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DISCOVERING THOUGHTS AND INVENTING FUTURE

HIGHLIGHTS

Evaluation for Pepper Production

Analysis of Household Demand

Assessment of Militancy Activities

Waterside Local Government

Wheat Plant

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Contents of the Volume

- i. Copyright Notice
- ii. Editorial Board Members
- iii. Chief Author and Dean
- iv. Table of Contents
- v. From the Chief Editor's Desk
- vi. Research and Review Papers
- 1. Yield Crop Water Use (Cwu) Evaluation For Pepper Production Under Irrigated Cultivation In Akure, Nigeria. *1-8*
- 2. Determinant of Land Management Practices among Crop Farmers in South-Western Nigeria. *9-14*
- 3. Analysis of Household Demand for Meat, in Southwest, Nigeria. 15-21
- 4. Economic Analysis Of Rural Women Income From Non-Timber Forest Products In Ife South Local Government Area Of Osun State, Nigeria. 23-31
- 5. Assessment of Militancy Activities on Rural Dwellers in Delta State, Nigeria. 33-42
- Evaluation Of Fishermen And Fish Traders In Transactional Sex For Fish Marketing In Coastal Areas Of Ogun Waterside Local Government Area, Ogun State, Nigeria. 43-53
- 7. Physiological Performance Of Different Durum Wheat Varieties Grown Under Rainfed Condition. *55-63*
- 8. Effects of phosphorus on biological nitrogen fixation in soybean under irrigation using saline water. *65-72*
- vii. Auxiliary Memberships
- viii. Process of Submission of Research Paper
- ix. Preferred Author Guidelines
- x. Index



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Yield-Crop Water Use (Cwu) Evaluation For Pepper Production Under Irrigated Cultivation In Akure, Nigeria

By Olotu Yahaya, Femi Alao, Odighi Cletus J

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Abstract - Three treatments of water application on NHVIA pepper were carried out at Department of Agricultural Engineering Teaching and Research Farm, Federal University of Technology, Akure, Nigeria. The study was conducted during the dry seasons of 2008 and 2009 respectively in order to determine the growth, yield; and evaluate water use of pepper. Relationship between crop water use and yield produced from pepper grown under micro- sprinkler irrigation system was established. NHV1A variety of pepper was nursed for six weeks and transplanted. It was subjected to three treatments based on 50% water requirement (WR) of pepper as low (treatment 1, T1), 75% WR as medium (T2) and 100% WR as high (T3) irrigation systems. Water applications were carried 3-day interval, volume of water applied in each treatment was technically monitored. Water balance parameters such as Soil Moisture Content (SMC) and evapotranspiration were measured using tensiometer and Water Balance Equation respectively. Agronomic parameters such as plant height stem diameter, fruit width, length, root depth, leaf area and leaf area index were measured on weekly interval. It was observed that T3 recorded highest yield of 20.101 ton/ha in 2008 and 21.062 ton/ha in 2009 seasons, while T1 with minimum yield of 14.886 ton/ha and 15.260 ton/ha for the two seasons, respectively. In addition, T3 recorded maximum crop water use of 821.07 mm in 2008 and 833.61 mm in 2009 seasons, respectively.

Keywords : Water requirement, water, pepper, yield, irrigation, parameter, leaf, interval, NHVIA pepper, season.

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Yield-Crop Water Use (Cwu) Evaluation For Pepper Production Under Irrigated Cultivation In Akure, Nigeria

Olotu Yahaya^{α}, Femi Alao^{Ω}, Odighi Cletus J^{β}

Abstract - Three treatments of water application on NHVIA pepper were carried out at Department of Agricultural Engineering Teaching and Research Farm, Federal University of Technology, Akure, Nigeria. The study was conducted during the dry seasons of 2008 and 2009 respectively in order to determine the growth, yield; and evaluate water use of pepper. Relationship between crop water use and yield produced from pepper grown under micro-sprinkler irrigation system was established. NHV1A variety of pepper was nursed for six weeks and transplanted. It was subjected to three treatments based on 50% water requirement (WR) of pepper as low (treatment 1, T1), 75% WR as medium (T2) and 100% WR as high (T3) irrigation systems. Water applications were carried 3-day interval, volume of water applied in each treatment was technically monitored. Water balance parameters such as Soil Moisture Content (SMC) and evapotranspiration were measured using tensiometer and Water Balance Equation respectively. Agronomic parameters such as plant height stem diameter, fruit width, length, root depth, leaf area and leaf area index were measured on weekly interval. It was observed that T3 recorded highest yield of 20.101 ton/ha in 2008 and 21.062 ton/ha in 2009 seasons, while T1 with minimum yield of 14.886 ton/ha and 15.260 ton/ha for the two seasons, respectively. In addition, T3 recorded maximum crop water use of 821.07 mm in 2008 and 833.61 mm in 2009 seasons, respectively.

Keywords : Water requirement, water, pepper, yield, irrigation, parameter, leaf, interval, NHVIA pepper, season.

I. INTRODUCTION

Peppers (*Capsicum annuum* L.) belongs to the family Solanaceae, which is an important group of vegetables cultivated extensively in Pakistan and also widely cultivated in almost every country of the world (Channabasavanna and Setty, 2000). It thrives best in warm climate, where frost is not a problem during the growing seasons. In general, it requires temperatures ranging from 25-35°C (Olalla and Valero, 1994). Peppers thrive in a wide range of soil types, but good drainage is essential. The soil should be worked over to break up large clods and any hardpan that prevents good drainage. A soil pH of 5.5–7.0 is

desirable. Green peppers are less sweet and slightly bitter than yellow, orange, purple or red peppers. The taste of ripe peppers can also vary with growing conditions and post-harvest storage treatment. Green pepper is widely grown in the Northern parts of Nigeria as a result of its uses and application which in turns increases demand and consumption of the vegetable. However, the vegetable is considered as medicinal plant in some parts of Nigeria. All these values have led to developing technically-based precision farming of green pepper so as to boost the production in order to match its increasing demand.

Consumption water use of pepper must be accurately maintained for its growth, development and yield. This could be achieved by uniform water application. Irrigation is an artificial application of water to the soil. It is applied to assist in the growing of agricultural crops, maintenance of landscapes and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Irrigation also has a few other uses in crop production, which include protecting plants against frost (Snyder and Melo-Abreu, 2005), suppressing weed growing in grain fields (Williams et al, 2007) and helping in preventing soil consolidation. Various types of irrigation techniques differ on how the water obtained from the source is distributed within the mechanism, field. irrigation design cost and technicalities.

Sprinkler irrigation systems are increasingly being used in crop production in South-West of Nigeria. Sprinkler irrigation systems apply water directly to the surface of the crop as well as the soil around the roots of the crop. Studies have shown that sprinkler irrigation systems reduce the water use of crop by about 50% compared to that under seepage system (Pitts and Clark, 1991). Due to efficiency and maintainability of sprinkler irrigation, it is therefore considered as method of water application for the purpose of this research study which focuses on determining the growth, development and yield response of green pepper cultivated under monitored sprinkler irrigation system.

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II. MATERIALS AND METHODS

a) Study Area

The study was carried out at the Research Farm of the Department of Agricultural Engineering, Federal University of Technology, Akure, Nigeria. Akure is located within the humid region of Nigeria on latitude 7°16'N; longitude 5°13'E. The field experiment was conducted during 2007/08 and 2008/2009 dry seasons respectively. The physical and chemical properties of the soil were determined. The experimental design was a Randomized Complete Block Design (RCBD) with three treatments and three replicates. The experimental plots were divided into 9 plots of 2 m by 2 m each. Each treatment was subjected to different water application of 50% Water Requirements (WR) as Low, 75%WR as Medium, and 100% WR as High irrigations.

b) The Crop

A variety of Pepper *(Capsicum annuum L.),* **NHV1A**, of drought resistance, was obtained from the National Institute of Horticulture (NIHORT), Ibadan to ensure the viability of the seeds used. Pepper seeds used were nursed at the farm site.

c) Water Supply at the Experimental Site

The water supply to the experimental site was mainly from a hand dug well located at about 50 m distance from the experimental plot. The water source has adequate water that could meet the irrigation water demand of the crop under study.

d) Experimental Design

Plot (10 m x 60 m) portion of the farm site was prepared for effective seed bed formation and (10 m x 10 m) part of the prepared land was divided into nine seed beds (micro-sprinkler plots), 2.0 m long, 2.0 m wide and 0.15 m deep and leaving 0.5 m spacing between beds. The micro-sprinklers were installed at the 2.0 m x 2.0 m plots. There were centers of the nine three treatments replicated three times in a randomized complete block design. Each treatment plot was connected to separate supplies (0.1 m³ capacity reservoirs) placed adjacent to each of the beds at uniform pressure head of 1.5 m as shown in Figure 3.1. Treatments were based on different percentage of water requirements (WR) of pepper as 50% WR, 75% WR, and 100% WR. Irrigations were carried out at three- day intervals and the volume of water applied in each treatment was monitored. Rainfalls were measured during the experiment with the aid of automated rainguage. Pepper seeds were transplanted manually at a spacing of 45 cm x 60 cm between stands after having been nursed on seedbeds for six weeks. Water application rates (A) from sprinkler into the catch cans

were determined using the following relationship (Michael and Ojha, 2003):

Application rate (A) =
$$\frac{KQ}{a}$$
 3.1

A = Application rate mm/hr

 $Q = \mbox{Sprinkler}$ discharge, l/min, determined from the volume of water applied divided by the period of application

a = Wetted area of sprinkler; m^2 (surface area of can) (3.01 x10⁻³m²)

 $K = Unit constant (K=60.0 \text{ for A in mm/hr, Q in l/min and a in m²), at a constant pressure head.$

The uniformity coefficient of the sprinkler system was determined to ascertain the efficiency of the uniformity in the sprinkling of water using the Christiansen's formula (Michael and Ojha, 2003).

$$C_{u} = 100 \left[1 - \frac{\sum |x_{i} - \overline{x}|}{\overline{x}n} \right]$$
 3.2

where

 $C_u = \mbox{Christiansen's uniformity coefficient, percent;}$

 $\mathbf{n} =$ number of collecting cans placed on the bed;

 $xi=\mbox{water}$ measurement in the ith $% xi=\mbox{collecting}$ can

(I = 1, 2, ..., n);

x = mean of n measurements in the area under consideration;

 $\sum |x_i - x| =$ sum of absolute deviations from the mean measurement.



Fig 3.1: Layout of the sprinkler irrigation system in the field of experiment

e) Evapotranspiration (Crop water use)

The consumptive use of each treatment at various stages of the crop was estimated using the Water Balance Equation (FAO 56):

$$\begin{split} ET &= P + I \pm \Delta S + R + D \\ 3.3 \\ P &= \text{Precipitation (Rainfall) in mm} \\ I &= \text{Irrigation (mm)} \\ \Delta S &= \text{Change in moisture storage (mm)} \\ R &= \text{Runoff (mm)} \end{split}$$

D = Drainage (mm)

f) Agronomic Measurements

Leaf area, leaf area index (LAI), plant height, stem diameter, fruits width, fruits length, number of fruits and root depths were measured on weekly basis beginning from 29 days after transplanting (DAT) to the maturity stage, that is, 65 DAT when harvesting began. A representative plant was selected weekly for the measurement of LAI. Leaf area index according to Gong <u>et al.</u>, (1995) was estimated from the relationship:

$Leaf area index (LAI) = \frac{Area of leaf per plant}{Area of soil covered per plant} 3.4$

g) Pepper Yield

Harvestable yields of Pepper (*Capsicum annum*) were determined on weekly interval starting from the day harvesting began (65DAT). Fresh peppers were harvested from the treatment plots for ease of measurement of fresh biomass. The weight of the harvested fresh biomass was determined using an electronic weighing device that could measure up to 0.01 level of accuracy.

III. RESULTS AND DISCUSSION

a) Soil properties at the experimental site.

Table 4.1 shows the description of the soil properties at the experimental site. The micro-sprinkler irrigation site has a mean soil texture (USDA method) of sandy loam in the top soil which forms mainly the

agricultural layer required for the cultivation of most vegetables. The textural class was determined through the use of the USDA soil textural triangle on the basis of particle - size analysis (Figure 4.1). Minimum and maximum organic carbon content of 0.69% and 1.04% respectively were observed within the top 0.3 m depth of the soil. The top soil average carbon content falls within the range (0.6-1.2%) given by Young (1976) as desirable for tropical crop production. The soil PH varies from acidic to neutral on the surface soil (5.95 - 6.4). The mean of the P.H. falls within the slightly acidic range (6.2) and is below the average value of (6.5) which was considered ideal for good availability of plant nutrients in the mineral soils (Foth and Ellis, 1997). The bulk density of the experimental site was 1.25g/cm³ at the first 0.3 m depth of soil. This is below the critical value of 2.1 g/cm³, beyond which plant growth is severely limited.

PH in % N Κ Са Samples Organic Organic P (mg/kg) Na Mg Textural class water(1:2) carbon matter (%) (%) Sandy loamy(SL) 6.10 1.02 1.92 0.46 10.85 0.07 0.11 0.45 0.31 1 2 6.26 0.84 1.46 0.42 11.73 0.09 0.12 0.96 0.40 SL 3 0.62 0.44 8.45 0.10 0.23 0.21 SL 6.17 0.73 0.06 9.29 SL 4 0.40 0.14 0.21 0.28 6.10 1.04 1.89 0.05 5 6.20 0.82 2.12 0.46 10.21 0.06 0.13 0.30 0.23 SL 6 6.35 0.71 0.74 0.43 9.85 0.06 0.12 0.40 0.31 SL 7 5.95 1.00 1.65 0.42 10.70 0.05 0.11 0.47 0.30 SL 0.40 8 6.25 0.79 0.14 11.05 0.06 0.10 0.41 0.28 SL 9 0.41 0.26 6.40 0.69 1.45 11.15 0.05 0.13 0.40 SL Min 0.69 0.14 0.40 8.45 0.10 0.21 0.21 5.95 0.05 2.12 0.46 11.73 0.14 0.40 Max 6.40 1.04 0.09 0.96 0.85 0.43 10.36 0.06 0.12 0.29 Mean 6.20 1.33 0.43 S.D. 0.40 0.14 0.68 0.02 1.04 0.01 0.01 0.22 0.06

Table 4.1 : Description of the soil properties at the experimental site.

Source: Field study, 2009

The soils in the irrigation plots have a high sand content with mean value of 63.6% in the top soil. The clay content has a mean value of 18.9%, this does not change so much from one point to the other around the sampled points indicating similar soil textural classification within the 0-30 cm soil depth.

b) Moisture Storage in the Soil Profile.

The variations in the volumetric soil moisture content (SMC) in the capsicum annum field up to a depth of 60cm is shown in Figure 4.1



Figure 4.1: Soil moisture stored under different treatments in (a) 2008 and (b) 2009 seasons respectively

(b)

36 Days after transplanting 43

The soil moisture in the soil profile was observed to increase down the soil profile in both seasons, but there was a decline at 43DAT due to high evaporation rate, and increased at 50DAT in 2008 season. However, the moisture regime under high irrigation treatment was highest among all the three treatments. This must have been resulted due to the application of irrigation water was at the highest rate, thus, allowing water to have enough time to accumulate around the root zone of the crop thereby permitting moisture build up at the topsoil. The differences of moisture stored for all the three treatments were significant at 5% level at different growth stages.

22

29

c) Crop Water Use (Evapotranspiration)

1

0.5

0

Evapotranspiration from the micro-sprinkler plots depended mostly on irrigation water applied and also on rainfall amount. There were variations in the crop water use in both seasons and this was largely due to the different irrigation schedules for all the treatment plots. Plots with high water applications have enough water to meet evapotranspiration demand, that is, evapotranspiration increases as the irrigation rates increases. This observation was confirmed by Hanks et al., (1976). The highest evapotranspiration value of 4.61mm/day was obtained in 2008, while 4.70mm/day was obtained in 2009. The variations between evapotranspiration (ET) with days after transplanting (DAT) for various treatments are shown in the figures below:

50

🗖 High



Figure 4.3 (a): Crop water use of *capsicum annum* under different growth stages in (a) low, (b) medium and (c) high irrigation treatments in 2008.



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d) Water Use of pepper and Yield relationship in the treatments

It was evaluated that irrigation treatments had significant effect on the yield of green pepper. The output of the experimentation shows that average yield of green pepper is proportional to the volume of water applied. Treatment with low water application, the total yield obtained was 14.9 t/ha in 2008 and 15.3 t/ha in 2009, while for treatment with high water application, total yield obtained was 20.1 t/ha in 2008 and 21.1 t /ha in 2009. Significant correlations were obtained (p<0.05) between yield and crop water use and shown in Figure 4.4:

Table 4.2 : Total Water Used (mm) by Pepper for each treatment in 2008

Treatment	25	27	29	31	33	35	37	39	41
Low	12.5	31.9	70.2	135.6	223.1	307.1	344.8	371.0	396.0
Medium	15.3	48.2	128.2	217.8	334.6	437.2	511.9	552.1	592.3
High	24.0	94.5	193.7	312.4	464.5	598.6	703.3	772.7	821.1

Treatment	25	27	29	31	33	35	37	39	41
Low	13.3	34.0	74.1	142.6	238.9	326.8	365.6	392.9	420.0
Medium	15.8	49.8	134.2	225.3	344.4	451.5	528.1	577.3	626.1
High	24.5	95.5	196.4	317.0	472.1	606.9	713.8	784.0	833.6



Fig. 4.4 : Yield-Water use calibration curve

e) Yield of pepper in the treatments

The first fruit was harvested 65 days after transplanting (DAT) of seedlings and there were 9 harvests during the growing season that lasted for121 days. Treatment 3 (high irrigation) recorded highest total yield of 20.1 t/ha in 2008 season and 21.1 t/ha in 2009 season. In treatment 2 (medium irrigation), the total yield obtained was 16.1 t/ha in 2008 and 17 ton/ha in 2009 season respectively. Treatment 1 (low irrigation) with the least amount of water recorded the lowest total yield of 14.9 t/ha and 15.3 t/ha in 2008 and 2009 respectively. Thus, the yields of pepper produced depend on the amount of irrigation water applied.

Table 4.3 : Total yield of pepper produced under the treatments.

Plot area (m²)	Treatments	Yield (ton/ha) (2008)	Yield (ton/ha) (2009)
4	Low	14.886	15.260
4	Medium	16.146	16.955
4	High	20.101	21.062

Source : Field study, 2009

IV. CONCLUSION

The research study was carried out to evaluate the response of *capsicum annum* to water application via micro sprinkler irrigation system. Observations throughout the entire growing period indicated that maximum yields was obtained at the treatment 3 plots (high) which were 20.1 t/ha in 2008 and 21.1 t/ha in 2009 season respectively. The relationship between crop water use and yield showed that treatment 3 plot (high) has the highest coefficient of determination of 0.93 and 0.93 for the two seasons, while the coefficient of determination for treatment 1 (low) and treatment 2 (Medium) are 0.91 and 0.89 in 2008;0.90 and 0.87 in 2009 seasons respectively. It was however shown that the total crop water use of treatment 3 is the highest with values of 821mm and 834mm for the two seasons, while treatments 1(low) and 2 (Medium) has a total crop water use of 396 mm and 420 mm in 2008; 592 mm and 626 mm in 2009 seasons. Therefore, the outputs of the study adequately indicated that green pepper requires sufficient amount of water for its growth and expected productivity and yield. Since the demand for green pepper on the increase due to its multiple usage and medicinal applications, this study however conclude that technically-monitored sprinkler or drip irrigation systems should be encouraged to supply to the root nodes of the plant to boost it growth, development and yield.

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Determinant of Land Management Practices among Crop Farmers in South-Western Nigeria

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Abstract - The study examined the determinants of land management practices among crop farmers in South-Western Nigeria. A total of 360 respondents were selected from the three agroecological zones of the State typical of some Nigeria South-Western States. Well-structured questionnaires with few open-ended questions were administered out of which 301 were found to be very useful for the study. Analysis of data was done using descriptive statistics and probit models were employed as the inferential statistics. The result showed that 90 percent of the farmers are male and married while 85.5 percent of their household members are literate. About 40 percent of the farmers are in their active age. The male education at secondary and tertiary level has significant impact on land management practices contrary to female education. Also the livelihood strategy of the household head has limited impact on most land management practices. Investment on land encourages fallowing and incorporation of crop residues while assess to credit favors non-farm rather than farm activities.

Keywords : Land, Land Management, Livelihood Strategy, Agro-Ecological Zones, Crops Diversification, Support Policy, Herfindal Index, Probit Model, Human and Financial Capital. GJSFR-D Classification : FOR Code: 960904, 070101



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Raufu, M.O.^{α}, Adetunji M.O.^{Ω}

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I. INTRODUCTION

and is the major resource for the livelihood of the poor. In Nigeria, a typical villager recognizes land in its entirety. According to Fabiyi, (1990) land, to the farmer, is home and work place and shares it with the entire biotic complex. As important as land is to farmers' livelihood, Adekoya (1997) observed that subsistent farmers are with a lot of in integrating many of the land management practices. Dixon (1995) arranged these constraint under three headings; economic obstacles such as capital need and financial incentives; social conditions which include land tenure, availability of infrastructures and educational level of farmers; and ecological consideration such as limited knowledge of inputs and sustainability of some systems.

Land use in many African nations have been characterized by a significant amount of land degradation. Moreover, these two processes are clearly related (Brabier, 1999). Many poor African pastorialists and farming households respond to declining land productivity by abandoning existing degraded pasture

and cropland, and moving to new land for grazing and crop cultivation. Due to the fact that the pattern of land use will often result into depletion of soil nutrients, appropriate management practices have to be adopted. Couper (1995) noted that the need for appropriate soil management in tropical soils becomes imperative because of inability of the soil to sustain increased crop yields as cultivation continues on an annual basis. This was traced to the fact that the clay in most tropical soil, referred to as low activity clay (LAC) does not expand and contract readily with moisture changes and the soil becomes susceptible to soil compaction. Also, LAC soils have a low cation exchange capacity, which means that nutrients are not held by the soil, but quickly leached below the crop roots. This is due to high temperatures, which makes organic matters in tropical soil to be susceptible to rapid mineralization.

Furthermore, in an imperfect market setting, the nature of poverty is also important in determining its impact on natural resources management and degradation. Households that are not poor by welfare criteria such as minimum levels of consumption may still face "investment poverty" that prevents them from making profitable investments in resource conservation and improvement. (Reardon and Vosti 1995) claimed that households that lack access to road and markets, or that own little land may deplete soil nutrients less rapidly since they are subsistence – oriented and thus export less soil nutrients in the farm of crop harvest and sales. On the other hand, households that are livestock poor may deplete soil nutrients more rapidly because they lack access to manure.

As a result of this, the study centered on land management since land is the major resource for the livelihoods of the poor. A large body of past research shows that the major determinants of land management include households' endowments of different types of capital, land tenure and the biophysical and socioeconomic environment in which rural households live (Reardon and Vosti, 1995; Barrett, et al, 2002; Nkonya, et al, 2004).

Land use and management practices affect human health directly and indirectly. It affects fauna and flora, contributes to local, regional, and global climate changes and is the primary source of soil, water and land degradation (Sala et al., 2000; Pielke, 2005). Altering ecosystem services— i.e., the provisions people obtain from ecosystems (e.g., food, water), regulating

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services (e.g., predator-prey relationships, flood and disease control), cultural services (e.g., spiritual and recreational benefits), and support services (e.g., pollination, nutrient cycling, productivity)—that maintain the conditions for life on Earth affect the ability of biological systems to support human needs (Vitousek et al., 1997). Alterations lead to large scale land degradation, changing the ecology of diseases that influence human health and making it more vulnerable to infections (Collins, 2001).

In addition, the identification of constraints to farmers' use of sustainable management practices would provide a direction of action for government in trying to boost farmers involvement in land management practices, reveal areas of inadequacy and where the farmers need improvement. There is likewise the need to focus on the sustainability of the environment through emphasizing the desirable ways by which farmers can utilize the land that would prevent consequential depletion of the soil fertility.

Finally, there is the need to develop a benchmark of wider dimension that would identify landuse indices and threshold in a typified smallholder farming system. This is even more important now that the Federal Government of Nigeria is exploring ways of sourcing revenue from non-oil sector. The consequence of enhanced production is also most likely to result in enhanced welfare for crop farming communities.

The achievements of all these would not only improve agricultural production but would further ensure the sustainability of the environment. The results of this study is likewise expected to provide policy makers with good understanding of the situation in the south-western part of the country such that they would be adequately equipped with the right policy intervention tools that will promote the welfare of crop farming households.

II. OBJECTIVE OF THE STUDY

The main objective of the study is to identify the determinants of land management practices among crop farmers in South-western Nigeria. The specific objectives are to:

- 1. identify the socio-economic characteristics of the farmers,
- 2. examine the pattern of land use as regards crops diversification, and
- 3. highlight the determinants of land management practices in the study area.

III. HYPOTHESIS

The working hypothesis stated in null form is ;

There is no significant relationship between access to credit and land management practices.

IV. METHODOLOGY

The study was conducted in Osun State of South-Western Nigeria that is made up of three agroecological zones, characteristics of some of the South-Western States of the federation. The State has six administrative zones and thirty local government areas. The predominant farming system in the area is shifting cultivation with mixed cropping and crop rotation. Crops cultivated include maize, yam, cassava, cocoyam, cocoa, kolanut, citrus and vegetables. Livestock like sheep, cattle, goat, pig rabbit and poultry are also reared for sales and consumption. A three-stage sampling procedure was adopted in proportionately selecting 71 respondents from Iwo (Savannah zone), 109 respondents from Osogbo (Derived savannah zone) and 180 respondents from Ife/Ijesha (Rainforest zone) zones of the State. Out of the 360 questionnaires administered, 301 were found to be very useful for the study. The primary data collected were coded and subjected to both descriptive and inferential statistics.

descriptive statistics The used are frequency and percentage distribution, mean and standard deviation to describe the socio-economic characteristics of the respondents while the probit models were employed as the inferential statistics since the dependent variables are dichotomous (e.g whether or not farmer use inorganic fertilizer, fertilizer, purchased seeds organic and agrochemicals) as shown below;

$$LM = f (NC, PC, HC, FC, AS, XN,)$$
(1)

Where;

LM = Land management practices

NC = Natural capital (including land size and investments on land)

PC = Physical capital (including fixed inputs such as farm buildings, equipments)

HC = Human Capital (including education and primary source of income of household head).

FC = Financial Capital (including access to financial capital or participation in rural credit and savings).

XN = Village and higher level factors influencing comparative advantage (agro-climatic potential and access to roads)

AS = Access to agricultural technical assistance (including contact

with extension agents).

 e^{I} = random factors

a) Land Use Pattern Analysis

Analysis of land use pattern was done by measuring the index of crop diversification. Crop Diversification Index (CDI) consists of Entropy and Herfindal Index. Entropy Index is given as;

$$CDIe = \Sigma P_i \log P_i^{-1}$$
(1)
i=1

Where CDI_e = Crop Diversification Index P_i = Proportion of net income from the crop. The Diversification Index is optimal when 0< CDI_e/n < 1⁻

n

The Herfindal Index is given as;

$$CDI_{h} = \Sigma P_{i}^{2}$$
(2)
$$i=1$$

P_i is as described above.

b) Probit model

The probit model represents another type of widely used statistical model for studying data with binomial distributions. Probit models are generalized linear models with a probit link;

$$\eta = \varphi^{-1}(\mu) \tag{3}$$

Where η is a linear predictor produced by $x_{1,}$ $x_{2},$ $x_{3,}$, \boldsymbol{x}_{k}

 $\phi^{\text{-1}}$ is the inverse of the standard normal cumulative distribution function (CDF) and μ is the expected value of the $x_s.$

The inverse of the normal CDF is in effect a standardized variable, or a Z score. As with the logit model, the probit model is used for studying a binary outcome variable. The probit model can be expressed in probability thus;

$$\Pr{ob(y=1)} = 1 - F\left[-\sum_{K=1}^{K}\beta_{K} b_{K}\right] = F\left[\sum_{K=1}^{K}\beta_{K} b_{K}\right]$$
$$= \phi\left[\sum_{K=1}^{K}\beta_{K} b_{K}\right] \quad \text{------} (4)$$

Where the more general form of CDF, F, is replaced by the standard normal cumulative distribution function, ϕ . Unlike the logit model, which may take on two major forms-one expressing the model in logit (and a transformed version expressed in odds) and the other expressing the model in event probability-the probit model expressed in η is a linear regression of the Z score of the event probability. The equation for probability of nonevent is then;

$$\operatorname{Pr}ob(y=0) = 1 - \phi \left[\sum_{K=1}^{K} \beta_{K} b_{K} \right]$$
(5)

The farmer's decision on use of a particular input depends on the criterion function,

$$Y_i^* = \gamma Z_i + \mu_i \tag{6}$$

Where Y_i^* is an underlying index reflecting the difference between the use of an input and ts non-use, γ is a vector of parameters to be estimated, Z_i is a vector of exogenous variables which explain use of an input, and μ_i is the standard normally distributed error term. Given the farmer's assessment, when Y_i^* crosses the threshold value, 0, we observe the farmer using the input in question. In practice, Y_i^* is unobservable. Its observable counterpart is Y_{i_i} which is defined by

 Y_i = 1 if Y_i^{\ast} > 0 (Household i use the input in question), and

 $Y_i = 0$ if otherwise.

In the case of normal distribution function, the model to estimate the probability of observing a farmer using a input can be stated as

$$P(Y_{i} = \frac{1}{X}) = \Phi(X^{1}\beta) = \int_{-\alpha}^{X^{1}\beta} \frac{1}{\sqrt{2\pi}} \exp(-\frac{z^{2}}{2}) dz$$
(7)

Where,

P is the probability that the ith household use the input and 0 otherwise;

x is the K by 1 vector of the explanatory variables; z is the standard normal variable, i.e., $Z \sim N(0,\sigma^2)$; and β is the K by 1 vector of the coefficients estimated. LIMDEP 8.0 software was used to derive estimates for

LIMDEP 8.0 software was used to derive estimates for the probit model used.

v. Results and Discussion

Table 1.0 reveals that about 69.8 percent of the farmers are between 16-45 years of age, showing that they are in active age brackets. The mean age is 46.81 and this has implication on the available family labor and productivity of the labor because age has a direct bearing on the availability of farm labor and the ease with which improved agricultural practices are adopted. The gender distribution of the farmers depicts more male (94.01%) than female owning farms. This result conforms with the cultural setting in the study area where male have more access to land than female.

Also the main occupation of most of the sampled farmers is farming and larger proportion (84.%) of them depends on crop production for daily existence. This result has effect on the level of cropping pattern and intensity in which the agricultural land is used. Majority (95.10%) of the respondents are married, 4.3 percent are single and just 0.3 percent each are widowed and divorced.

Most of the farmer's households (85.8%), male and female, have at least a primary education. Those households with tertiary education probably constitute the civil servants who engaged in part-time farming in the area. This is expected in line with a priori expectation, to have significant impact on productivities, income earning opportunities and ability of farmers to effectively adopt better management practices.

Table 2.0 shows that 52.5 percent of the farmers had two-crop mixture on their farm with combination mean of diversification index being 0.714. For the four-crop combination and five-crop combination, the average H-index is 0.433 and 0.218 respectively. The result however, shows that as the number of crops in combination decreases, the H-index increases and would become one for sole cropping implying specialization. But on the average, the H-index for all the sampled farms is 0.578. The H-indices show that the sampled farmers undertook one form of cropping diversity or the other, but the majority of them practiced one to two crop combinations.

Table 3.0 implies that secondary and tertiary education of males is associated with higher likelihood of practicing crop rotation and greater likelihood of encouraging fallow respectively. Encouraging crop rotation may be less labor intensive means of addressing concerns about soil fertility, pest and weeds while education at the tertiary level is a signal of higher opportunity cost of labor in more educated households directly encouraging fallow of agricultural land. But female education at all levels has no significant impact on land management practices.

The livelihood strategy of the household measured by the primary source of income of the household head, has limited impact on most land management practices. Non-farm activity as a primary source of income increases the probability to fallow relative to household for whom crop production is the primary activity. Likewise non-farm activities enable and encourage less intensive crop production, by providing households with alternative sources of income and increasing the opportunity cost of family labor. There is no statistical significant difference in land management practices between households whose primary income source is livestock as against crop production.

Natural capital, particularly in terms of investment on land encourages fallowing and incorporation of crop residues. Fallowing, for example, is common on farms where agro forestry (non-crop) trees have been planted. Other land investment such as fishponds, fences and paddocks increase the probability to incorporate crop residues. Furthermore, as expected, larger farms are more likely to fallow since they have enough land for crop production while resting part of their land. They are likewise less likely to incorporate crop residue on a given plot.

Access to credit has statistically insignificant impacts on most land management practices, except a negative impact on crop rotation. The negative association of credit with crop rotation may be because credit is used to facilities non-farm activities, rather than efforts to increase soil fertility and crop production. Therefore the hypothesis that there is no significant relationship between access to credit and land management practices is accepted. This findings suggest that credit constraint are not major impediment to adoption of improved land management practices, and that access to credit may promote less intensive land management practices by facilitating more remunerative non-farm activities. This finding goes in contrary to observation of Sharma and Buchernrieder (2002) that limited credit is a constraint to improved land management practices.

The results of the agro-ecological zone shows that fallowing and crop rotation practices are more common in the rainforest zone of the State than the other zones perhaps because of the adoption of noncrop trees in their farming systems.

VI. SUMMARY

The study revealed that about 40 percent of the farmers are between 36 to 45 years of age, majority (94.01%) are male and 84.1 percent of the farmers takes farming as main occupation. 95.10 percent of the farmers' are married and 85.8 percent of the farmers' households have at least primary education. Education of male at secondary and tertiary education level has significant impact on land management practices contrary to female education. Also the livelihood strategy of the household has limited impact on most land management practices. Investment on land encourages fallowing and incorporation of crop residues while assess to credit encourages non-farm rather than the expected farm activities.

VII. RECOMMENDATION

Government should encourage researches that would be farmers specific for awareness to be created on how to improve the quality of farm management practices currently in practice. More farmer groups should be formed for collection, distributions and utilization of agricultural loans. There is need for the government to add to the present subsidy style (credit support) of providing subsidized planting materials, inorganic fertilizers and agro-chemicals as well as provision of soft loan with a price support policy where farmers' outputs at peak period are bought at fairly reasonable prices above the current market prices. This will encourage farmers who are unable to benefit directly from the credit subsidies to remain in agriculture.

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Tables

Characteristics Frequency Percentage Age group (years) 16-25 14 4.7 26-35 77 25.6 36-45 119 39.5 46-55 36 11.9 44 14.6 56-65 11 3.7 >66 Gender 283 94.01 Male Female 5.99 18 Occupation Crop production 253 84.1 Livestock production 7 2.3 Non-farm activities 41 13.6 Marital status 13 4.3 Single Married 286 95.1 Widowed 1 0.3 Separate 1 0.3 Household Educ. Level 79 6.6 No schooling Μ F 91 7.6 Primary level Μ 222 18.6 F 210 17.6 Μ 235 19.7 Secondary level F 166 13.9 Tertiary level Μ 145 12.2 F 3.5 39

Table 1.0 : Distribution of Respondents by their Socio-economic Characteristics

Source; Field Survey, 2005/2006

2012

Description	Frequency	Combination	S.D	Min. value	Max. value
Sole cropping	63	1	1	1	1
Two-crop combination	158	0.714	0.051	0.323	0.875
Three-crop combination	50	0.526	0.118	0.427	0.662
Four-crop combination	27	0.433	0.101	0.152	0.609
>Five-crop combination	3	0.218	0.073	0.198	0.414
Sample mean	60.2	0.578	0.269	0.420	0.712

Table 2.0 : Herfindal Index of Crop Diversification

Source; Field Survey, 2005/2006

Table 3.0 : Determinant of Land Management Practices

	_ "	0	0
Variable	Fallow	Crop	Crop
		Rotation	Residue
Human Capital			
Male Household Members			
Primary education	-1.40	-0.137	0.354
Secondary education	0.066	0.062*	0.168
Tertiary education	0.572***	0.175	0.430
Female Household Members			
Primary education	0.240	0.341	0.564
Secondary education	0.150	-0.044	0.334
Tertiary education	0.034	-0.461	-0.063
Primary Source of Income of the Household Head			
Livestock	-0.286	-0.154	0.711
Non-farm	0.301***	-0.158	-0.098
Natural Capital			
Investment on Land	1.114**	-1.096	0.086**
Farm size (ha)	0.485**	-0.017	-0.115*
Physical Capital			
Fixed Capital	0.036	-0.708	1.123
Access to Farm and Services			
Access to credit	-0.244	-0.104**	-0.591
Number of extension visits	0.058	-0.246	-0.575
Distance of farm to residence (km)	0.066	0.037	0.067
Village Level Factor			
Agroecological Zone			
Savannah	0.164	-0.173	-0.128
Derived Savannah	-0.121	0.038	0.040
Rainforest	0.305*	0.226**	0.106

Source; Field Survey, 2005/2006



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Analysis of Household Demand for Meat, in Southwest, Nigeria

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Abstract - This study investigated household demand for meat in some selected states in the Southwest Nigeria. The systematic sampling technique was used to select two hundred and forty household in the study area and data were collected through well structured questionnaire. Analysis was done using Descriptive Statistics and Almost Ideal Demand System (AIDS) Model. The findings showed that beef (43.7%) was mostly preferred in the study area, income levels of respondents and taste influenced the type of meat preferred. The budget share of beef decreased with an increase in the price of chicken and vice versa, but increased with an increase in their own prices respectively. The budget share of pork increased with an increase in their own prices respectively. The budget share of pork increased with an increase in price of mutton but it decreased with an increase in its own price. Also one percent change in prices of beef, chevon and chicken would result in -0.827, -0.527 and -0.721 reduction in the quantity demanded respectively. Mutton and pork were confirmed to be luxury goods while chicken, beef and chevon were normal goods for households in southwest, Nigeria. Price intervention programmes should be introduced in order to stabilize the fluctuation in meat prices

Keywords : Meat, household demand, pork, mutton, beef, chevon, chicken, elasticity, price, Southwest, Nigeria.

GJSFR-D Classification : FOR Code: 630101, 839999p



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Analysis of Household Demand for Meat, in Southwest, Nigeria

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The findings showed that beef (43.7%) was mostly preferred in the study area, income levels of respondents and taste influenced the type of meat preferred. The budget share of beef decreased with an increase in the price of chicken and vice versa, but increased with an increase in its price, the budget share of chevon, chicken and mutton increased with an increase in their own prices respectively. The budget share of pork increased with an increase in the price of mutton but it decreased with an increase in its own price.. Also one percent change in prices of beef, chevon and chicken would result in - 0.827, - 0.527 and - 0.721 reduction in the quantity demanded respectively. Mutton and pork were confirmed to be luxury goods while chicken, beef and chevon were normal goods for households in southwest, Nigeria. Price intervention programmes should be introduced in order to stabilize the fluctuation in meat prices.

Keywords : Meat, household demand, pork, mutton, beef, chevon, chicken, elasticity, price, Southwest, Nigeria

I. INTRODUCTION

Before the 1970's oil boom, agricultural exports were the backbone of the Nigerian economy with livestock products accounting for a significant share of exports. During this period, the country had a well-developed domestic agricultural market. However, despite this sound potential for growth in the domestic market, Nigeria is currently witnessing a drastic decline in agricultural production, especially in livestock and meat sectors of the industry. This decline in agricultural production coincides with the nation's oil boom.

Furthermore, Nigeria has enjoyed yearly economic growth (GDP) of 10.8 percent in real terms between 1980 and 1987 as a result of export earnings from petroleum. Real per capita income rose at 60 percent per year during this period. However, the decline in the world oil prices experienced in 1987, combined with the reduction in world market prices of agricultural products in 1995 brought an end to country's economics growth and real per capita income. Between 1989 and 1997 real per capita income dropped at a rate of 7.8 percent per year (Ademosun, 2000).

During this period, the federal government of Nigeria maintained a trade policy dominated by quantitative restrictions and price controls on food items. In January 1990, a tax was imposed on meat imports, ostensibly to raise government revenues and stimulate domestic meat production. The abrupt drop in meat imports, coupled with inadequate domestic supply pushed up price of meat and thus depressed domestic demand. For example, per capita meat consumption that had risen from 12.05 kg in 1981 to 13.8 kg in 1986 dropped to 11.6 kg in 1992. Also meat prices rose by 70 percent from 1987 to 1999, resulting in a decline in Nigerian per capita meat consumption from 10.5kilograms of meat per year in 1987 to 9.4 kilograms per year in 1999 (Osho and Asghar, 2004).

Although the federal government of Nigeria has designed various programs to help stabilize meat prices and consumption, the country is still experiencing meat shortage and price fluctuations till date (Osho and Asghar, 2004)

Meat demand in most African countries its very low at a level of 25g and the demand is even lower especially in the southern and eastern parts of Nigeria where production of animal protein has not been high enough to meet the demand of rapid growth population (Obi, 2000). Ademosun (2000) puts Nigerian's total meat production at 810,000 tonnes for a population of about 110 million resulting in a meat production index of 22g per caput per day. Regmi. (2007) noted the unprecedented population growth that has occurred in the last half of the century has created an additional demand for meat and general food in developing countries.

Household demand for meat products such as beef, mutton, pork, chevon and chicken are faced with problems which is mostly due to market prices, consumers taste, credit availability and consumers wealth. This problem leads to unbalance diet because meat contributes essentially to human's diet Aromolaran (2004) and the consequence of this poor nutritional status is infection which will eventually result in weakness, lethargy, absenteeism, poor productivity and stress (Jamison and Leslie 2001).

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a) Approaches To Estimating Demand Equations

In estimating the demand relationships the formulation of a model expressing these relationship between consumption and the relevant explanatory variables. Various estimation functions have been developed and applied over the years. In their review of such models, Sadoulet and de January (1995).indicated that three demand system have received considerable attention because of their relative empirical expediency. These are the linear expenditure system (LES) developed by Stone (1954), the almost ideal demand system.(AIDS) developed by Deaton and Muellbauer (1980) and the combination of these two system into a Almost Ideal Demand system(GAIDS generalized proposed by Billion (1990). Another variant of the AIDS model is the Quadratic almost ideal demand system (QUAIDS) derived by Bank et al, (1997). Implications for each of these specifications have been well reviewed in the literature on demand analysis.(Wohlegenant, 1984) in this paper the LA/AIDS model is used to estimate the elasticities of demand for meat and meat products such as beef, mutton, and chevon, and chicken, eggs, fish and milk. because of its flexibility as a complete system this model has been used for similar studies in West Africa (Savadogo and Brandt, 1988), India (Abdulai and Jain, 2000), Greece (Karagiannis et al, 2000), Morocco (Mdafri and Borsen, 1993) and the United States of America (Helen and Pompelli, 1998).

II. EMPIRICAL STUDIES

Aromolaran ,(2004) studied intra household redistribution of income and calories consumption in south western Nigeria. His study investigates how per capita calorie in low income households of rural south western Nigeria responds to changes in total household income and women's share of household income. Two major questions were addressed in this study. First, is calories-income elasticity large enough to justify the use of income increases as a food/nutrition policy strategy for increasing calorie intake among low income household? Second, what is the potential effect of intra household redistribution of income from men to women on per capital calorie consumption? The results show that calorie income elasticity is small and close to zero implying that income policies may not be the most effective way to achieve substantial improvements in calorie consumption. Moreover, increases in women's share of household income are likely to result in marginal declines in per capital food calorie intake: this implies that income redistribution from men to women would not increase per capita food energy intake in these households.

Bereket (2003), studied intra-household distribution of expenditure in rural Ethiopia. This study examined the combined effects of changes in prices, income and demographic composition on young and adult, males and female household members. The recently developed Quadratic Almost Ideal Demand System (QUAIDS) was used since a demand system provides a unified framework for analyzing the combined effects in a systematic approach. The 'outlay equivalent method' which was used with single demand equation in previous studies, was married to the demand system literature. Panel/longitudinal data are used: helping to control for household level heterogeneity. Underlying preference structures for classifying goods into different groups was also examined by conducting alternative tests of separabilitity in preferences. The empirical results show that Ethiopians rural respond to price, income and demographic changes in a more complicated manner than usually assumed, demographic groups absorbing most of the impact differ for different types of changes. Furthermore, changes in household income affected male member (men and boys) more than female members. On the other hand, changes in prices affected women and boys more than men and girls. Also, adjustment in household expenditure due to demographic changes imply that boys were favoured relative to girls. However, the overall position of boys and girls in the household depends not only on the 'outlay equivalent ratios', but also on the effect of changes in household incomes and prices as determined by budget and price elasticities. These findings show that household distribute risks among different demographic groups rather than only one group absorbing all shocks. The findings indicated that studies that focus solely at 'out lay equivalent ratio' are incomplete.

Taljaard et al., (2003), used the Linear Approximate of Almost Ideal Demand System (LA/AIDS) model to estimate the demand for meat in South Africa. The LA/AIDS was first employ to analyze the demand relations for meat which comprises of beef, chicken, pork and mutton from 1970-2000. Two test for weak separability including an F and likely hood ratio version, failed to reject the null hypothesis of weak separability, confirming that four meat products are separable, and should be modeled together. Hausman exogeneity test show that, the expensive term in the South African meat demand model, is exogenous. As a result, a Restricted Seemingly Unrelated Regression (RSUR) was used to estimate the model, where after the estimated parameters were used to estimate compensated, uncompensated and expenditure elasticities.

Hughes et al., (2000), argued that for a shift: the focus for modeling production from traditional assumption of profit maximization and cost minimization to mere general assumption of managerial utility maximization that can incorporate risk incentives into the analysis of production and recover value-maximizing technologies. They show how this shift can be implemented using the Almost Ideal Demand System

(AIDS): and the more general way of measuring efficiency that can incorporate a concern for the market of firms assets equity and identify value maximizing firms were suggested. This shift bridges the gap between the risk incentives literature in banking that ignores the microeconomics of production and the production literature that ignores the relationship between production decisions and risk Many authors had used the Almost Ideal Demand System (AIDS) model to determine household demand pattern. Oyekale, (2000), studied the food demand among Nigerian household. Since food calorie has been found to have a strong empirical linkage with both human health productivity: they therefore, determine the probable influence of price and income changes on the availability of nutrient to the Nigerian household. Their findings show that guinea corn is the food that would have the greatest implication for the nutrient status of low income status: while millet, guinea corn and maize and rice, beans and maize respectively are the major food items for the household whose heads earn average and high income. Moreover, Adejobi (2004) studied the demand structure of rural household food pattern in relationship with poverty. In his study, the analysis of food demand revealed that 72.0% of household expenditure was on food; out of this, 56.0% was cereals, while 22.0%, 7.0%, 5.0%, 5.0%, 4.0% and 1.0% respectively was on animal protein, fruits, vegetables, legumes, roots and tubers, fats and oils other food items.

III. JUSTIFICATION FOR THE STUDY

Meat is a nutritious food containing quantities of essential amino acids in forms of protein, It contains B group vitamins (especially niacin and riboflavin), iron phosphorus, ash and calcium. Adeshinwa et al., (1999) observed that the Food and Agricultural Organization (FAO) recommended that an average of 200g animal protein is required per day for healthy living in the developing countries. (Obi, 2000), explained that global demand for meat production will increase by 58% between 1995 and 2020 and that the consumption of meat will increase tremendously by 2020.

Proteins are the major structural components of all cells of the body and amino acids are the building blocks of human proteins. Protein can function as enzymes, membrane transporters and hormones. As far as the human body is concerned there are two types of amino acids .There are essential and non essential amino acid. The former cannot be produced by the body while the latter can be produced out of other biochemical products in the body. The only means of obtaining essential amino acid is through feeding (Bopape and Myers, 2007).

Protein contains approximately 22 amino acids, eight of which are essential. The sulphur containing

amino acids: methionine, cysteine and cystine are particularly important for the health of the brain and nervous system. Protein constitute about 90% of dry weight of food, 80% of enzymes, hormones and antibodies of which meat is a major source (Oloyede, 2005). Proteins form the foundation for muscles, skin, bone, heart and billions of biochemical activities. When we fail to consume adequate amounts of protein, it result in growth retardation with the body being prone to infections and poor wound healing.

Man obtains his necessary proteins from either animals or vegetables. Meat from cattle, goat, sheep, pig and poultry are the main sources of daily per capita consumption of animal proteins. According to Britton (2003) the main difference between animal and plant protein is that animal products contain different ratios of amino acids and higher concentrations of proteins than most plant products. Hence in a strictly vegetarian diet, it is important to mix and match different plants to get the variety of protein and amino acids needed in the body as opposed to plant proteins in which one or more of these essential amino acids are lacking (Oloyede, 2005). Omotosho (2004) estimated that the daily minimum protein required of an adult in Nigeria should be between 65 and 85g per person and that 35g of this minimum requirement should be obtained from animal products.

A review of the data of food supplies available for consumption in different countries shows that the per caput proteins intakes in developing countries, Nigeria inclusive is comparatively low. Not only is the total protein deficient but the quality of dietary protein available is inferior to that consumed in developed countries FAO/WHO (2001).

a) Nutritional Value Of Meat

Meat, and other animal foods such as milk, can make a valuable contribution to the diets in developing countries. It has less nutritional importance in industrialized countries where a wide variety of foods of all kinds is available. Many diets in developing countries are based on cereals or root crops and are relatively bulky, especially where fats are in short supply, and this can limit the total energy intake. This is especially true of infants after weaning and young children. The importance of meat in the diet is as a concentrated source of protein which is not only of high biological value but its amino acid composition complements that of cereal and other vegetable proteins. It is also a good source of iron and zinc and several B vitamins, and liver is a very rich source of vitamin A (Somaiya, 1982).

Demand for meat and meat products has been assessed as an aggregate subset of the food category analyzed as one or two products separately from the general meat category in different countries. Abdulai and Jain (1999) made projections estimates for food and non-food commodities in Indonesia and desegregated data on the meat category(e.g. meat, poultry) as a subset of food categories.

Goat meat, also known as chevon (Northern Europe) Cappreto (Australia and Southern Europe) or Cabrito (Hispanic).has been around since the advent of civilization. It is the rising star in the red meat proteins as a result of its lower total fat, unsaturated fat, calories and cholesterol than traditional meats. It retains a sweet flavour which is reminiscent to mutton with similar protein content.

Chicken meat is derived from poultry and it is reputed to be one of the safest meats available, as it is least associated with any side effects of consumption. Many scientific studies have been conducted on chicken to assess its healthy properties and most of the research have found very positive side effects of the meat on human health. It is a very good source of lean high quality protein. Protein is an essential nutrient for growth and development and also plays important role in assisting overweight and obese people in losing weight fast. It is a good source of phosphorus ,which is a very essential mineral for the body .phosphorus maintains the health of teeth bones and also healthy functioning of the kidneys ,liver, and the central nervous system (Luz, 2009).

Although the most liking feature of meat consumption in many African society is the overwhelming importance of meat which contributes over 70% of betal protein intake Today, the increasing human population in the face of inelastic production strategies appear to have widened the demand supply gap and accentuates society of meat products. Regmi. (2007) supported this view and noted that the unprecedented growth that has occurred in the last half of the century has created an additional demand for meat and general food in developing countries.

Production capacity of beef and other meat products has failed to match with the human population growth and distribution of livestock in Nigeria is inadequate. Composite transportation cost incurred coupled with remote distance between major meat producing areas and consuming urban centres together make the value of wholesome beef, mutton, pork, chicken and chevon often unavailable (Mdafri and Borsen, 1993). Early empirical studies on meat production and consumption focused on single meat product analysis with little or no work done on effect of socio-economic variables on demand and effect of prices on expenditures.

This study was conducted to add to the existing literature by comparing how the changes in income and price affect the demand for meat products. The following are the objectives of the study;

- 1) Ascertain household preferential characteristics for meat product in the study area.
- 2) Analyse household expenditure on meat products in the study area.

3) Estimate its own price, cross price and expenditure elasticity of demand for meat in the study area.

IV. METHODOLOGY AND DATA

This study investigated household demand for meat in Oyo, Osun and Ondo States of Nigeria. The systematic sampling technique was used to select two hundred and forty household (n = 240) respondents from the study area; eighty respondents (80) from each state and data were collected through well structured questionnaire. Analysis was done using Descriptive Statistics and Almost Ideal Demand System (AIDS) Model.

a) Linear approximate of almost ideal demand system model

Theoretical model of demand are single and system of demand equations. Systems of demand include models such as; Translog model, Rotterdam model, Linear Expenditure System (LES) model, Armington model and Almost Ideal Demand System (AIDS) model (Giancarlo et al, 1994). The main difference between single equation model and AIDS is that the latter employs budget share as dependent variable: while the single equation make use of quantity consumed as dependent variable.

AIDS was used in this study because of its desirable properties relatives to the other models (Deaton and Muellbauer, 1980b). The functional form is general allowing variable to be either substitute or complement. AIDS flexibility allows it to encompass broad ranges of behavior and it avoids nonlinear estimation. It's flexibility permit wide range of variable to be included in the household demand modeling. It is consistent with the theory of demand, additivity, substitution, homogeneity and the postulate that household maximize utility (minimize cost) in their consumption decision making process. Since Deaton and Muellbauer (1980b) proposed AIDS model, it has been widely applied in many empirical studies for consumer behavior for both cross sectional and time series data.

The Linear Approximate AIDS (LA/AIDS) of Deaton and Muellbauer (1980b), that uses Stone (expenditure) share weighted price instead of the nonlinear general price index of full AIDS model is used to estimate the demand system.

The price and expenditure elasticities were derived from parameter estimates of the model using the following formulae:

Own-price elasticity: $= -1 + \frac{\alpha i 1}{wi} - Bi$

Where, $\alpha i1 =$ Expenditure coefficient of the ith commodity

- wi = Geometric mean of the budget share (dependent variable)
- wj = Geometric mean of price of each of the other meat types
- Bi = Coefficient of household expenditure.

Cross-price elasticities: = $(\alpha_{ij} / w_i) - B_i (w_j / w_i)$

Where α_{ij} = Expenditure coefficient of ijth commodity

- wi = Geometric mean of the budget share (dependent variable)
- wj= Geometric mean of price of each of the other meat types
- Bi = Coefficient of household expenditure.

The price and expenditure elasticities were derived from parameter estimates of the model using

the following formulae:

Expenditure elasticity: $1 + \frac{Bi}{Wi}$

Where , Bi = Coefficient of household expenditure. wj = Geometric mean of price of each of the other meat types .

V. RESULTS AND DISCUSSION

The findings showed in Table 1 that beef was most preferred meat type; about 17.2%, 16.4% and 9.4% of the respondents in Oyo, Osun and Ondo respectively revealed that beef was preferred. The sampled households in these selected states also emphasized that taste of the meat (65.0%), price (47.9%) and their income level (41.4%) were the major reasons for their choice of preference.

Table	1	[•] Distribution	of Res	pondents	According	to the	e Preferrec	Meat
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Variable	OYO (%)	OSUN(%)	ONDO(%)	POOLED(%)
Preferred Meat				
Beef	17.5	16.4	9.6	43.5
Chevon	6.3	9.1	5.4	20.8
Pork	2.9	3.0	2.5	8.5
Mutton	0.8	1.7	1.7	4.2
Chicken	8.6	9.6	5.0	23.2
TOTAL				100.00
*Factor Responsible for the				
Preference				
Income	18.5	12.5	10.4	41.4
Taste	20.0	25.0	25.0	65.0
Price	17.5	14.6	15.8	47.9
Proximity to market	9.6	10.4	6.3	26.3
Health reasons	18.5	9.2	5.0	32.7
Religion	10.4	13.3	9.6	33.3
Other	4.2	2.1	2.5	8.8

Source: Field Survey,2010.

* Multiple Responses

a) Estimation of Own price, Cross price And Expenditure Elasticity

The AIDS model was derived by Deaton and Muellbauer (1980) from an expenditure or cost function and its not based on an explicit consumer utility function. Using this model the demand equation for meat is without imposition of any restriction. From the table 2 test of homogeneity was carried out and the result of the test showed that in meat demand homogeneity condition was significantly violated. Table 2 showed that the Durbin-Watson statistics was within plausible region. The result revealed that as the budget share of beef decreased with an increase in the price of chicken, also the budget share of beef increased with an increase in its price. The budget share of chevon increased with an increase in its price. The budget share of pork increased with an increase in the price of mutton but it decreased with an increase in its own price. For mutton, the budget share increased with an increase in price of pork and also increase with its own price. Lastly the chicken's budget share decreased with an increase in the price of beef but increased with an increase in its own price.

Commodity	Const	Beef	Chevon	Pork	Mutton	Chicken	Expenditure	R²	Durbin Watson
Beef	0.136 (1.253)	0.038 (2.398)**	-0.012 (-0.876)	0.010 (0.403)	0.003 (0.106)	-0.023 (- 1.74)***	0.00026 (4.639)	70.0	1.899
Chevon	0.086 (0.354)	-0.002 (-0.352)	0.036 (5.818) [*]	0.006 (0.351)	0.012 (0.799)	-0.002 (-0.482)	-0.000023 (-2.134)	66.3	2.081
Pork	0.001 (0.094)	-0.001 (-0.657)	0.0004 (0.296)	0.038 (-13.329)*	0.006 (1.756)***	0.0005 (0.361)	-0.00076 (-3.176)	69.7	2.113
Mutton	-0.002 (-0.811)	0.00013 (0.286)	0.00016 (0.368)	0.002 (2.714)*	0.044 (41.475)***	0.00028 (0.694)	-0.00019 (-5.159)	95.6	1.973
Chicken	0.777 (1.538)	-0.142 (- 1.940)***	-0.004 (-0.712)	0.013 (1.080)	0.007 (0.450)	0.039 (6.359)*	-0.00044 (-2.235)	54.5	1.949

Table 2: Model Estimate And Test Of Homogenity For Household Demand For Meat

Source : Field survey, 2010. ***= 10% significance, **=5% significance, *=1% significance. Values in bracket are t-ratios

The estimated own price, cross price and expenditure elasticity were presented in table 3. The diagonal values represented own-price elasticity. The negative values of own price elasticity coefficients for the estimated variables are consistent with economic theory of demand (Luz et al., 2009). The coefficients revealed that meat are price inelastic This suggests that households are very sensitive to change in prices of various some meat type. For instance, one percent change in prices beef, chevon and chicken would result in -0.827, -0.527 and -0.721 reduction in the quantity

demanded respectively. Cross price elasticites revealed that the various meat types were substitutes for the other. The elastic curves also implied that mutton and pork were luxury goods while chicken, beef and chevon were normal goods for households in southwest, Nigeria. With the exception of pork and mutton, price elasticities of other meat type exhibit the expected signs and magnitudes. This indicates that the demand for meat is price inelastic in the study area.

Table 3 : Own Price	, Cross Price and	I Expenditure	Elasticity for I	Meat in Southwest,	Nigeria
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Price Ela	Beef	Chevon	Pork	Mutton	Chicken
Beef	-0.827	-0.050	0.050	0.013	-0.104
Chevon	-0.026	-0.527	0.078	0.157	-0.026
Pork	-0.055	0.022	1.111	0.333	0.027
Mutton	0.011	0.014	0.181	3.000	0.025
Chicken	-1.014	-0.028	0.092	0.050	-0.721
Expenditure elasticity	1.00	1.00	0.99	0.99	0.99

Source: Data Analysis,2010.

VI. CONCLUSION

Demand for meat in southwest Nigeria is relatively high. The empirical results of this study suggested several points of interest for researchers , policy makers , planners and traders with involvement in Nigeria livestock production and marketing . Firstly, it was revealed that most respondents preferred beef more than any other meats. Secondly The expenditure elasticity implied that mutton and pork were luxury goods, while beef chicken and chevon were normal goods for households in southwest, Nigeria.

It is therefore recommended that government price intervention programme should be introduced in order to stabilize the fluctuation in meat prices. There should also be policy measures that will ensure increase in purchasing power of people's income which will invariably contribute positively to the improvement of nutritional status of the people.

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Economic Analysis Of Rural Women Income From Non-Timber Forest Products In Ife South Local Government Area Of Osun State, Nigeria

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Abstract - This study was carried out to examine the effects of Non-timber forest products (NTFPs) on rural women income in Ife South Local Government area of Osun State, Nigeria. A sample of 90 respondents were randomly selected from five (5) of the eleven (11) wards. A structured interview schedule was administered on the respondents. Data were collected and analyzed using frequency counts, percentage and econometric model. The study discovered that there is a positive and significant relationship between the year of education, total cost and income earned from NTFPs activities, and a negative but significant negative association with distance from forest to point of sale. The majority of the respondents (58.9%) supported Non-availability of NTFPs as the significant effect of deforestation on NTFPs activities. The major problem encountered in NTFPs gathering and marketing are insufficient labour (38.9%), storage problem (23.2%), and thieves (14.4%).

Keywords : Non-Timber Forest Products (NTFPs), Tropical Forests, Rural women, Source of Livelihood, Deforestation.

GJSFR-D Classification : FOR Code: 140201, 120505

ECONOMIC ANALYSIS OF RURAL WOMEN INCOME FROM NON-TIMBER FOREST PRODUCTS IN IFE SOUTH LOCAL GOVERNMENT AREA OF OSUN STATE, NIGERIA

Strictly as per the compliance and regulations of:



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It is therefore, recommended that the government should educate the women and embarks on policies and strategies that aim at improving the welfare of rural people and controlling the rate of deforestation.

Keywords : Non-Timber Forest Products (NTFPs), Tropical Forests, Rural women, Source of Livelihood, Deforestation.

I. INTRODUCTION

a) Background

Tropical forests provide ample goods and services; these mainly include timber and Non-Timber Forest Products (NTFPs). NTFPs have been studied by researchers from many different academic fields and each field used a slightly different definition of NTFPs. NTFPs are any product or service other than timber that is produced in a forest (CIFOR, 2004). They include fruits, nuts, vegetables, fish and, medicinal plants, resins, essences, and a range of barks and fibers such as bamboo, rattans, and a host of other palms and grasses. NTFPs are indispensable part of the livelihood strategy of communities living in and near forests. Nontimber forest products (NTFPs) constitute an important source of livelihood for millions of people across the world. In India alone it is estimated that over 50 million people are dependent on NTFPs for their subsistence and cash income (Shaanker et al., 2004). Forest-based activities in developing countries, which are mostly in NTFPs area, provide an equivalent of 17 million full-time jobs in the formal sector and another 30 million in the informal sector, as well as 13-35% of all rural non-farm employment (Duong, 2008).

The independent nature of the activity is also suitable for people who do not fit comfortably within the demands of contemporary wage labour. The primary requirements to work with NTFPs are knowledge of products, their uses and locations, and the time, energy and mobility to access (Pierce et al., 2002). Clay (1992) and Ruiz Perezi (2005) stated that NTFPs attracted early attention among practitioners and researchers alike, based on three largely untested assumptions: i) NTFPs are widely distributed, contributing more than timber to forest people's livelihoods; ii) their harvesting is ecologically more friendly than alternative forest or non-forest uses , and iii) an increasing their commercial value will contribute to an increased appreciation of forests, therefore contributing both to poverty alleviation and to forest conservation.

Forests contribute to all aspects of rural life: providing food, fodder, fuel, medicines, building materials, and materials for all sorts of household items, as well as many more intangible benefits such as cultural symbols, ritual artifacts and locals (Facloner, 1995). There is, however, great variation in the extent to which forest products are used from area to area and even between households within a community. Because of this variation, it is difficult to abstract generalizations about NTFPs use. Indeed, this variation reflects the extent to which NTFPs are an integral part of rural livelihoods. People only exploit resources from the forests when they cannot be found on nearby fallow lands, or when they are collecting for trade and better supplies are available in the forest. Classifying these products into like categories is an important first step of understanding the NTFPs industry.

NTFPs can be classified into different categories, based on the purpose of use (for example, as food, fuel, medicine, house hold utensils, farm implements); level of use (self supporting, commercial);

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the part of plants harvested (leaf, fruit, stem ,roots) and trophy from wild animals (Jeannette, 2000). For this study, the classification of NTFPs is based on categories related to their use and on the recently developed International Economic Botany Data Collection Standard use categories of NTFPs (Andel, 2006) is considered.

This paper provides answers to the following questions;

- What are the socio- economic characteristics of the respondents?
- What are the main types of NTFPs in the study forest area?
- What are the effects of NTFPs on rural women income?
- What are the problems encountered in NTFPs gathering and marketing?

b) Objectives of the Study

The overall objective of this study is to investigate the effect of non-timber forest products on the income of rural women in Ife South Local Government.

c) Specific objectives

- To describe the socio-economic characteristics of the respondents.
- To identify the NTFPs usually collected by the women.
- To ascertain the effect of NTFPs on rural women income.
- To highlight the problems encountered in NTFPs gathering.

II. METHODOLOGY

This research was carried out in Ife-south local government area of Osun state, which has its secretariat at Ifetedo in Ife. The council is heterogeneously populated with high domination of Yoruba, all doing legitimate business harmoniously. The people of the area are mostly farmers.

The study population is made up of rural women who are engaged in NTFPS activities selected randomly across the local government area to give a total of 90 respondents. Primary data were collected through structured interview and data were analysed using descriptive statistics and econometric model.

The model is specified as:

 $Y = f(X_1, X_2, X_3, \dots, X_7)$

Where $\mathbf{Y} =$ the rural women income

 $X_1 = Age (yrs)$

 $X_2 =$ Year of Education

 $X_3 =$ Family Size

 $X_4 =$ Years of Experience

 X_5 = Hours Spent in NTFPS Collection

 X_6 = Distance to point of sale

 $X_7 = Total production cost$

This is estimated using four functional forms;

Linear function:

 $Y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + \dots \dots b_7 x_7 + e$

Semi-log function:

$$Y = lnb_0 + b_1 lnx_1 + b_2 lnx_2 + b_3 lnx_3 + b_4 lnx_4 + b_4$$

 $\dots b_7 ln x_7 + e$

Double log function:

$$lnY = lnb_0 + b_1 lnx_1 + b_2 lnx_2 + b_3 lnx_3 + b_4 lnx_4 + b_$$

 $\dots b_7 \ln x_7 + e$ and

Exponential function:

$$lnY = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + \dots + b_7x_7 + e$$

Where:

 $b_1 - b_8 =$ regression coefficient of the variables

 $b_0 = Constant Term$

e = Error Term

III. RESULT AND DISCUSSION

Table 1 shows the socio-economic characteristics of the respondents.76.7% of the respondents fell within age range 20-50years, and the mean age was 40.76years. Majority of the women are married (70%), this is to serve as financial support to the husband and children. 74.5% of the women has years of experience between 1-20years and the mean value is 15.46years which implies that people are realizing the potentials of NTFPS in the recent decades. Most respondents engage in trading to supplements income from NTFPS, other source of income include, farming (32%) and civil servants(3%).

The data in table 2 shows the distribution of various NTFPS usually collected by the women in the study area. The distribution according to the data collected is tri-modal. Equal number of people collect seasonal fruits, leaves and snails with 16.7% each of the total population. The diversion of most household to these products is due to their high income generating power than other NTFPS and their availability in the forest. Falconer (1992) noted that forest foods continue to contribute significantly to the diet of many rural households while a great variety of goods are gathered from forest and fallow lands, the forests commonly

2012

supply tubers, mushrooms and snails. Less people engaged in mushroom collection because it is readily available every where for every household, so, their marketing will be less economical. NTFPS coded by others include; honey, vegetables, ropes, e.t.c. Lesser people are into the collection of these products because they are available in little quantity. For vegetables, nearly every villager has access to it so it is less demanded in market.

Table 3 distributes the respondents according to income earned from other occupation and NTFPS. The highest income earned from NTFPS was within the range of #8,100 to #10,000, while the highest income from other occupation is between #4,100 and #6,000. From the analysis, it could be inferred that the major source of income to the household is the NTFPs and income from other occupation only supplements the real income. Studies conducted by (Shackleton and Shackleton, 2004) show that extraction, processing, and trading of NTFPs is often the only employment available for the population in remote rural areas. Being able to collect and use NTFP to a meet daily needs of energy, shelter, food and medicine, allows the scarce cash resources to be used to secure other household needs and to attempt to accumulate the necessary asset base for a more secure livelihood. This includes the education of children, investment in agricultural tools, or capital for activities that generate income. Such a cost saving would best be reflected by replacement values of the goods that the NTFPs substitute, rather than direct-use value based on farm-gate prices (Shackleton and Shackleton, 2004).

From table 4, the major perceived effect of deforestation on NTFPs is the non -availability of NTFPs as supported by 58.9% of the population study. 28.9% Of the population attested to soil degradation. When a tree is cut off, other valuable NTFPs are removed along with it and the soil structure is greatly affected. Many who approach NTFPs sector as conservation tool begin with a set of basic assumptions. It is assumed that natural forest will have greater long-term benefits if left standing; that local people will tend to manage their forest resources more sustainable if they directly benefit from doing so; and that poverty in forest communities is both caused by, degradation of the forest resources (Clark, 2004). The logical conclusion is that if poverty can be alleviated through harvesting forest products, then there will be greater incentive to conserve those forests (Neumann and Hirsch, 2000).

Table 5 distributes the respondents on basis of problem encountered in NTFPs activities. 38.9% supported insufficient labour,23.3% supported storage problem, 8.9% are restricted from the forest, 2.2% lack define right to the forest produce, 14.4% supported thieves stealing their produce and 11.1% respondents are faced with marketing problems.

Table 6 presents the regression analysis. Of the four functional forms, the exponential function was selected as the lead equation based on the value of adjusted R² (0.765); which implies that 76.5% of the variation in women income(dependent variable) is explained by the independent variable (Xs). Years of education (X_2) and total cost (X_7) have positive and significant relationship with the income earned by the women from NTFPs while distance from forest to point of sale (X₆) has a negative and significant association with it. The primary requirement to work with NTFPs are knowledge of product, their uses and location, and the time, energy and mobility to access (Pierce et al, 2002). These requirements are fulfilled with increasing years of education among the respondents and contrary to the apriori expectation, total cost can increase income from NTFPs if accompanished by increased quality of products. Also, distance from forest to point of sale (X_6) has a negative and significant effects on NTFPs income which may results from large transportation cost, if large quantities of NTFPs is gathered. Getachew et al (2007) also noted that distance from forest, household total income; adult labor and household size are among the factors that influence people dependence on forest resources. With the exception of household size, these factors are negatively related to forest income (Getachew et al 2007). Although not significant, hours spent in NTFPs collection had a negative effects on the income resulting from deforestation effects which causes non availability of the NTFPs and soil degradation has attested to by majority of the respondents and it is not significant.

IV. SUMMARY CONCLUSION AND RECOMMENDATIONS

Summarily, the socio-economic characteristics that affect the women income from NTFPs are age, marital status, years of education and other occupations they engaged in. Also, the major NTFPs activities they engaged in are leaves gathering seasonal fruit collection and snail gathering and major effect of deforestation perceived by the women are non-availability of NTFPs and soil degradation. The problem encountered in NTFPs include, inaccessibility to forest and forest produce, storage problem, thieves and marketing problems.

From this study, it can be concluded that certain factors affect the income earned by Rural women such as age, years of education family size, years of experience, hours spent in gathering NTFPs, distance point of sale and total production cost. Among these factors, the years of education, total cost and distance from forest to point of sale are important and significant determinant of the rural women income. NTFPs are the major source of income to the rural women. Deforestation has a significant effect on the availability of the NTFPs in the forest. The major problem encountered in NTFPs in the area was the insufficient of labour.

Based on these findings, it is therefore recommended that government should provide supports to the rural women in areas of education, storage and infrastructural facilities to include good road network. Also, policies and strategies that aim at improving the welfare of the rural people and increase productivity on agricultural land including NTFPs should be put in place.

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Characteristics	Frequency	Percentages (%)
Age (years)		
21 - 30	17	18.8
31 - 40	28	31.2
41 -50	24	26.2
51 - 60	18	20.0
>60	3	3.3
Marital status		
Married	63	70
Separated	5	5.6
Widowed	12	13.3
Divorced	3	3.3
Single	7	7.8
Years of experience		
1 – 10	33	36.7
11-20	34	37.8
21 - 30	19	21.1
31 - 40	4	4.4
Other occupations		
Farming	32	35.6
Trading	46	86.7
Civil servant	3	3.3
Private firms	6	6.7
Others	3	3.3
Total	90	100

Tables

diatributi f ospondente by socio nia abaractoriati Tabla 1 **.**+*c*

Source; Field survey 2010

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	0	1 5	
NTFPS Activities	Frequency	Percentage (%)	Cumulative percentage
Fuel wood	12	13.3	13.3
Leaves	15	16.7	30.0
Seasonal fruits	15	16.7	46.7
Herbs	13	14.4	61.1
Mushrooms	3	3.3	64.4
Raffia	14	15.6	80.0
Snail gathering	15	16.7	96.7
Others	3	3.3	100
Total	90	100	

Table 2 : Percentage distribution of respondents by NTFPS activities

Source; Field survey 2010

Table 3 : Percentage distribution of the respondents by income and from other occupation and NTFPS.

Income	Other oc	cupation	NTFPS		
earned (₦)	Frequency	Percentage	frequency	Percentage	
< 200	47	52.2	38	42.2	
2100 - 4000	15	16.7	20	22.2	
4100 - 6000	12	13.3	22	24.4	
6100 - 8000			7	7.8	
8100 - 10000			3	3.3	
Missing value	16	17.7			
Total	90	100	90	100	

Source; Field survey 2010

Table 4 : Percentage distribution of respondents by perceived effect of deforestation on NTFPS activities.

Deforestation effect	Frequency	Percentage (%)	Cumulative percentage
Soil degradation	26	28.9	28.9
Non - availability of	53	58.9	87.8
NTFPS			
More time spent in	10	11.1	98.9
NTFPS collection			
No response	1	1.1	100
Total	90	100	

Source; Field survey 2010

Problem	Frequency	Percentage (%)	Cumulative percentage
Lack of assess to forest	8	8.9	8.9
Inaccessibility of forest			
produce	2	2.2	11.1
Storage problem	21	23.2	34.4
Insufficient labour	35	38.9	73.3
Thieves	13	14.4	87.7
NTFPS marketing	10	11.1	98.8
No response	1	1.1	100
Total	90	100	

Table 5 : Percentage distribution of respondents by problem encountered in NTFPS gathering

Source; Field survey 2010

					Table 6 .	' Regressio	n Analysis					
Functional	Dependent	Constant	X1	\mathbf{X}_2	X ₃	X_4	\mathbf{X}_{5}	$\mathbf{X_6}$	\mathbf{X}_7	\mathbf{R}^2	R ² Adjuste	d F Value
forms	variables	Terms										
Exponential	Log Y	7.182	-0.005	0.050	0.022	0.003	-0.010	-0.014	0.001	0.788	0.765	34.407
			(-1.079)	(3.705) *	(0.789)	(0.368)	(-0.284)	(-3.403)*	(-2.194) **			
Linear	Υ	518.389	-14.211	138.503	92.214	4.631	-113.188	25.950	-0.617	0.762	0.737	29.689
			(-0.620)	(2.252) **	(0.732)	(0.136)	(-0.693)	(0.166)	(1.916) ***			
Semi log	Y	-18668.5	-242.446	581.658	617.932	-226.520	-650.659	-272.977	-184.589	0.683	0.647	19.361
			(-0.510)	(0.813)	(-0.488)	(-0.488)	(-0.702)	(0.386)	(-0.608)			
Double log	Log Y	2.449	-0.40	0.308	0.114	-0.026	-0.69	-0.012	-0.066	0.791	0.768	34.042
			(0.653)	(2.293) **	(0.941)	(-0.302)	(-0.396)	(-0.91)	(-1.151)			

Source: field survey, 2010 * Significant at 1 %

** Significant at 5 %

*** Significant at 10 %

Figures in parenthesis are the t – values

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Assessment of Militancy Activities on Rural Dwellers in Delta State, Nigeria

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Abstract - Militant activities in the oil-rich Delta region have been wanton and continuous with dire health, social and economic consequences for its people, for over three decades. The study assessed militancy activities in rural areas of Delta State, Nigeria. Study was carried out using multistage sampling technique to draw respondents from the three zones of Delta State Agricultural Development Programme. Respondents were selected from seven (7) cells located within five (5) blocks namely Oshimili South, Aniocha, Ughelli South, Warri North, Warri South. Farmers within each community were selected purposively, making a total of seventy (70) respondents. Both descriptive (frequencies and percentages) and inferential statistics (Chi-square and t-test) were used in data analysis. Result revealed that 75.71% of the respondents were males while 22.29% were females. Majority (60%) of the respondents had at least a secondary school education while 85.71% were married. Only 25.71% had over 25 years of farming experience with 32.86% having less than 1 hectare of farmland. Also, 50% of the respondents strongly agreed that the government should be blamed for the crises in the State while 41.31% strongly disagreed that militants are to be blamed.

Keywords : Militancy Activities, farming experience, Multinational Oil Companies, developmental projects, Sustainable development.

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Assessment of Militancy Activities on Rural Dwellers in Delta State, Nigeria

O.R. Ashimolowo $(Ph.D)^{\alpha}$, Odiachi G.N.^{α}

Abstract - Militant activities in the oil-rich Delta region have been wanton and continuous with dire health, social and economic consequences for its people, for over three decades. The study assessed militancy activities in rural areas of Delta State, Nigeria. Study was carried out using multistage sampling technique to draw respondents from the three zones of Delta State Agricultural Development Programme. Respondents were selected from seven (7) cells located within five (5) blocks namely Oshimili South, Aniocha, Ughelli South, Warri North, Warri South, Farmers within each community were selected purposively, making a total of seventy (70) respondents. Both descriptive (frequencies and percentages) and inferential statistics (Chi-square and t-test) were used in data analysis. Result revealed that 75.71% of the respondents were males while 22.29% were females. Majority (60%) of the respondents had at least a secondary school education while 85.71% were married. Only 25.71% had over 25 years of farming experience with 32.86% having less than 1 hectare of farmland. Also, 50% of the respondents strongly agreed that the government should be blamed for the crises in the State while 41.31% strongly disagreed that militants are to be blamed. Nevertheless, 50% of the respondents agreed that Multinational Oil Companies (MNOC'S) provided infrastructures for the area before amnesty. Furthermore, 37.14% of the respondents opined that militancy activities caused very little destruction of farmland. Moreover, 50% of the respondents strongly agreed that the government did the right thing by granting amnesty. Significant relationship existed between marital status (χ^2 = 4.37, p=0.04) and their perception of militancy activities in Delta State. Also, result revealed a significant relationship between the perception of rural dwellers on the MNOC'S before and after the amnesty (t=-1.90) at 0.05. The study concluded that marital status of individual farmers affects their perception of the MNOC'S. The study recommended that the government should create enabling policies towards enforcing developmental projects aimed at sustainable development and improved family lifestyles.

Keywords : Militancy Activities, farming experience, Multinational Oil Companies, developmental projects, Sustainable development.

I. INTRODUCTION

ilitancy is a state or condition of being combative or disposed to fight for a cause or belief (Chindah and Braide (2000). It can also be defined as a violent response by an individual, group or sect in a region, community, state or nation due to claims of underdevelopment, political oppression, religious beliefs and segregation. The motive is that people want their rights and if they are not going to get it by negotiation, they simply will then have it by violence against the "powers that be".

The presence of oil resources in developing countries presents a large paradox (Shakleman, 2006). On one hand, oil and gas discovery make the eradication of poverty and the development of weak economies a possibility. An example of this is Angola which sees its burgeoning oil industry as a means of escaping poor economic conditions. On the other hand, the "curse of oil" is evident in many oil-rich countries worldwide with oil producing states showing a high incidence of corruption, violent conflicts, poor educational structure and health services and economic strength.

Delta state which is one of the nine states of the Niger-delta region is greatly endowed with abundant natural resources and a weather which supports all year round agricultural production. About fifty percent of the active labour force is engaged in one form of agricultural activity or another (cropping enterprise and fishing enterprise), with yam, cassava, plantain, maize, cocoyam, and vegetables as the predominant food crops grown by the farmers in the area. However, owing to the hydrographic conditions of the state, only a fraction of the land size is cultivated with crops. (Federal Office of Statistics, 1995). Farming practices are traditional, and the use of crude implements such as hoe and cutlasses predominate. Mechanization is on a very low scale and the use of modern farming inputs such as fertilizers and pesticides is limited because farmers hardly have access to it, since it is nationally distributed by the Federal Government.

Delta state is the largest crude oil producing state in the Niger-delta area and in Nigeria. Nigerian oil and gas industry generates over ninety percent of the nation's foreign exchange earnings. Paradoxically, in spite of the increasing revenue from crude oil exploration, the communities from which these resource flow in Delta state continue to live in conditions of social deprivation and abject poverty. This has led to militancy activities in the state.

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Oil was meant for the indigenes of Delta state. People's rights have come under severe assault by the ecologically unfriendly practices of the Multi-national Oil Companies (MNOC'S). In addition, state laws and policies as they relate to petroleum resources officially take away private property from indigenous people for public use denying them of their rights to their natural resources. Farming lands were collected by the Government and promises made to the communities have not been kept, and all form of agricultural activities was almost totally abandoned by the Government in this areas including funding. According to Brown (1998), the local economies of the oil producing communities have collapsed, and they are not integrated into the oil economy of the nation. The success of the all companies has not directly led to their own development.

With militancy in the state and region escalating, and disturbing Nigerian oil production, the government offered to give militants amnesty in return for laying down and surrendering their arms in October 2009.

II. PROBLEM STATEMENT

Delta state has been embroiled in crisis between the government forces and militant groups that are aggrieved over certain fundamental issues affecting the region. Since the turn of a "new democracy" in 1999, militants intensified their fight with government forces, sabotaged oil installations (which has led to more oil spillages), taken foreign oil workers hostage and carried out lethal car bombings. At the root of the problem is a crisis of underdevelopment. The crisis was exacerbated by emergent issues of gross distortion of Nigerian federalism in respect to resource control, citizenship rights and environmental degradation. Unfortunately, the external manifestation has been mainly that of violent agitation, and criminal activities of some elements, taking advantage of the bad situation. Communities are in severe need for help as their youths see no more hope and end up joining these militant groups as they are very lucrative.

This led to government imposing security measures like curfew to reduce the rate of crime but also this affects the economic activities of these communities (agriculture, education, health, etc). The amnesty deal from October 2009 is failing, money allocated for training are not reaching the ex-militants as contractors skim huge profits for themselves, the oil companies continue to neglect the environment and needs of the community. The Nigerian Federal and state governments' commitment is limited to speeches and promises. The above mentioned scenario has affected agricultural activities within the area, leading to increased poverty among the farming households.

III. OBJECTIVE OF STUDY

a) Broad Objective

The general objective of this study is the assessment of militant activities on rural dwellers in Delta-state, Nigeria.

b) Specific Objective

- 1. Examine the socio-economic characteristics of the respondents
- 2. Ascertain their perception on the causes of the militant crisis in the state.
- 3. Investigate the rural dwellers perception on the MNOC'S before and after the amnesty
- 4. Investigate the perception of the rural dwellers on effects of militant activities on their farming operations.
- 5. Determine the rural dwellers' perception of the amnesty granted to the militants by the Federal Government.
- 6. Ascertain the rural dwellers views on the end to crisis.

IV. HYPOTHESIS

H01 : The is no significant relationship between the socio-economic characteristics of the respondents and their perceptions on militant activities in the state

Ho2 : The is a significant difference between the rural dwellers perception on the MNOC'S before the amnesty and after the amnesty

V. Research Methodology

a) Area of study

Delta State lies approximately between longitudes 5000E and 6045E of the Greenwich Meridian, and latitude 5000N and 6030N of the equator. It is one of Nigeria's extremely southern states, and covers an area of 17, 001Km2(Delta State Environmental Protection Agency, 1996).

Delta state consists of 25 local government areas. According to the Delta State Agricultural Development Programme (DSADP), these local governments have been grouped into three zones:

- (1) Delta-north, which has its headquarters in Agbor has nine local governments under it with most of them consisting of the Igbo speaking tribe. This area of the state has little or insignificant amounts of militant activities with kidnapping the major militant activity.
- (2) Delta-central, which has its headquarters in Effurun has ten local governments under it with most of them Urohbos by tribe. This area of the state suffers from spillover of militant activities from the highly volatile delta-south zone. This is where the amnesty camp for the rehabilitation of the militants is located.

 (3) Delta-south, which has its headquarters in Warri has six local governments under it with the tribes being Urohbos, Ijaws and Itsekiri. This area is where almost all of the militant activities take place in the state.



Figure. 1 : DSADP ZONAL MAPPING OF THE STATE

b) Sampling technique and sample size

Multistage sampling technique was used to draw samples for the study. There are three zones within the Delta State Agricultural Development programme (DSADP). In DSADP structure, there are 25 blocks, each block consists of 8 cells, and each cell consists of 8 groups while each group consists of 10 farmers. The blocks selected were Warri north and Warri south (Delta

south zone), Ughelli north and Ughelli south (Delta central), and Oshimili south (Delta north zone). The communities within the cells that were selected are Tsekeleoou, Koko, Abigborode, Odeitsekiri, Warri, Omadina, Otu-jeremi, Oginibo, Okwe, Ogwashi-ukwu, Ukwuoba based on their farming nature as well as frequency of militancy activities.

Zones	Blocks	Cells	Communities	Number of
				respondents
Delta north	Oshimili south	8	Okwe	8
	Aniocha south	8	Ogwashi-ukwu	6
		8	Ukwuoba	4
Delta central	Ughelli south	8	Otu-jeremi	10
		8	Oginibo	12
Delta south	Warri north	8	Tsekeleoou	6
			Koko	4
			Abigborode	5
	Warri south	8	Odeitsekiri	4
			Warri	7
			Omadina	4
Total				70

Total

VI. RESULTS AND DISCUSSION

a) Socio-economic characteristics of the rural dwellers

Table revealed that 75.71% of the respondents were males while 22.29% of the respondents were females. This means most of the farmers in the study area are males. This may be due to the feminization of farming as most men go in search of the white collar jobs in urban areas and probably militancy activities. This could contribute to an increase in female headed household.

Table also revealed that 34.29% of the respondents fall between the age group of 41-50 years while 25.71% are 31-40 years. About 18.57% of them are above 50 years of age. The result indicates that most of the respondents are young. The fact that youths constitute a greater percentage of the workforce could be an indication of more capable hands on the farm. It could also be a reason for the high percentage of youth involved in militancy in the study area.

Educational status revealed that 60% of the respondents had at least secondary school. Also, 1.43% of the respondents did not complete primary school, 21.43% of the respondents did not complete secondary school while 12.86% attended tertiary school with 4.29%

of them not completing their programme. An alarming 11.43% had no formal education. This means the respondents are relatively literate. This could have effect on the perception of their rights. This study supports the assertion of Mukagbo (2004) that it is the very few that are opportuned to be educated from the region are the voices of the people.

Marital status shows that 85.71% of the respondents are married while 14.29% of them are single. This may be due to the societal belief in early marriage which is one of the characteristics of rural communities. This means that most of the respondents are responsible due to their marital status.

Also, 51.43% of the respondents have a household size of between 5-8 and 11.43% have a household size of 8 and above. This means most of the households have a relatively large household size. This could be as a result of need for more hands on the farm. Thus supporting the preponderance of large family sizes among the poor in rural areas of Nigeria (Eboh 1995).

Farmers that participated in both crop and livestock production were 32.86%, while crop farmers were 47.14%, livestock farmers were 20%. Hence, most of the farmers in Delta State are into crop farming, while integrating with livestock. The farmers practice crop

production as well as fish farming due to the riverine nature of the area.

The respondents had farming experience with 25.71% having above 25 years and 24.29% having between 21-25years farming experience. Only 5.71% of the respondents had below 10 years farming experience. This means that most of the farmers have been practicing the profession for a long time. This could be as a result of low level of education of the respondents and involvement in farming activities at a tender age.

Nonetheless, 63% of the respondents had no family member working with the MNOC'S. This means a few number have family members working with MNOC'S. Those who had no family members working with the MNOC'S could be as a result of their poor educational qualifications.

Most of the farmers had small farm sizes with 32.86% of them having less than 1hectare and 28.57% having between 1-1.5hectares. This indicates that farmers have small land holdings. This may either be as a result of their low income and unavailability of cultivable land as a result of land degradation.

Variables	Categories	Frequency	percentage
Sex	Male	53	75.71
	Female	17	24.29
Age(years)	21-30	15	21.43
	31-40	18	25.71
	41-50	24	34.29
	51-60	9	12.86
	60 and above	4	5.71
Education status	No formal education	8	11.43
	Primary	6	8.57
	Secondary	28	40.00
	Tertiary	9	12.86
	Uncompleted primary	1	1.43
	Uncompleted secondary	15	21.43
	Uncompleted tertiary	3	4.29
Marital status	Single	10	14.29
	Married	60	85.71
Household size	1-4	26	37.14
	5-8	36	51.43
	8 and above	8	11.43
Occupation of respondents	Livestock	14	20.00
	Crop	33	47.14
	Both	23	32.86
Farming experience group(years)	Below 10	4	5.71
	10-15	15	21.43
	16-20	16	22.86
	21-25	17	24.29
	Above 25	18	25.71
Family working with MNOC'S	Yes	26	37.14
	No	44	62.86
Community status	Adviser to village chief	3	4.29
	Head of farmer group	18	25.72
	Member of village council	38	54.29
	Village head	2	2.86
	None	9	12.86

Table 1 : Distribution of respondents by socio-economic characteristics (n=70)

b) Perception of rural dwellers on causes of crisis

Results indicated that 50.00% strongly agreed that the government is to be blamed for the militant crisis in Delta State, 51.43% strongly agreed that MNOC was insensitive to the plight of the masses while only 38.57% strongly agreed that the high rate of the unemployed youths is responsible for militant activities. Also, 41.43% strongly disagree that militants are to be blamed while 47.14% agree that oil spillage on farmland and destruction of production site is the cause of the crisis. This means that most of the respondents see the government and the MNOC'S as the cause of the militant crisis in the state.

Table 2 : Distribution of resp	condents based on their	perception of cause o	f crisis (n $=$ 70)
			· · · · · · · · · · · · · · · · · · ·

Variables	SD	D	A	SA
Government is to be blamed	1(1.43)	4(5.71)	30(42.86)	35(50.00)
MNOC'S insensitivity to the plight of respondents	3(4.29)	12(17.14)	19(27.14)	36(51.43)
Traditional rulers are to be blamed for the militant crisis	22(31.43)	37(52.86)	9(12.86)	2(2.86)
Militants are to be blamed	29(41.43)	30(42.86)	4(5.71)	7(10.00)
Lack of physical development in the rural areas is the bone of contention	1(1.43)	3(4.29)	19(27.14)	47(67.14)
High rate of unemployed youths in the rural areas was a casual factor	0(0)	8(11.43)	35(50.00)	27(38.57)
Oil spillage on farmland and destruction of production site	2(2.86)	11(15.71)	33(47.14)	24(34.29)

SD = strongly disagree, D = Disagree, A = Agree, SA = strongly agree Percentage in parenthesis

c) Rural dwellers perspectives on MNOC'S before the amnesty and after the amnesty

Results from the study indicate that 50.00% of the respondents agreed that MNOC'S provided infrastructure for the area before the amnesty, while 24.29% strongly disagreed. Nonetheless, 38.57% disagree that MNOC'S provided better healthcare. On the receipt of adequate compensation for destroyed properties, 30.00% of the respondents strongly disagreed. Also, 41.43% 0f the respondents agreed that MNOC'S provided jobs for the rural dwellers while 18.57% of the respondents strongly disagree that scholarships were provided. This means that MNOC'S try to meet their societal obligation to the ruralites. If encouraged, this could have an impact on reduction of crisis in the region.

Only, 37.14% of the respondents agree that the MNOC'S are responsible for the death of livestock and fishes, while 25.72% of the respondents strongly disagree that the MNOC are responsible for the deaths of indigenes through pollution and 31.43% and 22.86% of the respondents respectively agree and strongly agree respectively that the MNOC are responsible for the deaths of indigenes through pollution. Also, 40.00% agree that they recorded low harvests as a result of the activities of MNOC'S. This indicates that MNOC'S are responsible for some crisis recorded in the farming enterprise. This could have implication on their continuous presence in the region.

In terms of provision of infrastructure after the amnesty, 42.86% of the respondents disagree that infrastructure has been provided, 48.57% disagree that better healthcare has been provided, 42.86% of the respondents strongly disagree that rural dwellers received adequate compensation for destroyed properties and 47.14% of the respondents disagree that the MNOC'S provided jobs for the rural dwellers. Meanwhile, 37.14% of the respondents agree that MNOC'S provide scholarships for the students in the area, 37.14% of the respondents agree that MNOC'S are responsible for the death of livestock and fishes, 31.43% agree that the MNOC'S are responsible for the deaths of indigenes through pollution, while 47.14% of the respondents agree that low harvests have been recorded as a result of MNOC'S activities. This could mean that amnesty has had significant impact on the provision of infrastructures in the region. This might lead to reduced conflict due to the gainful employment of youth.

		Befo	ore			Af	ter	
Variables	SD	D	А	SA	SD	D	А	SA
They provided infrastructure for the area.	18(25.72)	17(24.29)	35(50.00)	0(0)	28(40.00)	30(42.86)	10(14.29)	2(2.86)
They provided better healthcare.	15(21.43)	27(38.57)	26(37.14)	2(2.86)	19(27.14)	34(48.57)	16(22.86)	1(1.43)
Rural dwellers received adequate compensation for destroyed properties.	21(30.00)	21(30.00)	25(35.71)	3(4.29)	30(42.86)	24(34.29)	14(20.00)	2(2.86)
MNOC'S provide jobs for rural dwellers.	13(18.57)	25(35.71)	29(41.43)	3(4.29)	18(25.71)	33(47.14)	18(25.71)	1(1.43)
Provision of scholarships for students.	12(17.14)	24(34.29)	31(44.29)	3(4.29)	18(25.71)	23(32.86)	26(37.14)	3(4.29)
Supply of school materials and buildings.	14(20.00)	22(31.43)	32(45.71)	2(2.86)	13(18.57)	26(37.14)	30(42.86)	1(1.43)
MNOC'S are responsible for the death of livestock and fisheries.	11(15.69)	21(30.00)	26(37.14)	12(17.14)	12(17.14)	15(21.43)	26(37.14)	17(24.29)
MNOC'S are responsible for the death of indigenes through pollution.	20(28.57)	22(31.43)	18(25.71)	10(14.29)	18(25.71)	14(20.00)	22(31.43)	16(22.86)
They provided better education for the community	18(25.71)	18(25.71)	33(47.14)	1(1.43)	18(25.71)	33(47.14)	17(24.29)	2(2.86)
Low harvests recorded as a result of MNOC'S.	9(12.86)	18(25.71)	28(40.00)	15(21.43)	10(14.29)	11(15.71)	33(47.14)	16(22.86)

Table 3 : Distribution of respondents' perception on MNOC'S before and after the amnesty (n=70)

SD= Strongly disagree, D= Disagree, A= Agree, SA= Strongly Agree Percentages in parenthesis

d) Perception of the rural dwellers on effect of militant activities on farming operations

Result further shows that 37.14% of the respondents believed that the militant activities caused very little destruction of their farmland, while 24.29% said the militant activities caused very much destruction of their farmland. Also, 48.57% of the respondents said militant activities made transportation of workers and harvested crops a little difficult, while 14.29% said it affected them very much. This means militant activities has affected farming operation in the region. This could lead to low harvest, high cost and scarcity of agricultural products.

Results also showed that 42.86% of the respondents said the militant activities affected the marketability of their products a little, while 20.00% said it affected them very much. Moreover, 47.14% of the respondents said militant activities affected the visits of extension agents very much. For labour on the farm, 40.00% of the respondents opined that militant activities affected them little while only 17.14% said it affected them very much. This means MNOC's activities has adversely affected the livelihood of the farming population.

Table.4: Distribution of rural dwellers based on their perception of effect of militant activities on farming operation (n=70)

Variables	VL	L	М	VM
Militant activities caused destruction of farmland	26(37.14)	16(22.86)	11(15.71)	17(24.29)
Militant activities made transportation difficult	12(17.14)	34(48.57)	14(20.00)	10(14.29)
Militant activities made marketability of products difficult	7(10.00)	30(42.86)	19(27.14)	14(20.00)
Militant activities affected the visits of extension workers	11(15.71)	8(11.43)	18(25.71)	33(47.14)
Militant activities affected labour on the farm	14(20.00)	28(40.00)	16(22.86)	12(17.14)
Timing of harvests was disrupted by militant activities	10(14.29)	35(50.00)	19(27.14)	6(8.57)
Loss of animals and aquatic products	24(34.29)	25(35.71)	11(15.71)	10(14.29)

VL = Very little, L = Little, M = Much, VM = Very muchPercentage is in parenthesis

e) Rural dwellers views on amnesty

indicated that 50.00% the Results of respondents strongly agreed that government did the right thing by granting the militants amnesty, while 58.57% of the respondents agreed that the militants did the right thing by accepting the amnesty granted by the government. Also, 60.00% of the respondents disagree that the amnesty programme was badly setup, 44.29% of the respondents disagree that the amnesty has enhanced overseas training, 41.43% of the respondent disagree that the amnesty has improved healthcare facilities and other infrastructures, 32.86% disagree that the amnesty has increased the scale of production of their enterprise, 54.29% of the respondents strongly

agree that the amnesty has reduced considerably, fear and tension in Delta state and 34.29% of the respondents strongly disagree that kidnapping in the region has increased as a result of the amnesty. This means amnesty has generated a lot of controversies in the region as some had positive and negative views on the programme. This could have implication on the success of the programme. This supports findings of Gaugran(2009) that the Niger Delta provides a stark example of the lack of accountability of a government to its people, and MNOC'S almost total lack of accountability when it comes to the impact of their operations on the rural dwellers.

Table 5 : Distribution	of rural	dwellers views	on amnest	V	(n = 70))
					\ \	

Variables	SD	D	А	SA
Government did the right thing to grant the amnesty.	0(0)	2(2.86)	33(47.14)	35(50.00)
Militants did the right thing by accepting the amnesty granted.	1(1.43)	3(4.29)	41(58.57)	25(35.71)
Amnesty programme was badly set up.	10(14.29)	42(60.00)	9(12.86)	9(12.86)
Amnesty has led to improved education for the populace.	14(20.00)	20(28.57)	31(44.29)	5(7.14)

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Overseas training has been enhanced by the amnesty	24(34.29)	31(44.29)	15(21.43)	0(0)
Improved healthcare facilities and other infrastructure	17(24.29)	29(41.43)	24(34.29)	0(0)
Increase in the scale of production of rural dwellers enterprise.	9(12.16)	23(32.86)	27(38.57)	11(15.71)
Fear and tension in the area has reduced considerably as a result of the amnesty	1(1.43)	5(7.14)	26(37.14)	38(54.29)
Host community is in danger as a result the camping of the militants.	30(42.86)	24(34.29)	11(15.71)	5(7.14)
Kidnapping in the region has increased in the region as a result of the amnesty	24(34.29)	22(31.43)	18(25.71)	6(8.57)

SD = strongly disagree, D = Disagree, A = Agree, SA = strongly agree Percentage in parenthesis

f) Rural dwellers views on end to crisis

Results indicated that 61.43% of the respondents agreed that the amnesty programme has brought an end to the militant crisis and 15.71% of the respondents strongly agreed. Also, 55.71% of the respondents agreed that the amnesty has brought peace finally to the communities involved and 37.14% of the respondents agreed that the amnesty has made the militants repentant, while 57.14% of the respondents agreed that government will keep to its own side of the bargain of the amnesty and only 12.86% of the

respondents strongly disagree that government will keep to their own side of the bargain. This means respondents are apprehensive of the success of amnesty

Results further shows that 67.14% of the respondents agree that militants will keep to their own side of the bargain, while 91.43% of the respondents strongly agree that failure to keep to the conditions of the amnesty could trigger off a fresh crisis. This could mean that the crisis has not yet ended in the region.

Table 6: Distribution of Rural dwellers views on end to crisis (n=70)

Variables	SD	D	A	SA
Has brought an end to the militant activities	2(2.86)	14(20.00)	43(61.43)	11(15.71)
Has brought peace finally to the communities involved	1(1.43)	12(17.14)	39(55.71)	18(25.71)
Has made the militants actually repentant	15(21.43)	24(34.29)	26(37.14)	5(7.14)
Militants will keep to their own end of the bargain	9(12.86)	19(27.14)	40(57.14)	2(2.86)
Failure to keep to the conditions of the amnesty could trigger off a fresh crisis	3(4.29)	13(18.57)	47(67.14)	7(10.00)

SD = strongly disagree, D = Disagree, A = Agree, SA = strongly agree Percentage in parenthesis

Table 7 : Chi-square analysis of respondents socio economic characteristics and their perception of militancy activities in Delta state

Socio economic characteristics	\varkappa^2	Df	Р	Decision
Sex	0.46	1	0.49	NS
Age	4.30	4	0.37	NS
Education	3.29	6	0.77	NS
Marital status	4.37	1	0.04	S
Household size	3.43	2	0.18	NS
Occupation	2.15	2	0.34	NS
Farming experience	7.51	4	0.11	NS
Family working with MNOC	0.49	1	0.48	NS
Membership of farmers organization	5.36	4	0.25	NS
Farm size	2.24	5	0.81	NS
Community status	7.01	4	0.54	NS

H01: There is no significant relationship between the socio economic characteristics of the respondents and their perception on militant activities in the state.

Result of Chi-square analysis indicated a significant relationship between marital status (=4.37)

and the perception of respondents on militant activities at $p \le 0.05$. This means that the marital status of the respondents would determine their perception of militant activities. This means for instance that a married respondent could perceive militancy as bad due to its effect on their family.

Table 8 : Relationship between perception of rural dwellers on the MNOC'S before the amnesty and after the amnesty

Variable		Ν	Df	Mean	Std Dev	t-value	Р	Decision
Perspective	Before	70	138	23	4.25	-1.90	0.05	Sig
	After	70	137	21.67	4.01	-1.90	0.05	Sig

Source : Field survey 2010

Ho2: The is a significant difference between the rural dwellers perception on the MNOC'S before the amnesty and after the amnesty

A significant difference was recorded between the perceptions of rural dwellers on the MNOC before (t = -1.90) and after (t = -1.90) the amnesty at $p \le 0.05$. This means that the perception of the respondents on the MNOC activities differ before and after amnesty probably due to their conditions.

VII. CONCLUSION AND RECOMMENDATION

a) Conclusion

The educational qualification and literacy level of the rural dwellers is still very low and nothing urgent is being done by the Government and stakeholders to solve this problem and therefore employment opportunities for the people of the region is limited since they do not have the necessary educational qualifications to get good jobs.

Also, the rural dwellers blame the Government and the MNOC'S for the crisis in the state and accuse them of not providing infrastructure, job opportunities, better education, better healthcare, degraded forests and farmland, clean enabling environment for living and a few of them also accuse them for the death of livestock, fishes and even relations through pollution. The amnesty granted to the militants and the reduction of violence and tension in the state has done little to improve and/ or solve the problems that led to the crisis in the first place. Although most of the people believe the amnesty was the right and best step to take, they still insist that the Government and the MNOC'S have not improved in terms of their commitment to the region.

b) Recommendation

- 1) Non-farm enterprises are a strategy by which the rural farming community in the state can cope with the decline in farmland availability and unemployment
- Government interventions to develop rural social and economic infrastructure (transport, communication, health and education) and skills development are fundamental in creating peace in the state.

- Rural dwellers should be better informed on the need for quality education so that they can get the jobs they feel they have a right too.
- 4) Government and the MNOC'S should involve the rural dwellers in project planning, implementation and policy making as they are the ones that know their needs the most.

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Evaluation Of Fishermen And Fish Traders In Transactional Sex For Fish Marketing In Coastal Areas Of Ogun Waterside Local Government Area, Ogun State, Nigeria

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Abstract - This study was undertaken to reveal the occurrence of transactional sex in coastal fishing communities of Ogun water side local government area, Ogun state, Nigeria. Fifty fishermen and female fish traders were randomly selected from four locations, Enu waya, JK Camp, Mosafejo and Okun- Elefon based on the fishing activities. Questionnaires were randomly administered to respondents to determine their socioeconomic activities and the level of involvement and reasons for going into transactional sexual activities in the study area. Data collected from the interview guides were subjected to statistical analysis such as descriptive and inferential analysis. Respondents' age ranged between 26years - 65years, fishermen to fish traders ratio was 3:2(60% and 40%respectively), marital status of respondent was single, married, divorced/separated or widowed, Respondents religion was Islam, Christianity or Traditional belief. Trading is reduced in dry season as fish abundance is only experienced in rainy season. The study revealed that main reasons for going into transactional sex in fish trading was linked to inadequate capital (F cal = 0.00 for p<0.05), Generosity (F cal = 0.004 for p< 0.05) and Poverty (F cal = 0.040 for p<0.05) there was no significant difference in the frequency of involvement of transactional sex analyzed for both fishermen and fish traders (p>0.05 of F cal = 0.429) when statistically tested.

Keywords : Transactional-sex, coastal, Ogun waterside, socio-economic.

GJSFR-D Classification : FOR Code: 070499



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Evaluation Of Fishermen And Fish Traders In Transactional Sex For Fish Marketing In Coastal Areas Of Ogun Waterside Local Government Area, Ogun State, Nigeria

Idowu, AA^{α}, Olaoye, OJ^{Ω}, Ifegbesan, A^{β}, Abdul, WO, ^{α} Olawale O 'Busayo^{α}

Abstract - This study was undertaken to reveal the occurrence of transactional sex in coastal fishing communities of Ogun water side local government area, Ogun state, Nigeria. Fifty fishermen and female fish traders were randomly selected from four locations. Enu wava, JK Camp, Mosafeio and Okun-Elefon based on the fishing activities. Questionnaires were randomly administered to respondents to determine their socioeconomic activities and the level of involvement and reasons for going into transactional sexual activities in the study area. Data collected from the interview guides were subjected to statistical analysis such as descriptive and inferential analysis. Respondents' age ranged between 26years - 65years, fishermen to fish traders ratio was 3:2(60% and 40% respectively), marital status of respondent was single, married, divorced/separated or widowed, Respondents religion was Islam, Christianity or Traditional belief. Trading is reduced in dry season as fish abundance is only experienced in rainy season. The study revealed that main reasons for going into transactional sex in fish trading was linked to inadequate capital (F cal = 0.00 for p<0.05), Generosity (F cal = 0.004 for p< 0.05) and Poverty (F cal = 0.040 for p<0.05) there was no significant difference in the frequency of involvement of transactional sex analyzed for both fishermen and fish traders (p>0.05 of F cal = 0.429) when statistically tested. Resultant effects of transactional sex are financial loss, unwanted pregnancy which brings about polygamy and increase in household size. Information derived from this study serves as baseline study to establish the fact that transactional sex exist among fishermen and fish traders in the study area. It is suggested that adequate provisions be made to fish traders by government to help reduce poverty, augment their trading capital especially the fish traders who are majorly women as they fall victims of transactional sex in order to survive.

Keywords : Transactional-sex, coastal, Ogun waterside, socio-economic.

I. INTRODUCTION

ish is one of the most important foods on the planet earth. It is a rich source of protein and easily accessible compared to other sources of protein such as egg, milk, meat etc. Fish is the most important animal protein food available in the tropics and it constitute about 40% of animal protein intake in Nigeria (Eyo, 1992). Coastal communities are the first to benefit from the different fish species that forage for food in estuaries, marshes, wetlands and bar areas (Cantoria, 2010). A constant but subtle theme in human development in the regions surrounded by water is the use of fish and dependence on fish and other aquatic lives for sustenance, trade, and livelihood and for the environment (Williams, 2004). With an estimated 200 million people directly dependent on fisheries and aquaculture by 2008, the sector contributes significantly to livelihoods around the world (FAO/IFAD/WB, 2009). The current estimates from the big number projects for employment in small scale capture fisheries in developing countries alone reach 25 to 27 million with an additional 68 to 70 million engaged in post harvesting (FAO/World Bank and World Fish, 2008).

As women form the majority that engaged in post harvesting in many countries, revised estimates of employment in the fisheries could indicate that the sector is predominantly a female one, challenging the long held notion that fisheries is a male dominated vocation. Preliminary BNP data for nine significant fish producing countries based on available statistics and case studies revealed that 47% of the labour forces in fishery sector (including post harvest) are women (FAO/ World Bank and World Fish, 2008). The major role women play in the fishery sector is to preserve and process the fish so as to retain some freshness. Consumers' acceptability depends on the freshness of the fish. Freshness of fish can be maintained by processing and preservation, through which spoilage can be slowed or stopped (Tobor, 1985). The women 2012

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get involved in activities such as frying, smoking, drying, just to extend the fish's shelf life and satisfy a proportion of the fish demanding ever growing population because according to Tobor (1990) increase in Nigeria's population with restrictions to fish importation has put stress to limited supply of fish.

In modern times, fish in these region surrounded by water has been a source of stability and instability and over time, the same resource may cause either (Williams, 2004). One of the instabilities is transactional sex which has silently crept into the fishery sector without much being done about it. Transactional sex however means the exchange of sex for money, goods or services. Transactional sex affects mostly women in that it is a way of life for many poor women in developing countries (Robinson and Ethan, 2008). According to Weeratunge and Synder (2009) much of the researches on gender differences and inequalities in capture fisheries in Africa and Pacific remain descriptive of the gender division of labour within the sector. They emphasize the need to move beyond this perspective by identifying emerging research on globalization, market changes, poverty and trends in gendered employment in the fishery sector.

In the fishery sector, the women mostly affected by transactional sex are chiefly in the post harvest sector and are not called sex workers but fish traders. This they are called because they can't pay fishermen enough, so they exchange sex for fish (Laura, 2010). The above has been affirmed in recent studies in Botswana, Swaziland, Malawi, Zambia and Tanzania. Another reason given for it is the acute food insecurity (Laura, 2010). Ben (2006) reported that transactional sex is likened to prostitution and that it has come to stay in the Pacific Islands where nearly the whole world goes to fish because of its water. There, the women or ladies spend days with purse seiners in their harbour, gets ride back home and also get cash, fish and other material goods.

An ever increasing population, lack of employment, crowded housing conditions, low educations, low educational opportunities and sustenance at all cost has left many at the mercy of transactional sex. Women are mostly affected by the above and this reaches far to the fishery sector where they process, transport and retail fish (Christophe and Mertenb, 2007). To anyone in business, profit maximization is the most eligible reason. Hence, the fish traders probably engage in transactional sex to really maximize their profit. The need to survive has led many such as single mothers, divorced and widows to transactional sex as they are very prone to poverty. This study therefore describe the socio-demographic features, identify the reasons of transactional sex between the fishermen and fish traders and know the effects of transactional sex on the health and economic status of the respondents of respondents in the study

area. The exploitation of both fishing and transactional sex in places where they constantly create new vulnerabilities is another reason for taking up the project work to reveal the risk involved in the partnership between transactional sex and fishery sector.

II. MATERIALS AND METHODS

a) Description Of The Study Area

The study was carried out in Ogun state, a south-western part of Nigeria. Ogun state has a total land area of 16,762km which is about 2% of the country's land mass. It is bordered in the south by Lagos state and Atlantic Ocean, the north by Oyo and Osun State, the east by Ondo State and the West by republic of Benin (Oloruntoba and Adegbite, 2006).

Rainy season in Ogun state starts around middle of March and continues until late October. Dry season starts around middle October and continues until February in most part of the State. The State is warm throughout the year with a temperature of between 28OC and 35 OC. Humidity is between 85% and 95% (Oloruntoba and Adegbite, 2006).

Ogun state is predominantly inhabited by people who belong to the Yoruba ethnic group, the largest ethnic group in the West African Coast and one of the largest and longest established ethnic groups on the African continent (Oyesiku, 1992).

Ogun state has marine biotopes covering 12, 482, 640 Ha, lacustrine biotopes totalling 4, 404.35 Ha and estuarine biotopes of 767.3km2 (Ayansanwo, 1999).

Ogun waterside Local Government Area has a total land area of 734.35km2 and a population of 72,935 people (2006 census). Ogun waterside is the only area of Ogun state with a coastline on the might of Benin and which borders Lagos lagoon. It is bounded in the west by Ijebu East local government area and in the east by Ondo and Lagos lagoon. Its coordinates in Nigeria are 6029'N4 O 24'E6.483 O N4.4 O E (www.ogunministry oflocalgovtandchieftaffairs.com).

b) Study Population

Respondents targeted for the study were fishermen and fish traders in Ogun waterside Local government area, Ogun state, Nigeria.

c) Data Collection Technique And Sample Size

Fifty fisherfolks (50) were randomly selected from four locations, Enu waya, JK Camp, Okun-Elefon and Mosafejo from the study area based on activities. 50 questionnaires were administered to the respondents to get information on the socioeconomic activities, factors that are determinant to transactional sex in fisheries activities and the effects of transactional sex on the health and economic status of the respondent in the study area.

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III. MEASUREMENT OF VARIABLES

The following variables were measured:

a) Socio-Demographic Features Of Respondent

i. Age: this is obtained in years and measured at interval level and numeric values of 1 is used for ages 18-24 years, 2 for 25-35 years, 3 for 36-45 years, 4 for 46-55 years and 56-65 years.

ii. Sex: respondents were distributed according to their roles and measured at numeric level of 1 is for male and 2 for female.

iii. Marital Status: respondents were measured at numeric level of 1 for single, 2 for married, 3 for separated/divorced and 4 for widowed.

iv. Household size: it refers to the number of people living under the same roof as the respondent, numeric value 1 stands for 1person, 2 for 2people, 3 for 3people, 4 for 4people, 5 for 5people and 6 for 6people and above.

v. Education type: numeric value of value 1 is for formal and 2 is for informal

vi. Education level: numeric value of 1 is for No formal education, 2 for primary education, 3 for Secondary education, 4 for NCE, 5 for HND, 6 for B.Sc, and 7 for Post graduate.

vii. Religion: this refers to respondent's belief measured at numeric value of 1 for Christians, 2 for Muslims and 3 for Traditional.

viii. Month of fish abundance: numeric value of 1 is used for April-June and 2 for September-December

ix. Season of fish abundance: numeric value of 1 is used for rainy season and 2 for dry season.

x. Mobility Period: numeric value of 1 stands for a period of 1-2 weeks, 2 for 3-4 weeks, 3 for 1-2 months and 4 for 3 months and above.

xi. Seasonality of trade: refers to the effects of different season on the fish trade and numeric value of 1 stands for seasonal and 2 for not-seasonal

xii. Level of involvement: numeric value 1 stands for full involvement while 2 is for part involvement.

xiii. Year of fishing: numeric value of 1 stands for 1-10years, 2 for 11-20 years, 3 for 21-30 years and 31-40 is denoted by 4.

xiv. Water body fished in: numeric value of 1 for coastal, 2 for lagoon and 3 for marine.

b) Determinants Of Transactional Sex

i. Source of capital: numeric value of 1 stands for personal savings, 2 for loan from cooperative, 3 for loan from friends, 4 for loan from relatives, 5 for personal savings and loan from friend, 6 for personal savings and loan from personal savings and 7 for personal savings and loan from cooperatives.

ii. Amount loaned: numeric value of 1 is used for N5,000 - N 10,000, 2 for N11,000 - N20,000, 3 for N 21,000 - N 30,000, 4 for N 40,000 - N 50,000, 5 for N51,000 - N100,000 and 6 for N101,000 and above.

iii. Returns per time on investment: numeric value of 1 stands for varied while 2 stands for no response.

iv. Form of loan repayment: numeric value of 1 stands for cash, 2 for kind and 3 for cash and kind.

v. Type of kind payment: numeric value of 1 connotes fish sale, 2 for sex, 3 for friendship and 4 for domestic work.

vi. Convenience: numeric value of 1 connotes very convenient, 2 for convenient and 3 for not convenient.

vii. Penalty Involved: numeric value of 1 is used for presence of penalty while 2 is for no penalty

viii. Relationship between fisher-folks: numeric value of 1 stands for Yes, 2 for No and 3 for No response.

ix. Basis of trade transaction: numeric value of 1 stands for credit, 2 for payment and 3 for both credit and payment.

x. Factors leading to Transactional Sex: the possible listed factors were rated using numeric value of 1 for Greed, 2 for Pleasure, 3 for Poverty, 4 for Social Status, 5 for No response and 6 for To get fish for sale.

xi. Rating for each factor: numeric value of 1 was used for Strongly Agreed, 2 for Agreed, 3 for Undecisive, 4 for Disagree and 5 for Strongly Disagree.

c) Effects Of Transactional Sex

i. Sex outside marriage: numeric value of 1 is used for Yes, 2 for No and 3 for No response.

ii. If Yes, reason?: numeric value 1 stands for pleasure and 2 stands for exchange medim.

iii. Ever traded sex?: numeric value of 1 is used for Yes, 2 for No and 3 for No response.

iv. Ever used protection?: numeric value of 1 is for Yes, 2 for No, 3 for No response and 4 for Not Always.

v. Protection used: numeric value of 1 stands for condom, 2 for no protection, 3 for traditional protection and 4 for withdrawal.

vi. Awareness of STI'S: numeric value of 1 stands for Yes, 2 for No and 3 for Not sure.

vii. Ways of erasing STI: numeric value of 1 stands for faithfulness to one's partner, 2 stands for condom use and 3 for traditional means.

viii. Effects: suggested effects are commercial loss for fishermen, exposure to STD, unwanted pregnancy, abortion, transfer of communicable disease and lack of respect between transactors. The different effects were rated with description to way of response. 1 stands for Strongly Agreed, 2 for Agreed, 3 for Undecisive, 4 for Disagree and 5 for Strongly Disagree.

Statistical Analysis

Data generated from the questionnaires were pooled and subjected to Descriptive and Inferential analyses. SPSS model 16.0 software package was used to process the data derived.

Results

Descriptive Analysis

Table 1 : Socioeconomic characteristics of the respondents in the study area

AGE	F	%
25-35yrs	10	20.0
36-45yrs	22	44.0
46-55yrs	10	20.0
56-65yrs	8	16.0
Total	50	100.0
SEX		
Male	30	60.0
Female	20	40.0
Total	50	100.0
MARITALSTATUS		
Single	6	12.0
Married	36	72.0
Separated/divorce	6	12.0
Widowed	2	4.0
Total	50	100.0
SEASON OF FISH		
ABUNDANCE		
Raining season	41	82.0
Dry season	9	18.0
Total	50	100.0
SOURCE OF CAPITAL		
IO SIARI BUSINESS	0	10.0
Personal saving	8	16.0
Loan from cooperative	19	38.0
Loan from relatives	10	32.0
Dereand asving and	2	4.0
Loan from friends	4	8.0
Personal saving and loan		
form cooperative	1	2.0
Total	50	100.0
LOANED CAPITAL		
.00	7	14.0
N5,000.00-N10,000	3	6.0
N11,000N20,000	6	12.0
N21,000-N30,000	6	12.0
N51,000-N100,000	9	18.0
N101,000- Above	19	38.0
Total	50	100.0

TYPE OF KINDNESS	г	
	Г	%
.00	19	38.0
Fish sale	16	32.0
Sex	2	4.0
Friendship	6	12.0
Help with domestics works of group member	3	6.0
Total	46	92.0
System	4	8.0
Total	50	100.0

Table 2 : Reasons for going into transactional sex in fish marketing from the study area

Poverty	F	%
SA	17	34.0
A	21	42.0
UD	6	12.0
D	6	12.0
Total	50	100.0
Greed		
SA	33	66.0
A	8	16.0
D	7	14.0
SD	2	4.0
Total	50	100.0
Pleasure		
SA	2	4.0
A	30	60.0
D	17	34.0
SD	1	2.0
Total	50	100.0
Inadequate capital		
SA	7	14.0
A	33	66.0
UD	7	14.0
D	1	2.0
SD	2	4.0
Total	50	100.0
Generosity		
SA	11	22.0
A	4	8.0
UD	22	44.0
D	10	20.0
SD	3	6.0
Total	50	100.0
Special likeness for		
fishermen		
SA	20	40.0
A	12	24.0

UD	8	16.0
D	10	20.0
Total	50	100.0
Traditional effect		
SA	1	2.0
A	12	24.0
UD	17	34.0
D	18	36.0
SD	2	4.0
Total	50	100.0

Table 3 : Resultant effects of transactional sex in fish marketing according to the respondents from the study area

Commercial loss on the	F	%
part of fisherman	I	/0
SA	6	12.0
A	32	64.0
D	11	22.0
SD	1	2.0
Total	50	100.0
Exposure to sexually		
transmitted disease		
SA	17	34.0
A	23	46.0
UD	2	4.0
D	8	16.0
Total	50	100.0
Unwanted pregnancy		
SA	11	22.0
А	24	48.0
UD	7	14.0
D	8	16.0
Total	50	100.0
Abortion		
SA	4	8.0
A	18	36.0
UD	8	16.0
D	20	40.0
Total	50	100.0
Lack of respect		
between transactors		
SA	9	18.0
А	27	54.0
UD	9	18.0\
D	3	6.0
SD	2	4.0
Total	50	100.0

Statistcal Analysis

Table 4 : Resultant effects of transactional sex in fish marketing according to the respondents from the study area.

	SA	А	UD	D	SD
Commercial loss on the part	6	32		11	1
of fisherman	(12.0)	(64.0)		(22.0	(2.0)
Exposure to sexually	17	23	2	8	
transmitted disease	(34.0)	(46.0)	(4.0)	(16.0)	
Unwanted pregnancy	11	24	7	8	
	(22)	(48)	(14)	(16)	
Abortion	4	18	8	20	
	(8)	(36)	(16)	(40)	
Lack of respect between	9	27	9	3	2
transactors	(18)	(54)	(18)	(6)	(4)

Table 5 : ANOVA of effects of transactional sex on respondent in the study area.

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a	
	-,

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.290	8	7.911	11.290	.000(a)
	Residual	28.730	41	.701		
	Total	92.020	49			

b)						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B Std. Error		Beta	t	Sig.
1	(Constant)	3.220	.744		4.326	.000
	Poverty	.492	.233	.352	2.117	.040
	Greed	038	.148	034	256	.799
	For pleasure	153	.167	118	917	.365
	Inadequate capital	.733	.186	.450	3.937	.000
	Generousity	.471	.154	.405	3.058	.004
	Threat	186	.162	156	-1.151	.257
	Special likeness for the fishman	267	.198	227	-1.352	.184
	Tradition effects	464	.201	308	-2.308	.026

a Dependent Variable: Transsex

Table 6 : Test of significant difference on the reasons, occurrence and effect of transactional sex on respondent in the study area.

	SEX	Ν	Mean	Std. Deviation	t	Sig.
Reasons	Male	30	18.3667	4.80290	-1.474	.147
	Female	20	20.4000	4.73953		
Transactional sex	Male	30	4.2667	1.41259	.798	.429
	Female	20	3.9500	1.31689		
Health	Male	30	11.3333	10.14833	-1.085	.283
	Female	20	14.6500	11.22157		

IV. DISCUSSIONS

The study site was chosen because apart from its relevance to fisheries, it is more of a rural area. This relates with the works of Varga (1996), Webb (1997), Luiz and Roets (1998) who affirmed that transactional sex occurs in township, rural areas and semi urban areas. 50 respondents selected for the interview is as a result of the sensitivity of the work. Previous work done on transactional sex by Minki et al (2004) required that small geographical locations be used for such studies. The ages of the respondents ranged between 36 and 45 years and formed 44% of the study population that were more informed about the occurrence of transactional sex possibly because it thrives more within that age group. This goes in line with the study done by Nzyoku et al (1997) which found out that young people were more proned to transactional sex activities. As against the findings from the work of Ali et al (2008) which revealed that the percentage of people involved in fish marketing fall within the age bracket of 20-30 above is about three times that of those within age bracket 40-50 above, this study recorded the same percentage of 20% for both age brackets.

Multiple sex partners confessed by some of the respondents as seen in the case of polygamy for men and women having extramarital affairs though in a monogamous relationship is a very good medium for transactional sex to occur. Castle and Konate's 1999 study supports this view as a socio-cultural factor that is present in Nigeria. From responses given to the interview guide by respondents, tradition believers especially men are most proned to transactional sex, Muslim men were more proned to it while Christians are less proned group due to different beliefs held by the different religious group on man-woman relationship. This is in accordance with the findings of Minki et al (2004) where they discovered that in eight out of the eleven countries they worked on, tradition believers are more proned to transactional sex than Christians while in seven of the eleven countries, Muslims are more engaged in transactional sex than Christians. The countries are sub Saharan African countries among which are Nigeria, Togo and Kenya to mention a few.

From findings, married women are less likely to engage in transactional sex when compared to single or once married women such as divorced, separated and widowed considering the admitting of transactional sex occurrence by the different female group. In six of the twelve countries on which Minki et al (2004) worked on specifically Nigeria, Togo, Kenya, Guinea, Niger and Zambia, percentage of ever married women engaged in transactional sex is 80% lesser than never married women. Also in countries like Chad, Mali, Zimbabwe and Central African Republic, percentage of ever married women involved in Transactional sex is 60% lesser than those of single women. The works of Jonathan and Ethan(2008) also reflects that transactional sex is very present in the midst of divorced and separated who see themselves as survivals exchanging sex to survive.

The work of Adewale and Ikeola (2005) revealed that volume of market and income generated depends on seasonality of trade which also depend on seasonality of production supports what this study found out. In table 1, 82% of the respondent agreed that fish is more abundant in rainy season which implies more trade and more income at that time.

In support to findings made from this study, women are the major marketers of fish and they do so at small scale level or with little capital (Adewale and Ikeola 2005). They however have to lend money from friends, relatives, and fishermen if they want to make the business grow as formal credit institutions hardly lend out money to females (Moll et al 2001). Credit most times goes from fishermen to traders and rarely from traders to fishermen, these were affirmed on the field and work done by Adewale and Ikeola (2005) supports this. This creates a cordial relationship between the fishermen and fish traders and transactional sex could eventually result. Considering the large household size majorly recorded in my findings, women from poor household may see transactional sex as a way of augmenting what is being given them by the household head. This approves what is observed in Burkina-Faso by Minki et al (2004) that probability of women from poor household engaging in transactional sex is 118% higher than those from rich household and because poor household most times have large population.

According to WHO (2006), poverty, gender inequality are reasons that make people vulnerable to involvement in transactional sex and hence the risk of HIV/AIDS contraction. This could be seen from Table 2 where most percentage of the study population strongly agreed (34%) and agreed (42%) to poverty as a factor that could predetermine transactional sex and also the power the men has over them since they supply fish to the women for marketing because they are the ones who source it from the wild and could determine on what basis they dispose it. Research carried out by Minki et al (2004) suggests adverse economic conditions as a factor that could lead to transactional sex. This agrees with what is perceived on the field as the economic condition of most of the female respondent doesn't meet up to what is seen as their necessities.

The livelihood/survival strategies employed by the fish traders depend to a large extent on their age, educational background, income level, experience in the trade and seasonality of trade among others. Work done by Adewale and Ikeola (2005) supports this implying that all this factor work together to either suggest Transactional sex to the trader or not. Whether or not to resolve to Transactional sex at times of constraint, factors such as indigenous knowledge, credit transaction, social capital, dependence on female friends for loan and network of trust helps the fish trader make her decision. The strict division of labour between fishermen and fish traders has made fish trade a source of income for women in the fish marketing sector, however institutional and cultural constraints notably lack of infrastructure and finance, polygamous household among others limit their economic activities and livelihood and hence make these women diversify as a survival strategy into things that could include transactional sex, Clark (1994).

According to Udong et al (2009), there was no formal financial and infrastructural support for the sector and these works translate to high transaction cost and low income creating a barrier to the women's success and livelihood security in the fishery sector. This could make them embrace transactional sex as a survival means. It could be seen in the analyzed filled interview guide that most of these women get the fish they sell on credit and only make payment after sales.

According to Clark (1994), household upkeep and children education lies mostly on women's shoulder in the rural community, hence most of the women in the market place struggle by all means to secure household livelihood, household upkeep and children's education and since they earn little, transactional sex is embraced. This was affirmed on the field. Considering the reasons why male and female go into transactional sex in the study area, the analysed data using t-test got for it a significant difference of 0.147 (Table 6) Of the reasons leading to transactional sex, poverty is very significant with a value of 0.040 from Table 5b. The present age of unemployment and poverty in Southern Africa may make many women rely on sexual exchange to support themselves financially (Ogden, 1996 and Schoepf, 1992) Even outside the African world, work done by Barker et al (1998) and Johnson (1997) on survival sex (sex for money or gift exchange) in United States of America reveals that it is done at times just to survive poverty.

Greed has no significant (p>0.05) F cal = 0.799 (Table 5b).

The significance of pleasure is little with a value of 0.365 from Table 5b.

Inadequate capital is greatly significant as it has a value of 0.000 from Table 5b. Work of Udong et al (2009) affirms that lack of infrastructure and finance, polygamy and patriarchy limit their economic activities and livelihood strategies and as a result, most women diversify as a survival strategy.

Generosity as one of the reasons for going into transactional sex in marketing fish in the study area was statistically significant (p<0.05) with a value of 0.004 (Table 5b).

Threat as a reason for engaging in transactional sex has little significance of 0.259 (Table 5b). According to Janet (2002), women are at risk for violence because of factors that link resources exchange with sex.

Special likeness between fishermen and fish traders as a reason for transactional sex was significant (p<0.05) of 0.184 from Table 5b.

Use of traditional spell to bring about transactional sex has significance of 0.026 from Table 5b.

When frequency of involvement in transactional sex was analysed for both male and female respondent, there was no significant difference as a value of 0.429 was gotten using t-test from Table 5b.

The implication transactional sex had on the health of both the male and female respondent has a significant value of 0.283 from Table 6.

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Physiological Performance Of Different Durum Wheat Varieties Grown Under Rainfed Condition

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Abstract - Wheat is a cereal of choice in most countries of the world and it is a staple food crop for more than 35% of the world population and also one of the widely cultivated crops in Syria. Constant efforts are therefore needed to boost its production to keep the pace with ever increasing population. But unfortunately, these efforts are seriously being hampered by a number of abiotic stresses among which is drought. Considerable attention over the years from plant breeders with the purpose of increasing the grain yield and to minimize crop loss due to unfavourable environmental conditions. Drought tolerance is a difficult trait to define as it encompasses a wide range of characteristics involving multiple genetic, physiological, cellular and biochemical strategies in the plant. Nine tolerant, moderately tolerant and susceptible durum wheat varieties were used in this experiment with major objective of examine the efficiency of the physiological system of these varieties under rainfed condition. Our result clearly showed significant differences between the three groups of varieties under study at vegetative and anthesis stage.

Keywords : Drought; rainfed; wheat; chlorophyll; membrane stability; relative water content; *Fv/Fm.*

GJSFR-D Classification : FOR Code: 070302, 070307

PHYSIOLOGICAL PERFORMANCE OF DIFFERENT DURUM WHEAT VARIETIES GROWN UNDER RAINFED CONDITION

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Physiological Performance Of Different Durum Wheat Varieties Grown Under Rainfed Condition

Moaed Almeselmani^α, AbdAlrzak Saud^Ω, Kamal Al Zubi^β, Fouad Hareri^β, Mahran Naaesan^β, Mohammad Adel Ammar^β, Osama Zuher Kanbar^β

Abstract - Wheat is a cereal of choice in most countries of the world and it is a staple food crop for more than 35% of the world population and also one of the widely cultivated crops in Syria. Constant efforts are therefore needed to boost its production to keep the pace with ever increasing population. But unfortunately, these efforts are seriously being hampered by a number of abiotic stresses among which is drought. Considerable attention over the years from plant breeders with the purpose of increasing the grain yield and to minimize crop loss due to unfavourable environmental conditions. Drought tolerance is a difficult trait to define as it encompasses a wide range of characteristics involving multiple genetic, physiological, cellular and biochemical strategies in the plant. Nine tolerant, moderately tolerant and susceptible durum wheat varieties were used in this experiment with major objective of examine the efficiency of the physiological system of these varieties under rainfed condition. Our result clearly showed significant differences between the three groups of varieties under study at vegetative and anthesis stage. Drought tolerant varieties showed better physiological performance (membrane stability index, relative water content, chlorophyll content and chlorophyll florescence), higher yield and yield components (total biomass, grain yield, tiller number/m2, grain number/ear and 1000 grain weight) compared to susceptible one. Our finding indicates that the physiological approach would be the most attractive way to develop new varieties rapidly with better adaptation to dry and semidry area.

Abbreviations : RWC: relative water content; MSI: membrane stability index; Fv/Fm: chlorophyll florescence.

Keywords : Drought; rainfed; wheat; chlorophyll; membrane stability; relative water content; Fv/Fm

I. INTRODUCTION

heat is widely grown as a rainfed crop in semiarid areas, where large fluctuations occur in the amount and frequency of rainfall events(Pakniyat and Tavakol, 2007).Drought is generally accepted to be the most widespread abiotic stress experienced by crop plants, and is becoming an increasingly severe problem in many regions of the world (Demirevskaet al., 2008, Ashraf and Harris, 2005, Quarrieet al., 2003). It considered as the main causes for crop yield reduction in the majority of agricultural regions of the world particularly in the dry and semi dry areas (Mollasadeghiet al., 2011).Plant growth and productivity are negatively affected by water stress and genetic improvement of water stress tolerance is important to agricultural plants. Water stress tolerance has been documented in almost all plants but its extent varies from species to species (Chaitanyaet al., 2003).Water stress limiting durum wheat distribution and productivity in the Mediterranean environment and its major contributors to yield reduction in the semiarid regions, therefore improving drought resistance is a major objective in plant breeding programs for rainfed agriculture (Zareiet al., 2007).

Drought tolerance does not exist as a unique and easily quantifiable plant attribute, it is a complex physiological, morphological and molecular character connected with relative water content (RWC), relative water loss (RWL), chlorophyll fluorescence, stomatal resistance, cell membrane stability (CMS) and accumulation of free proline (Farshadfaret al., 2008). The integration of these novel approaches with conventional system of crop genetic improvement should provide exciting results to breed for drought tolerance in wheat in the near future (Khan and Igbal, 2011). The development of drought tolerant cultivars of wheat will give great opportunities to obtain high productivity in stressed environments(Abdel-Hady and El-Naggar, 2007)But it is hampered by low heritability for tolerance and lack drought of effective strategies(Kirigwiet al., 2004; Pakniyat and Tavakol, 2007).Conventional plant breeding attempts have changed over to use physiological selection criteria since they are time consuming and rely on present genetic variability (Zhu, 2002). A physiological approach would be the most attractive way to develop new varieties rapidly (Turner and Nicolas, 1987). The scientists pay attention to the physiological basis for improving yield under abiotic stress and the use of physiological indices in the breeding program. Physiological traits that are integrative, either in time or at an organizational level (Arauset al., 2002) constitute ideal selection criteria for drought adaptation. In recent

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years they have acquired increased importance in breeding programmes largely due to a greater understanding of their relative contribution to yield (Rebetzkeet al., 2002, Reynolds et al., 2005).

This experiment was conducted with major objective of understanding physiological response of some durum wheat varieties differ in their response to drought stress (susceptible, moderately tolerant and tolerant) grown under rainfed conditions and its effect on yield and yield components

II. MATERIALS AND METHODS

a) Plant materials and growth conditions

Nine drought tolerant and susceptible durum wheat varieties were chosen to represent a range of genetic diversity within Syrian wheat varieties, viz., Sham3, Sham5 and Doma3 (drought tolerant), Bohouth7, Bohouth11 and Sham9 (moderately drought tolerant), Bohouth5 Bohouth9 and Sham7 (drought susceptible) were used in this study. Seeds were obtained from Crop Research Directorate, GCSAR, and sown under rainfed conditions in the field on 20th Nov. 2010 in the first settlement zone (Jellen research station, annual rainfall 400mm). Crops were sown at an adjusted rate of 300 viable seeds/m2 in three replications. Normal agronomic practices were performed and relevant metrological parameters were obtained from the observatory at each research station and daily minimum and maximum temperature and rainfall were recorded. Chlorophyll content (chl), membrane stability index (MSI), relative water content (RWC), chlorophyll fluorescence Fv/Fm were estimated on the first fully expanded leaf (third from top) at vegetative stage and flag leaf at anthesis stage.

b) Chlorophyll Content

The chlorophyll meter (SPAD meter) was used for chlorophyll estimation and it is a simple, portable diagnostic tool that measures the greenness or the relative chlorophyll concentration of leaves. The meter makes instantaneous and non-destructive readings on a plant based on the quantification of light intensity (peak wavelength: approximately 650 nm: red LED) absorbed by the tissue sample. A second peak (peak wavelength: approximately 940 nm: infrared LED) is emitted simultaneous with red LED for to compensate the thickness leaf. Compared with the traditional destructive methods, this equipment might provide a substantial saving in time, space and resources.

c) Membrane Stability Index

A conductivity test to estimate drought tolerance as suggested byAlmeselmaniet al. (2006). 100 mg leaf sample was placed in a test tube containing 10 ml of double distilled deionized water. Electrical conductivity of the solution was measured after incubating the test tubes at 45°C and 100°C.

e) Relative Water Content (RWC)

Was determined by the method described by Barrs and Weatherley, (1962). 100 mg leaf material was taken and kept in double distilled water in a petridish for two hours to make the leaf tissue turgid. The turgid weight, dry weight of the leaf materials was measured and RWC was calculated.

d) Chlorophyll fluorescence

The polyphasic rise of fluorescence transients of intact leaves was measured by a Plant Efficiency Analyzer (PEA, Handsatech Instruments Ltd., King's Lynn, UK) according to Strasseret al., (1995). For the measurement of the chlorophyll fluorescence all the samples were covered with clips, kept in dark for 30 minutes before fluorescence measurements. The transients was induced by red light of 3000 μ mol m-2 s-1 provided by an array of six light emitting diodes (peak 650 nm), which focused on the sample surface to give homogenous illumination over exposed area of sample surface and maximal quantum yield of PS II (Fv/Fm) was measured.

On mid Jun plants harvested from m2 and used for recording number of tillers, grain number per ear, 1000 grain weight, total biomass and grain yield.The experimental design was complete randomized blocks. Analysis of variance and L.S.D. values were estimated.

III. RESULT AND DISCUSSION

In this study some physiological parameters were examined in the field under rainfed condition of the most important durum tolerant and susceptible wheat varieties grown in Syria. The total amount of rainfall received during the growing season was 388mm as shown in table(1).Only 148mm were received at the most sensitive stage (anthesisand grain filling stage) which may have adverse effect on growth and productivity of susceptible varieties.

Month	mm
Oct-10	1
Nov-10	
Dec-10	85
Jan-11	44.5
Feb-11	109.5
Mar-11	60.5
Apr-11	61.5
May-11	26
Jun-11	
Total amount of	388
rainfall	

Table 1 : Total amount of rainfall (mm) in Jellen research station during the growing season

2012

January
Cell membrane is one of the first targets of plant stresses (Levitt, 1972) and membrane stability is a widely used criterion to assess crop drought tolerance. This indicates the importance of this test in discriminating among tolerant and susceptible varieties. Drought susceptible varieties showed highest MSI value i.e., 82.1compared to moderately tolerant and tolerant one, i.e., 79.4 and 80.4 % respectively at vegetative stage, however no differences were recorded between tolerant and moderately tolerant varieties. While at anthesis stage drought moderately tolerant varieties showed lowest MSI values i.e., 75.7% and the highest value were recorded in drought tolerant varieties i.e., 78.8% as shown in figure (1), in general, MSI decreased as plant advanced in age. Water stress caused water loss from plant tissues which seriously impair both membrane structure and function. Martin et al., (1987) reported that electrolyte leakage was correlated with drought tolerance. The leakage was due to damage to cell membranes which become more permeable.

Figure 1 : Effect of drought stress on membrane stability index (%), of drought tolerant, moderately tolerant and susceptible wheat varieties at vegetative and anthesisstages, LSD values at vegetative and anthesis stage: 1.5 and 1.2 respectively.



No differences in RWC were recorded between drought tolerant, moderately tolerant and susceptible wheat varieties at vegetative stage, however RWC values at this stage were more higher compared toanthesis stage. Data at anthesis stage showed that drought tolerant varieties had highest value of RWC in compared to the other varieties, the values were, 83.5, 82.3 and 81.4% for tolerant, moderately tolerant and susceptible varieties respectively as shown in figure(2).A decrease in the RWCin response to drought stress has been noted in wide variety of plants (Navyar and Gupta, 2006). According to Almeselmaniet al., (2011; 2006) RWC indicates the water status of the cells and has significant association with yield and stress tolerance. Sinclair and Ludlow, (1985) reported that RWC of the leaves is a better indicator of water stress than other growth or biochemical parameters of the plants. RWC of the leaves is very responsive to drought stress and has been shown to correlate with drought tolerance (Colom and Vazzana, 2003).





The results in this experiment showed no differences in chlorophyll content between tolerant and susceptible varieties at vegetative stage and highest value were recorded in moderately tolerant varieties. At anthesis stage lowest chlorophyll content were recorded in drought varieties and no significant differences between drought tolerant moderately, tolerant varieties at this stage, however, the values were 60.7, 63.4 and 62.8 for drought susceptible, moderately tolerant and tolerant varieties respectively as shown infigure (3). This trait has been used successfully by many workers for screening and selection of drought tolerance wheat cultivars (Almeselmaniet al., 2011). According to Izanlooet al., (2008) water deficit leads to an increased depletion of chlorophyll and a decreased concentration of chlorophyll. Zaharievaet al., (2001) reported that leaf color and chlorophyll content were correlated, as expected, since chlorophyll loss is the main factor responsible for change in leaf color. According to Manivannanet al., (2007) chlorophyll is one of the major chloroplast components for photosynthesis and relative chlorophyll content has a positive relationship with photosynthetic rate and flag leaf chlorophyll content is an indicator of the photosynthetic activity and its stability conjugation of assimilate biosynthesis for the (Bijanzadeh and Emam, 2010).





Use of a chlorophyll fluorescence technique as a tool to investigate drought tolerance in different wheat genotypes has been reported. The data presented in figure(4) showed significant differences in Fv/Fm values between the three groups under study, however, highest values for chlorophyll florescence in drought tolerant varieties at vegetative stageand the values were 0.79, 0.82 and 0.83 for susceptible, moderately tolerant and tolerant wheat varieties respectively as shown in figure (4), however the values for all varieties at this stage were more higher compared to anthesis stage which may indicate high photosynthetic efficiency at this stage compared to anthesis stage. While at anthesis stage lowest Fv/Fm values were recorded in drought susceptible varieties i.e., 0.75 and no significant differences were recorded between moderately tolerant and tolerant one which had the same value i.e., 0.79. Chlorophyll fluorescence has been used in several studies to detect the genotypic differences in response to drought in many plant species, including wheat. Various studies reported that Fv/Fm ratios indicate the maximum efficiency of photosystem II and in healthy plants, the value of Fv/Fm is 0.83. A similar effect of water stress on the PS II efficiency and a significant decline in Fv/Fm values were reported in intact wheat leaves (Xuet al., 1999). Chlorophyll fluorescence quick variation can be used as a valuable index for evaluation plants of tolerance to environmental stresses (Paknejadet al., 2007). Flagella et al., (1995) also reported that drought tolerant cultivars showed a smaller

decrease in photosynthetic efficiency (Fv/Fm ratios) and higher osmotic adjustment and leaf water potential under water stress.





Drought, being the most important environmental stress, severely impairs plant growth and limits plant production development, and the performance of crop plants, more than any other environmental factor (Shao et al., 2009). Significant differences were recorded between drought tolerant, moderately tolerant and susceptible varieties with regard to total biomass i.e., 1202, 1287 and 1183g/m2 respectively as shown in table (2), however, Drought moderately tolerant varieties showed highest total

biomass values compared to other two groups. Plant produces their maximum biomass under adequate water supply, whereas moisture stress causes a marker decrease in plant biomass production (Clarke et al., 1991; Ashraf, 1998).

Table 2 : Effect of drought stress on wheat yield and yield components (total biomass g/m², grain yield g/m², grain number per ear, tiller number/m2, 1000 grain weight (g) in drought tolerant, moderately tolerant and susceptible

group.

	Total	Grain yield	Tillers	Grain	grain weight 1000
	biomass (g)	(g)	number/m ²	number/m ²	(g)
Tolerant	1184	588	349	50.5	51.6
Moderately Tolerant	1287	568	374	49.3	50.1
susceptible	1202	563	363	48.2	49.8
LSD at 5%	18	7	15	0.88	0.63

Blum and Pnuel (1990) reported that yield and yield components of twelve spring wheat varieties were significantly decreased when they received minimum annual precipitation. Our data showed thattolerant wheat varieties were superior in grain yield as shown in table (2) and drought susceptible varieties showed lowest grain yield i.e., 563g/m2 compared with moderately tolerant and tolerant one i.e., 568 and 588g/m2 respectively. However significant differences were reported between the three groups of varieties.

Drought stress may reduce all yield components, but particularly the number of fertile spikes per unit area and the number of grains per spike (Giuntaet al., 1993; Simaneet al., 1993), while kernel weight is negatively influenced by high temperatures and drought during ripening (Atefehet al., 2011). Our data on tillers number/m2 showed no significant differences between the moderately tolerant and susceptible one i.e., 363 and 374 respectively and lowest value were recorded in drought tolerant varieties i.e., 349.

While in case of grain number per ear, significant differences between susceptible and moderately tolerant and tolerant wheat varieties and the values were 48.2, 49.3 and 50.5 respectively as shown in Table (2), which indicates that drought tolerance varieties had highest grain number per ear. Drought stress reduced the number of gain/spike and grain yield (Saleem, 2003) and the genotypes with higher number of grain/ear produce more yields (Iqbalet al., 1999).

In general the highest 1000 grain weight was observed in tolerant varieties i.e., 51.6g and no significant differences between susceptible and moderately tolerant varieties. However lowest 1000 grain yield were recorded in drought susceptible varieties i.e., 49.8g. Chandler and Singh (2008) reported that number of grains per main spike, 1000-grain weight, number of tillers per plant, biological yield per plant and grain yield per plant were decreased under stressed environment.

Plant growth and productivity are negatively affected by water stress and genetic improvement of water stress tolerance is important to agricultural plants. Generally, drought stress reduces growth (Levitt, 1980) and yield of various crops by decreasing chlorophyll pigments and photosynthetic rate (Asada, 1999). It's obvious that all these traits have directly or indirectly transfer their effects to yield particularly at anthesis stage, at the time the tolerant varieties showed better Physiological performance and maintain efficient physiological system the same varieties showed better yield. Considering that any improvement in grain yield must be a result of an underlying physiological change it is surprising that direct selection for a physiological trait has not contributed more to yield progress.

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2012

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Effects of phosphorus on biological nitrogen fixation in soybean under irrigation using saline water

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Abstract – A field experiment was conducted on Serdang soil, to study the effect of both phosphorus application and bacterial inoculation on the growth and yield of soybean crop under irrigation by saline water (3.5dS/m). Factorial experiment was used with randomize complete block design (RCBD) for phosphorus and Rhizobial inoculation factors, the phosphorus levels were 0, 40, 80 and 120 Kg P /ha, while Rhizobial inoculation contained two treatments(Rhizobial inoculation and control) with three replicates. The following parameters were measured: number of nodules, weight of nodules, plant dry weight, plant height, number of pods, weight of pods and root dry weight. The results showed that the inoculation treatment was significantly higher than non – inoculation treatment, also results showed increasing in all parameters at 120 Kg P/ ha. We can conclude that the rhizobial inoculation with phosphorus application for soybean crops caused increasing in both yield and its components

Keywords : phosphorus, saline water, bacterial inoculation, soybean. GJSFR-D Classification : FOR Code: 100103, 070103

EFFECTS OF PHOSPHORUS ON BIOLOGICAL NITROGEN FIXATION IN SOVBEAN UNDER IRRIGATION USING SALINE WATER

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Effects of phosphorus on biological nitrogen fixation in soybean under irrigation using saline water

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Abstract - Afield experiment was conducted on Serdang soil, to study the effect of both phosphorus application and bacterial inoculation on the growth and yield of soybean crop under irrigation by saline water (3.5dS/m). Factorial experiment was used with randomize complete block design (RCBD) for phosphorus and Rhizobial inoculation factors, the phosphorus levels were 0, 40, 80 and 120 Kg P /ha, while Rhizobial inoculation contained two treatments(Rhizobial inoculation and control) with three replicates. The following parameters were measured: number of nodules, weight of nodules, plant dry weight, plant height, number of pods, weight of pods and root dry weight. The results showed that the inoculation treatment was significantly higher than non - inoculation treatment, also results showed increasing in all parameters at 120 Kg P/ ha. We can conclude that the rhizobial inoculation with phosphorus application for soybean crops caused increasing in both yield and its components.

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I. INTRODUCTION

oybean is considered one of the most important legumes because it contains a good percentage Jof protein and improves soil characters through its ability to produce root nodule. Rhizobium is affected by many different environmental factors such as soil physical and chemical properties (temperature, humidity and salt concentration in soil). Nitrogen fixation is affected by many factors such as the presence and density of nodulating bacteria in the root zone during the emergence and formation of root hairs. In case of symbiotic relation between plant and specialized bacteria, bacteria and plant will thus be more tolerant to environmental stress conditions like drought and soil conditions, which limit growth like rising in soil and irrigation water salinity (Idris et al., 1986). The biological system needs energy which provides hydrogen reductant and also the energy for ATP system in nitrogenase reactions. Thus, adding phosphorus may reduce stress in the symbiotic relation between root bacteria and legume plant in case of rising salinity levels which come from soil and irrigation water (Dixon and Wheeler, 1986).

The effect of high salt content on nitrogen fixation ability of alfalfa could be detrimental (Wilson, 1970). Bhardwaj (1974) mentioned that pulse crops decrease the number of nodules on highly salt-affected land even though native Rhizobia are known to be present. Therefore, this study aims at determining the effect of irrigation by saline water (3.5 dS /m) and adding different levels of phosphorus on Rhizobium and plant growth. The salinity level was fixed at 3.5 dS /m since this is the average level of soil salinity in many experimental station administered by the Ministry of Agriculture, Iraq.

II. MATERIALS AND METHODS

As shown in Table 1, an experiment was carried out on Serdang series soil. The Ground soil was put in 20 kg pots, and 33.7 g of calcium carbonate was added to each pot to raise the soil pH. All pots were left for 2 weeks with irrigation to ensure that CaCo3 was totally absorbed in the soil. A soil sample was taken to measure the pH after adding calcium carbonate. Before planting of the seeds, four levels of phosphorus were used 0, 40, 80, 120 kg P /ha, nitrogen was added as urea at 40 kg N /ha and potassium sulphates was also added at 100 kg K /ha Soybean seed (variety AGS190) was used, and Bradyrhizobium strain UPMR020 was applied as bacterial inoculation. During the experiment, all the pots were irrigated using saline water with a concentration of 3.5 dS /m.

III. EXPERIMENTAL DESIGN AND DETERMINATION OF GROWTH PARAMETERS

The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replicates, and plants were harvested after 16 weeks. The treatments were: 1- Control 2- 40 kg of P /ha 3- 80 kg of P /ha 4- 120 kg of P /ha 5- UPMR020 6- UPMR020+ 40 kg of P /ha 7- UPMR020+ 80 kg of P /ha 8- UPMR020+ 120 kg of P /ha. The parameters recorded in this experiment were: number of nodules /plant, weight of nodules mg /plant, plant dry weight g /plant, root dry weight g /plant, plant height (cm), number of pods /plant and weight of pods g /plant.

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IV. RESULTS

a) Number of nodules

The number of bacterial nodules increased significantly in plants inoculated with UPMR020, compared with non-inoculated plants (P≤0.01) Figure 1. Adding phosphorus at different levels led to an increase in bacteria nodules, which was progressive until 120 kg of P /ha having 3.50 nodules /plant. This increase was significant at (P≤0.01) in spite of irrigation by saline water. The interaction between bacterial inoculation and different levels of phosphorus revealed significant differences at (P≤0.01) in the number of nodules at all levels of phosphorus; the best interaction was the inoculated treatment with 120 kg of P /ha giving 40.50 nodules /plant.

b) Weight of nodules

Results in Figure 2 indicate an increase in the weight of dry nodules when soybean seeds were inoculated with bacteria and the increase was significant at ($P \le 0.01$). The effect of adding different levels of phosphorus increased the weight of root nodules, compared with control. The highest increase in the weight of nodules was at 120 kg of P /ha having a nodule weight of 52.50 mg /plant. The results demonstrate the obvious interaction between bacteria inoculant and phosphorus level whereby nodule weight increased in response to higher levels of P.

c) Plant dry weight

The effect of bacterial inoculation and phosphorus on increasing the dry weight of green parts of the plants showed in Figure 3. The difference in increase between inoculated and non-inoculated treatments was significant (P≤0.01). The role of phosphorus fertilization was obvious in increasing the dry weight whereby the dry weight increased from 13.34 g /plant for control to 16.59, 22.52 and 27.79 gm /plant for 40, 80, 120 kg of P /ha. The interactions between bacterial inoculation and different levels of phosphorus had obvious effect in increasing the weight of the dry matter, whereas interaction between bacterial inoculation and 120 kg of P /ha showed the highest amount 45.75 g /plant followed by 36.54, 38.29 and 38.83 g /plant respectively for P fertilization 0, 40 and 80 kg of P /ha.

d) Plant height

The results in Figure 4 indicate an increase in plant height whereby inoculated treatment increases significantly, compared to non-inoculated treatments at (P \leq 0.01). The increase in phosphorus levels enhanced plant height, and the highest plants were at 120 kg of P /ha, which gave 12.25 cm /plant compared with 0, 40, 80 kg of P /ha. The interactions between bacterial inoculation and phosphorus levels revealed significant

increase at (P \leq 0.01) particularly in the interaction between 120 kg of P /ha and the bacterial inoculation which gave 43.75 cm /plant, followed by 40, 80 kg of P/ha and inoculation alone.

e) Number of pods

As shown in Figure 5, the effect of bacterial inoculation increased the number of pods under inoculation treatments. This can be compared with non inoculation at (P \leq 0.01), which gave 27.50 pods /plant for inoculation and 6 pods /plant for control. The role of phosphorus fertilizer was obvious in increasing the number of pods from 40 kg of P /ha to 120 kg of P /ha which gave the highest number of pods 12.50 pods /plant. The interactions between bacterial inoculation and phosphorus levels were significant at all levels P \leq 0.01, especially in the interaction between 120 kg of P /ha and bacterial inoculation giving 41.50 pods /plant, compared with inoculation alone with 27.50 pods /plant.

f) Weight of pods

The weight of pods as affected by phosphorus levels and Rhizobium inoculation showed in Figure 6. The results demonstrated that adding Rhizobium alone without any input of P increased pod weight much more than the treatment with P without inoculation ($P \le 0.01$). Also, Rhizobium inoculation significantly increased pod weight with an increase in the amount of P. The highest pod weight was obtained with 120 kg of P /ha with a value of 7.75 g /plant. The lowest amount of pod weight was shown by control treatment. The results suggested the importance of inoculation with Rhizobium to increase pod weight ($P \le 0.01$).

g) Root dry weight

As shown in Figure 7, the effect of bacterial inoculation and phosphorus on root dry weight was obvious as the root dry weight significantly increased under bacterial inoculation (P≤0.01), compared with non bacterial inoculation. The root dry weight under bacterial inoculation was 20.55 g /plant, whereas there was 10.18 g /plant in control. This proves the continuity of growth and distribution of roots in soil under soil circumstances. Adding phosphorus in different levels led to a significant increase in root dry weight under 120 kg of P /ha at (P \leq 0.01), compared with other levels. The interactions bacterial between inoculation and phosphorus showed significant differences, particularly between bacterial inoculation and 120 kg of P /ha as compared to other interactions at (P≤0.01). The increase in the root dry weight emphasizes the role of phosphorus in soil plus the nitrogen fixed by nodulation bacteria, which resulted in the improvement of plant growth compared with non-inoculated plants.

V. DISCUSSION

The response of soybean to bacterial inoculation was obvious through increasing all parameters. Biological fertilization by nodules bacteria improved the growth and yield of soybean. Increasing phosphorus levels improved plant growth and fixed atmospheric nitrogen by specialized bacteria, which benefitted soybean and increased the studied parameters.

The decrease in plant parameters under low phosphorus treatments with or without bacterial inoculation may be due to the negative effect of low phosphorus on the nodule capacity to fix nitrogen as a result of small nodules. On the other hand, the effect of low phosphorus on nodules formation and functions may be due to low exchange between shoot and nodules, which is the proper way to decrease leaf photosynthesis with the decline in the available phosphorus (Tsvetkova and Georgiev, 2003). In this experiment, the balancing in nutrient elements especially phosphorus contributed to the growth and survival of bacteria.It reduced salt stress in spite of irrigated plants by water with Ec = 3.5 dS/m.

Un-inoculated plants produced fewer nodules and had lower dry matter than inoculated plants, which confirms the result obtained by Hafeez et al. (1988). Accordingly, Hafeez found that bacterial inoculation and using saline water with suitable concentration had obvious effect on both bacteria and plant and suggested that salinity had an indirect effect on biological nitrogen fixation. The bacteria are generally more capable to survive with salinity than their host plants.

Since soybean is considered moderately sensitive to salinity, irrigation by saline water with a concentration of 3.5 dS /m did not much affect plant parameters. According to Keating and Fisher (1985), soybean has a higher tolerance to salinity (3.5 to 5.4 dS /m) than green gram, black gram and pigeon pea, all cultivated in the same soil salinity.

In line with Wilson (1985), inoculation with suitable Rhizobium strain showed good tolerance of high salinity. Accordingly, Wilson found that Siratro plants depend on symbiotic nitrogen fixation. They show a better tolerance of salinity compared with Cooper (glycine), which appear to be less resistant than Siratro cells to injury at high tissue salts concentrations.

Adding saline water with 3.5 dS /m did not have inhibitory effect on plant nodulation, which is in accordance with Douka et al. (1984). In their experiment it was found that additional NaCl to soil- agar slopes displayed higher or equal nodulation compared with plants grown without any addition of NaCl.

Adding phosphorus to legumes increases plant parameters, paralleled with an increase in phosphorus

levels. Deficiencies in phosphorus are most likely to be manifested in decreasing the growth of the legumes, which in turn reduces total nitrogen fixation and effect the nodule formation. These results confirmed the results mentioned in FAO (1984) on soybean; it showed that application of phosphorus alone increased the number of nodules per plant and per unit volume of soil.

Fertilization with phosphorus and bacterial inoculation increased the number of nodules and other plant parameters. Hoque and Haq (1994) also reached the same results when they treated several legumes with Rhizobium and phosphorus and they found an increase in the number of nodules and maximum growth features with inoculation and phosphorus. In line with the result of a study on lentil by Abdallah (1986), using 120kg of P/ ha with bacterial inoculation increased the number of nodules, number of pods and plant dry weight.

VI. CONCLUSION

Using bacterial inoculation was very effective on all plant parameters where adding UPMR020 showed significant increase in the plant growth, compared with the control. This experiment indicated that UPMR020 with 120 kg of P /ha was the best and most effectinve combination for soybean plants under irrigation by saline water (3.5 dS /m).

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Figure 1 : Effect of phosphorus and bacterial inoculation on number of nodules under irrigation by saline water. The letters above the bars represents significant differences at 0.01 level of significance.















Figure 5: Effect of phosphorus and bacterial inoculation on number of pods under irrigation by saline water. The letters above the bars represents significant differences at 0.01 level of significance.







Figure 7: Effect of phosphorus and bacterial inoculation on roots dry weight under irrigation by saline water. The letters above the bars represents significant differences at 0.01 level of significance.

Table (1)

The chemical properties of Serdang soil series

Analyses	Results
рН	4.2
N %	0.13
Available P(ppm)	2.50
Available K(ppm)	12.30

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٠

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- Fundamental goal
- To the point depiction of the research
- Consequences, including <u>definite statistics</u> if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

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Approach:

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- If use of a definite type of tools.
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Approach:

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- Resources and methods are not a set of information.
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The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently. You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

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Approach

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Approach:

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INDEX

Α

absenteeism \cdot accompanished \cdot agro-ecological \cdot 13, 19 Anthropology \cdot 77, 79 apprehensive \cdot artifacts \cdot augmenting \cdot

В

biochemical \cdot 27, 28, 81, 85, 95 biosynthesis \cdot 87

С

calorie \cdot 25, 27 Capsicum \cdot 2, 4, 6 chlorophyll \cdot 81, 83, 84, 87, 89, 91, 93, 94, 95, 96 Chlorophyll \cdot 83, 84, 89 cholesterol \cdot 29 cocoyam \cdot 15, 50 collapsed \cdot 52 combination \cdot 18, 21, 25, 104 commercialization \cdot 43, 44 concentration \cdot 83, 87, 99, 100, 103 contractors \cdot 52 correlations \cdot 11 criterion \cdot 17, 85 cumulative \cdot 16

D

deforestation \cdot 37, 41, 42, 44, 47 Deforestation \cdot 37, 43, 47 degradation \cdot 13, 14, 15, 41, 42, 47, 52, 56 developmental \cdot 50 Directorate \cdot 83 diversification \cdot 15, 18 Diversification \cdot 13, 15, 16, 21 domestication \cdot 44

Ε

ecologically · 37, 52 Econometrics · 35 economical \cdot 41 elasticities \cdot 25, 26, 30, 31, 33, 35 elasticity \cdot 23, 25, 30, 31, 33 emphasize \cdot 64 encourages \cdot 13, 18, 19 Ethiopians \cdot 26 evaporation \cdot 8 Evapotranspiration \cdot 6, 8 exogenous \cdot 16, 26 expenditures \cdot 29 experimentation \cdot 11 exploitation \cdot 65

F

federalism \cdot 52 feminization \cdot 55 fertilization \cdot 101, 103, 105 fixation \cdot 1, 99, 101, 103, 104, 105, 107, 108, 109, 110 fluorescence \cdot 81, 83, 84, 89, 91, 95, 96

G

genotypic · 89, 94 globalization · 64

Η

harmoniously \cdot 39 Harvestable \cdot 6 Helianthus \cdot 95 Herfindal \cdot 13, 15, 16, 21 heterogeneously \cdot 26 heterogeneously \cdot 39 homogeneity \cdot 30, 31 Horticulture \cdot 4 household \cdot 13, 15, 16, 18, 19, 23, 25, 26, 27, 29, 30, 31, 37, 40, 41, 42, 43, 45, 55, 63, 75, 76

I

 $\begin{array}{l} \text{implementation} \cdot 62 \\ \text{implication} \cdot 16, 27, 57, 59, 77 \\ \text{Inaccessibility} \cdot 48 \\ \text{Indonesia} \cdot 28, 43, 44, 45 \\ \text{inferential} \end{array}$

infrastructural · 43, 76 inoculation · 99, 100, 101, 102, 103, 104, 105, 107, 108, 109 instabilities · 64 irrigation · 1, 2, 4, 5, 6, 8, 9, 10, 11, 12, 99, 101, 103, 104, 105,

L

localization · 95

М

 $\label{eq:maximization} \begin{array}{l} \text{Macroptilium} \cdot 105 \\ \text{marketability} \cdot 59 \\ \text{maximization} \cdot 26, 64 \\ \text{metabolism} \cdot 95, 96 \\ \text{methionine} \cdot 28 \\ \text{metrological} \cdot 83 \\ \text{militancy} \cdot 50, 52, 55, 60, 61 \\ \text{monogamous} \cdot 74 \\ \text{Multinational} \cdot 50 \end{array}$

Ν

 $\begin{array}{l} negotiation \cdot 50 \\ Neonotonia \cdot 105 \\ nodulating \cdot 99 \end{array}$

0

observation · 9, 19

Ρ

pastorialists · 13 perception · 50, 53, 55, 57, 58, 59, 60, 61 phosphorus · 1, 27, 29, 99, 101, 102, 103, 104, 105, 107, 108, 109,110 photosynthesis · 87, 94, 95, 103 physiological · 81, 83, 84, 93, 94, 95 Physiological · 1, 81, 82, 83, 85, 87, 89, 91, 93, 94, 95, 97, 98 plausible · 31 polygamous · 76 precipitation · 93 predominantly · 63, 65 preferential · 29

Q

 $\begin{array}{l} \mbox{qualification} \cdot 61 \\ \mbox{qualifications} \cdot 56, 61 \\ \mbox{quantification} \cdot 83 \end{array}$

R

redistribution \cdot rehabilitation \cdot remunerative \cdot requirement \cdot 2, 28, 42 retardation \cdot Rhizobium \cdot 99, 102, 103, 104 ruralites \cdot

S

sabotaged \cdot 52 scarcity \cdot 59 seasonality \cdot 75 secretariat \cdot 39 significantly \cdot 31, 40, 63, 93, 99, 101, 102 specialization \cdot 18 specifically \cdot 74 spillage \cdot 57 statistical \cdot 16, 18, 63 susceptible \cdot 13, 81, 83, 84, 85, 87, 89, 91, 93 Sustainable \cdot 20, 45, 50, 62 symbiotic \cdot 99, 103, 104 systematic \cdot 23, 26, 30

Т

transactional \cdot 63, 64, 65, 68, 72, 73, 74, 75, 76, 77 transplanting \cdot 6, 8, 9, 12

U

unobservable · 16



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