IMPACT OF AGRICULTURAL TRANSFORMATION AGENDA ON RICE FARMERS' INCOME IN NORTH-CENTRAL ZONE OF NIGERIA

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ABSTRACT
The study was carried out to analyze the impact of agricultural transformation agenda (ATA) on the income of rice farmers in North central zone of Nigeria. A multi-stage sampling procedure was used to select 992 rice farmers comprising 429 respondents from beneficiaries and 563 from the non-beneficiaries. Primary data were collected on prices of variable inputs of beneficiaries and non-beneficiaries and constraints using structured questionnaire and interview schedule. Data were analyzed using descriptive statistics, net farm income analysis, two sample t-test and propensity score matching. The net farm income (NFI) for ATA beneficiaries and non-beneficiaries was ₦47,241.42/ha and ₦38,935.35/ha, respectively, an indication that rice production was profitable in the study area. The mean test revealed P≤0.01 statistical difference in the input used by beneficiaries and non-beneficiaries. The impact of agricultural transformation program on beneficiaries' income showed a statistically significant difference between the beneficiaries and non-beneficiaries. It was concluded that the ATA program had an impact on the beneficiaries' income thereby enhanced an increased livelihood of the farmers. It was recommended that governments should make provisions for early delivery of agricultural inputs.

Keywords: Agricultural Transformation, Impact, Net farm Income, Nigeria, Rice Farmers.

INTRODUCTION
Nigerian farmers cultivate many staple food crops, but rice is the most important staple food crop in Nigerian diets (Awotide *et al*., 2015). It is a crop that is highly important in the attainment of national food security and for eradication of rural poverty and overall economic growth. For several decades, successive Nigerian government have tried to avert any food insecurity crisis that could be engendered by rice scarcity. One of the adopted strategies is the huge importation of rice from other notable rice exporting countries across the globe. It was however realized that this approach takes so much foreign exchange from the external foreign reserve and it is also not a sustainable approach. Hence, to curtail rice importation, successive Nigerian governments have adopted many trade policies such as increase in tariff, ban and unban of rice importation and import quota (Awotide *et al*., 2015).
The Nigerian government over the years has formulated and used various policy instruments and interventions to boost local production, reduce the volume of imports and reduce external shocks. Some of these measures includes Operation Feed the Nation (OFN) in 1976, government provided inputs subsidies; Abakaliki Rice Project (1978) was established for rice production and processing; Green Revolution (GR) in 1980, government ensured provision of agricultural input and favourable pricing policy for the agricultural products, import restrictions, tariff restriction, input subsidies and ban on imports. Also, the inauguration of Presidential Task Force (PTF) on rice (1986-1995). The Federal, State and Local government

have all been involved in fertilizer procurement, distribution and the subsidizing of fertilizer at various times through the State Agricultural Ministries and/or Agricultural Development Projects (ADPs) prior to 1996. These policies were put in place to stimulate local production and make local rice more competitive. In 2002, the Federal Government set up a presidential initiative on rice production with the aim to become rice sufficient in 2007 (Daramola, 2005). In-spite of these numerous programmes, the exiting rice production potential has not yet been realized, as smallholder (small-scale, subsistence and *fadama* farmers) output is inadequate and paddy rice processing is still sub-standard.

The effort to make the country become rice self-sufficient was again renewed in 2010 which led to the formal lunch of the rice transformation strategy, the GESS under the Agricultural Transformation Agenda (ATA). The Growth Enhancement Support Scheme (GESS) is one of the many critical components of the Federal Government's Agricultural Transformation Agenda (ATA). It was designed for the specific purpose of providing affordable agricultural inputs like fertilizers and hybrid seeds to farmers in order to increase their yields per hectare and make it comparable to world standards (Nasta, 2013). Despite the vast potentials for rice production in Nigeria, the persistence of a demand and supply gap has been attributed to several factors, the vast majorities of these farmers have limited access to modern inputs and other productive resources, unable to apply optimally farm inputs as recommended by research institutes and are unlikely to have access to pesticides, fertilizers, hybrid seeds and irrigation at affordable prices without some form of public sector intervention. Rural financial services are still scarce and the rural finance policies implemented by Nigeria some decades ago have not yielded the desired impact on the wellbeing and productivity of smallholder farmers. These factors coupled with the use of low external inputs have been responsible for the low rice productivity in Nigeria which is brought about importation of produce to the country either legally or illegally (Ositanwosu and Qiquan, 2016).

Although several studies have been carried out on the rice sub-sector in Nigeria with little or no much attention has been focused on the income of rice farmers under ATA programmes. Therefore, the study seeks to examine the impact of ATA programme on rice farmers' income in North-central Nigeria. While the specific objectives were to: estimate the net farm income of the beneficiaries and non-beneficiaries rice farmers; identify the constraints that exit in rice production (ATA) in Nigeria.

MATERIALS AND METHODS
The Study Area

The study was conducted in some selected states in North-Central of Nigeria which includes Benue, Nassarawa and Niger State. The temperature throughout the year in the area ranges from 28°C-34°C and the annual rainfall varies from 1500 mm to 1200 mm. The rainfall decreases in amount and distribution from the southern to the northern part of the zone. The north-central zone has a total land area of 281,796 km^2 representing almost 30 percent of the country's total land area. It is situated between latitude 110^0 20'. Benue State has an estimated population of 4,253,641 (NPC, 2006). The estimated projected population of the State at 3% growth rate per annum in 2014 is 5,348,001. Nassarawa State has an estimated population of 1,863,275 (NPC, 2006). The estimated total population of the State at 1.33% growth rate per annum in 2015 was 2,235,275 million. Niger State estimated projected population at 3% growth rate per annum in 2014 is 4,898,309 (NPC,2006). The total arable land in the zone is estimated at 23.2 million hectares, but only 5.9 million hectares is under cultivation annually. The crops grown include maize, rice, guinea corn, millet, cowpea, soya beans and tuber crops

such as cassava, yam, irish potato, sweet potato and cocoyam. The zone also keep livestock such as sheep, goat, pigs as well as poultry and artisanal fishing is also done.

Sampling Techniques

A multi-stage sample technique was used to select the sample size of the beneficiaries and non-beneficiaries in the study area. The first stage involves purposive selection of three states namely Benue, Nassarawa and Niger State because of their relative economic advantage in rice production. The major agricultural zones producing rice was considered in each state. In stage two, 40% of the Local Government Areas in each zone were purposively selected namely Kwande, Katisna-Ala and Ukum (Benue State), Lavun, Badeggi and Gbako (Niger State), Lafia and Doma (Nassarawa State). This gave a total of eight Local Government Areas (LGAs) that were used for the study. In stage three, 30% of the districts in each Local Government Area (LGA) were selected making a total of 10 districts. The fourth stage involved selection of 40% of the villages from each district, giving a total of 51 villages. In stage five, a list of farmers (sampling frame) under the growth enhancement support scheme (GESS) in each State was obtained from the state ministry of Agriculture, which is the ministry mandated to oversee and supervise the implementation of the scheme in the state. From the list of the population, simple random sampling was used to select 10% of the rice farmers in the selected villages to give a total sample size of 992. The rice beneficiaries comprise 429 farmers while the non-beneficiaries comprise 563 farmers.

Data Collection

Primary data were used for this study. A structured open and closed ended questionnaire and oral interview was used in collecting primary data from the beneficiaries and non-beneficiaries rice farmers.

Analytical Techniques

This study employed the following analytical tool; Net farm income, Two Sample test and Propensity Score Matching (PSM) was used.

1. Farm budget: Farm budget is a detailed physical and financial plan for the operation of a farm for a certain period (Olukosi and Erhabor, 2004). Since the fixed cost variables were considered in the study, net farm income of farm budgeting technique was used in the study as:

$$NFI = GFI - TVC - TFC \qquad \qquad \dots(1)$$

where;
NFI = Net farm income
GFI = Gross farm income
TVC = Total variable cost
TFC = Total fixed cost

The fixed cost is the depreciation for farm tools used by the farmer (hoes, cutlasses, tractor, knapsack sprayers, threshing machine and milling machine). The straight line method of depreciation was used to calculate the rate of depreciation. Depreciation by this method is the difference between the purchase price (P) and the salvage value (S) divided by the number of years of the life of the asset (n).

2. Two sample t-test: The two sample test was used to derive the mean test of all the input parameter.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{S^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)} \qquad \qquad \dots(2)$$

$$S^2 = \frac{\sum_{i=1}^{n_1}(x_i - \bar{x}_1)^2 + \sum_{j=1}^{n_2}(x_j - \bar{x}_2)^2}{n_1 + n_2 - 2}$$ ...(3)

where;

x bar 1 and x bar 2 = the sample mean

S^2 = the pooled sample variance n_1 and n_2 are the sample sizes

t = Respondent t quantile with n_1+n_2-2 degree of freedom.

3. Propensity score match (PSM): The most common evaluation parameter of interest is the Average Treatment Effect on the treated (ATE), which is defined as:

4.

$$ATE = E(Y_1 - Y_0 / P = 1) = E(Y_1 / P = 1) - E(Y_0 / P = 1)$$ ...(4)

The propensity score is the probability of the beneficiary for farm household (Pufahl and Weiss, 2009). The propensity scores are derived from the regression models in which these characteristics were compared. The impact of treatment on the treated (causal effect of project on the beneficiaries) was estimated by computing the differences across both groups:

$$ATE = 1/N_1(Y_1 - Y_0)$$ …(5)

where;

ATE = Average Treatment Effect on the treated,

N_1 = Number of matches (from regression model),

Y_1 = net farm income as proxy for farmers' income,

Y_0 = net farm income as proxy for farmers' income. A positive (negative) value suggests that farm household beneficiaries in the project have higher (lower) outcome variable than non-beneficiaries.

RESULTS AND DISCUSSION
Net Farm Income of the Respondents

Total cost of production per hectare of beneficiaries and non-beneficiaries were ₦42,351.12/ha and ₦37,409.27/ha, respectively (Table 1). The total cost incurred by the beneficiaries was higher than that of the non-beneficiaries. The cost of seeds and fertilizers of beneficiaries was higher than that of non-beneficiaries. This was due to the fact that beneficiaries used some of the provisions of inputs from ATA programme to acquire and/or expand their farmlands in other to have a larger output. This result compared favourably with Osondu *et al.* (2015). Furthermore, the cost of labour of beneficiaries was higher than that of the non-beneficiaries. This could be inferred that the programme impacted more on the beneficiaries due to the expansion of farm land. This is in line with Ogbonna and Nwaobiala (2014) who reported similar result of higher cost of labour on participant of agricultural programme.

Table 1: Estimated Costs and Returns of Rice Production

Items	Beneficiaries		Non-beneficiaries	
Variable costs	**Cost (₦)/ha**	**% contribution**	**Cost (₦)/ha**	**% contribution**
Cost of seed	15,524.80	42	12,896.80	39
Cost of fertilizer	17,203.45	46	15,479.26	47
Cost of agrochemical	3,775.73	10	3,899.07	12
Cost of labour	858.59	2	720.82	2
Total variable cost	37,362.57	100	32,995.94	100
Fixed cost (FC)				
Rent on land	1,409.46	28	1,217.86	27
Depreciation on				
Cutlass	373.53	7	466.52	10
Hoe	573.15	11	674.93	15
Tractor	414.92	8	103.94	2
Knapsack sprayer	704.20	14	467.55	10
Threshing machine	139.86	3	261.11	6
Milling machine	1,373.43	28	1,302.42	29
Total fixed cost (TFC)	4,988.55	100	4,494.32	100
Total cost of production (TCP)	42,351.12		37,490.27	
Gross income (GI)	89,592.54		76,425.62	
Gross margin (GM)	52,229.97		43,429.67	
Net farm income (NFI)	47,241.42		38,935.35	
Gross ratio (TCP/GI)	0.47		0.49	
Operating ratio (TVP/GI)	0.42		0.43	
Return on naira invested (GI-TC/TC)	1.12		1.04	

Source: Field Survey, 2018

In Table 1, the total revenue was ₦89,592.54 and ₦76,425.62/ha for beneficiaries and non-beneficiaries, respectively. The total revenue obtained by the beneficiaries was higher than that of the non-beneficiaries. This is because of the increase in the output of the beneficiaries. The net farm income (NFI) for ATA beneficiaries and non- beneficiaries was ₦47,241.42/ha and ₦38,935.35/ha, respectively, this was attributed to the increase in farm output realized by the beneficiaries. The result indicates that rice production is profitable in the study area. The return on investment for ATA beneficiaries and non-beneficiaries is ₦1.12 and ₦1.04, respectively. The interpretation of this result for ATA beneficiaries is that for every ₦1.00 invested, ₦1.12k is their profit while for the non-beneficiaries, for every ₦1.00 invested, ₦1.04k is their profit. Beneficiaries' profitability index is higher because they could have been taught better techniques in farming which had impacted on their yield and revenue.

Mean Test of Cost Input Used in Rice Production

The mean test of all the cost input parameters used in rice production in the study area showed 1% level of significance in the mean difference of cost of seed, rent on land, cost of tractor, knapsack sprayer, threshing and milling among beneficiaries and non-beneficiaries of rice farmers (Table 2).This means that the cost used for seed, rent on land, tractor, knapsack sprayer, threshing and milling where higher among beneficiaries than non-beneficiaries. This implies that during the ATA program beneficiaries had to increase their farm size which had an effect on the cost of rent of land. Furthermore, due to the increase in farm-size, there was

an increase in the usage of seed this is because farmers bought additional seed input to use on their land but due to the program the seed input were subsidized to farmers. Also, during the ATA program, the beneficiaries used more tractor, knapsack sprayer due to increase in farm-size by the farmers. Threshing and milling machine were also used more, this is because increase in farm-size of the beneficiaries resulted to a larger output of rice.

Table 2: Mean Test of the Cost of Inputs used Rice Production

Inputs	Beneficiaries	Non-beneficiaries	Significance
cost of seed	33172.6	23337.9	0.000
cost of fertilizer	34074.94	34074.94	0.500
cost of agrochemical	8589.038	9051.423	0.818
cost of labour	1687.919	1686.387	0.478
Rent on land	7874.049	5309.89	0.000
Cost of Cutlass	1927.036	2705.839	0.965
Cost of Hoe	631.7673	3024.58	1.000
Cost of Tractor	41973.63	3974.30	0.000
Cost of Knapsack sprayer	256966.40	11187.86	0.000
Cost of Threshing	13385.46	940.70	0.000
Cost of Milling	165482.80	17677.75	0.000

Source: Field Survey, 2018

Impact of ATA on Income from Rice Production

The impact of ATA on farmer's income from the rice production is also estimated using the NNM and RM techniques. The result is presented in Table 3. The result of the ATE (NNM and RM) reveals significant increase by ₦204232.075 and ₦213803.015, respectively, which is higher than their counterpart. The increased cash incomes can be convincingly attributed to the fact that the ATA programme focused on assisting smallholder farmers in the study area which is part of the transformation agenda of the intervention, to develop profitable and resource efficient agro-enterprises in order to meet the market standard.

The results of the NNM and RM (Table 3) also shows that income of the ATA beneficiaries has a positive sign and statistically significant at 1% probability level. This means that ATA programme had an impact on the income of beneficiaries than the non-beneficiaries in the study areas. Therefore, the null hypothesis is rejected. This is in agreement with Awotide *et al.* (2015) work on the impact of agro-industrial development strategies on smallholder rice farmers' productivity, income and poverty in Nigeria which was observed that the programme had an impact on contract farming in the study area. Furthermore, it agrees with Nwachukwu and Ezeh (2007) in a work titled impact of selected rural development programmes on poverty alleviation in Abia State, Nigeria who reported a positive and significant impact.

Table 3: Estimate of the Impact of ATA Programme on Farmer's Income on Farmers

Estimation	Beneficiaries	Non-beneficiaries	Difference	Std. error	T-value
Nearest Neighbor matching					
Unmatched	669415.951	493417.009	175998.942	44569.099	3.950
ATE	669415.951	465183.876	204232.075	61258.130	3.330***
Radius matching					
Unmatched	669415.951	493417.009	175998.942	44569.099	3.950
ATE	671570.008	457766.993	213803.015	52333.573	4.090***

Note: *** Significant at 1% level of probability
Source: Field Survey, 2018

CONCLUSION AND RECOMMEDATION

The study concludes that net-farm income of beneficiaries and non-beneficiaries rice farmers was ₦47241.42/ha and ₦38,935.35/ha, therefore, rice production is profitable in the study area. The return on investment for ATA beneficiaries and non-beneficiaries was ₦1.12 and ₦1.01. However, the ATA programme had significant impact on the income of beneficiaries than the non-beneficiaries in the study area. Hence, the null hypothesis with regards to no impact of ATA on beneficiaries' income is rejected. Also, the major constraint faced by beneficiaries of ATA in rice production includes delay in delivery of inputs, unstable market prices, lack of extension agent and inadequate credit facilities. It was recommended that efforts should be intensified by the government and the input suppliers in planning and delivery of inputs ahead of the planting season in other to discourage late arrival of inputs.

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