanation of each variable and parameter in the equations can be found in Appendix 1.

**(a) Price Block**

Equations 1 and 2 describe the world export and import prices in terms of the domestic currency

$$PM_i = pwm_i(1+tm_i)EXR \quad 1)$$

$$PE_i = pwe_i(1+te_i)EXR \quad 2)$$

Equations 3 and 4 describe the prices for the composite commodities Q and X. CES aggregation of sectoral imports ($M$) is represented by Q and domestic goods supplied to the domestic market ($D$). $X$ is total sectoral output, which is a CET aggregation of goods supplied to the export market ($E$) and goods sold on the domestic market ($D$).

$$PX_i = \frac{(PD_i * D_i + PE_i * E_i)}{X_i} \quad 3)$$

$$PQ_i = \frac{(PD_i * D_i + PM_i * M_i)}{Q_i} \quad 4)$$

**(b) Production and Trade Block**

Equation 5 gives the value added output $XV_i$ in the economy, Equation 6 ensures that producers will demand each input up to the point where their unit costs equal their marginal value products.

$$XV_i = B_j(\beta_j LD_i^{-\rho} + (1-\beta_i)KD_i^{-\rho})^{\frac{-1}{\rho}} \quad (5)$$

$$\frac{KD_i}{LD_i} = \left[ \frac{w_i}{r_i} * \frac{\beta_i}{1-\beta_i} \right]^{\frac{1}{1+\rho_i}} \quad (6)$$

Equation 7 shows that consumers maximize their utility where the marginal rate of substitution between the domestic and imported goods equal their respective price ratios:

$$\frac{M_i}{D_i} = \left[ \frac{PD_i}{PM_i} * \frac{\delta_i}{1-\delta_i} \right]^{\sigma_i} \quad (7)$$

Producers, on the other hand, maximize their revenue where the marginal rate of substitution between local sales $QD$ and export $QE$ equates their respective price ratios (Equation 8).

$$\frac{D_i}{E_i} = \left[ \frac{PD_i}{PE_i} * \frac{\mu_i}{1-\mu_i} \right]^{\varphi_i} \quad (8)$$

**(c) Demand and Income Block**

The income accruing to aggregate capital, $KY$, among the sectors is given by the following equation

$$KY = \sum (K_i * r_i (1 - DepR_i)) \quad (9)$$

The income accruing to labour on the other hand is obtain from the equation below:

$$LY = \sum (L_i * w_i) \quad (10)$$

Total demand for good $i$ for intermediate use is given by:

$$INTD = \sum a_{ij} * X_i \quad (11)$$

Household income, $HHY$ is calculated by summing capital income and labour income across sectors:

$$HHY = \sum K_i * pK_i (1 - DepR_i)) + \sum (L_i + w_i) \quad (12)$$

Household disposable income $HHYD$ is given by the Equation 13:

$$HHYD = HHY * (1 - SavR_i) \quad (13)$$

Equation 14The quantity of composite commodity consumed by households $HEXPQ_h$ is given by the equation:

$$HEXPQ_h = HEXPS_h * HHYD_h / P_i \quad (14)$$

Household utility is given by the following Equation 15

$$HHU_h = \sum (HEXPS_i * LOG(HCONS_{h,i})) \quad (15)$$

Government gets its income mainly from taxes. Government total income $GYtot$ is given by:

$$GYtot = \sum TARIFF + INDTAX + HHTAX \quad (16)$$

Total government expenditure $GEtot$, is shown below:

$$GEtot = GCONS + GSUB \quad (17)$$

**Savings and Investment Block**

Total savings for household $i$ is obtained by multiplying household income for household $i$ by its corresponding savings rate as shown below:

$$HHSAV_i = \sum (HHY_i * SavR_i) \quad (18)$$

Government savings GOSAV is the difference between total government income and total government expenditure:

$$GOSAV = GY_{tot} - GE_{tot} \quad (19)$$

Foreign savings $FSAV$, described as the total value of imports less the total value of exports, is given by:

$$FSAV = \sum (M_i * PWM_i) + \sum N_i * PWN_i - \sum E_i * PWE_i) \quad (20)$$

Since the model satisfies Walras' law, the sum of household savings, government savings and net foreign savings must equal investment. Hence:

$$Savings = Investment = HHSAV + GOSAV + FSAV + DepTOT \quad (21)$$

**(d) System Constraints' Block**

These are constraints that the model economy must satisfy. These include both market clearing conditions and the choice of macro closure rules for the model. Market clearing conditions include equations relating to composite commodity (*Q*) and its components, investment (*INVEST*), labour supply (*L)*, and capital supply (*K*), which is the sum of all the capital stock employed across sectors.

$Q_I = INT_I + \sum_H HCONS_{H,I} + SECGOV_I + ID_I$ (22)

$INVEST = SAVINGS$ (23)

$L = \sum_I LD_I$ (24)

$K = \sum_I KD_I$ (25)

For closure rules, we assume a flexible exchange rate in order to maintain a fixed level of foreign savings. As for savings-investment balance, an investment driven approach is assumed which means that investment within the model is fixed while savings adjust to equalize both.

**(e) Dynamic Equations' Block**

The equations are to ensure that the model solutions extend beyond a given year and they serve to update key variables such as capital stock (*CAP*), labour supply *(L)*, sectoral government expenditure *(SECGOV)* and foreign savings.

$CAP_{IT} = CAP_{I(T-1)} + ID_{I(T-1)} - DEP_{I(T-1)}$ (26)

$L_T = (1+g) * L_{(T-1)}$ (27)

$FSAV_T = (1+g) * FSAV_{(T-1)}$ (28)

$SECGOV_I = (1+g) * SECGOV_{(I,T-1)}$ (29)

Hicksian Equivalent Variation (HEV) was used to obtain welfare impact of shocks.
The Hicksian Equivalent Variation (EV) is given by:

$$HEV^{h_i} = \left[ \frac{U_n^{h_i} - U_o^{h_i}}{U_o^{h_i}} \right] Y_o^{h_i} \quad (30)$$

A positive HEV value shows positive impact while a negative value shows negative impact. The greater the value of the equivalent variation, the more impactful the policy is to the household. Calibration was done so as to produce values for parameters by replicating the benchmark equilibrium data. After calibration, the simulations for the study were carried out. Each policy simulation provided a new counterfactual equilibrium which was compared with the benchmark equilibrium using comparative static analysis. The difference in both equilibrium states becomes the impact of the shock been simulated.

**Scenarios for simulation**

Three scenarios were simulated in this study:

i. Combined impact of a 10% (DD10) and 20% (DD20) increase in raw agriculture and processed food export.
ii. Combined impact of a 10% (PW10) and 20% (PW20) increase in world agricultural export prices of raw agricultural and processed food sectors.
iii. Combined impact of a 10% (PD10) and 20% (PD20) decrease in world agricultural export prices of raw agricultural and processed food sectors.

## III. Results And Discussion

**Impact of Increasing Agricultural and Processed Food Export on Aggregate Economic Variables**

The findings show that increasing agricultural and processed food export in Nigeria will have a positive impact on aggregate output. From Figure 1, a 10% and 20% rise in agricultural and processed food export will lead to a rise of 2.86% and 4.17% of aggregate output. This should be expected since higher aggregate demand will encourage increased local production to meet up with the increase in demand. This finding is in line with the works of Kassey and Holland (2011) and Rolim *et al.* (2022). As expected, government revenue rises by 2.15%, and 0.36% in the corresponding scenarios possibly due to increase in revenue from export tax and import tariffs.

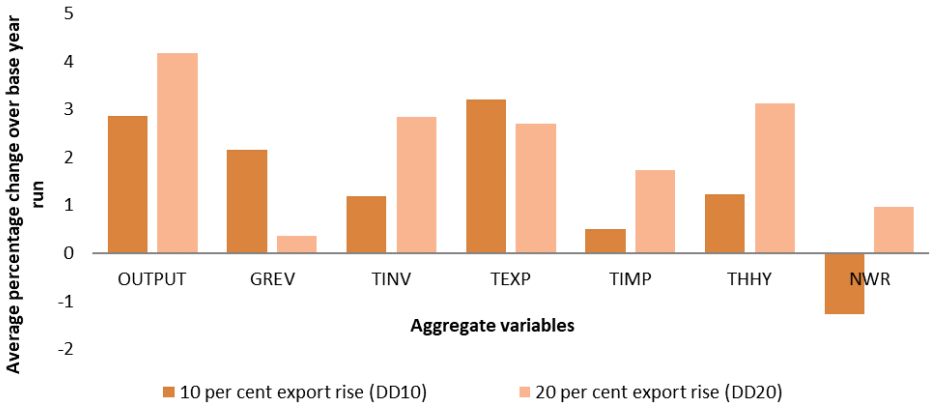


**Figure 1: Impact of DD10 and DD20 Scenario on Aggregate Variables**
*Source: Authors' computation using GAMS software*

Total investment demand rises by 1.9% and 2.84% respectively spurred by increased production. Total export from all sectors sees a significant rise by 3.2% and 2.69%, while total import also increases by 0.5% and 1.73% respectively. However, export rises more than import leading to improvement in the balance of trade. Aggregate Household income also rises by 1.2% and 3.1%. However, national wage rate falls in the first scenario indicating that the rise in household income comes from capital income earnings rather than wages.

**Impact on Sectoral Variables**

Table 1 shows result for the impact of a 10% and 20% increase of a combined agricultural and processed food export on some sectoral variables. The results for both scenarios show that all sectors are positively impacted. Agricultural production rises by 2% and 3% respectively while processed food sectors rise by 4.5% and 3.5% respectively. This is in line with the findings of Chhuor (2017) who, in his work on Cambodia's agricultural export, observed positive growth trends in agricultural output as a result of higher export demand in the sector.

The processed food sector experiences higher production compared to agricultural sector for the same amount of export increase, an indication that exporting processed agricultural products will give higher returns when compared to exporting raw commodities. Studies like those of Adeolu et al. (2014) and Zhuka and Tanti (2022) have shown that local farmers who usually export unprocessed produce usually get very little in the agricultural value chain. Manufacturing and services sectors also experience higher output indicating a strong linkage with agriculture and processed food sectors. A similar study by Cassey *et al*. (2010) which involved a 3% rise in world demand for crop export of the Washington state economy showed a rise in output of the agricultural sector, but unlike result from this study, they recorded a decline in the manufacturing and service sectors adducing the reason as the result of a reallocation of labour away from these sectors to the agricultural sector.

**Table 1: Sectoral Impact of Increasing World Demand of Raw and Processed Agricultural Exports**

| AGR | | | MIN | | | PRF | | | MAN | | | SER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BAU | DD10 (%) | DD20 (%) | BAU | DD10 (%) | DD20 (%) | BAU | DD10 (%) | DD20 (%) | BAU | DD10 (%) | DD20 (%) | BAU | DD10 (%) | DD20 (%) |
| Sectoral Output | | | | | | | | | | | | | | |
| 42427 | 2.0 | 3.0 | 18343 | 8.8 | 2.0 | 13690 | 4.5 | 3.5 | 18343 | 8.8 | 2.1 | 16536 | 3.5 | 3.1 |
| Domestic Supply | | | | | | | | | | | | | | |
| 42288 | 2.5 | 3.0 | 10783 | 7.5 | -0.1 | 13417 | 4.5 | 3.5 | 16830 | 0.3 | 7.3 | 10366 | 3.5 | 3.1 |
| Sectoral Labour Demand | | | | | | | | | | | | | | |
| 35955 | -3.7 | -1.2 | 320 | 4.2 | -1.0 | 192 | 2.5 | 6.9 | 11132 | 1.9 | 0.8 | 38140 | -0.5 | 1.07 |

*Source: Authors' computation using GAMS software*
DD10= 10% increase, DD20= 20% increase. BUA values are in Millions of Naira. Figures in the table are average values.

The difference in result from both works can be attributed to the size of agricultural labour force in both countries. While less than 2% of Americans are involved in agricultural production, about 49% of Nigerians get their livelihood from the sector. In other words, there is abundance of cheap labour in the agricultural sector in Nigeria which will discourage the migration of labour from other sectors.

Result for domestic demand shows that increasing agricultural and processed food export will not impact negatively on domestic supply from those sectors. For the agricultural sector, domestic supply rises by 2.5% and 3% respectively. This is not the case with the work of Chhuor (2017). Reason for this outcome could be the fact that most of the agricultural exports from Nigeria are not staple foods in the country. Other sectors also experience increase in domestic supply except the mining sector which experiences a decrease in the DD20 scenario. This can be explained by the rise in intermediate demand from other sectors to meet the increased production in the agricultural sector. Higher domestic supply may be as a result of a possible increase in local demand arising from higher income.

Table 1 shows a 3.7% and 1.2% decline in labour demand in the agricultural sector. However labour demand rose by 2.5% and 6.9% in the processed food sector suggesting a reallocation of labour from agricultural sector to the processed food sector. Recall that the agricultural sector in Nigeria is a low wage sector and employs a high percentage of the labour force. Growth in other sectors with a higher wage rate will lead to a reallocation of labour from the low wage sector to the high wage sector. The base year SAM figures show that only 0.3% of the labour force is engaged in the processed food sector. This may explain the reallocation of more labour to the sector when compared to others.

**Impact on households**

Table 2 shows the impact of increased agricultural and processed food export on the income, consumption and savings of poor and non poor household groups. From the table, it is evident that increased agricultural and processed food export by both 10% and 20% leads to increased income for all household groups in both scenarios. Non poor households, however, are higher beneficiaries with figures of 2.2% and 2.7% compared to1.9% and 2.5% for poor households in the DD10 and DD20 scenarios respectively. This result shows that non poor households are more favoured to utilize opportunities arising from higher export demand since they are better positioned financially to meet the capital demand need for higher production.

The increased household income leads to increase in consumption in both household groups and scenarios with non poor households experiencing the highest consumption in both scenarios. Household savings for both households is, however, negative in all scenarios except for the DD10 scenario which is

**Table 2: Impact of Increased World Demand of Agricultural and Processed Food Export on Household Income, Consumption, Savings and Welfare**

| | POOR HOUSEHOLDS | | | NON POOR HOUSEHOLDS | | |
|---|---|---|---|---|---|---|
| | BAU N'Million | DD10 (%) | DD20 (%) | BAU N'Million | DD10 (%) | DD20 (%) |
| Household Income | 9137 | 1.9 | 2.5 | 100181 | 2.2 | 2.7 |
| Household Consumption | 9594 | 1.1 | 1.3 | 77029 | 2.7 | 3.4 |
| Household Savings | -457 | -1.7 | -4.7 | 23152 | 1.6 | -1.6 |
| EV | | 687 | 1994 | | 771 | 5065 |

*Source: Authors' computation using GAMS software*

Note: DD10= 10% increase, DD20= 20% increase.

positive for non poor households. In terms of welfare, Equivalent Variation (EV) values from Table 1 show that increase in export for both agricultural and processed food export increases the welfare of both household groups. However the higher EV values for non poor households show that they enjoy more welfare impact compared to poor households.

**Impact of an Increase in the World Export Prices of Agricultural and Processed Food on Aggregate Variables**

Figure 2 shows that a 10% and 20% increase in world agricultural export price increases total output in the economy by about 2.9% and 1.5% respectively. Government revenue increases by 1.45% in the PW10 scenario as a result of increase in export and production tax. Total investment also rises by 3.51% and 0.8% as a result of increase in production. Total export is positive in both scenarios and increases as export price increase. This can be explained by the fact that, in the short run, exporters may be encouraged to increase their export due to the price incentive. Total import also rises due to heightened trade activities. Although aggregate household income rises in both scenarios, national wage rate relates negatively to increased export. This could be explained by the fact that the major source of the increase in household income is through the increase in capital income as evident by the rise in the price of capital in the agricultural, processed food and manufacturing sectors. The greater percentage of non-poor income comes from capital ownership while the greater percentage of poor income comes from labour supply.

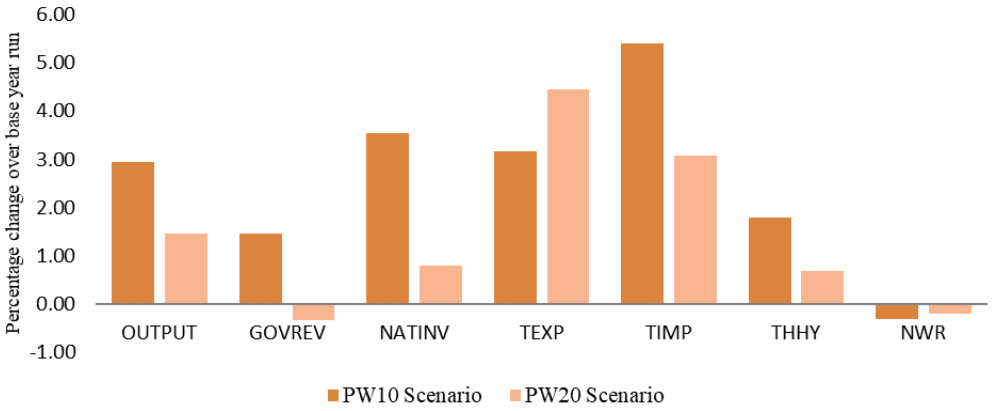


**Figure 2: Impact of a 10% and 20% increase in world price of raw and processed agricultural export**
*Source: Authors' computation using GAMS software*

**Impact of an Increase in the World Export Prices of Agricultural and Processed Food on Sectors**

A 10% and 20% rise in world export prices of both agricultural and processed food will lead to a 2.7% and 1.6% increase in total output of the agricultural sector. Processed food sector output rises by 2.8% and 1.6% (Table 3). Other sectors also show positive growth in output. Domestic supply of agricultural output is negatively affected in the PW20 scenario meaning that higher export prices will generate more incentive for agricultural export to the detriment of domestic supply. This is in line with the findings of Aragie *et al.* (2023) who studied the synergies between agricultural export promotion and food security in three different African countries. They observed that agro-export promotion and rising export price significantly impacted the composition of output away from staple food items which led to a deterioration of the domestic availability of food and agricultural products. The processed food sector is, however, not so affected.

From the data on sectoral export, agricultural sector responds positively to export price increases. A 10% rise in export price leads to a 1.4% and 0.9% increase in agricultural export. Processed food export rises by 2.1% and 0.3% indicating a positive relationship with export price rise.

**Table 3: Impact of an Increase in the World Export Prices of Agricultural and Processed Food on Sectors**

| AGR | | | MIN | | | PRF | | | MAN | | | SER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BAU | PW10 (%) | PW20 (%) | BAU | PW10 (%) | PW20 (%) | BAU | PW10 (%) | PW20 (%) | BAU | PW10 (%) | PW20 (%) | BAU | PW10 (%) | PW20 (%) |
| **Sectoral Output** | | | | | | | | | | | | | | |
| 42427 | 2.7 | 1.6 | 19956 | 1.2 | 0.6 | 13690 | 2.8 | 1.6 | 18343 | 0.6 | 0.5 | 106536 | 0.4 | 0.5 |
| **Domestic Supply** | | | | | | | | | | | | | | |
| 42288 | 0.0 | -0.2 | 10783 | 1.02 | 0.6 | 13417 | 0.2 | 0.2 | 16830 | 0.6 | 0.5 | 10366 | 0.2 | 0.05 |
| **Sectoral Export** | | | | | | | | | | | | | | |
| 138 | 1.4 | 0.9 | 9172 | 4.2 | 6.1 | 273 | 2.1 | 0.3 | 1449 | 7.3 | 8.3 | 2871 | -1.4 | -2.3 |
| **Sectoral Labour Demand** | | | | | | | | | | | | | | |
| 35955 | 0.5 | 0.1 | 320 | 0.0 | 0.0 | 192 | 0.9 | 2.1 | 11132 | 0.1 | 0.1 | 38140 | 0.09 | 0.1 |

*Source: Authors' computation using GAMS software*

DD10= 10% increase, DD20= 20% increase. BUA values are in Millions of Naira. Figures in the table are average values.

**Impact on Household Welfare**

From table 4, increasing world price of agricultural and processed food export by 10% and 20% will lead to a decline in the income of poor households by 2.5% and 0.4% respectively. Non poor households, on the other hand enjoy a 1.4% and 1.1% income increase. The result suggests that non poor households are likely to benefit from the price shocks while poor households will be negatively affected probably due to decline in domestic supply.

Poor households experience a general decrease in household consumption for both PWE10 and PW20 scenarios. This may be as a result of declining domestic supply which may result to higher domestic prices. Non

poor households, on the other hand, experience higher consumption due to rise in their income. Poor households also experience decrease in their welfare of poor households due to a fall in their income and consumption levels. On the other hand, rich households will enjoy a better welfare with price increase.

**Table 4: Impact of an Increase in the Export Prices of World Agricultural and Processed Food on the Income, Consumption and Savings of Households**

| | POOR HOUSEHOLDS | | | NON-POOR HOUSEHOLDS | | |
|---|---|---|---|---|---|---|
| | BAU N'Million | PW10 (%) | PW20 (%) | BAU N'Million | PW10 (%) | PW20 (%) |
| Household Income | 9137 | -2.5 | -0.4 | 100181 | 1.4 | 1.1 |
| Household Consumption | 9594 | -0.47 | -0.04 | 77029 | 0.23 | 0.13 |
| Household Savings | -329 | -0.44 | -0.18 | 22462 | 0.25 | 0.07 |
| EV | | -207 | 2620 | | -37.37 | 2668 |

*Source: Authors' computation using GAMS software*

Note: PW10= 10% increase, PW20= 20% increase. Figures in the table are average values.

**Impact of a Decrease in the Price of World Agricultural and Processed Food Export on Aggregate Variables**

Figures 3 show the impact of a decrease in world export price of the agricultural and processed food sectors on some aggregate variables. Result shows that a 10% decrease in world export price of the sectors under consideration will lead to a 0.74% increase in total production which may arise as a result of stronger demand by importing countries due to the price fall. Government revenue responds negatively due to the price fall. National investment declines while export increases by about 3.7% as result of increased demand occasioned by the low priced exports. Total import declines as domestic supply increases. Household income declines as national wage rate drops.

At 20% price decline, Aggregate production drops by 4.07%. Hence price decline of up to 20% will serve as a disincentive for producers to produce. These results are similar to the findings of Chhuor (2017) and Szeto (2002) who also recorded decline in aggregate production as a result of export price decline. Government revenue falls by about 1.7%, while total export declines by about 2.2%. Total import declines as more production resources are reallocated to the production of domestic goods. The economy also witnesses a decline in Total household income in both scenarios as national wage rate declines.

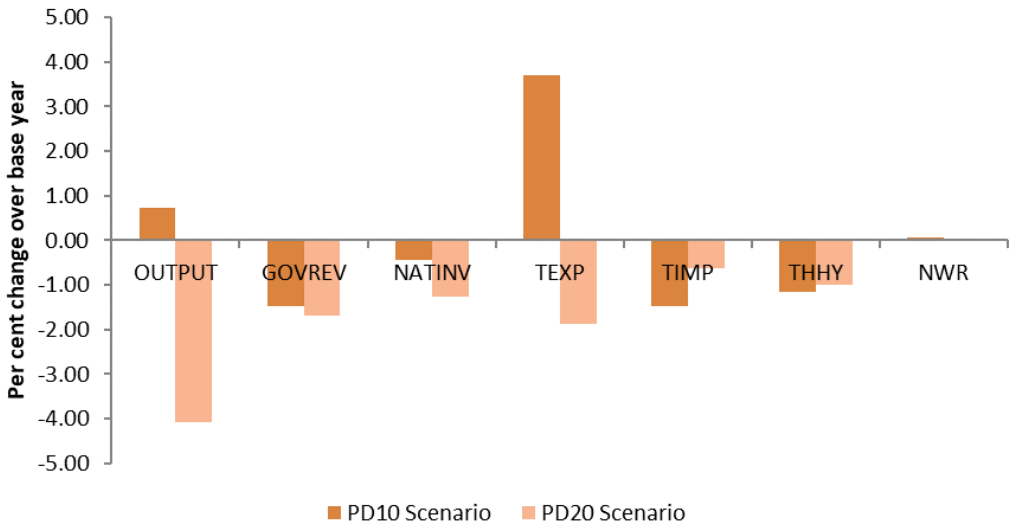


**Figure 3: Impact of a 10% and 20% Decrease in World Price of Raw and Processed Agricultural Export on some Aggregate Variables**

Source: *Source: Authors' computation using GAMS software*

**Impact on Sectoral Variables**

From table 5, decrease in world export price in the PD20 scenario shows a 0.2% decline in the agricultural output, but no impact in the PD10 scenario. The processed food sector shows more resilience to falling price of export in the PD10 scenario, but declines by 2.4% in the PD20 scenario. Export price decline of up to 20% will hurt production in the agricultural and processed food sectors. Other sectors are not negatively affected as they show some positive growth in production. As a result of export price decline, agricultural

export falls by 0.42% in the PD20 scenario while processed food export falls by 2.4%. However, domestic supply for agricultural and processed food sectors rise as a result of decline in their export.

**Table 5: Impact of a Decrease in the Export Prices of World Agricultural and Processed Food on Sectoral Output**

| AGR | | | MIN | | | PRF | | | MAN | | | SER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BAU | PW10 (%) | PW20 (%) | BAU | PW10 (%) | PW20 (%) | BAU | PW10 (%) | PW20 (%) | BAU | PW10 (%) | PW20 (%) | BAU | PW10 (%) | PW20 (%) |
| **Sectoral Output** | | | | | | | | | | | | | | |
| 42444 | 0.0 | -0.2 | 10795 | 1.2 | 5.6 | 13928 | 2.0 | -2.4 | 25385 | 5.8 | 4.4 | 10600 | 2.2 | 0.6 |
| **Sectoral Export** | | | | | | | | | | | | | | |
| 138 | 0.9 | -0.4 | 9172 | -0.1 | -0.12 | 273 | 0.4 | -0.1 | 1449 | 1.65 | 1.1 | 2871 | -0.08 | -0.23 |
| **Domestic Supply** | | | | | | | | | | | | | | |
| 42288 | 0.01 | 0.1 | 10782 | 0.1 | 0.04 | 13417 | 0.1 | 0.1 | 16830 | 0.5 | 0.4 | 10365 | -0.1 | -0.1 |
| **Sectoral Labour Demand** | | | | | | | | | | | | | | |
| 35955 | -0.6 | -0.1 | 319 | -0.7 | -0.4 | 192 | -1.0 | -2.1 | 11132 | 1.2 | -0.6 | 38139 | -0.9 | -0.2 |

*Source: Authors' computation using GAMS software*

DD10= 10% increase, DD20= 20% increase. BUA values are in Millions of Naira. Figures in the table are average values.

**Impact on households**

Table 6 shows that a decline in world price of agricultural and processed food export leads to a general decline in the income of both household groups in both the PD10 and PD20 scenarios. The highest decline of 5.6% and 0.8% is experienced among poor households indicating their higher degree of vulnerability compared to non poor households who experience a decline of 0.7% and 0.6% respectively.

The reduction in income of both poor and non poor households leads to a decline of consumptions by 0.49% and 0.11% for poor households and 0.01% and 0.08% for non poor households. Savings also decline for both household groups. EV figures show a general welfare decline for both household groups, although non poor households suffer more welfare decline.

**Table 6: Impact of a Decrease in the Export Prices of World Agricultural and Processed Food on Household Income, Consumption and Savings**

| | POOR HOUSEHOLDS | | | NON POOR HOUSEHOLDS | | |
|---|---|---|---|---|---|---|
| | BAU N'Million | PD10 (%) | PD20 (%) | BAU N'Million | PD10 (%) | PD20 (%) |
| Household Income | 9137 | -5.6 | -0.8 | 100181 | -0.7 | -0.6 |
| Household Consumption | 9594 | -0.49 | -0.11 | 77029 | -0.01 | -0.08 |
| Household Savings | -457 | -0.95 | -0.95 | 23152 | -0.30 | -0.17 |
| EV | | -392.21 | -1293 | | -119 | -1530 |

*Source: Authors' computation using GAMS software*

DD10= 10% increase, DD20= 20% increase. Figures in the table are average values.

## IV. Conclusion And Recommendations

The simulation results for increased export demand for agriculture and processed food sectors suggests that such increase in foreign demand will lead to an increase in total output and GDP. Other sectors will also enjoy higher exports due to inter linkages between sectors. Such growth in the export sector will further lead to an improvement in the balance of trade for Nigeria. The increased demand will also lead to higher domestic supply thus reducing domestic price. Although labour demand will decrease in agricultural sector, excess labour will be absorbed by other sectors like the processed food and manufacturing sectors. Both poor and non poor households will enjoy higher income and consumption as national wage rate increases. Result from the welfare impact, though positive, shows that non poor households will be more favoured since they are better positioned financially to meet investment demand need for higher production.

The study also show that shocks on the world export prices of the agricultural and processed food sectors can have strong consequences on the performance of the sectors in particular and the economy in general. Although a 10% rise in export price increased total output, higher price increase of up to 20% could lead to a reduction in output, GDP and total export leading to loss of income and welfare for households. Welfare analysis shows that increase in the export price of agricultural and processed food export will lead to a

decrease in the welfare of poor households due to a fall in their income and consumption levels. On the other hand, rich households will enjoy a better welfare with price increase.

When the prices of agricultural and processed exports fall, total output decreases leading to a decline in national investment and capital demand. GDP and government revenue falls. Total import declines as more production resources are reallocated to the production of domestic goods. The economy also witnesses a decline in Total household income both in the medium and long terms as national wage rate also declines. Analysis of the impact on household groups shows that income, consumption and savings of both poor and non poor households are negatively impacted. EV results show that welfare of poor households is worse when compared to non poor households. The processed food sector shows more resilience to falling price of export when compared to agricultural sector.

Based on the research findings obtained from this study, a few recommendations are suggested:

1. Government should provide targeted assistance to rural farmers to enable them benefit from the export market
2. Develop the agro processing subsector to encourage export of value added products rather than raw commodities
3. Implement price support scheme to cushion the effect of export price volatility
4. Policies that mandate a certain level of processing before export should be considered by government
5. Government should invest heavily in R&D of modern agricultural processing techniques to enhance domestic processing capacity

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