

LONGITUDINAL AND CROSS SECTIONAL MIX DATA APPROACH TO IMPACT ASSESSMENT: A CASE STUDY OF COMMUNITY BASED NATURAL RESOURCE MANAGEMENT PROGRAMME, NIGERIA.

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Abstract

The study employed longitudinal and cross-sectional mix data approach, “before and after”, “with and without” technique in assessing the impact of IFAD Assisted Community Based Natural Resource Management Programme on the socio-economic livelihood, including agricultural productivity, nutrition and job creation potentials of the beneficiaries. Multi-stage sampling was employed to elicit responses from 1,928 households in 64 communities covering 9 participating states in the Niger-Delta Region of Nigeria. The Component Index Analysis, Productivity Index and Double Differencing techniques were employed for data analysis. The Component Index Analysis revealed that even though beneficiaries were of better wealth standing compared to non-beneficiaries, inequalities were observed within the ranks of targeted beneficiaries. Also, direct enterprise productivity impact of programme on beneficiaries was 61.1%, 203.3% and 30.1% for crops, livestock and fisheries respectively. Programme impact on food consumed was 21.4% while 84.95% of the beneficiaries observed improved nutrition compared to 67.7% under control group. About 47,454 jobs were created with crop sub-sector accounting for about 75% of the total. The study concluded that the programme impacted on the socio-economic livelihood of beneficiaries, although, impact varied within the rank and file of beneficiaries.

Key Words: *Impact, Livelihood, Productivity, Nutrition, Job-creation, Socio-economic*

Introduction

Nigeria, being the largest economy in Africa and 26th in the world in terms of magnitude of the economy, with a nominal Gross Domestic Product (GDP) of \$USD 510 billion and an average growth rate of between 6% and 7%; its per capital GDP, a measure of economic livelihood, ironically stands at

\$2,688, thus placing it on 121st position in the world economy. Available data from National Bureau of Statistics indicated that relative poverty head count for Nigeria increased sharply from 1980 to 2010 by about 153.7 percent within thirty years (NBS, 2011). Also, the proportion of Nigerians living in poverty is increasing yearly, with

the rural population accounting for 62 percent of this figure. AfDB (2013) also noted that economic growth in Nigeria has not translated into job creation or poverty alleviation. According to AfDB Africa outlook, unemployment increased from 21% in 2010 to 24% in 2011 because the sectors driving the economic growth are not high job-creating sectors. It further observed that economic growth was not accompanied by a structural change of the Nigerian economy. Akinwunmi (2011) observed that about 4 million unemployed young people enter the workforce annually. The FGN in its 1999-2003 economic policy had placed emphasis on poverty reduction and revitalization of the non-oil sectors, particularly agriculture and fisheries while the Rural Development Strategy (RDS) launched in 2001 involved a participatory community development approach with the aim of transferring resources to rural households and developing local communities. IFAD Assisted Community Based Natural Resource Management Programme (CBNRMP-ND) in Niger Delta is a poverty alleviation programme consistent with IFAD's Country Strategic Opportunities Paper (COSOP) for Nigeria and Country's rural and economic development policies. The Programme is a community-based, people centered intervention, with emphasis on the needs of women, youth, core poor households and other vulnerable groups in the nine (9) states of Niger Delta region (Figure 1), namely: Abia, Akwa-Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers (CBNRMP-ND, 2010).

The objectives of this study are as follows: (i) assess improvement in the socio-economic wellbeing of the respondents; (ii) ascertain the impact of the programme on agricultural productivity; (iii) determine the impact of programme on food security and (iv) estimate jobs created by programme. The study is justified given that over the past

eight years, CBNRMP-ND carried out a number of activities cutting across programme components and sub-components and as such in view of the impending programme restructuring and redesign, the key stakeholders will be desirous of information to facilitate scaling-up and replication of successful activities while weeding out unsuccessful ones.

Before the commencement of the CBNRMP-ND in 2005, unemployment rate in the Niger-Delta Region like in most parts of Nigeria was spiralling, driven by the wave of millions of young people entering the workforce every year with only a small fraction able to find formal employment. This development arising from long years of neglect resulted in many consequences including, high unemployment for increasing youth of the Niger Delta region, lack of food security, high poverty rate, in-equality, non inclusive and poor economic growth. In view of these developments, various social vices were the order of the day, including cultism, armed robbery, militancy, kidnapping for ransom and assassination. This prompted vital research question from stakeholders following extended period of implementation bordering on the impact of the programme.

The study is justified given that since over 8 years of implementation, numerous socio-economic and livelihood activities have been undertaken by the programme which were expected to have impacted on beneficiaries. Thus, without prejudice to the on-going programme re-structuring and anticipated programme exit, stakeholders are desirous of the impact of the programme for possible replication and up-scaling.

Hypothesis Tested

The hypothesis put forward under this study were as follows:

Ho: The socio-economic wellbeing of beneficiaries was better than that of non-beneficiaries of the programme

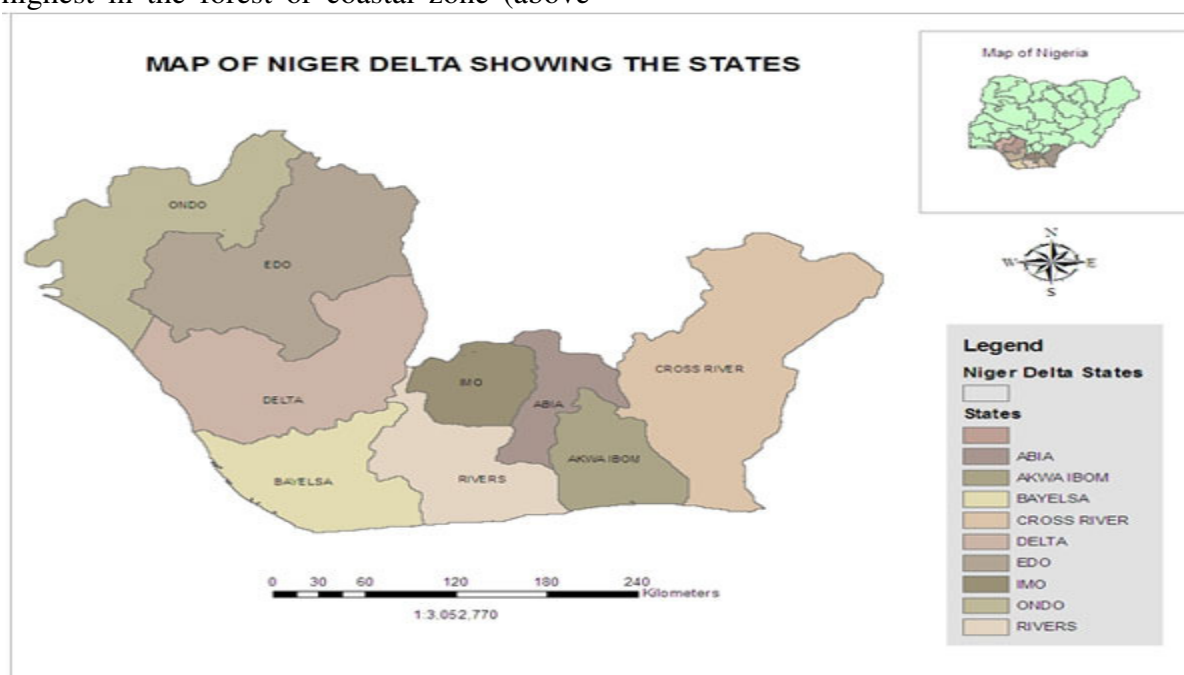
Ha: The socio-economic wellbeing of beneficiaries was not better than that of non-beneficiaries of the programme

Methodology

Study Area

The Niger Delta agro ecological zone covers the coastal plain and rain forest belt in the southern parts, to derived savanna and highlands in the northern parts. The region has a tropical humid climate characterized by distinct wet and dry seasons. The coastal region and northern region have about 9-10 months and 7-8 months of wet seasons respectively. Rainfall is lowest in the Northern Zone (less than 170 mm) and highest in the forest or coastal zone (above

(3,000mm), with the dry months having less than 60 mm of rainfall. The driest months have less than 29 mm of rainfall. Dry season starts in November and terminates by February. At this time, wind becomes dry and dusty resulting in harmattan haze which characterizes the period. There is very little or no rainfall with cooler nights, low relative humidity, less cloud cover and increased incipient solar radiation resulting in hotter days (Figure 1). Mean annual temperature of the region is between 21°C and 29°C on the Hilly and Plateau areas of the region. Annual rainfall distribution varies throughout the region (CBNRMP, 2008).



Source: Robinson, T. S. (2009). Challenges of Mapping Applications in Health and Academic Research in the underdeveloped World - Case Study of The Niger Delta Region (Nigeria)

Figure 1: Map of Niger-Delta Region, Nigeria

Sampling Design and Data Collection

Theory based Impact evaluation technique, quantitative, evidence-based and qualitative approaches were applied for the study. The data were gathered through direct observations, focus group discussions through in-depth interviews and

administration of household and community questionnaires. Respondents from both the participating and non-participating communities in the States were selected through a multi-stage sampling approach. The Local Government Area (LGA) and community sampling frames were the list of

participating and non-participating LGAs and communities in each of the programme states. The first stage of sampling covers the random selection of 3 - 4 LGAs in each state (2 each from the participating and non-participating LGAs). For the second stage of sampling, a community was randomly selected from beneficiary and non-beneficiary communities in each of the selected LGA (Figure 2). Thereafter, 30 households were selected using the random walk method in each of the selected communities, and enumerators were instructed to ensure that at least 30% of the households interviewed were female-headed

or belonged to vulnerable and/or physically challenged category. In each state, 6 - 8 communities were ultimately selected for community/focus group interview and 180 - 240 households for household interview. A total of 64 communities and 1,928 households were interviewed in the 9 states covered. While households in survey were identified with the assistance of the village/community leaders, communities covered in the survey had their geo-coordinates determined by the Global Positioning System (GPS) instrument (Figure 2).

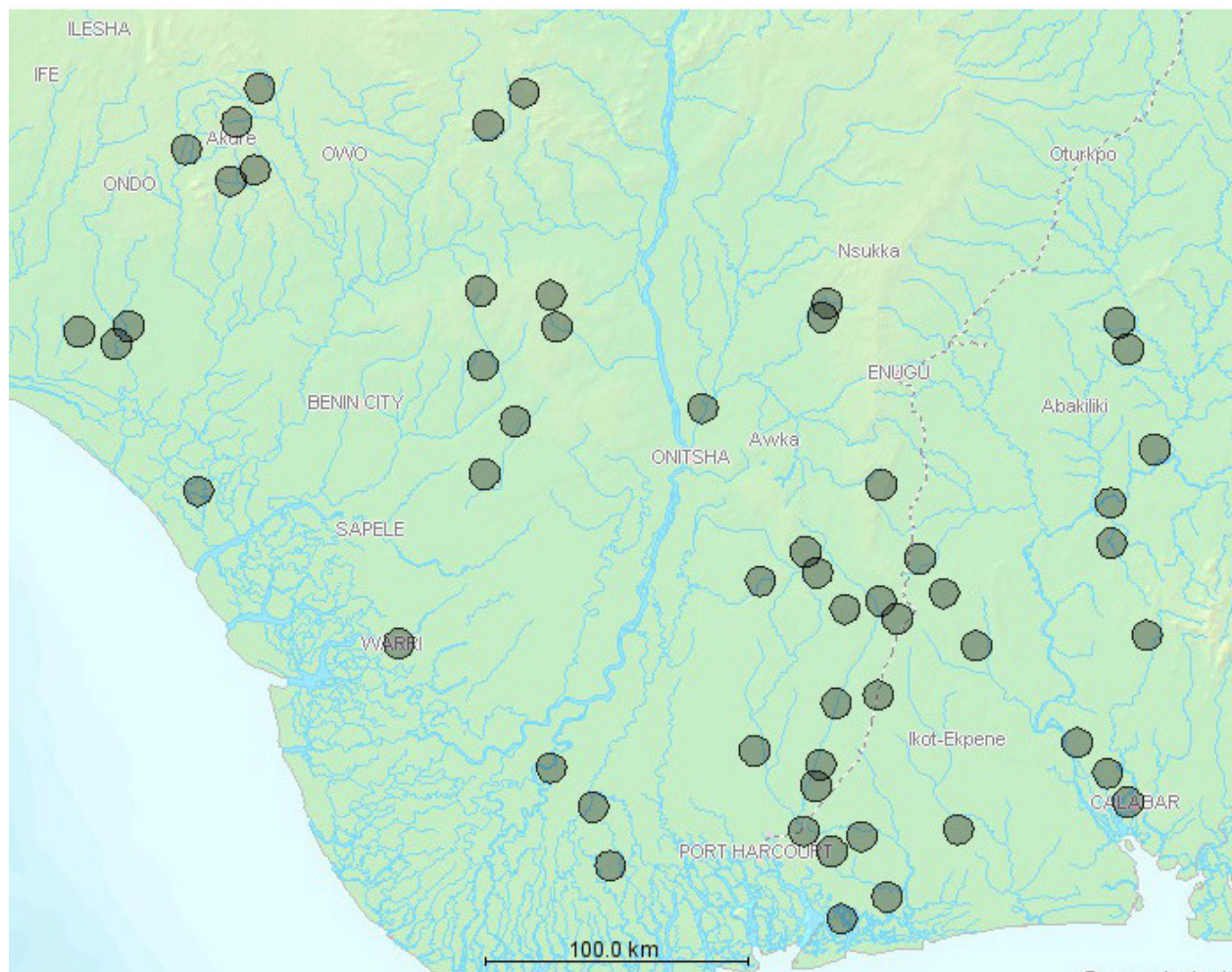


Figure 2: GPS Locations of Sampled Communities, 2014

Analytical Technique and Model Specification

To effectively capture the requirements of the study's objectives, descriptive and inferential statistics were employed to deduce and explain programme's impact on participants. This entailed content analysis, double differencing, graphical and tabular presentations, the use of t-test to ascertain significance of impact. The productivity index and principal component analytical tools were also used to deduce productivity and assess level of improvement in socio-economic well-being of respondents.

Model Specification:

Principal Component Analysis Model

This study employed Principal Component Analysis (PCA) used by Filmer and Pritchette, 1998 and Prakongsai (2007) to compare improvement in socio-economic well-being of sampled programme beneficiaries and non-beneficiaries (Objective 1). The Principal Component Analysis (PCA) is very similar to factor analysis. According Prakongsai (2007), the technique can determine the weight as a factor score for each asset variable. It seeks a linear combination of variables such that maximum variance is extracted from variables. It then removes this variance and seeks a second linear combination which explains the maximum proportion of remaining variance, and so on. This is called the Principal Axis Method and results in orthogonal (uncorrelated) factors. The output of the asset index obtained from PCA for each household asset can be obtained with the following formula:

$$A_j = f_1(a_{j1}-a_1) / (s_1) + \dots + f_n(a_{jn} - a_n) / (s_n)$$

Where:

A_j is an asset index for each household ($j = 1, \dots, n$)

f_i is the scoring factor for each durable asset of household ($i = 1, \dots, n$)

a_{ji} is the i th asset of j th household ($i, j = 1, \dots, n$)

a_i is the mean of i th asset of household ($i = 1, \dots, n$)

s_i is the standard deviation of i th asset of household ($i = 1, \dots, n$)

Z is the standardized variables of each household

The Asset Index analysis was used to compare improvement in socio-economic well-beings of sampled programme beneficiaries and non-beneficiaries. Specifically, the analysis was used as a proxy to measure household living standards, given peculiar problems in generating accurate household income data.

Productivity Index

This tool was employed to ascertain productivity. The model was specified thus:

$$\text{Productivity (Kg/Ha)} = P_1 \text{ (Kg)} / A_1 \text{ (Ha)} \dots \dots \dots (1)$$

Where:

P_1 = Output of i th Farmer in Kilogram

A_1 = Area of Farm-land Cultivated in Hectares

Double Differencing (DD₂) Model

$$D_{1Yr1p} - D_{1Ymp} = DD_b$$

$$D_{1Yr1c} - D_{1Ymc} = DD_c$$

$$DD_b - DD_c = DD_2$$

Where:

D_{1Yr1p} - Achievement Base Year for Programme Beneficiaries

D_{1Ymp} - Achievement Assessment Year for Programme Beneficiaries

DD_b - Difference between Base Year and Assessment Year for Programme Beneficiaries

D_{1Yr1c} - Achievement Base Year for Control Group

D_{1Yrnc} - Achievement Assessment Year for Control Group

DD_c - Difference between Base Year and Assessment Year for Control

DD₂ - Difference between DD_b and DD_c

Results and Discussions

Improvement in Socio-economic Well-being of Programme Beneficiaries

In line with a priori expectations, households with high economic status tended to have assets with high factor scores while those with low factor scores are associated

with low economic status. The asset-based measure depicts a household's long-run economic status and does not necessarily account for short term fluctuations in economic well-being or economic shock. The index takes into consideration the distribution of assets in the participating and non-participating communities in order to reflect economic conditions of each group (Beneficiaries or Non-beneficiaries). In all, 22 assets (home and production) were considered for analysis (Table1). A higher Asset Index represents a higher level of livelihood improvement.

Table 1: Assets ownership and Index Score in 2013

Assets	Owning Assets (%)		Asset Index score	
	Beneficiaries	Non-Beneficiaries	Beneficiaries	Non-Beneficiaries
Radio	78.4	78.9	0.1472	0.2597
Television	70.4	61.7	1.0450	0.2480
Refrigerator	34.1	26.1	0.1830	0.0261
Dvd/vcd	66.8	51.1	-0.2492	0.2668
Gsm handset	78.1	71.7	2.4995	0.1958
Landline phone	6.2	6.1	0.2786	0.6049
Bicycle	30.4	30.7	-0.0172	0.4693
Motorcycle	36.0	32.9	1.0372	0.5810
Car	10.1	7.5	7.7351	-0.2326
Truck/lorry	0.9	1.2	5.8169	1.5846
Pickup van	1.4	1.5	1.2631	1.2886
Storage facility	1.3	1.8	0.6676	1.1456
Water pump	12.6	10.5	4.6162	-0.6592
Tractor	1.3	1.8	7.4900	2.2240
Tractor implements	1.0	2.2	2.4570	2.0004
B-hole/t-well/w-bores	6.4	2.7	2.3611	0.4086
Dugout canoe	6.4	2.7	4.3674	1.1962
Motorized engine boat	3.5	4.8	5.6240	1.6550
Lumberjack	1.5	2.3	1.8172	1.6867
Cast net	9.7	10.1	1.9612	1.2455
Crop proc. Machine	8.5	4.8	0.2994	0.2963
Personal electr. Source	45.7	33.4	2.3	0.2806
Mean	23.2	20.3	2.4	0.8

The analysis showed that beneficiaries had more production related assets compared to non-beneficiaries (Figure 3). Households that owned assets such as trucks, pick-up van, tractor parts and Lumber-jack had higher

Asset Index Score than those without it. The result further indicates that the programme beneficiaries, given their wealth status advantage may be in a position to liquidate asset in order to access food compared to

non-beneficiaries. This result is in tandem with findings of the external evaluation of the National Special Programme on Food security which observed improved access of programme beneficiaries to irrigation facilities and infrastructure compared to the non-beneficiaries, even though access to

processing asset was almost equal for the two groups (PCU, 2008). CBARDP (2013) also observed increment in assets like radio, television, mobile phones, music sets, beddings and house properties for programme beneficiaries.

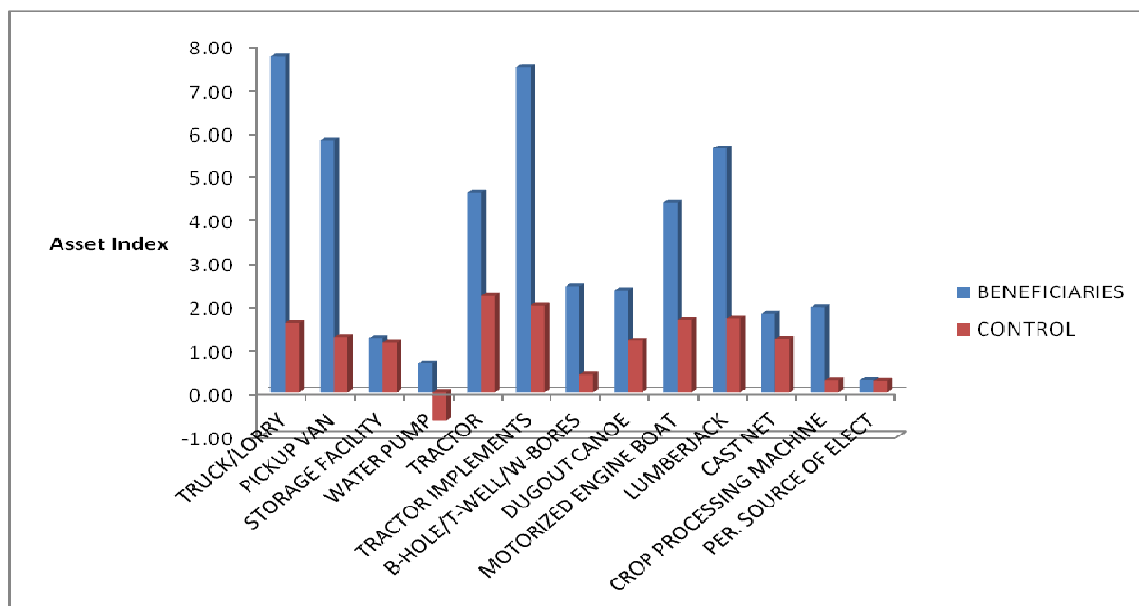


Figure 3: Status of production asset index between beneficiaries and control in 2013

To further ascertain presence of inequality and assess the trend of well-being among programme beneficiaries, sampled households were categorized into five quintiles from the core poor to the fairly well off using principal component analysis approach. The review of the 2013 component analysis results showed that individuals in the fifth quintile unambiguously show much higher level of wealth than the rest of beneficiaries' population. For instance, 69.7%, 65.2% and 55.6% of those in fifth quintile under the programme beneficiaries owned water pump, crop processing equipment and refrigerator respectively compared to 0 %, 3.0 % and 1.6 % obtained

in the first quintile during 2013 (Table 2). The ensuing results revealed that there were still some levels of inequalities within targeted beneficiaries of the programme. Even though beneficiaries of the programmes were of better wealth standing compared to non-beneficiaries as reflected by increasing and high average index score; the well-being within the core poor (first quintile) which is supposed to be the primary target of the programme was not superior to that of non-beneficiaries. The aforementioned result confirms the null hypothesis of this study which stated that the well-being of the beneficiaries was better than that of non-beneficiaries.

Table 2: Beneficiaries' Asset Index Quintiles

Assets	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
Radio	0.9	29.8	20.7	23.2	25.4
Television	0	1.3	7.3	41.5	49.8
Refrigerator	0	0	1.7	17.6	80.7
Dvd/vcd	0	0.8	9.5	36.4	53.4
Gsm handset	0	4.1	20.5	31.4	44
Landline phone	11.1	11.1	33.3	33.3	11.1
Bicycle	4.6	15.2	23.4	20.8	36
Motorcycle	0	1.3	20.9	21.5	56.3
Car	0	0	2.8	8.3	88.9
Truck/lorry	0	0	0	0	100
Pickup van	0	0	12.5	12.5	75
Storage facility	0	0	15.6	28.1	56.2
Water pump	0	0	0	18.2	81.8
Tractor	0	0	100	0	0
B-hole/t-well/w-bores	0	0	0	6.7	93.3
Dugout canoe	14.6	7.3	24.4	29.3	24.4
Motorized engine boat	0	11.1	44.4	11.1	33.3
Lumberjack	0	0	40	20	40
Cast net	12.2	12.2	34.7	32.7	8.2
Crop processing machine	0	0	12.5	31.2	56.2
Personal electricity source	0	0	7.1	18.4	74.5

Impact on Livelihood

The study revealed that direct average productivity impact on programme beneficiaries' yields stood at an average of 61.1% in 2013 while it varied from about 45.3% for plantain to 103.5% for cassava (Table 3). Across board, cassava productivity was about 25mt/ha compared to about 12mt/ha by non-beneficiaries. Z-test of significance indicated a significant difference between the cassava productivity of the two populations under study. Similarly, average yield for rice was 3mt/ha compared to 2mt/ha reported by non-beneficiaries (Figure 4). This is higher than the 38% increase observed for rice as a result of the intervention of Community Based Agricultural and Rural Development Programme in Nigeria

(CBARDP, 2013). In Ondo State, for example, yield of cassava was higher as about 30mt/ha was recorded in some participating communities. This may not be unconnected to the trainings and improved technologies introduced by programme through Songhai Technology Transfer Station, National Root Crop Research Institute, Umudike and activities of extension components of the States' Agricultural Development Programmes. Generally, productivity figures obtained under the programme for maize (2.57mt/ha), rice (2.93mt/ha), cassava (25.3mt/ha) and yam (19.45mt/ha) were higher than the 1.72 mt/ha, 2.24 mt/ha, 13.62 mt/ha and 13.45 mt/ha national agricultural production figures obtained for Nigeria (NPFSS, 2010).

Table 3: Impact of CBNRMP-ND on beneficiaries crop productivities (Kg/ha)

Crops	2007			2012			2013		
	Beneficiary	Non-Beneficiary	% Impact	Beneficiary	Non-Beneficiary	% Impact	Beneficiary	Non-Beneficiary	% Impact
Maize	1,662	1,623	2.40	1,728	1,643	5.17	2,571	1,684	52.16
Rice	1,840	1,843	-0.16	2,314	1,894	22.18	2,933	1,921	52.68
Cassava	12,044	12,012	0.27	19,014	12,082	57.37	25,324	12,442	103.54
Yam	11,265	11,476	-1.84	16,542	11,662	41.85	19,453	11,724	65.92
Vegetables	983	987	-0.41	1,404	1,004	39.84	1,822	1,246	46.23
Plantain	5,512	5,541	-0.52	6,321	5,620	12.47	8,214	5,652	45.33
Mean			-0.04			29.81			61.06

Evidence from Table 3 also reveals some marginal increases in the productivity among the non-beneficiaries for most crops under consideration. The outreach impact is expected to be greater considering intra-communal innovation diffusion and provision of social amenities like roads, which eased intra-communal interaction and farmer-to-farmer technology dissemination.

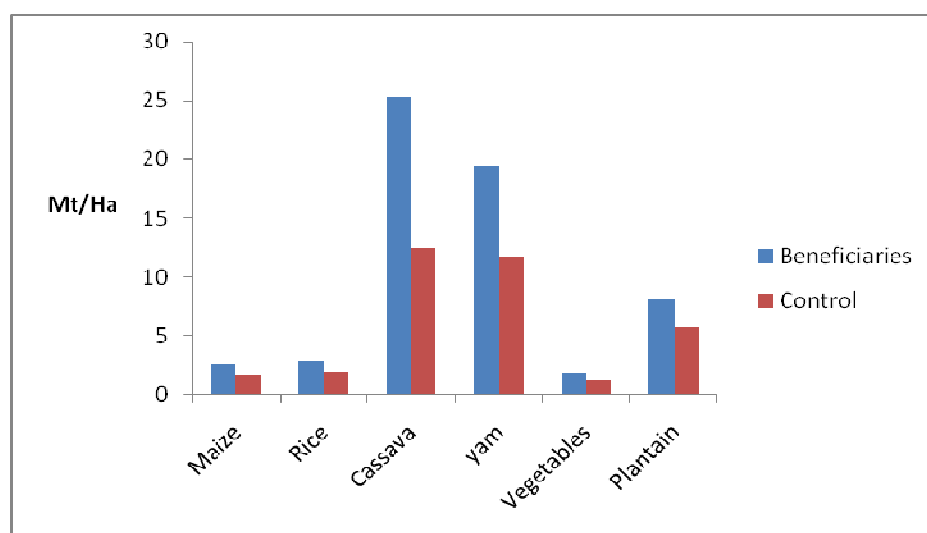


Figure 4: Impact on crop productivity as at 2013

With respect to livestock production, the positive impact was over 100% for goat, pig and poultry enterprises (Table 4). The impact was largest under poultry, thus showing the intensity of support for poultry production under the programme. The result differ from that obtained by PCU (2008) which observed that percentage of non beneficiary

households (38%) that produced poultry, goat and sheep exceeded that of the beneficiary households (30%) under the National Programme for Food Security in Nigeria; but noted that while the former maintained free range system the latter embraced intensive production system.

Table 4: Livestock production impact: mean number of livestock produced and sold by households

Livestock Type	2007			2012			2013		
	Beneficiaries	Non-Beneficiaries	% Impact	Beneficiaries	Non-Beneficiary	% Impact	Beneficiaries	Non-Beneficiaries	% Impact
Goats	2	3	-33	4	4	0	5	2	150
Sheep	1	1	0	1	2	-50	3	3	0
Pigs	11	5	120	37	4	825	28	5	460
Poultry	11	12	-8	695	29	2 296	771	35	2 103
Mean			19.7			258.3			203.3

The impact on beneficiaries' fishery production was over 20% for both aquaculture and artisanal interventions as at the close of 2013 (Table 5).

Table 5: Mean quantity of fish produced and sold by households (kg)

Fishery Enterprise	2007			2012			2013		
	Beneficiaries	Non-Beneficiaries	% Impact	Beneficiaries	Non-Beneficiary	% Impact	Beneficiaries	Non-Beneficiaries	% Impact
Aquaculture	1,472.3	781.0	88.5	1,488.85	1,110.95	34.0	1,647.83	1,314.48	25.3
Artisanal	2,376.1	1,652.6	43.8	2,524.21	1,672.58	50.9	2,184.53	1,619.5	34.9
Mean			66.1			42.5			30.1

Impact on Nutrition and Food Security

Normally, the focus of nutrition and food security impact assessment is on accessibility, affordability, sustainability and quality of nutrition, rather than the quantity. However, given that data collection domain was the household, assessment focused largely on quantity and number of meals household consumed. The assessment also ignored food purchased and consumed outside the home. The study revealed that the average household in both the participating and non-participating groups had at least 3 meals a day (Table 6). The impact of programme on food consumed is depicted by outcome of the double differencing result, where positive changes in quantities were observed for rice, garri/fufu, beans and plantain consumed by household per week (Table 7). Furthermore, with respect to quality and composition of household meals,

there were positive impacts of programme for eggs, milk, vegetables and fruits consumption (Table 8). These categories of food items are rich in vitamins A & C and many minerals such as calcium, potassium and zinc; some of these vitamins serve as sources of fibre for a healthy digestive system. The results further justify the need for intensification of farm diversification activities involving livestock and fisheries production. Table 9 further revealed that about 85% of the households interviewed affirmed that their nutritional status changed compared to 68% that reported for the non-beneficiaries (Figure 5). This result is in line with the outcome of the IFAD Assisted Community Based Agricultural and Rural Development Programme impact Assessment Study which observed improved nutrition for programme beneficiaries including children compared to the non beneficiaries (CBARDP, 2013).

Table 6: Number of meals taken daily by the households

State	2007		2013	
	Beneficiaries	non-beneficiaries	Beneficiaries	non-beneficiaries
Abia	2	3	3	3
Akwa Ibom	3	2	3	3
Bayelsa	3	3	3	3
Cross River	2	3	3	3
Delta	3	3	3	3
Edo	3	3	3	3
Imo	3	2	3	3
Ondo	3	3	3	3
Rivers	3	3	3	3
Mean	3	3	3	3

Table 7: Quantity of food items consumed per week

Crop	Beneficiaries			Non-beneficiaries			Double Difference (% impact)
	2007	2013	% Change	2007	2013	% Change	
Rice	10.82	16.61	53.5	10.83	13.53	24.9	28.6
Garri/Fufu	15.42	19.08	23.7	22.11	23.85	7.9	15.9
Yam	8.84	11.54	30.5	12.50	16.77	34.2	-3.6
Beans	6.97	11.02	58.1	7.74	10.17	31.4	26.7
Plantain	7.60	11.30	48.7	8.49	9.26	9.1	39.6
Mean			42.9			21.5	21.4

Table 8: No of meals with food items

Food	Beneficiaries			Non-Beneficiaries			Double Difference	% Impact
	2007	2013	Change	2007	2013	Change		
Meat/Fish	1.95	2.14	0.19	1.86	2.2	0.34	-0.15	-44.12
Eggs	0.61	1.02	0.41	0.67	0.96	0.29	0.12	41.38
Milk	0.72	1.12	0.4	0.76	1.01	0.25	0.15	60.00
Vegetables/Fruits	1.96	2.35	0.39	1.8	2	0.2	0.19	95.00
Rice/Yam/Garri/Fufu	1.99	2.08	0.09	2.02	2.16	0.14	-0.05	-35.71
						0.26		100

Table 9: Assessment of the nutritional status of household members (%)

Indicators	Beneficiaries	non-beneficiaries	% Difference
Improved	84.9	67.7	20.26
Declined	5.4	9.1	-68.52
Unchanged	9.1	22.6	-148.35

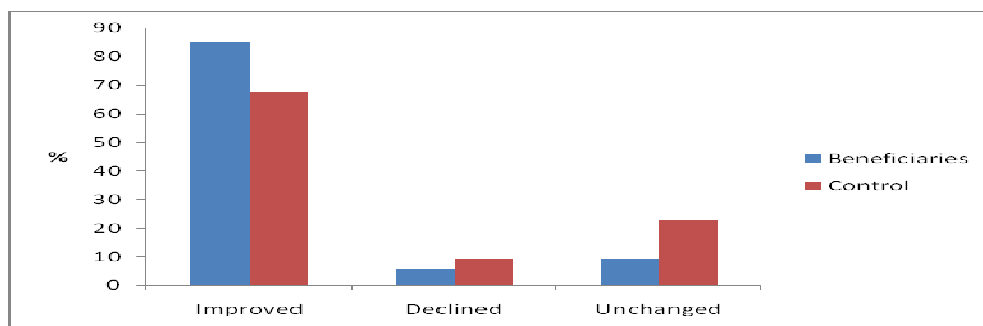


Figure 5: Assessment of nutritional status of household members

Job Creation

In line with IFAD’s definition, the creation of job within the agricultural sector is premised on any task which an individual or person performs continuously for twenty one days for the purpose of earning a wage (IFAD, 2007). The study showed that the programme impacted significantly on employment, which was put at 47,454 from all enterprises supported. The percentage impact of thematic enterprise on total employment, ranged from about 1% under non-timber and forest products to 75% for crop sub-projects (Table 10 and Figure 6). The employment created equally had some multiplier effects on the implementing states and country through poverty reduction. The employment effects could even be higher if all the enterprises were taken as completed rather than on-going concern.

Table 10: Estimated impact of programme on employment

Enterprises	Employment created (No of jobs)	% Total
Crops	35,689	75.21
Livestock	3,210	6.76
Fisheries	4,263	8.98
Agro-processing	2871	6.05
Non-Timber and Forest Products	351	0.74
Non-farm enterprises	1070	2.25
Aggregate	47,454	100

Source: CBNRMP-ND States

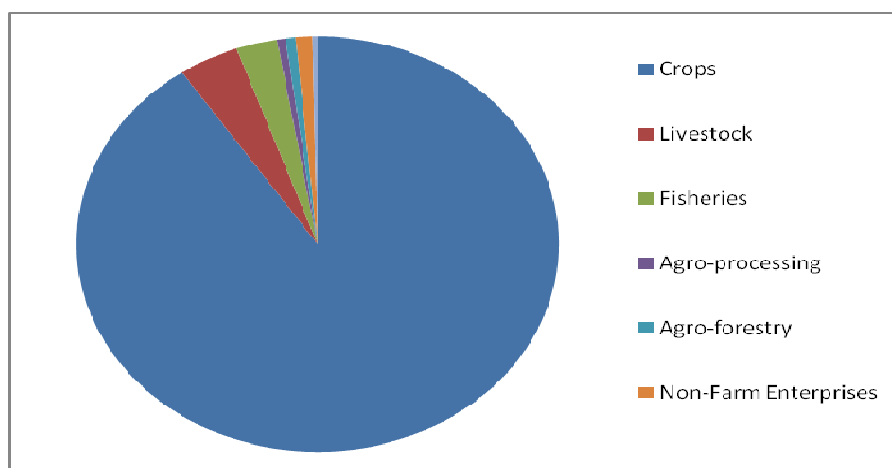


Figure 6: Impact of programme on employment

Conclusion and Recommendations

It is recommended that the programme strengthens its nutrition related sensitization, encourage the consumption of protein rich food items, such as meat and fish and further support the adoption of technology enhancing inputs, through effective participation under the on-going Agricultural Transformation Agenda propelled Growth Enhancement Support Scheme and sustained linkage with the technology transfer station like Songhai. Focus on profitable production enterprises, while encouraging diversification will ensure long run enterprise sustainability, improve beneficiaries' income, purchasing power and livelihood.

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