Online ISSN : 2249-4626
Print ISSN : 0975-5896

GLOBAL JOURNAL

OF SCIENCE FRONTIER RESEARCH : D

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Volume 12 | Issue 6 | Version 1.0 ENG

Global Journal of Science Frontier Research: D
Agriculture & Veterinary Sciences

Global Journal of Science Frontier Research: D
Agriculture & Veterinary Sciences
Volume 12 Issue 6 (Ver. 1.0)

Open Association of Research Society

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Registration No.: 430374
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Employer Identification Number (EIN):
USA Tax ID: 98-0673427

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Contents of the Volume

Global Journal of Science Frontier Research
Agriculture and Veterinary Sciences
Volume 12 Issue 6 Version 1.0 April 2012
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Urban-Rural Migration in Delta State, Nigeria : Implications for Agricultural Extension Service

By Ofuoku, A. U.
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Abstract - This study was conducted to examine urban-rural migration in Delta State, Nigeria and its implication for extension service. Data were collected from 180 respondents who were purposively selected. It was discovered that most of the migrants were males, mostly in the age range of 50 years and above; mostly married and had one form of formal education or the other; had average household size of 6 persons. Most of them have spent 6-10years in the rural area and their migration was mostly prompted by retirement. The selected socio economic variables of the migrants had significant relationship with the decisions of the migrants to engage in agricultural activities. Implications of the findings for extension service include identifying and training the migrants on the current skills and technologies of agriculture, taking advantages of their level of exposure to make them opinion leaders and identifying them a year to their retirement and giving them training in agricultural enterprise of their choice for their post retirement life.

Keywords : Urban-rural migration, opinion leader, agricultural extension service, retirees, agricultural development.

GJSFR-D Classification : FOR Code: 070107, 070106, 120507

Strictly as per the compliance and regulations of :

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I. Introduction

Generally, migration is a regular occurrence in the life of a nation. While rural-urban migration is mostly temporary, urban – rural migration tends to be on permanent on basis. Observations indicate that most people that are involved in urban-rural migration are return migrants. Return migrants are people who return after emigration to their community of origin (Bovenkerk, 1974; Ekong, 2003). People migrate in response to prevailing conditions or situations. The decision to migrate or move is always informed by the prevailing situations. Movement of people tend be a selective process affecting individuals or families with certain economic, social, educational and demographic characteristics (Adewale, 2005).

In the present decade, Adewale (2005) suggest that urban-rural migration is one of the important modes of migration. Previous studies concentrated on rural and rural-urban modes of migration. For instance, Okpara (1983); Fadayomi (1998); Ekong (2003) discovered that rural-urban and rural-rural types of migration were predominant in developing societies. However, studies by okpara (1983) reveal that rural-urban migrants out number urban-rural migrants.

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According to Ekong(2003), Fadoyomi(1998); Afolabi (2007), rural-urban migration negatively impacts on agricultural productivity through loss of productive members of the rural communities. It is expected that a reversed trend in migration will help to mitigate this problem of negative impact on agricultural productivity. Williams (1970) observed that some factors such as crisis, old age, transfer, retirement and invasion of pests and disease are correlates of urban-rural migration. Jibowo (1992) opined that urban-rural migration is influenced by factors like congestion, traffic jams, sanitation problems, increasing urban unemployment, increased crime rate and accommodation (housing) problem. These factors are actually prevailing in Nigeria currently and every Nigerian, especially those from the Niger Delta Region in which Delta State is located, wishes that these problems are addressed.

The discovery of petroleum in the Niger Delta Region of Nigeria has fuelled rural-urban migration to the detriment of the agricultural sector of the economy of the region. A lot of people in the rural areas were prompted by the petroleum industry to migrate from rural to urban areas to seek employment. This means deficit in agricultural productivity in the Delta State.

Fadayomi (1998), Ekong (2003), Afolabi (2007) observed that rural-urban migration negatively impact on agricultural productivity through loss of productive citizens of rural communities. Urban-rural migration has generally increased agricultural outputs while the population of economically active persons in agriculture also increased between 1970 and 2000 (Majid 2004). While the trend in growth of agricultural productivity suggest improvements in China and the rest of Asia, it is not so in Sub-Sahara Africa (Afolabi, 2007). Urban-rural migrants are also involved in educative and health related occupations and trading. People who have lived in the urban are cosmopolitan in nature. This is because of their interaction with others from other places. In the rural areas, people are engaged in agriculture related activities such as farming and processing. Other rural occupations include artisanal activities like blacksmithing, bicycle repairing, etc.

This study will unveil the occupations urban-rural migrants are engaged in and the results will form a guide for agricultural extension service in their programme planning.

II. Objectives

This study was undertaken to examine urban-rural migration in Delta State and its implications for agricultural extension services. The specific objectives of this study were to:

i. ascertain the demographic characteristics of the migrants;
ii. determine their length of stay in the rural areas
iii. identify the causes of their migration to rural areas
iv. ascertain the jobs the presently engage in, in the rural area.

Hypothesis

Ho: involvement of urban-rural migrants in agriculture is not influenced by their demographic characteristics.

III. Methodology

This study was conducted in Delta State, Nigeria. The state consists of 25 local government areas which are grouped into Delta North, Delta Central and Delta South Agricultural Zones by the Delta State Agricultural development programme (the public agricultural extension agency). The urban areas in the state include Asaba, Agbor, Sapele, effurun, Ughelli, and Warri.

Two local government areas were randomly selected from each of the 3 agricultural zones selected. At the second stage, 3 rural communities were randomly selected from each selected local government area which gave a total of 18 rural settlements. From each rural settlement selected to have a sample size of 180 respondents.

Data were collected from the respondents with the use of questionnaire and interview schedule administered to formally educated respondents and the respondents who had little or no formal education respectively. The instrument was subjected to reliability test. The test was done using test retest method. The retest was done 3 weeks after the retrieval of the instrument for the first administration. The result of the correlation between the first and second responses showed a high level of correlation for the questionnaire (r =0.831) and the structured interview schedule (r= 0.791).

The data collected were subjected to descriptive statistics such as frequency counts and percentages. The hypothesis was tested with the use of logistic regression technique.

Though, logistic regression model is similar to linear regression model, it was best suited for this study because the dependent variable was dichotomous. The binary response in this study was whether the respondents were engaged in agriculture related activity or not, i.e. yes or no. The logistic model was implicitly stated as:

$$\ln\left[\frac{Pi}{1 - Pi}\right] = \exists i + \sum_{j=i}^{n} \exists j \; x \; ji + \varepsilon$$

The empirical model specifying engagement in agriculture related activity by the ith farmer is explicitly specified

$$\ln\left\{\frac{Pi}{1 - Pi}\right\} = \exists o, \exists_1 X_1, \exists_2 X_2, \exists_3 X_3, \exists_4 X_4, \exists_5 X_5, \varepsilon$$

Where :

y =engagement in agriculture (dummy)
$\exists_o$ = constant term
X_1 = gender (dummy)
X_2 = age (years)
X_3 = quantity status dummy
X_4 = education (yearof schoding)
X_5 = Household size (no of persons)
ε = error term

Engagement in agriculture was regressed against the defined demographic characteristics of the urban-rural migrants.

IV. Results and Discussion

a) Demographic characteristics of urban-rural migrants

Most of the urban-rural migrants were males (70.0%) and majority of them were in the age range of 60-69 years (27.2%), most of them were married (78.9%), about 82.1% of them had one form of formal education or the other. Most (31.1%) of them had household sizes of between 5-7 persons (Table 1).

The results indicate that most of the respondents were retirees who still have responsibilities as married men, considering the fact that most of them had fairly large household size. The retirement pension paid to retirees is lower than the salary they used to earn. Those who worked in private enterprises in the urban do not receive pensions, as only gratuity is paid to them. The fact that most of them had one form of formal education or the other means that education would have guided their decision to migrate to rural areas which most likely are their places of origin. Education is also suspected to inform their decision to be engaged in one activity.

Table 1: Demographic characteristic of respondents

Variables	Frequency	Percentage %
Gender		
Male	126	70.0
Female	54	30.0
Age		

20-29	38	21.1
30-39	26	14.4
40-49	19	10.6
50-59	19	10.6
60-69	49	27.2
70 and above		
Marital Status		
Married	142	78.9
Single	38	21.1
Formal Education		
No formal education	32	17.8
Primary education	44	24.4
Secondary education	51	28.3
Tertiary education	53	29.4
Household size (no. of persons)		
1	36	20.0
2-4	52	28.9
5-7	56	31.1
7-9	20	11.1
Above 9	16	8.9

From these activities they earn and save money, in order to be afloat financially. These results are congruent with those of Adewale (2005) who discovered that most of the urban - rural migrants in Oyo State, Nigeria were males who were mostly married and had one form of formal education or the other.

b) Length of stay of migrants in rural areas

Table 2 indicates that most (34.4%) of the urban-rural migrants have been living in the villages for 6-10 years, while 20% have spent 1-5years since their return. This implies that most of the migrants migrated to the rural areas almost recently. Their movement and stay in the villages may have been informed by the presence of motorable roads and electricity. Most of the villages now have health centers and people have started having the awareness about friendly physical and biological environment of the villages.

Table 2 : Length of stay of migrants in rural areas

No. of years	Frequency	Percentage (%)
1-5	36	20.0
6-10	62	34.4
11-15	25	13.9
16-20	28	15.6
Above 20	29	16.1

The migrants studied in Oyo State were also found to have mostly moved into the rural areas in recent years (Adewale, 2005).

c) Causes of urban-rural migration

Most of the migrants (46.1%) were pushed to rural areas by retirement while 26.1% were by urban unemployment (Table3). The implication is that most urban-rural migrants embarked on return migration. Most retirees return to their villages of origin after retirement, to avoid financial insolvency of the household as life in the village is cheaper than in the urban. This is especially so with those who already built houses in their villages.

Prolonged unemployment among the youth in the urban forces tham to migrate back to the rural areas where life is simple, especially when their hosts tend to become hostile or exhibit some element of hostility towards them. Guatam (1999) observed that those people migrating in India are careful enough to take all precautions so that they will be sure of their host and job before they leave rural areas to urban for job.

Table 3 : Causes of migration fron urban to rural areas.

Causes	Frequency	Percentage (%)
Unemployment	47	26.1
Cost of living	119	5.0
Retirement	83	46.1
Ethnic crisis	15	8.3
Transfer	7	3.9
Congestion	6	3.3
Illness	13	7.2

d) Occupations engaged in on movement to rural areas

Table 4 indicates that most (54.4%) of the urban-rural migrates were involved in agriculture and agriculture related activities or occupations while 20% of them were into trading. Ekong (2003) defined rural as an area of settlement in which half or more than half the adult working population is engaged in farming. This finding confirms the rurality of the rural areas the respondents migrated to. The major occupations in rural areas is farming and other agriculture related activity like processing. Most families have enough land to sustain farming activities – crop, livestock and fish farming. Most retirees take up agriculture related activity after retirement in order to keep their body busy for fear of early death. They hold the belief that on retirement if one stays at home everyday doing nothing, the body organs deteorarate faster as they are not put to full use. According to Gautam (1999), urban-rural migrants acquire land and engage in farming on getting back to the village after saving money for such while working in the urban area.

Table 4 : Occupations engaged in on movement to rural areas

Occupation	Frequency	Percentage (%)
Farming/processing	98	54.4
Trading	36	20.0
Civil service	22	12.2

e) Influence of demographic characteristics on decision to engage in agriculture

The logistic regression result showing the influence of demographic variables on decision of urban-rural migrants to engaged in agricultural occupation is presented in table 5.

Gender (X_1): the results show that gender had a negative coefficient, but was significant. This implies that the male household heads, though engaged in agricultural activities, are less involved than their wives. This is as a result of the fact that women put in more interest in farming than men. This is congruent with Uzokwe and Ofuoku (2006) who discovered that women have taken over almost every farm operation from their husbands.

Age (X_2): this variable was also found to have significant, but negative coefficient. This result was according to *a priori* expectation. It implies that older people are the less likely they will take decision to engage in farming as they have become weaker as they become older.

Marital status (X_3): marital status had positive and significant relationship with decision to engage in farming. This is in consonance with *a priori* expectation. This means that the respondents had responsibilities. This signifies much load on their shoulders. For this reason they decide to engage in farming.

Table 5 : summary of logistic regression results

Variables	Coefficient	Standard error	Wald statistics
Constant	0.047	1.322	0.035 *
Gender(X_1)	-0.026	0.477	0.002*
Age (X_2)	-0.467	0.702	0.443*
Marital status (X_3).	0.096	0.562	0.029*
Educational (X_4)	0.015	0.114	0.018*
Household size (X_5)	0.096	0.562	0.029*
$R^2 = 0.892$			

**significant ($p<0.05$).*

Education (X_4) : eductation had positive and significant relationship with decision to engage in farming. This was expected. This implies that the more the years of schooling, the more the likelihood they were informed enough to know the importance of agriculture in their micro economy.

Household size (X_5): household size had positive and significant relationship with decision to engage in farming. This is consistent with *a priori* expectation. It implies that the larger the household size, the more the likelihood to make a decision to engage in farming or agricultural activities. Most of the urban-rural migrants had large household sizes. This implies that there were many people to feed and cater for. Having this in mind the decision to engage in farming becomes easy.

The result of the logistic regression analysis confirms that some demographic variables influenced urban-rural migrants decision to engage in farming. It also shows that the demographic variables explained 89.2% variation in the decision to engage in farming (dependent variable).

f) Implications for extension service

Several implications for extension services can be deduced from the findings of this study. One of the objectives of extension programme is aimed at increasing arable crop production through encouragement of people to become involved in farming. Most of the urban-rural migrants are retirees and those who are unemployed. It is therefore, necessary for extension officers and planners to identify these sets of urban-rural migrants, with the objective of encouraging them and design a programme of training for them. The training programme is expected to make them acquire current skills and technologies in farming.

This programme will have the advantages of re-intergrating them into the farming community and making them to have a sense of belonging as they always feel not recognized because of their status as retirees and unemployed . Once they are re-integrated into the farming system the feel relevant in the social system once more. Most of the retirees had one form of formal education or the other and expectedly had more experience than non - migrants. For this quality the extension service can take the advantage of making them opinion leaders in farmers' groups in the various rural communities. Villagers very well respect the views of those who have lived and worked in the urban, especially those who had tertiary education.

Making them opinion leaders will aid extension agents in their persuasive exercise with the farmers who did not migrate from their rural communities. This is particularly beneficial when these farmers are conservative. The extension service can even put up a system where they will collaborate with ministries, government agencies and private firms to identify those who are to retire a year later. After this is done, pre-retirement training on agricultural practice can be organized for them, based on their agricultural enterprises of interest. This implies preparing them for post retirement life.

V. Conclusion

Most of the urban-rural migrants are retirees and are interested in farming. It is conceivable that it would be beneficial to encourage these retirees who have migrated form urban areas to rural areas, in agricultural activities. It is expected therefore, that the results of this study and implication deduced could be passed on to agricultural extension agencies for necessary actions as the retirees also make their contribution to agricultural development.

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Global Journal of Science Frontier Research
Agriculture and Veterinary Sciences
Volume 12 Issue 6 Version 1.0 April 2012
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Land Use Planning for Vegetable Farming in Benue State of Nigeria

By Idoga, S. & O. M. Egbe
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Abstract - Management of soil organic matter is the key to successful organic farming with regards to soil productivity. Vegetable production is most successful in soils rich in organic matter and also with adequate soil moisture. This paper examines two broad groups of soils in Benue State (the upland and the wetland soils) with respect to their suitability for organic vegetable farming. In 2008/2009 and 2009/2010 cropping seasons, a soil characterization study for field assessment of vegetable crop yields in the upland and wetland soils of Benue state was conducted. The wetland soils were found to be richer in organic carbon (2.28%) than the upland soils (0.87%). This singular difference had multiplier effects as wetland soils had higher total N (0.31%) and available P (9.8 mg kg-1), higher pH (6.7) and total exchangeable bases (12.8 mol kg-1) and by implication higher water holding capacity. Among the wetland soils, okra yields averaged 5.92mt ha-1 (wetland) as against 2.75 mt ha-1 (upland) and garden egg yields were 6.00mt ha-1 (wetland) and 4.50mt ha-1 (upland). These results indicated that wetland soils had greater advantage for organic farming than the upland soils. Since land use planning is all about allocation of land to optimize yields and minimize damage to soil resources, the wetland soils are therefore recommended for organic vegetable farming in Benue State.

Keywords : *Land use planning, organic matter, organic vegetable farming.*

GJSFR-D Classification : *FOR Code: 820215, 820602, 070107*

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Keywords : Land use planning, organic matter, organic vegetable farming.

I. Introduction

Organic farming involves the use of renewable resources and cycling (returning to the soil the nutrients found in waste products). Organic farming respects the environment's own systems for raising crops without use of chemical fertilizers (ICAR, 2006). In Nigeria, before the oil boom era of the late 70s, soil fertility management for agricultural use depended solely on natural soil fertility regeneration through soil organic matter build up. This practice called shifting cultivation was based on the principle that continuous cultivation depletes the soil of its nutrients, mainly as a result of depletion in soil organic matter. Time was therefore needed for soil organic matter to build up, ranging from 5 to 10 years depending on climate and vegetation (Brady, 1990).Over the years, accumulated knowledge about soils point to soil organic matter as the key factor in soil productivity sustenance (Greenland, 1994). Soils with high organic matter normally produce very high yields. As organic matter content declines, yield equally declines.

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Consequent upon this finding and the fact that shifting cultivation is no longer feasible due to increasing population, other systems have been developed to either improve or maintain soil organic matter or to sustain soil productivity. Some of these systems include fallow system, crop rotation and use of farmyard manure, agroforestry and of course inorganic farming (the use of chemical elements to maintain and improve soil fertility). Of these systems, inorganic farming has been the most popular, bringing about more than 100% increases in crop yield in the past few decades (Adediran et al., 1999). But the scarcity and consequent high prices of chemical fertilizers due to very poor distribution channels have pushed the commodities out of reach of the resource-poor farmers (who produce most of the food crops) (Oyinlola and Wujat, 2007).The ill effects of unbalanced and unscientific use of chemical fertilizers, especially nitrogen in developing countries (Nigeria inclusive), have necessitated the development of organic agriculture because of safety and local availability.

Current land use patterns in Benue state show that a wide range of food crops (yam, cassava, maize, rice and sorghum, etc.), cash crops (soybean, beniseed,etc.), tree crops (orange, mango, cashew,etc.) and a variety of vegetables (tomatoes, pepper, leafy vegetables, garden egg, onion,etc.) are grown. These crops, including vegetables, are mainly cultivated under rain-fed conditions in the upland. The starch-based diets of the people consider vegetables as secondary in terms of hectarage and attention, despite their importance in the supply of minerals and vitamins as well as proteins (Denton et al., 1988). Like the food and cash crops, vegetables are commonly cultivated on the well-drained upland soils with little or no attention given to weeding, fertilizer application and watering (in times of dry spell). Under these conditions, vegetable yields are low and there is a break in supply in the dry season leading to soaring prices. This is because wetlands are scarcely cultivated in the dry season and vegetables are secondary to cassava during that season. Despite favorable physical and chemical properties as well as soil moisture conditions of the wetlands, they are marginally utilized in the dry season. The objective of this work was therefore to identify (employing land use planning techniques) suitable soil types for organic vegetable farming in Benue State and to characterize and classify such soils for research extrapolation.

II. Materials and Method

a) Field Work

In 2008/2009 and 2009/2010 cropping seasons, field assessment of vegetable crop yields by a multi stage sampling technique using structured questionnaires administered through field enumerators was carried out in Benue State[Latitude 06^0 $30^/$ - 08^0 $10^/$ N, Longitude 08^0 10^0 – 10^0 E]. The state was stratified into local government areas (LGA) (23№) and the LGA was stratified into wards with 5 wards picked from each LGA. Four respondents were then sampled from each selected ward using the table of random numbers. In all, 460 respondents were involved in the study.

Soil characterization studies were then carried out from selected fields of the respondents. The studies were on two broad soil types – the well-drained soil of the upland (upland soils) and the poorly drained soils of the lowland (wetland soils). Composite surface soil samples were taken from 10 fields each of the upland and wetland soils. Two typical representative profile pits were sunk in each of the soil types to characterize and classify the soils for research extrapolation. The pits were described using the procedures of Soil Survey Staff (1998). Soil samples were collected from identified natural horizons and were carefully labeled and kept for laboratory analysis.

b) Laboratory Work

Both the composite and profile soil samples were air-dried for 5 days, ground and sieved to obtain the fine earth fraction (<2mm). Routine laboratory analyses such as particle size distribution, soil pH, organic carbon, total nitrogen, available phosphorous, exchangeable bases and cation exchange capacity (CEC) were carried out using the methods of IITA (1979). Base saturation was calculated using the total bases and cation exchange capacity.

III. Results and Discussion

Table 1 presents the vegetable crop yields in wet and upland ecologies for the two cropping seasons of 2008/2009 and 2009/2010. Generally, crop yields were higher in the wetland soils than in the upland, but this was only significant in 2008/2009 cropping season. Of the six vegetables, onion and Amaranthus did not show any significant difference in yield between the two soil types in both cropping seasons. However the yields of okra, tomatoes, pepper and garden egg were significantly higher in the wetland than in the upland soils. The reasons for this difference may be found in Table 2. The physical and chemical properties of the soils showed that the wetland soils were by far more favorable for crop yield than the upland soils. The wetland soils had higher organic carbon (2.28%) than the upland soils (0.87%). This singular difference had multiplier effects as wetland soils had higher total N (0.31%) and available P (9.8 mg kg-1), higher pH (6.7) and total exchangeable bases (12.8mol kg-1) as shown in Tables 3-6. The textural class of the wetland soils was sandy clay loam while that of the upland soil was sandy loam. The implications are that soil structural development, CEC (i.e., the ability of the soil to retain plant nutrients and water) are higher among the wetland soils than the upland soils. Available soil moisture content is very critical in crop production. One of the reasons for the declining productivity of the upland soils is erratic rainfall in recent times coupled with the rapid run-off from the upland (Idoga, 2005).

Table 1: Vegetable crop yields (t/ha) in wet and upland environments in 2008/2009 and 2009/2010 cropping seasons in Benue State.

Crop	2008/2009 cropping season			2009/2010 cropping season		
	Wetland	Upland	Mean	Wetland	Upland	Mean
Onion	6.11	6.11	6.11	6.26	6.10	6.18
Okra	5.92	1.76	3.84	5.96	2.14	4.05
Tomato	5.69	2.75	4.22	5.70	3.20	4.45
Pepper	2.97	1.84	2.41	3.11	2.33	2.72
Garden egg	6.00	4.60	5.30	6.82	6.11	6.47
Amaranthus	8.81	8.20	8.26	8.99	9.36	9.18
Mean	5.83	4.20	5.02	6.13	4.87	5.50
SED	0.48	0.04	-	0.006	0.003	-
Paired t-test (0.05)						
Wetland vs Upland (2008/2009)	-2.43*					
Wetland vs Upland (2009/2010)	-1.97ns					

**: significant at 5% probability level; ns: not significant*

Soil PH, organic carbon, total nitrogen, available phosphorous, exchangeable bases, CEC and percentage base saturation were higher in the wetland soils than in the upland. It is important to note that most of these soil properties are dependent to some degree on the quantity and quality of organic matter. Tel and Hagarty (1984) had listed these properties to include, reserves of exchangeable bases, capacity to supply N and P, stability of soil structure, adequacy of soil aeration and CEC which influences the absorption and retention of water and plant nutrients. Kekong et al. (2008) also indicated that lowering of soil bulk density and increased porosity are some other benefits of soil organic matter.

Table 2 : Physico–Chemical properties of upland and wetland soils.

Soil Characteristics	Upland Soil	Wetland Soil
Sand (%)	76	55.6
Silt (%)	14	9.2
Clay (%)	10	35.2
Textural class	Sandy loam	Sandy clay loam
pH(H2O)	5.5	6.5
Organic C (%)	0.87	2.28
Total N (mg kg^{-1})	0.10	0.31
Available P (mg Kg-1)	6.80	9.80
Exchangeable Ca (Cmol Kg-1)	1.10	6.40
Exchangeable Mg (Cmol Kg-1)	0.89	7.80
Exchangeable K (Cmo lKg-1)	0.12	0.10
Exchangeable Na (Cmo lKg-1)	0.11	0.09
CEC (Cmol Kg-1)	3.05	15.36
B.S. (%)	76	94

Since both the upland and wetland soils of Benue state fall within the same vegetation zone and climatic conditions, the differences in their organic matter content could only result from differences in their topographic positions and relative wetness. Fagbami and Akamigbo (1986) observed that topography and parent materials are the major factors that influence soil characteristics in Benue state. Tables 3-6 which show the morphological, physical and chemical properties of two typical representative profiles each of the upland and wetland soils of Benue state are clear illustrations of the influence of topography on the soils. The morphological properties of the upland soils show that they were well drained with dominant colour hues of 7.5YR in the A horizons to 5YR in the B horizons. The A horizons of the upland soils were thin (<10cm) with the texture of loamy sand. On the other hand, the wetland soil profiles had very thick A horizons (>30cm) that were poorly to very poorly drained. The soil color hues were 10YR on the surface and 2.5Y and 5Y in the lower horizons. In the wetland soils of both locations, water table stood at less than 100cm of soil surface keeping the surface horizons moist even in February. This implies that crop production can be carried out in the dry season without irrigation in the wetland soils. Tables 3-6 show that the wetland soils were classified as Aeric Kandiaqualfs /Gleyic Luvsols, meaning that aquic soil moisture regime or gleyic soil conditions are the major attributes of the soils. These soils are saturated with water for most part of the year. Such soils are known to occupy over 300,000 hectares in Benue State (Idoga 2005) and can therefore supply more vegetable than the needs of the people, leaving excess for the market. The chemical properties of the soils are tied to their organic matter content. The organic matter content of the wetland soils is not only higher than that of the upland soils, but also remains relatively stable over the years because of slow decomposition and the effect of cumulization from the surrounding upland, especially of organic particles. These two processes (slow decomposition and cumulization) continually maintain the organic matter content of depressional soils (wetland) and their attendant high nutrient content. These soil conditions help to reduce the negative impact of high temperature and bulkiness in organic materials on organic farming in the tropics. From the fore going discussions, organic vegetable production is recommended for the wetland soils of Benue state especially in the dry season.

Table 3 : Morphological properties of upland and wetland soils of Makurdi LGA.

Horizon	Depth (cm)	Munsell colour (moist)	Mottling	Texture	Structure	Boundary	Remark
Ap	0 – 9	7.5YR3/3	-	LS	1fcr	gs	Many fine roots.
BC	9 – 27	7.5YR5/6	-	SL	2msbk	gs	Common fine roots.
C	27 – 58	5YR4/6	-	Gr.SL	2msbk	-	Many medium Fe concretion.
Ap	0 – 35	10YR2/3	7.5YR5/6fif	SL	2msbk	gs	Many fine roots.
B	35 – 50	2.5Y3/2	10YR5/8fif	SC	3csbk	ds	Few fine roots.
Bt_1	50 – 65	2.5Y3/3	10YR5/8cif	C	3csbk	ds	Few fine roots.
Bt_2	65 - 96	5Y5/6	10YR5/6c2d	C	3csbk	-	Water table at 96cm.

Key: Mottling: fif : few fine faint
Cif: common fine faint
Textures: LS= few fine filth
SL= sandy loam
SC= sandy clay
C= clay
Gr.SL = granalitic sandy loam

Structure: 1fcr= weak fine crumb
2msbk= moderate medium sub angular blocky
3csbk = strong coarse sub angular blocky
Boundary: gs =gradual smooth
ds = diffuse smooth

Table 4 : Physical and Chemical Properties of the upland and wetland soils of Makurdi LGA.

		PSD (%)							Exch. Bases ($cmolKg^{-1}$)					
Horizon	Depth (cm)	Sand	Silt	Clay	pH (H_2O)	Org. C (%)	Total N(%)	Avail. P($mgKg^{-1}$)	Ca	Mg	K	Na	CEC ($cmolKg^{-1}$)	B.S (%)
Upland Soil														
Soil Name: OxicUstropept/ EutricCambisol														
Ap	0 – 9	78	14	8	5.6	0.78	0.09	6.2	1.2	1.0	0.12	0.11	3.15	77
BC	9–27	76	14	10	5.2	0.42	0.05	3.2	0.92	0.94	0.13	0.11	2.84	75
C	27–58	74	16	10	5.0	0.30	0.03	3.0	0.96	0.68	0.12	0.08	2.80	66
Wetland Soil														
Soil Name: AericKandiaqualf/GleyicLuvisol														
Ap	0 – 35	60	23	17	6.9	2.40	0.35	12.0	6.18	2.40	0.10	0.09	9.56	92
B	35– 50	48	15	37	6.6	1.35	0.15	8.12	5.40	1.89	0.12	0.10	8.36	89
Bt_1	50–65	40	12	48	6.4	0.60	0.05	7.10	4.00	1.90	0.14	0.11	7.36	84
Bt_2	65-96	42	13	45	6.4	0.36	0.04	8.00	3.80	2.44	0.10	0.11	7.40	87

Table 5 : Morphological Properties of Selected Upland and Wetland Soils of Gboko LGA

Horizon	Depth (cm)	Munsell colour (moist)	Mottling	Texture	Structure	Boundary	Remark
Upland: TypicPaleustalf/EutricLuvisol							
Ap	0 – 8	7.5YR3/4	–	SL	1fcr	gs	Many fine roots.
B	8 – 25	7.5YR4/6	–	SL	2msbk	gs	Common fine roots.
Bt_1	25 – 68	5YR4/6	–	SCL	3msbk	gs	Few fine roots.
Bt_2	68 – 90	5YR4/8	–	SCL	3msbk	gs	Few fine roots.
BC	90 – 135	2.5Y4/8	–	SCL	3msbk	–	–
Wetland: UmbricKandiqualf/GleyicLuvisol							
Ap	0 – 32	10YR2/2	7.5YR 4/6 fif	SCL	2msbk	gs	Many fine roots.
B	32 – 56	2.5Y2/2	10YR5/8 fif	SCL	3msbk	ds	Common fine roots.
Bt	56 – 81	5Y6/6	–	C	3msbk	–	Water table at 81cm.

Key: Textures : SCL = sandy clay loam
Structures: 3msbk = strong medium sub angular blocky
Boundary: gs = gradual smooth
ds = diffuse smooth

Table 6 : Physical and Chemical Properties of Selected Upland and Wetland Soils of Gboko LGA.

		PSD (%)							Exch. Bases ($cmolKg^{-1}$)					
Horizon	Depth (cm)	Sand	Silth	Clay	pH (H_2O)	Org. C (%)	Total N(%)	Avail. P($mgKg^{-1}$)	Ca	Mg	K	Na	CEC ($cmolKg^{-1}$)	B.S (%)
Upland: Typic Paleustalf/ Eutric Luvisol														
Ap	0 – 8	75	13	12	5.8	0.81	0.09	6.50	1.30	1.00	0.14	0.10	3.50	73
B	8–25	73	10	17	5.6	0.50	0.06	4.60	1.20	1.10	0.11	0.11	3.80	66
Bt_1	25–68	70	8	22	5.6	0.50	0.03	5.00	1.40	1.60	0.10	0.09	4.23	75
Bt_2	68 – 90	65	10	25	5.4	0.30	0.03	4.80	1.45	1.60	0.11	0.09	4.36	75
Bc	90 – 135	68	10	22	5.2	0.30	0.03	4.60	1.30	1.20	0.11	0.10	4.20	65
Wetland: Umbric Kandiaqualf/Gleyic Luvisol														
Ap	0 – 32	60	18	22	6.8	2.51	0.35	12.80	6.28	2.28	0.21	0.12	10.00	89
B	32– 56	58	18	24	6.6	1.20	0.15	11.00	4.60	2.16	0.12	0.10	8.52	82
Bt	56–81	48	14	38	6.9	0.80	0.10	11.50	4.00	2.86	0.14	0.09	8.86	80

IV. Conclusion

Yields of vegetable crops were higher when planted in wetland soils than in upland environment in the absence of synthetic fertilizers, implying suitability of wetland soils for organic agriculture in Benue State of Nigeria.

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Global Journal of Science Frontier Research
Agriculture and Veterinary Sciences
Volume 12 Issue 6 Version 1.0 April 2012
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Assessment of Agricultural Taxes Reform on Sudan's Economy

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Abstract - This study evaluates the effects of agricultural taxes changes on Sudan economy. It uses the Computable General Equilibrium model as analytical tool; with Sudan Social Accounting Matrix for year 2004 constitutes the core database. The activity and commodity accounts are disaggregated into agriculture (sesame, sorghum, cotton, wheat and other agriculture), industry and service accounts. The model results show that reduction of wheat import tariff increases wheat imports, output and export of cotton, sesame, industrial and services sectors. The overall effect of this policy is improvement of GDP, balance of trade and investment. The results reveal that reduction of production tax or value added tax for each crop would increase its domestic output and exports and reduce those of the other crops, except for sorghum. The overall effect of reducing these taxes improves the GDP and private consumption despite the mixed effect on investment and balance of trade. The study recommends reduction of taxes on agriculture and increasing direct taxes on private companies to compensate government revenue loss.

Keywords : *Sudan, CGE, SAM, CGE, Import Tariff, VAT and Production Tax.*

GJSFR-D Classification : *FOR Code: 070103, 070105*

Strictly as per the compliance and regulations of :

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The results reveal that reduction of production tax or value added tax for each crop would increase its domestic output and exports and reduce those of the other crops, except for sorghum. The overall effect of reducing these taxes improves the GDP and private consumption despite the mixed effect on investment and balance of trade. The study recommends reduction of taxes on agriculture and increasing direct taxes on private companies to compensate government revenue loss.

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I. Introduction

There is a worldwide trend of market globalization and trade liberalization. The World Trade Organization (WTO) is playing a significant role in liberalization of the international trade system, especially between its member countries, through reduction of tariff and non-tariff barriers that hinders flows of goods and services. Trade liberalization brings benefits and drawback to each economy, whereas the comprehen - sive impact of trade liberalization has some uncertainty. Bruno (1997) argued that trade liberalization in the long run, would improve resource allocation efficiency and promote economic growth by introducing benefits to local consumers by lowering the cost per unit. He also stated that in the short run trade.[1] This work is financially supported by the Economic and Social Research Bureau, Sudan liberalization will result in disturbing cost by leaving open some highly protected sectors or negative balance of payment by rapid growth of imports. Agion and Montiel (1996) argued that trade liberalization would not necessary result in decreased employment and output and negative balance of payment.

Sudan has a relatively huge economic potential measured in terms of its endowments of natural resources, including arable and grazing land, water, mineral resources, and a dry and semi-dry climatic zones. Since mid 1970s, Sudan began to pursue a sort of stabilization and adjustment policies with the aim of stimulating agricultural production and the promotion of agricultural exports. These programs included the economic recovery programme (ECRP) 1978-1985, the four-year economic salvation programme (ESP) 1987-1989 and the national economic salvation programme (NESP) 1990-93. The recent 1990s policy reforms were more oriented towards the liberalization of trade, with more flexible exchange rate, removal of subsides, restructuring of taxes (such as agricultural tariff, production and value added tax), and privatizing public corporations and parastatals in the Sudan (Ministry of Finance and Economic Planning (MFEP), 1990).

The performance of agriculture under these programs varied considerably depending on factors such as the magnitude of the economic crisis that preceded each programme, the extent to which the government actually implemented and sustained the adjustment reforms, and the effect of exogenous factors, such as climate, civil war and changes in the terms of trade facing the country (Hag Elamin and Elmak (1997). However, in reality the agricultural sector is still heavily taxed, directly and indirectly.

The agricultural sector in the Sudan is distinguished into four sub-sectors including, the traditional rain-fed, the mechanized rain-fed, the irrigated and livestock. Despite the relative decline in the agricultural share in the national GDP from 45% to 35% during the last decade, it still provides the livelihood for more than 60% of the total population and employs more than 55% of the labour force in the country (Bank of Sudan, 2010). The exploration and exports of petroleum products associated with an increase in the service sector resulted in the relative decline in agricultural GDP and share of agricultural exports, with an appreciating domestic currency exchange rate.

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Today with the secession of the South and the loss of 75% of the petroleum revenues, it seems that Sudan has no way out except to rely on agriculture again. Therefore it is apparent that in the near future the welfare of Sudan's population, especially of the poor who are largely located in rural areas depending on agriculture, will be highly affected by the policy changes. In this regard the government in 2008 launched the five years Agricultural Revival Program (ARP). The main focus of the program is to increase the efficiency of agricultural sector through encouraged private sector investments, improving research and development (technology development and transfer) among farmers.

Removal of production taxes in agriculture would improve its competiveness, where as tariff reduction would result in cheaper imports, changing demand patterns with consequent changes in flow of agricultural and other sectors. The effect of such policy has yiel important implications on income distribution, government finance and the external current account. To capture such implications comprehensively, CGE models are widely used for simulating such effects.

II. Objectives of the Study

The main objective of this study is to simulate the expected effects of reduction of agricultural taxes on macro-economic indicators (GDP, balance of trade, private consumption and investment), and on sectoral ones (domestic output, export and imports). Specifically, the study assesses the implications of these changes and shed light on the required policies for enhancing social welfare expected effects of changes in the following variables :

1. Import tariff of wheat, sorghum, cotton and sesame on macro and sector economic indicators of Sudan,
2. Production tax of wheat, sorghum, cotton and sesame on macro and sector economic indicators of Sudan,
3. Value added tax wheat, sorghum, cotton and sesame on macro and sector economic indicators of Sudan,
4. Indirect tax reduction on direct tax compensation on government income.

III. Research Methodology

CGE models are frequently used to simulate the effects of policy changes on endogenous variable. They are often regarded as extensions of input-output and linear programming models in the sense that they are multi-sectoral models and capture interdependence between sectors. But in addition they capture the interdependence between other agents in the economic system such as households and other domestic institutions, as well as the external sector. The core of CGE model is a representation of the markets for products and factors. Decisions by producers and consumers determine supplies and demands for products and factors which become mutually consistent through adjustments in relative prices. This is because quantitative assessment made with these models are usually more detailed and comprehensive than those made by others model. The basic merit of CGE lies in its solid microeconomic theory foundation, which facilitates explicit modeling of the behavior of different economic agents.

This study uses the standard CGE model developed by the International Food Policy Research Institute (IFPRI), structured on the tradition of trade-focused CGE models of developing countries. The CGE model analysis is based on a Social Accounting Matrix (SAM). The SAM is a comprehensive, economy-wide database that contains information about the flow of resources associated with all transactions that have taken place between economic agents in a certain economy during a certain period, including the existing relationship on the level of Input–Output Table (Löfgren et al, 2002).

Three model closure rules have been applied in this study. Firstly, the government balance, and here the government savings was assumed to be flexible while direct tax rates were assumed to be fixed. Secondly, the external balance, where foreign savings was assumed to be fixed while the real exchange rate was taken as the equilibrating variable. Thirdly, saving-investment rule, where the model is assumed to be investment–driven indicating a fixed investment and a flexible savings variable. The model was implemented using General Algebraic Modelling System (GAMS) software that computed both equilibrium prices and quantities and their percentage changes in response to policy shocks.

In this study, Sudan SAM for year 2004 (Table 1) constitutes the core database for the CGE model. The activity and commodity accounts are disaggregated into agriculture, industry and service accounts. The agriculture account is further disaggregated into sesame, sorghum, cotton, wheat and other agriculture[5] accounts. This disaggregation is based on the relative importance of these commodities to the Sudanese economy (export, imports and food security issues). Taxes and tariffs accounts are disaggregating into income tax, production tax, import tariff, and value added tax accounts. Thus, the SAM provides detailed description of the Sudanese economy, with special emphasis on disaggregating agricultural and taxes accounts to achieve the study objectives.

The data for the SAM are derived from the following sources: Central Bureau of Statistics (CBS; 2007), Central Bank of Sudan (BOS, 2010), Sudan Customs Authority (SCA), Ministry of Agriculture and Forestry (2008), and Ministry of Finance and National Economy (MOFNE; 2006). The study has considered the National Accounts reports of the CBS to be the core data source for controlling the totals and balancing of the SAM.

[5] It includes all agricultural activities other than sesame, sorghum, cotton and wheat activities

IV. Literature Review

CGE models are widely used in literature to simulate the effect of trade liberalization. Fan and Zheng (1999) uses the CGE model to assess the impact of China's trade liberalization for WTO accession. They shows that tariff cuts induced by trade liberalization in China have minor but positive effect on macro-economy in terms of GDP and its components changes. It also has strong effect on the trade pattern. Some industries win and others lose because of their differences in input and output patterns, as well as export transformation and input substitution possibilities.

Sapkota and Sharma (1998) constructed a CGE model for Nepal, and simulated the impact of reduction of import duty across the board by 25% on competitive imports, and the elimination of input tariff. The result of tariff reduction was a slight increase in import demand. The net effect on government income had been negative due to higher reduction in import tariff that crowded out the positive effect of export taxes.

Bautista and Thomas (2000) used an agricultural-focused CGE model for Zimbabwe and a 1991 Social Accounting Matrix (SAM) as a database to quantify the income and equity effects of trade liberalization with and without complementary changes in fiscal policies and land reforms. The study shows that trade liberalization by itself leads to an appreciable increase in total GDP, and even a more significant rise in agricultural GDP, implying an anti- agricultural bias of the existing trade restriction. The exchange rate depreciates, and both imports and exports expand substantially. In addition, there was a positive impact on aggregate real disposable income.

Thurlow and Seventer (2002) adopted IFPRI's CGE model for South Africa using its 1998 SAM. The model was used to simulate the effects of a full elimination of tariff barriers. The results indicated that a complete abolition of import tariffs generated increases in GDP, with negative and positive consequences for aggregate manufacturing and services, respectively.

Norman (2002) developed a CGE model to assess the impact of reduction of import tariff on agricultural sector of Bangladesh. The model results indicated that by reducing import tariffs, domestic output increased in almost all sectors but government revenue and savings declined significantly. It also depicted an increase in exports coupled with a greater increase in imports, a matter that caused deterioration in the balance of trade.

In Sudan, few studies have been conducted to evaluate the effect of trade liberalization on Sudan economy using CGE models. Elbushra (2007) used the standard IFPRI CGE model based on Sudan SAM for the year 2000 to analyze the possible effects of trade liberalization policy on the Sudanese economy. The study revealed that indirect tax reduction (import tariff and activity (production) tax) had improved the GDP, but at the cost of deteriorated balance of trade. It also argued for increasing the direct tax to compensate for the declining government income. Siddig (2009) examined the impact of macroeconomic and trade policies on the Sudanese economy applying the standard IFPRI CGE model based on Sudan SAM of the year 2004 and Global Trade Analysis Project (GTAP) CGE model. The study concluded that tariff elimination will promote exports; raise GDP, employment, and welfare.

Table 1: Sudan Social Accounting Matrix for Year 2004 (SDG Million)

Expenses \ Receipts		Prod. Factor		Current acc		Capital acc		Agric activity					Indust. Act.	Service act.
		lab	**Cap**	**hh**	**gov**	**S-I**	**Dstk**	**Asesa**	**Asorg**	**acott**	**awhea**	**aother**		
Prod. factor	**Lab**							88.9	140.2	23.7	20.2	3168.3	1656.4	12683.9
	Cap							503.6	794.7	134.1	114.7	17957.8	8466.9	19502.4
current acc.	**Hh**	17780.5	41392.4		2669.7									
	Gov		6081.8											
capital acc.	**S-I**			9737.0	1222.3									
	Dstk					1845.0								
Agric. act.	**Asesa**													
	Asorg													
	Acott													
	Awhea													
	aother													
	Aind													
	Aser													
Agric. comm	**Csesa**			175.7	0.6		3.5	95.4	4.6				108.4	114.0
	Csorg			471.1	1.6		9.3		135.3			25.9	21.7	681.6
	Ccott			14.4	0.0		0.3		0.1	0.3	0.0		4.3	21.7
	Cwhea			322.1	1.1	0.0	6.4		2.7		22.7		158.0	403.2
	Cother			11064.7	697.9	105.5	1676.5					1839.0	3924.2	6099.2
Industry com				4450.5	119.5	3635.9	68.3	6.4	1.4	1.4	2.7	259.4	2138.9	3383.8
Service comm.				35554.1	4916.2	7483.2	80.8	183.9	195.0	78.4	43.0	2246.2	4059.0	7444.1
Taxes and tariff	**Ytax**			760.7										
	Atax							42.0	44.6	30.6	15.0	12.8	990.1	414.7
	Tar													
	Vtax							34.0	34.0	9.8	8.3	192.1	159.9	289.6
Rest of the world acc		1.1			679.3									
Total		17781.5	47474.2	62550.3	10308.2	13069.6	1845.0	954.2	1352.5	278.2	226.7	25701.5	21687.9	51038.3

Receipts / Expenses		agic commodity					Industry Comm.	Service	Taxes and tariffs				Rest of world	**Total**
		csesa	**csorg**	**ccott**	**cwhea**	**cother**			**ytax**	**atax**	**tar**	**vtax**		
Prod. factor	**Lab**													17781.5
	Cap													47474.2
current acc.	**Hh**												707.8	62550.3
	Gov								760.7	1549.8	1188.0	727.8		10308.2
capital ac.	**S-I**												2110.4	13069.6
	DSTK													1845.0
Agic. act.	**Asesa**	954.2												954.2
	Asorg		1352.5											1352.5
	Acott			278.2										278.2
	Awhea				226.7									226.7
	Aother					25701.5								25701.5
Industry act.							21687.9							21687.9
Sevice act.								51038.3						51038.3
Agic. comm	**Csesa**												451.9	954.2
	Csorg												6.0	1352.5
	Ccott												237.2	278.2
	Cwhea													916.2
	Cother												814.9	26221.8
Industry comm.													8250.4	22318.5
Sevice comm.													108.6	62392.6
Taxes and tariff	**Ytax**													760.7
	Atax													1549.8
	Tar				19.9	11.2	66.9	1090.0						1188.0
	Vtax													727.8
Rest of world acc.					669.7	509.1	563.6	10264.3						12687.1
Total		954.2	1352.5	278.2	916.2	26221.8	22318.5	62392.6	760.7	1549.8	1188.0	727.8	12687.1	

Source : Authors Compilation

V. Model Simulation, Result and Discussion

a) Model scenarios

Three Scenarios with fifteen affiliated sub-scenarios have been developed to assess the impact of agricultural taxes on Sudan economy (Table 2). Scenario 1 is dealing with Import tariff and it is one of trade barriers; therefore its reduction is expected to create better opportunities for free trade between countries. At the same time, import tariff is a main source of government income in the developing countries, thus its reduction will negatively affect the government budget. Wheat is the main agricultural import commodity in the Sudan. Based on this, a reduction in wheat import tariff by 50% (partial liberalization) and 100% (full liberalization) is assessed in scenario Tar1 and Tar2, while Tar3 is performed to measure by how much the direct tax should be raised to compensate for government revenue loss of full liberalization of wheat import tax.

Scenario 2 is concerned with production tax and it is one of the indirect tax measures that affect the price of both producers and consumers. In the Sudan, production tax contributed about 15% of the total government revenue in 2004. Scenarios (Prod1 to Prod4) simulate the impact of 50% reduction of this tax on sesame, sorghum, cotton, wheat. Scenario (Prod5) applies production tax reduction (50%) to all agricultural commodities together, while scenario (Prod6) is performed to measure by how much the direct tax should be raised to compensate for government revenue loss of full liberalization of production tax on the agricultural sector.

Scenario 3 is concerned with Value Added Tax (VAT); it is a special type of indirect tax in which a sum of money is levied at a particular stage in the sale of a product or service. In 2004, it constituted about 7% of total government revenue. In 2007, the government of Sudan abolished the value added tax on the agricultural sector; therefore, a full elimination of this tax is simulated in this study to assess its impact on the Sudanese economy. Scenarios (Vat1 to Vat4) simulated the impact of a 100% reduction of this tax on sesame, sorghum, cotton, wheat. Scenario Vat5 applies full liberalization of value added tax to all agricultural commodities together, while scenario Vat is performed to measure by how much the direct tax should be raised to cover full liberalization of value added tax on the agricultural sector.

Table 2 : Scenarios Codes and Definitions

Scenario Codes	Scenario Definitions
Scenario1	**Reduction of Import Tariff**
Tar1	50% reduction of wheat import tariff (Partial liberalization)
Tar2	100% reduction of wheat import tariff with flexible government savings
Tar3	100% reduction of wheat import tariff with fixed government savings
Secnario2	**Reduction of Production Tax**
Prod1	50% reduction of sesame production tax
Prod2	50% reduction of sorghum production tax
Prod3	50% reduction of cotton production tax
Prod4	50% reduction of wheat production tax
Prod5	50% reduction of production tax for all agricultural sector
Prod6	100% reduction of production tax for all agricultural sector production tax with fixed government savings
Scenario3	**Reduction of Value Added Tax**
Val1	100% reduction of sesame value added tax
Val2	100% reduction of sorghum value added tax
Val3	100% reduction of cotton value added tax
Val4	100% reduction of wheat value added tax
Val5	100% reduction of value added tax for all agricultural sector
Val6	100% reduction of value added tax for all agricultural sector with flexible government savings

VI. Results and Discussion

a) Impact of Import Tariff Reduction on the Economy

Reduction in import tariff of wheat (partial and full) had broad inter-linkages among all sectors which have been reflected in the macroeconomic indicators. It has increased wheat imports, associated with a decrease of imports of other agricultural, industrial and service commodities (Table 3)

The increased wheat imports would lower domestic prices forming disincentive to produce and deviate resources to production of cotton, sesame, industrial and services sectors that would be reflected in their increased output and exports. On the other hand, the decrease in sorghum output would result in decreased consumption associated with increased consumption of wheat as a substitute and perhaps increased sorghum exports (Table 3).

The overall effect of reducing wheat import tariff is shown in the form of improvement of the GDP, balance of trade and investment, while the private consumption depicted a drop due to the reduction in imports and domestic output of other agricultural commodities.

Table 3 : Impact of Import Tariff Reduction on the Economy.

Sectors	Base value (Million SDG)	Percentage change from the base Tar1	Tar2
Macroeconomic indicators			
Private consumption	52053	-0.0001	-0.0004
Investment	13070	0.0070	0.0140
GDP	68721	0.0010	0.0030
Balance of Trade	-3326	-0.0015	-0.0030
Imports			
Wheat	689.5	0.356	0.722
Other agric	520.3	-0.007	-0.014
Industry	630.6	-0.006	-0.013
Service	11354.3	-0.010	-0.021
Total	13194.7	0.009	0.018
Exports			
Sesame	451.9	0.003	0.006
Sorghum	6.0	0.019	0.038
Cotton	237.2	0.002	0.003
Wheat	0.0	0.000	0.000
Other agric	814.9	0.012	0.024
Industry	8250.4	0.013	0.027
Service	108.6	0.027	0.054
Total	9869	0.013	0.025
Domestic output			
Sesame	954	0.0005	0.0010
Sorghum	1353	-0.0012	-0.0025
Cotton	278	0.0011	0.0022
Wheat	227	-0.1949	-0.3914
Other agric.	25701	-0.0012	-0.0024
Industry	21688	0.0046	0.0092
Service	51038	0.0002	0.0004
Total	101239	0.0003	0.0006

Source : Model Results

b) Impacts of Reduction in Production Tax and Value Added Tax on the Economy

Reduction of each production tax or value added tax for each crop (scenario Prod1 to Prod4 and Val1 to Val4) would increase its domestic output and exports, and would reduce those of the other crops, industry and service sectors except for sorghum, which is associated with increased exports of service sector (Tables 4 and 5). These are due mainly to increases in resource use drawn from other competing activities such as wheat and cotton in the irrigated schemes. On the other hand, reducing the production tax and value added tax of sesame and cotton would increase the imports of wheat, other agriculture, industry and service sectors while the reduction of these taxes on sorghum would have opposite effects. Moreover, the effect of reduction of wheat taxes is operative only on its import reduction reflecting in decreasing total imports.

The overall effect of reducing production tax and that of value added tax would improve the GDP mainly due to improvement in private consumption despite the mixed effect on investment and balance of trade. For the case of sorghum, the improvement in the GDP could be attributed to increase in investment and export of service with improved balance of trade.

When reducing the production tax for aggregate agriculture (Pro5), the output and export of all crops increase except for those of other agricultural, industry and services sectors. Similar results were obtained with reduction of value added tax for aggregate agriculture (Val5), except for that of other agricultural commodities. In addition, the impact of the production tax for aggregate agriculture would reduce import of wheat and increase those of other agricultural, industry and services. In the same venue, similar results were obtained with reduction of value added tax except for that of other agricultural commodities. The different effects of the two taxes with respect to other agricultural commodities can be attributed to the heavy tax on the other agricultural commodities by the value added tax compared to the production tax.

In general, the reduction of production tax would improve the GDP due to improvement in private consumption and investment despite the deterioration in the balance of trade. In the case of reducing the value added tax, GDP has improved due to improvement in private consumption, despite the deterioration of both investment and balance of trade.

Table 4 : Impact of Production Tax Reduction on the Economy

Sectors	Base value (Million SDG)	Percentage change from the base				
		Prod1	Prod2	Prod3	Prod4	Prod5
Macroeconomic indicators						
Private consumption	52053	0.001	0.000	0.001	0.0002	0.002
Investment	13070	-0.001	0.008	-0.001	0.0010	0.004
GDP	68721	0.001	0.002	0.001	0.0006	0.006
Balance of Trade	-3326	0.007	-0.001	0.007	0.0004	0.014
Imports						
Wheat	689.5	0.002	-0.003	0.003	-0.154	-0.15
Other agric	520.3	0.016	-0.003	0.016	0.003	0.025
Industry	630.6	0.009	-0.002	0.010	0.002	0.018
Service	11354.3	0.021	-0.004	0.021	0.004	0.043
Total	13194.7	0.019	-0.004	0.019	-0.004	0.031
Exports						
Sesame	451.9	1.111	-0.006	-0.017	-0.005	1.081
Sorghum	6.0	-0.056	2.323	-0.056	-0.013	2.191
Cotton	237.2	-0.014	-0.005	2.116	-0.004	2.091
Wheat	0.0	0.000	0.000	0.000	0.000	0.000
Other agric	814.9	-0.051	-0.006	-0.048	-0.012	-0.095
Industry	8250.4	-0.027	-0.006	-0.026	-0.005	-0.066
Service	108.6	-0.069	0.002	-0.063	-0.014	-0.151
Total	9869	0.023	-0.004	0.023	-0.006	0.036
Domestic Output						
Sesame	954	0.632	-0.004	-0.009	-0.003	0.6146
Sorghum	1353	-0.004	0.212	-0.003	-0.001	0.2031
Cotton	278	-0.012	-0.004	1.832	-0.003	1.8102
Wheat	227	-0.008	-0.004	-0.007	0.744	0.7239
Other agric.	25701	-0.0049	-0.004	-0.004	-0.002	-0.0117
Industry	21688	-0.0110	-0.004	-0.011	-0.002	-0.0288
Service	51038	-0.0050	-0.0022	-0.003	-0.0013	-0.0130
Total	101239	-0.0002	-0.0002	0.000	0.0001	-0.0006

Source : Model Results

Table 5 : Impact of Value Added Tax Reduction on the Economy

Sectors	Base value (Million SDG)	Percentage change from the base				
		Val1	Val2	Val3	Val4	Val5
Macroeconomic indicators						
Private consumption	52053	0.001	-0.00003	0.001	0.0003	0.002
Investment	13070	-0.002	0.012	0.000	0.001	-0.083
GDP	68721	0.002	0.003	0.001	0.001	0.013
Balance of Trade	-3326	0.012	-0.002	0.005	0.001	0.022
Imports						
Wheat	689.5	0.003	-0.004	0.002	-0.181	-0.203
Other agric	520.3	0.026	-0.005	0.011	0.004	-0.147
Industry	630.6	0.015	-0.003	0.007	0.002	0.013
Service	11354.3	0.035	-0.006	0.014	0.005	0.072
Total	13194.7	0.032	-0.006	0.013	-0.005	0.047
Exports						
Sesame	451.9	1.891	-0.0098	-0.012	-0.0056	1.796
Sorghum	6.0	-0.095	3.6616	-0.038	-0.0152	3.369
Cotton	237.2	-0.025	-0.0071	1.443	-0.0043	1.351
Wheat	0.0	0.000	0.0000	0.000	0.0000	0.000
Other agric	814.9	-0.086	-0.0097	-0.033	-0.0143	0.518

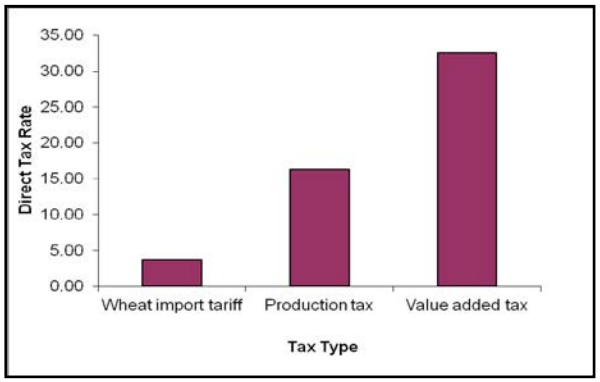
Industry	8250.4	-0.046	-0.0092	-0.018	-0.0064	-0.121
Service	108.6	-0.118	0.0028	-0.043	-0.0170	-0.371
Total	9869	0.039	-0.0068	0.016	-0.0071	0.055
Domestic Output						
Sesame	954	1.0759	-0.0066	-0.006	-0.0033	1.012
Sorghum	1353	-0.0064	0.3328	-0.002	-0.0015	0.288
Cotton	278	-0.0205	-0.0068	1.249	-0.0037	1.165
Wheat	227	-0.0132	-0.0062	-0.004	0.8730	0.807
Other agric.	25701	-0.0083	-0.0063	-0.003	-0.0018	0.057
Industry	21688	-0.0187	-0.0065	-0.007	-0.0028	-0.062
Service	51038	-0.0086	-0.0034	-0.002	-0.0015	-0.0552
Total	101239	-0.0005	-0.0003	0.0001	0.0001	-0.0081

Source : Model Results

c) *Effect of Reducing Indirect Taxes on the Rate of Direct Tax to compensate for Government Savings losses*

The government depends on taxes as a main source of generating income. However, levying taxes has repressive effect on economic activities and therefore the reduction of indirect tax could be compensated for by increasing the direct taxes. Figure (1) reveals that the elimination of wheat import tariff (Tar3), production tax (Prod6) and value added tax (Val6) on the agricultural sector would increase the levies of direct tax by 3.7%, 17.3% and 32.6% respectively.

Figure 1: Impact of indirect Tax Reduction on the Rate of Direct Tax to Sustain Government Savings



Source : Model Results

VII. Recommendation

The following recommendations are based on the study results:

1. Encourage the innovation of fast food from traditional food to decrease wheat consumption,
2. Increasing direct taxes on private companies to compensate reduced government revenue as a result of indirect tax reduction.

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Global Journal of Science Frontier Research
Agriculture and Veterinary Sciences
Volume 12 Issue 6 Version 1.0 April 2012
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Climate Change Perception and Adaptation Strategies on Catfish Farming in Oyo State, Nigeria

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Abstract - This study examines perception of climate change and adaptation strategies on catfish farming in Oyo State. Data were collected with the aid of structured questionnaire to elicit information from 90 catfish farmers using snow ball technique. Data were analyzed using descriptive and statistics such as frequency count, percentages, and mean. The results showed that majority (70.0%) of the respondents were aged 30-49 years, about 58.9% were males. Majority (68.9%) of the respondents was married and over 65.8% had completed formal schooling, while only 25.6% had not formal education. The average household size was 6 persons. However, the highest percentage on perceived climate change include incidence of heavy rainfall 82.2%, increased precipitation 78.9%. Adaptation strategies employed include isolation of sick fish, daily water temperature check and stocking of healthy fingerling which was ranked 1st, 2nd and 3rd. The study concludes that respondent's perception about climate change was unfavourable. The study therefore recommended that there should be introduction of sustainable fishing operation in the study area.

Keywords : *Perception, Adaptation, Climate Change, Catfish.*

GJSFR-D Classification : *FOR Code: 070403 , 070402*

Strictly as per the compliance and regulations of :

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Keywords : Perception, Adaptation, Climate Change, Catfish.

I. Introduction

The issue of climate change has become more threatening not only to the development of socio economic and agricultural activities of any nation but to the totality of human existence (Adejuwon, 2004). Interest in this issue has motivated a substantial body of research on climate change and agriculture (Lobella et al, 2008), climate change is expected to influence crop and livestock production, hydrologic balance, input supplies and other components of agricultural system. However, the nature of these biographical effects and the human responses to them are complex and uncertain.

In Nigeria, the effect of climate change on fish is not in doubt. The effect ranges from overall reduction in productivity to yield quality which invariably threatens food security situation at both national and household levels. The impact is famously arising from flooding, drought and depositions of silt which not only do physical damage to the farm structures and profitability but also causes loss of fish and great changes in the quality of water (Ayanwamide, 2002).

Adaptation is identified as one of the policy options to reduce the negative impact of climate change (Kurukulasuriya and Mendalsohn 2006). Also adaptation to climate change refers to adjustment in natural or human system in response to actual or expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities Inter-Government Panel on Climate Change (IPCC) 2001.

It is evidenced that in Nigeria almost 2/3 of land cover is prone to drought and desertification. Its water resources are under threat which will affect energy sources (like the Kanji and Shiroro dam). Moreover, rain fed agriculture practiced and fishing activities from which 2/3 of the Nigeria population depend primarily on food and livelihoods are also under serious threat besides the high population pressure of 140 million people surviving on the physical environment through various activities within an area of 923, 000 square kilometers (IPCC 2007; NEST 2004).According to King (2004) climate change is the most severe problem that has been faced in this present day and is more severe than the threat of terrorism. It is on the basis of perception of climate change and adaptation strategies that this study is aimed at achieving the following objectives.

(i) determine the respondents socio economic characteristics in the study area.
(ii) identify farmer's perception about climate change
(iii) investigate adaptation strategies employed by the respondents.
(iv) examine the constraints militating against catfish product

II. Methodology

The study was carried out in Egbeda Local Government Area of Oyo State. Oyo State covers a land area of approximately 35,743 square kilometers and occupies about 42 percent of the country' total land area of about 927,769 square kilometers. The study area is bounded in the west by Ibadan North- East, in the North by Lagelu LGA; in the south by Ona Ara LGA and in the east by Irewole LGA; which is now part of Osun State. It has an area of 191km^2 and a population of 281,573 at

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the 2006 census. Both cash and arable crops were grown in the area. The major occupation of the people is farming while non farming activities vary. The people residing in the area are predominantly Yoruba's and non indigenes from other tribes. The population of the study consists of all catfish farmers in the area. Snowball technique in which the catfish association official assisted in identifying some members which generate 90 respondents. Primary data were collected using structured questionnaire and reports obtained from past records, referenced books, journals and statistical publication form the information base and serve as secondary data.

Information was collected on selected personal characteristics such as age, sex, marital status, educational level, farming experience and perception of climate change. Description statistics such as frequency count, mean and percentages were used to summarize the data.

The adaptation strategies of respondents were measured using a 3 - point scale of regularly, occasionally, rarely attracting scores of 2, 1, and 0. The aggregate was computed as total score for adaptation strategies used. The area with highest score was ranked first while the least score was ranked last.

The respondents perceptual about climate change was measured by using 10 perceptual statements using a 5-point likert type scale of strongly agree =5, agree =4, undecided =3, disagree =2 and strongly disagree =1 for positive statements. However the scores were reversed for negative statements. The maximum score obtain was 50 while the minimum score was 10. Mean perceptual score was determined.

III. Results and Discussion

a) Socio economic characteristics of respondents

Table 1 indicates that majority (70.0%) of the respondents were found within the age range of 30-40years, 10.0% were in the range of range of 20-29 years while the remaining 20.0% were 50 years and above. This result suggests that majority of the respondents were young adults who are actively involved in catfish production and have potential drive to sustain fish production for many years. Majority (8.0%) of the respondents were male as revealed in the table 1. This finding suggests that respondents in the study area shave additional responsibilities to carry out to their family. Marital status is of great importance in rural setting as it serves as potential source of labour that can be made available for cat fish production. Majority (74.4%) of the respondents had formal education ranging from primary to tertiary education. This implies that respondents would be able to understand innovation which will help to improve their production. According to Akinkunmi and Park (1990) the level of people's education bears direct influence on their attitude, belief, values and general behaviour.

Table 1 further shows that majority (84.4%) of the respondents had a household size ranging from 4-9 member with mean of 6 members. The respondents had a large family member to cater for and can be use as source of cheap family labour. Also 57.8% of respondents had fishing experience range between 5 and 15 years, with the mean of 13 years. This shows that respondents were well experienced in catfish production in the study area. About (56.7%) of the respondents owned ponds between 11-20 with mean sizes of 12 ponds. This suggests that respondents can easily increase their ponds if they can adapt to climate change. Also, majority (80.0%) of respondents earned above N30.000 per month from their catfish production. This suggests that respondents in the study area earn sizeable income from their cat fish production.

b) Respondents Perceived Climate Change

Table 2 reveals that 82.2% of the respondents perceived climate change as incidence of heavy rainfall, 78.7% of respondents perceived climate change as increased precipitation and 76.7% of the respondents perceived climate change as decreased precipitation. However, only 34.0% of the respondents perceived climate change as frequency of drought. This finding suggests that respondents in the study area perceived climate change.

c) Perception about climate change on fish production

To confirm whatever information respondents has given on perception about climate change on their production they were further requested to indicate their opinion (agreement or disagreement) on ten relevant statements presented to them concerning perception. The analysis of the result is presented in Table 3

The respondents 'Agreed' that

(i) Change in time of rain leads to increase in fish production.
(ii) Increase in precipitation leads to increase in fish production.

Also the respondents "Disagreed" with the following five statements:

(i) long period of hot season leads to decrease in fish production
(ii) increase in drought leads to increase in fish production
(iii) occurrence of flood in the farm area increases cat fish production.
(iv) Long period of harmattan season increase cat fish production
(v) Pond sizes affect climate change

Finally, the result showed that the respondents "strongly agreed" to the statement which says that

(i) rainy season starting earlier increasing catfish production

(ii) occurrence of drought decrease catfish production.

The implication of the results in Table 3 tends to indicate that

(i) Respondents have unfavorable disposition towards climate change.
(ii) Respondents realized the importance of climate change in catfish production.
(iii) Sudden change in climate affect the quantities and qualities of catfish produced.

d) Adaptation Strategies on Cat fish Production

Adaptation is the process of improving time, scales from short term (e.g. seasonal to annual) to long term (decades to centuries). IPCC (2001) defines adaptive capacity as the ability of a system to adjust to climate changes to moderate potential damages, to take advantage of opportunities, or to cope with consequences.

Table 4 revealed that isolation of sick fish, daily water temperature check and stocking of healthy fingerlings were among the strategies used and was ranked first, second and third with mean score of 1.77, 1.76 and 1.63. The findings suggest that respondents adjust to adverse effect associated with climate change. However, good water circulation ranked 4^{th} with mean score = 1.58 construction of dike ranked 5^{th} with mean score 1.54 Table 4 further revealed that introduction of organic material ranked 6^{th}, planting of shrub as wind break ranked 7^{th}, Avoid ponds linkages ranked 8^{th}, regular change of pond water ranked 9^{th} and Adding of lime to reduced acidity ranked 10^{th}. This finding suggests that respondents in the study area use adaptive measure to increase capacity to survive external shock and changes in order to increase their production.

e) Constraints to Catfish Production

As seen in Table 5 majority (81.1%) of the respondents faced problem of hoarse weather, 70.0% with poor access to input, 80.0% claimed lack of capital and 63.3% with shortage of labour and 43.3% of the respondents claimed poor marketing facilities.

IV. Conclusion and Recommendation

The incidence of climate change on catfish production cannot be overemphasized. The respondents' perception about climate change was unfavourable i.e. it has negative effect on their production.

Based of the findings of the study, the following suggestions are made.

<> There should be introduction on boosting adaptive capacity that can increase catfish production.
<> Enlightenment programmes should be introduced on climate change.
<> Introduction of sustainable fishing operation that will improve the livelihood of the respondents at risk from the effects of climate change.
<> There should be timely advice and help from research institutions.

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Table 1: Socioeconomic Characteristics of Respondents

Variables	Frequency	Percentage
Age		
20-29	9	10.0
30-39	29	32.2
40-49	34	37.8
50 and above	18	20.0
Sex		
Male	53	58.9
Female	37	41.1
Marital status		
Married	62	68.9
Single	13	14.4
Widowed	7	7.8
Separated	8	8.9
Educational qualification		
No formal education	23	25.6
Primary school education	11	12.2
Secondary school education	27	30.0
Tertiary school education	21	23.3
Adult education	8	8.9
Household size		
1-3	6	6.7
4-6	47	52.2
7-9	29	32.2
Above 10	8	8.9
Number of ponds owned		
1-10	28	31.1
11-20	51	56.7
21-30	11	12.2
Average income (naira)		
Below 10,000	18	20.0
10,001-20,000	19	21.1
21,001-30,000	27	30.0
30,001 and above	26	28.9
Years of experience		
<5	16	17.8
5-15	52	57.8
16-25	17	18.9
Above 26	5	5.6

Table 2 : Distribution of Respondents According to Perceived Climate Change

Variables	*Frequency	Percentage
Incidence of heavy rainfall	74	82.2
Increased precipitation	71	78.9
Decreased precipitation	69	76.7
Change in time of rainfall	67	74.7
Too much wind	64	71.1
Too much sunlight	63	70.0
Longer period of hot season	42	46.7

**Multiple responses recorded*
Field survey 2011

Table 3 : Distribution of Respondents According to Perception about Climate Change on Catfish production

Perceptual statement	Strongly agree	Agree	Undecided	Disagree	Strongly agree	Total score	Mean score	Remark
Increase in rate of rainfall has positive impact on fish production	53(58.9)	15(16.7)	2(2.2)	19(21.1)	1(1.1)	370	4.11	Strongly agree
Too much wind increase fish production	3(3.3)	62(68.9)	3(3.3)	21(23.3)	1(1.1)	315	3.50	Agree
Long period of hot season decrease fish production	2(2.2)	6(6.7)	4(4.4)	5(5.6)	73(81.1)	129	1.43	Disagree
Rain season starting earlier increase production of fish	65(72.2)	9(10.0)	8(8.9)	7(7.8)	1(1.1)	400	4.44	Strongly agree
Occurrence of drought decrease fish production	64(71.1)	13(14.4)	5(5.4)	4(4.4)	4(4.4)	395	4.38	Strongly agree
Increase in drought increase fish production	2(2.2)	4(4.4)	2(2.2)	79(87.8)	3(3.3)	193	2.14	Disagree
Occurrence of flood in the farm area increase fish production	7(7.8)	3(3.3)	2(2.2)	10(11.1)	68(75.6)	141	1.57	Disagree
Long period of harmattan season increase fish production	8(8.9)	8(8.9)	8(8.9)	4(4.4)	62(68.9)	166	1.84	Disagree
Pond size affect climate change	2(2.2)	3(3.3)	6(6.7)	66(73.3)	13(14.4)	185	2.05	Disagree
Increase in precipitation increase fish production	11(12.2)	46(51.1)	24(26.7)	4(4.4)	5(5.6)	328	3.64	agree

Table 4 : Distribution of Respondents According to Adaptation Strategy

Adaptation strategies to climate change	Very important	Somewhat important	Not important	Mean	Rank
Daily water temperature check	73(81.1)	12(13.3)	5(5.6)	1.76	2nd
Avoiding pond leakages	57(63.3)	28(31.1)	5(5.6)	1.26	8th
Stocking of health fingerlings	72(80.0)	10(11.1)	8(8.9)	1.63	3rd
Adding of lime to reduce acidity	63(70.0)	13(14.4)	14(16.6)	1.00	10th
Regular change of pond water	49(54.4)	15(16.7)	26(28.9)	1.03	9th
Isolation of sick fish	52(57.8)	27(30.0)	11(12.2)	1.77	1st
Introduction of organic material	38(42.2)	17(18.9)	35(38.9)	1.48	6th
Planting of shrubs as wind break	59(65.6)	15(16.7)	16(17.8)	1.46	7th
Construction of the likes	39(43.3)	12(13.3)	39(43.3)	1.54	5th
Good water circulating system	9(10.0)	15(16.7)	66(73.3)	1.58	4th

Source : Field survey 2011

Figure in parenthesis are percentages

Table 5 : Distribution of Respondents According to constraint militating catfish production

Variables	*Frequency	Percentage
Poor weather condition	73	81.1
Poor access to input	63	70.0
Lack of capital	72	8.0
Poor marketing channel	39	43.3
Shortage of labour	57	63.3

**Multiple responses recorded*
Source: Field survey 2011

Global Journal of Science Frontier Research
Agriculture and Veterinary Sciences
Volume 12 Issue 6 Version 1.0 April 2012
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Influence of Farmers' Group Cohesion on Adoption of Climate Change Adaptation Strategies in Delta State, Nigeria

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Abstract - This study was conducted to assess the influence of farmers' group cohesion on climate change adaptation measures in Delta State, Nigeria. Data for the study were collected from 143 arable crop farmers drawn from the three agricultural zones of the state. Data were collected with the use of descriptive and inferential statistics. Most of the farmers subscribed to groups for access to extension service and credit facilities. The various groups were cohesive and the level of adoption of climate change adaptation strategies was high. Group cohesion influenced the high level of adoption of climate change adaptation methods .The major barriers to adaptation to climate change were lack of money and scarcity of technologies. It was recommended that farmers should be encouraged to continue to subscribe to farmers' group and should be given credit through the groups by the government and more technologies on climate change adaptation should be transferred to farmers.

Keywords : *Group cohesion, climate change, adaptation, prevention motivation theory.*

GJSFR-D Classification : *FOR Code: 070106*

Strictly as per the compliance and regulations of :

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Abstract - This study was conducted to assess the influence of farmers' group cohesion on climate change adaptation measures in Delta State, Nigeria. Data for the study were collected from 143 arable crop farmers drawn from the three agricultural zones of the state. Data were collected with the use of descriptive and inferential statistics. Most of the farmers subscribed to groups for access to extension service and credit facilities. The various groups were cohesive and the level of adoption of climate change adaptation strategies was high. Group cohesion influenced the high level of adoption of climate change adaptation methods .The major barriers to adaptation to climate change were lack of money and scarcity of technologies. It was recommended that farmers should be encouraged to continue to subscribe to farmers' group and should be given credit through the groups by the government and more technologies on climate change adaptation should be transferred to farmers.

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I. Introduction

The need for food security in any nation cannot be over emphasized. Efficient agricultural sector is a prerequisite for food security of any nation. It also ensures adequate supply of raw materials to the industrial sector. It does not only bring foreign exchange, but it also provides employment for her growing population and serves as a market for products of industrial sector (Olaitan, 1993). The agricultural sector accounts for 70% of the work force of Nigeria and their contribution to the gross domestic products (GDP) during the first decade of Nigeria's independence was very significant (Njoku, 1991). Akubuilo (2000), as cited by Eze et al (2006), averred that agriculture's contribution to GDP in Nigeria was about 64% in the 1960s declining to about 44.6% in the 1970s, and for 2007- 2009 its average contribution was 37%.

Adetunji et al (2005) opined that agricultural production is still dependent on weather and climate despite the impressive advances recorded in agricultural technology and wealth of accumulated knowledge on agricultural system. It is obvious that the climate change has impact on agricultural production. The climatic conditions prevalent within the top soil and atmosphere where crops and livestock are raised influence their growth and performance (Ayoade, 2002). Arable crop farmers produce the food needed to feed the nation and Delta State in particular. They manage the natural resources needed for their livelihood and sustenance. Their farming activities are directly affected by factors of climate change in various ways.

Adaptation is widely recognized as a vital component of any policy response to climate change (Gbetibouo, 2009). According to Easterling et al (1993) and Smit and Skinner (2002), without adaptation, climate change is generally detrimental to the agricultural sector, but with adaptation vulnerability can largely be reduced. This implies that the extent to which our agricultural system is affected by climate change depends on its adaptive capacity. IPCC (2001) opined that adaptive capacity is the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damage, to take advantage of opportunities, or to cope with the consequences.

People come together to form groups not only for fellow feeling, but also for themselves. This means that individuals form groups for their own common benefits. Belonging to groups serves many functions to the individual members. One of those functions is access to extension service. In their study, Ofuoku and Urang (2009) discovered that 91.7% of farmers subscribe to their respective farmers groups for access to extension service. This is more so because of the dearth of extension agents which has prompted the use of group method of extension outreach.

Cohesion is often viewed from an affective perspective as interpersonal attraction among members of a group. However, cohesion can also be considered as "attraction to collectivity" as opposed to an attraction to the individuals who make up that grouping. Thus, cohesion moves beyond simple interpersonal liking (Ofuoku et al ,2008). Groups in which members are committed to the groups are said to be highly cohesive, while groups in which there is little attraction on the part of members are said to be low in cohesiveness.

Cohesion is regarded as the degree to which members of a group desire to remain in the group, that is, how closely the members interact or the resultant forces acting on the member to remain in the group.

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Cohesiveness is central to groups. It is considered vital in a group decision making, goal attainment, identity and member satisfaction (Ofuoku and Urang, 2009). It is pertinent to ask: what is the relationship between cohesion of arable farmers' groups and adoption of climate change adaptation measures?

Adaptation to climate change requires that farmers first notice that climate has changed, and then identifies useful adaptations and implement them (Maddison, 2006). According to Gbetibouo (2009), many agricultural adaptation options have been suggested in literature. The development and promotion of new crop varieties and advances in water management techniques represent potential adaptation measures rather than ones actually adopted (Gbetibouo, 2009). Indeed, there is no evidence that these adaptation options are feasible, realistic or even likely to occur, he further stated. Agricultural extension delivery is done on group basis as a result of the dearth of extension agents. Cohesiveness of such groups is vital to adoption decision – making, goal attainment and members' satisfaction.

Climate change is already being felt and its effects are expected to continue and to increase. Meanwhile, rural communities where arable farmers are found are increasingly vulnerable to climate induced hazards (Guung and Bhandari, 2008). Cohesion of farmers' groups is central to farmers' group decision – making on adapted technologies, which help them to cope with changes in climate. Extension agencies can take advantage of existing farmers' groups in networking with farmers to promote strategies for coping with effects of climate change.

II. Objectives of the Study

The major objective of the study is to assess the influence of cohesion of arable farmers' groups on adoption of climate change adaptation measures in Delta state, Nigeria. Specifically the study seeks to:

i. ascertain the level of cohesion in farmers' groups;
ii. identify the reasons behind their subscription to various groups;
iii. determine the level of adoption of climate change adaptation measures among the farmers in groups;
iv. determine the relationship between farmers' group cohesion and adoption of adaptation measures for coping with climate change.;
v. ascertain the barriers to adoption of climate change adaptation measures.

Hypothesis

H_0: Cohesiveness of arable farmers' groups does not influence the level of adoption of climate change adaptation strategies.

III. Methodology

The study was conducted in Delta State, Nigeria. It is located in the Niger Delta Area of Nigeria. It is made up of 25 local government areas covering a total of 24, 480 square kilometers.

Agriculture and agro-related activities are the major occupations of the people of Delta state. Varieties of food and cash crops are farmed, thus it runs an agrarian economy with a vast majority of the populace taking to farming. The major crops grown in the study area include maize, cassava, yam, vegetables and cocoyam. Oil palm and rubber are the cash crops grown in the state. Animals reared include poultry, goats, sheep and fishery.

The population for the study will comprise of members of all the arable crop farmers' association in Delta state. Multi-stage sampling techniques was used to randomly select five crop farmers associations from each of the three agricultural zones of the state to get fifteen (15) arable crop farmers' associations. The farmers' associations were selected from the list in each of the three zonal headquarters of Delta State Agricultural Development (DTADP). Ten percent (10%) of the members of each association were randomly selected to constitute the study sample as shown in Table 1; this gave rise to one hundred and forty-three (143) respondents.

Table 1 : Arable farmers' associations and selection of respondents

Agricultural zone	Farmers association selected	Membership	10 percent
Delta North	Ubulu-okiti farmers' group	76	8
	Obiaruku farmers' union	167	17
	Ebu cassava farmers association	71	7
	Abavo farmer' association	211	21
	Igbodo farmers' association	86	9
Delta Central	Cassava farmers' association, Eku	77	8
	Kokori farmers' association	70	7
	Elume cassava farmers' association	81	8
	Farmers' association Olar-udu	79	8
	Jesse farmers' union, Jesse	221	22
Delta South	Patani farmers association	85	9
	Bomadi farmers' union	52	5
	Kiagbodo farmers' association	46	5
	Isaba farmers' union	64	6
	Ogbe-Ijaw farmers' association	25	3

Primary data to be used were collected using structured interview schedule and questionnaire for non formally educated and formally educated farmers respectively. These were administered by the researcher and secondary school teachers within the various locations of the farmers' groups.

The data collected were addressed as follows: objective (i) was treated with the use of 4 point Liker-type scale. Indicators of cohesiveness such as regular attendance to meetings, payment of subscriptions, involvement in group activities, and leadership's prompt response to members' needs were measured with the use of 4-point Likert- type scale of very regular(4), regular(3), seldom regular(2) and not regular. The mean scores for all the indicators were summed up and divided by the number of farmers' groups to get the grand mean (mean of means). Cut off mean was calculated to be 2.5(> 2.5 = highly cohesive, 2.5 = cohesive, 2.3 – 2.49 = fairly cohesive, < 2.3 = not cohesive).Objective (iii) dealt with adoption of climate change adaptation strategies. Adoption level was calculated as followa.

Adoption level – adopters were categorized into low, medium and high adopters Those who adopted 0-2 adaptation measures are low adopters, 3-5 techniques are associated with medium adopters and above 5 adaptation technologies are associated with high adopters.. The level of adoption was determined by counting the number of technologies adopted by the farmers in the study area. Adoption percentage was computed by dividing those who adopted a climate change mitigation measures with total number of farmers and multiplying with 100. The hypothesis that dealt with relationship between group cohesiveness and adoption level was tested using Pearson product moment correlation coefficient. The correlation formular is stated as follows:

$$r = \frac{\sum x\, y - (\sum x)\,(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2]\,[(N\sum y^2) - (\sum y)^2]}}$$

where :
r = correlation coefficient
x = level of adoption
y = group cohesiveness
n = number of respondents

IV. Results and Discussion

a) Reason for subscribing to groups

The farmers (Table 2) subscribed to their various groups mainly for the reasons of accessing credit facilities, accessing extension services and information, need for group membership, the group goals and attraction to group activities. Farmers groups have credit facilities which they give out to members. These groups loan their financial resources and use it to assist members as self-help groups. As a result of the dearth of field extension agents, extension services are now best carried out in groups so as to reach out to many people at once. It is easier to reach out.

Table 2 : Distribution reasons for subscribing to groups

Reasons	Frequency	Percentage (%)
Attraction to group activities	46	32.2
Groups goals	79	55.2
Needs for group membership	83	58.0
Access to extension services/information	141	98.6
Access to credit facilities	143	1000
Liking for the members	2	1.4

**There were multiple responses.*

They saw the needs for groups membership as a reason for subscribing to their various groups because the facilities offered by the groups are meant for their members only. For one to have access to such facilities like extension services/information and credit, he or she has to join the group.They also considered the group goals as being a reason for joining their groups because the group goals are in harmony with their personal goals. The activities carried out by the groups, like extension activities have formed a source of attraction for many of the farmers. This is more so as they derived the motivation to improve on their farming operations. These findings are congruent with those of Ogionwo and Eke (1999), Ofuoku et al (2008), Ofuoku and Urang (2009) as they discovered similar reasons for subscription to groups among various self-help groups.

b) Cohesiveness of farmers' groups

The farmers' groups in the three agricultural zones (Table 3) were most highly cohesive according to the respondents as they polled the mean score of 2.62 except ElumeCassava Farmers' Association, Isaba and Ogbe-Ijaw Plantain farmers' Unions that had mean scores which fell between of 2.43-2.48 which translated as being fairly cohesive. On the whole, the farmers groups were generally found to be highly cohesive (mean score >2.5). The high level of cohesion is attributed to the fact that the needs of the farmers were being met by their various groups. The more the needs of farmers, which form the reasons for subscribing to their various groups are met or satisfied the more they would like to remain in their various groups as active members (Ofuoku et al, 2008, Ofuoku and Urang, 2009).

According to Ogionwo and Eke (1999), cohesiveness is higher in groups in which the goals of the group are congruent with the goals of the members than in groups where the members do not share the overall group goals. Therefore, a group maintain its cohesiveness if members share common goal. As long as the members achieve their goals, they would want to continue as members of the group and would also be committed to the group.

Table 3 : Level of cohesion of farmers groups

Agricultural farmers groups	Meeting attendance (mean)	Payment of subscription (mean)	Involvement in group activities (mean)	Need satisfaction (mean)	Pooled mean score
Zone					
Delta North					
Ubulu-Okiti Farmers' Union (n=8)	2.5	2.6	2.3	2.9	2.58
Obiaruku Farmers' Union (n=17)	2.9	2.8	2.5	2.5	2.68
Ebu Cassava Farmers' Assoc. (n=7)	3.0	2.9	2.3	2.8	2.75
AbavoCcassava Farmers' Assoc. (n=21)	3.1	3.0	2.8	2.9	2.95
Igbodo Cassava Farmers' Assoc. (n=9)	2.7	2.5	2.3	2.6	2.53
					2.70
Delta Central					
Cassava Farmers Aassoc. Eku (n=8	3.1	2.8	2.6	2.9	2.78
Elume Cassava Farmers' Assoc. (n=7)	2.6	2.3	2.3	2.5	2.43
Kokori Farmers' Assoc. (n=8)	2.6	2.6	2.5	2.8	2.63
Farmers Assoc. Otor-udu (n=8)	2.5	2.3	2.7	2.9	2.60
Jesse Farmers' Union (n=22)	2.9	2.3	2.5	2.9	2.65
					2.62
Delta South					
Patani Potato Farmers' Aassoc. (n=9)	2.8	2.3	2.5	2.7	2.58
Bomadi Potato Farmers' Assoc. (n=5	2.6	2.3	2.7	2.9	2.63
Kiagbodo Farmers' Union (n=5)	3.0	2.8	2.8	3.1	2.93
Isaba Plantain Farmers' Union (n=6)	2.3	2.3	2.5	2.8	2.48
Ogbe-Ijaw Plantain Farmers' Union	2.3	2.3	2.5	2.6	2.43
					2.61
Grand mean score					2.62

Cut off mean = 2.5(> 2.5 = highly cohesive, 2.5 = cohesive, 2.3 – 2.49 = fairly cohesive, < 2.3 = not cohesive).

c) Level of adoption of climate change adaptation strategies

Most (81.8%) of the farmers adopted more than 5 climate change adaptation strategies (see Table 4). This implies that there is high level of adoption among members of most of the various groups. This is suspected to have been promoted by access to extension services and information. It is also suspected that the extension agents serving them may have applied the protection motivation theory (PMT). According to this theory, behavior change may be achieved by appealing to an individual's fears (Munro et al, 2007). Here, three components of fear arousal are postulated: the magnitude of harm of a depicted event; the probability of that event's occurrence and the efficacy of the protective response (Rogers, 1975). These it is contended, combine multiplicatively to determine the intensity of protection motivation (Stroebe, 2000), resulting in activity occurring as a result of a desire to protect oneself from danger (Rogers, 1975). This theory within the broader cognitive perspective explicitly uses the costs and benefits of existing and commended behavior to predict the likelihood of change (Gabhardt and Maes, 2001).

Table 4 : Adoption levels of climate change adaptation strategies

Number of strategies adopted	Frequency n=143	Percentage (%)
0 - 2 (low level)	9	63
3 – 5 (medium level)	17	11.9
Above 5 (high level)	117	81.8

Further analysis shows that 67.1% of the farmers have already adopted early/late planting strategies; 77.6% had adopted mulching; 83.9%, tree planting and 89.5% farm yard manure (Table 5). Others (41.3% and 44.1%) had adopted vermin-composting and heat resistant varieties of crops respectively. The overall adoption score for all climate change adaptation strategies was computed as 60.3%.

Table 5 : Adoption decision process among farmers

Adaptation strategies	Awareness (%)	Interest (%)	Evaluation (%)	Trial (%)	Adoption (%)	Total
Early/late planting	6.3	7.7	8.4	10.5	67.1	100
Irrigation	15.4	25.2	6.3	35.0	18.2	100
Mulching	0	1.4	6.3	14.7	77.6	100
Heat resistant varieties	12.6	8.4	13.3	21.7	44.1	100
Vermin-composting	9.8	16.1	18.1	14.7	41.3	100
Planting of trees	0	0	3.5	12.6	83.9	100
Use of farm yard manure	0	0	2.1	8.4	89.9	100

The pooled adoption score for all the strategies is 60.3%

Results in Tables 4 and 5 indicate that arable farmers have adopted most of the available climate change adaptation methods.

d) Influence of group cohesion on adoption of climate change adaptation methods

Results in Table 6 indicate that there is a high positive influence of group cohesion on adoption of climate change adaptation measures (r =0.925). This is attributed to the fact that within the group, members exchange information and ideas as well as influence each other This is especially so in the process of finding solution to common problems affecting them.

The high relationship between group cohesiveness and adoption level can also be attributed to the fact that extension - farmers contact is mostly carried out in groups and the more cohesive a group is, the higher the frequency of agricultural extension contact.

Table 6 : Relationship between group cohesion and adoption of climate change

Variable	Cohesiveness (x)	Adoption (y)
Cohesiveness (x)	1	0.9251194
Adoption (y)	0.9251194	1

The high correlation between group cohesiveness and adoption of climate change adaptation measures is almost in agreement with the finding of Saiki (2009) who found that agricultural extension worker/farmer contact is positively related to adoption of climate change adaptation methods.

e) Barrier to adoption of adaptation strategies

The reasons for low adoption level of irrigation is that most farmers (81.8%) did not have the financial resource to carry out irrigation practices (Table 7) . For heat resistant varieties and vermin-composting, the technologies were scarce and the materials needed to produce the technologies were scarce. Poor adoption of irrigation could be attributed to the need for more capital and low capability to mount irrigation facilities. This agrees with the findings of Deressa et al (2009) and Saiki (2009) who observed that lack of money and poor capacity for irrigation were the challenges faced by farmers.

Table 7 : Barriers to adaptation of climate change adaptation strategies.

Barriers	Frequency	Percentages (%)
Lack of money	117	81.8
Lack of information	0	0
Unavailability of technologies	0	0
Scarcity of technologies	80	55.90

V. Conclusion and Recommendations

Adoption level of climate change adaptation methods was high and the various groups were cohesive. Cohesiveness of farmers' groupshad high positive correlation with adoption of the climate change adaptation strategies. However, lack of money and scarcity of technologies were barriers to adoption of climate change adaptation measures. Based on the findings, the following recommendations are given:

i. Farmers should be encouraged to continue to subscribe to groups.
ii. Farmers group should be given credits for the members to access.
iii. More technologies on climate change adaptation should be transferred to the farmers groups.

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Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
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Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
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References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

INDEX

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ISSN 9755896