Journal of Agriculture and Agricultural Technology 6(1), 2015

MULTINOMIAL LOGIT ANALYSIS OF CHOICE OF ENTERPRISE AMONG MAIZE/SORGHUM BASED CROPPING SYSTEMS IN NIGER STATE, NIGERIA

*Yisa, E. S., *Nmadu, J. N., *Tanko, L. and **Tsado, E. K.

*Department of Agricultural Economics And Extension Technology, ** Department of Crop Production, Federal University of Technology, Minna., Niger State, Nigeria

Corresponding author's e-mail address: ezekielyisa@yahoo.com, ezekiel.yisa@futminna.edu.ng

Phone Number: +2348033931252

ABSTRACT

This study examined the choice of enterprise amongst farmers involved in maize/sorghum based cropping systems in Niger State, Nigeria. A multi-stage sampling technique was employed to select a total of 360 maize/sorghum based farming household heads sampled from nine (9) Local Government Areas across the three agricultural zones of the state. Primary data used for this study were collected using structured questionnaires. Descriptive statistics, perception index using a 5-point Likert scale, a multinomial logit model and the farm budgeting technique were used to analyze the data. Results of the socio-economic characteristics of the farmers revealed that a typical maize/sorghum based farmer was about 46 years old, married with nine family members and had attained at least primary level of education with 24 years of experience in farming. Average farm size cultivated was 2.36 hectares, planted with several crops in diverse combinations with less than 10% of these planted with maize and sorghum as sole crops. Derivation of more income from mixed cropping and the desire to produce most of the food consumed by the household served as incentives for the extensive practice and preference for mixed cropping systems by the farmers. Number of plots at the farmers' disposal, income derived from the preferred chosen enterprise, farming experience, distance of farmland from farmer's home and membership of association or co-operative all had significant influence on the farmers' choice of enterprise. The study recommended increased research into mixed cropping systems, as well as a holistic system of inputs supply and distribution to ensure that farmers get the complete package of relevant production inputs at the appropriate times and at affordable prices in order to boost food production.

Key words: Enterprise, Multinomial Logit, Cropping systems

INTRODUCTION

Agricultural production in Nigeria according to Oladele *et al.* (2008) is largely in the hand of peasant farmers. The characteristics of these peasant farmers predispose them to low productivity. Most arable food crops such as sorghum, maize, yam and cassava are produced either as sole crops or in association with other crops in intercropping farming systems. Cropping patterns such as sole and intercropping of annual crops and intercropping of annual and perennial crops are practiced by farmers to varying degrees of complexity as part of strategies to cope with dwindling land resources, pests and disease problems and risks of crop failure (Alene and Hassan, 2007). While farmers have different reasons for the cropping systems adopted and the enterprises combined, two major reasons are most outstanding, and these according to Chukwuji (2008) are net income stabilization and income maximization. Income maximization entails comparison of costs and returns from the different enterprises combined.

Maize and sorghum are traditionally principal staple food crops grown across the entire breadth of Northern Nigeria. They are two cereals most commonly grown together or in combination with other cereals, legumes, roots and tuber crops (Amos *et al.*, 2004). Holt (2007) in a special report on preliminary livelihoods zoning in Northern Nigeria by the United States Agency for International Development Famine Early Warning Systems Network (USAID FEWSNET) described sorghum as the dominant cereal in Nigeria, in terms of staple consumption and demand in processing industries especially for breweries, which are mostly located in the south. Sorghum is mostly intercropped with other cereals or with pulses and leguminous crops. It is a very valuable industrial crop for brewing alcoholic and non-alcoholic drinks as well as in the baking and confectionery industry in Nigeria. According to National Research Council (NRC), (1997), sorghum has greater untapped potentials than any other crop. It even postulated that if the twentieth century was the century of wheat, rice and maize, then the twenty-first century could well become the century of sorghum.

Maize was reported by FAO (2001) as the most important cereal crop after wheat and rice respectively. It is produced across Nigeria right from the mangrove regions in the south to the Sahel savannah in the north. Maize was the dominant staple food crop for early civilization of the western hemisphere and today, it still plays an

important role in the diet of millions of people because of its capacity to produce a large amount of dry matter per hectare, it's ease of cultivation, versatile food uses and storage characteristics. Maize has a great potential and can play a crucial role in contributing to food and nutritional security, income generation, poverty alleviation and socio-economic growth of Nigeria.

According to Ofor *et al.* (2009), the stems of maize and sorghum (Guinea corn) are used for fuel and building of fences and local huts. Maize and sorghum are used as basal ingredients of livestock feed and are also rich in carbohydrates. In spite of the importance of these cereals as sources of food for human consumption, their production is concentrated in the hands of peasant farmers whose average hectarage is very small, approximately 0.5 – 1.0 hectare per farmer (Amos *et al*, 2004).

Most research efforts in Nigeria fail to consider variations in cropping systems and management practices at the plot level in conducting efficiency analyses thus investigating only the general (at best at farm level) social and economic factors impeding efficient crop production, most of which are cultivated as sole crops. Consequently, the influence of farm management that is observable only at the plot level on resource use efficiency largely remains unexplained. The practice of intercropping maize and sorghum (two cereals) and intercropping either of these with other crops especially legumes, is common among small scale farmers in Northern Nigeria particularly in the North-central region even though the reasons for such practice may not be clearly known.

Researchers, according to Amos *et al.* (2004), are often apt to conduct investigations on sole crop and most recommended technologies available to farmers are often tailored toward sole cropping to the neglect of farmers' goals and strategies. Few studies such as Amos *et al.* (2004), Tanko *et al.* (2011), Ahmadu and Alufohai (2012) and Ojo (2013) have been conducted in Niger State, North Central Nigeria on the efficiency and productivity of arable crop farms and these were mostly focused on sole crops. It is against the backdrop of the indispensable role of the smallholder farmers coupled with the dearth of information on factors influencing choice of cropping enterprise among maize and sorghum based farmers in Niger State that this study sought to address the predominant cropping patterns and the factors influencing choice of these cropping patterns among farmers in the study area.

The specific objectives were to describe the socio-economic characteristics of maize and sorghum based crop farmers in Niger State; determine the most preferred cropping patterns practiced among maize and sorghum based farmers; and identify the factors influencing the choice of cropping patterns practiced among maize and sorghum based crop farmers.

METHODOLOGY

The Study Area:

Niger State is bounded on the West by the Republic of Benin, North by Zamfara State, North West by Kebbi, South by Kogi State, South West by Kwara State, North East by Kaduna State and South East by the Federal Capital Territory (FCT, Abuja). With its 25 Local Government Areas (LGAs), it is one of the largest states in Nigeria with a landmass of 86,000km^2 (8.6million hectares) which represents about 9.3% of the total landmass of Nigeria (Niger State, 2008). The provisional result of the 2006 National Population Census shows that the State had a population of 3,950,249 persons comprising 2,032,725 males and 1,917,524 females (National Population Commission [NPC], 2006). This represents a percentage share of 51.5% for males and 48.5% for females. Moreover, as opposed to a national annual growth rate of 3.2%, Niger State is growing at 3.4%. The population of the state is likely to double in about 19 years (Niger State, 2008). The World Bank (2013) however projected the population of the State to be 4, 695,604 persons as at 2013 going by the projected growth rate of 2.5% for Nigeria. The vegetation of the state consists of the forest Savannah Mosaic, Southern Guinea Savannah and the Northern Guinea Savannah. Geographically, the State is characterized by varying landforms such as extensive and swampy features which are common in the lowland areas that occur in the areas along the valleys of Rivers Niger and Kaduna. The vegetation, soil and weather patterns are favorable for the production of a wide spectrum of agricultural food, industrial and cash crops of various types. The major crops grown in Niger State include rice, maize, millet, sorghum, yam and cassava.

Sampling Techniques and Data Collection:

Multi-stage sampling technique was used to select the farming household heads from which primary data were collected through a cross-sectional household survey using structured questionnaire, interview schedules, plot measurements and observations undertaken between May 2012 and

April 2013. The first stage involved the selection of nine (9) Local Government Areas (LGAs), three (3) each from the three (3) agricultural zones in the State. In zone I, the selected LGAs were Edati, Gbako and Lavun, selected LGAs in zone II were Bosso, Paikoro and Gurara while the selected LGAs in zone III were Wushishi, Mariga and Kontagora. The second stage was a simple random selection of five (5) villages in each LGA. The third stage was the selection of eight (8) maize/sorghum based farming household heads in each village giving a total of 360 farming household heads in Niger State from whom relevant input-output data and socio-economic information were elicited.

Analytical Techniques

Various analytical tools were used to achieve the objectives outlined for this study. The description of the socio economic characteristics and the assessment of the constraints faced in maize/sorghum based crop production by the respondents were achieved using descriptive statistics such as frequency distribution tables, percentages, arithmetic means, variances and standard deviations to group and summarize the data obtained from the field. The farmers' preference for either sole or multiple cropping systems was assessed using a 5-point Likert Scale. To analyze factors influencing the choice of cropping pattern among sorghum and maize farmers, a Multinomial Logit model was constructed and estimated.

The general form of the Multinomial Logit model is specified as:

$$Y_z = \beta_i (X_i)$$

The explicit form of the function is specified as follows: $Y_z = \beta_0 + \beta_1 (X_1) + \beta_2 (X_2) + \beta_3 (X_3) + \beta_4 (X_4) + \beta_5 (X_5) + \beta_6 (X_6) + \beta_7 (X_7) + \beta_8 (X_8) + \beta_9 (X_9) + \beta_{10} (X_{10}) + \beta_{11} (X_{11}) + \beta_{12} (X_{12}) + \beta_{13} (X_{13})$

The dependent variable (Y_z) in this case is a multinomial variable indicating the choice of cropping system by the farmer as follows. The cropping systems chosen by the maize/sorghum based farmers were categorized as follows.

0 = maize only; 1= sorghum only; 2 = sorghum/maize (the reference group); 3 = maize with other crops; 4 = sorghum with other crops; and 5 = sorghum and maize with other crops

The independent variables in the model are a set of socio-economic characteristics of the farmers and are defined as:

X_1 = Educational level of respondent (years spent in school);

X_2 = Marital status (1 if married, 0 otherwise);

X_3 = Income from the preferred cropping pattern (in Naira);

X_4 = Total size of farmland allocated to the preferred cropping pattern (in hectare);

X_5 = Measure of land fragmentation (number of plots owned by farmer under maize/sorghum crop based system of cultivation);

X_6 = Total crop yield in Kg of preferred cropping pattern where all crop output in each cropping pattern were aggregated into a single output grain equivalent unit;

X_7 = Years of experience in the preferred cropping pattern (in years);

X_8 = Number of people in household involved in farm work (Number);

X_9 = Tenural status or Mode of land ownership (1 if direct ownership; 0 otherwise);

X_{10} = Frequency of extension contact in the production season (Number of times visited by extension agent);

X_{11} = Farmers' perception of weather condition (1 if favourable, 0 otherwise);

X_{12} = Distance to the plots from farmer's homestead (Kilometers)

X_{13} = Membership of farmer cooperative or association (1 if respondent is a member of a group; 0 otherwise); and

$\beta_{(0,..,13)}$ = Parameters to be estimated.

The multinomial logit model was estimated using the statistical package STATA 11.2. The software not only provides the coefficients of the estimated multinomial logit model for factors influencing the choice of enterprise, it also provides the marginal effects (partial derivatives) with respect to particular explanatory variables which are converted to quasi elasticities. According to Greene (1993), neither the sign nor the magnitude of the marginal effects need bear any relationship to the sign of the coefficients used in obtaining them. The quasi-elasticities represent the percentage point change in the probability of being in each of the alternative groups relative to the reference group. These elasticities are superior to the coefficients and the partial derivatives by their ease of interpretation and like the derivatives, they may change sign as well as value when estimated at different points (Basant, 1997).

RESULTS AND DISCUSSION

Socio Economic Characteristics of Maize and Sorghum Based Farmers in the Study Area

The socio-economic characteristics of the respondents considered in this study (Table 1) were age, marital status, gender, farming experience, farm size, household size and educational status of the respondents. These

results revealed that the mean age of maize/sorghum based farmers in Niger State was 45.85 years. Majority (65%) of the sampled active years and were likely to be more productive. Their income earning capacities are likely to be greatly improved through the adoption of readily accessible farming inputs and improved technologies. This agrees with the findings of Tanko *et al.* (2011) who reported a mean age of 44 years for crop farmers in Niger State and emphasized that as the age of the farmer increases, the adoption of agricultural technology will likely decrease while sensitivity to risk will increase as older farmers are more risk averse. Sorghum and maize could be regarded as traditional food crops for peasant farmers in the study area as the production of these crops is not restricted to only the younger farmers but is undertaken by relatively older farmers too. The result shows that majority (88.1%) of the farmers were married while only 11.9% were singles. This implied that most of the farmers were married, hence were saddled with the responsibility of catering for their families, which will directly or indirectly influence their participation in income generating activities and programmes for improving the economic status of their household. The results in Table 1 also showed that majority (91.1%) of the maize and sorghum based farmers were male, showing complete dominance of food crop production particularly maize and sorghum by male farmers. This further lends credence to the call for more concerted effort at empowering women so as to redress the gross inequality in gender distribution and greater involvement in food crop production. This result agrees with Amos (2006), and Ahmadu and Alufohai (2012) who reported that food crop production in Nigeria is dominated by male farmers. Moreover, the results also indicate that the mean years of farming experience is 16.7 years, implying that the respondents were relatively young with a few decades of experience in farming. This may affect their level of awareness and consequently their level of adoption of improved technologies. This agrees with the findings of Tanko *et al.* (2011) who reported that as farmers become more experienced, it enables the farmer set realistic time and cost targets by identifying production risks and constraints with greater ease.

The results further indicated a mean farm size of 2.36 hectares. This is lower than the 2.63 ha mean farm size reported for yam and cassava farmers in Niger state by Ojo (2013) but much higher than the mean farm size of 0.9 ha reported for food crop farmers in Niger State by Tanko *et al.* (2011). Small size of cultivated farmlands is a common feature in small holder agriculture. Farm size is an important fixed input in agricultural production and determine to a large extent the output and income of the farmers. Farmers usually own several plots devoted to crops in scattered locations, the average in the study area being three (3) plots per farmer. The size of farmland allocated to the cultivation of a particular crop is closely related to the household size, available labour and population pressure. With increasing population, the sizes of holdings become smaller while big farms become smaller; the rate of change depends mostly on the size of the farming households. This is because, the larger the family members, the more fragmented the lands become. This study reveals a mean household size of 10 persons which implies that farming households in the study area have small to moderately large household sizes. This may mean there is increasing disaggregation of farming communities as more farmers tend to move away from communal to independent settlements. Since labour requirement for agricultural activities are enormous, the farmers in the study area had to resort to hiring labour for farm work. Household size is an important factor in traditional subsistence agriculture, because it determines to a larger extent the supply of labour for immediate farm employment and general income for meeting family needs. This finding is in agreement with those of Olanipekun and Kuponiyi (2009), who pointed out that a large family may serve as incentive for engaging in livelihood diversification in order to meet the obligations of the family.

Results in Table 1 also showed that the respondents have spent average of 7.73 years in formal schooling. Education plays a crucial role in technology dissemination and adoption. Increased level of education increases the ability of the farmer to cope with the complexities of new technologies. This result agrees with the findings of Njoku (2005) and Ogungbile *et al.* (2002) which indicate that formal education has a positive influence on the adoption of innovations as well as improvement in technical efficiency of the farmers. This is why farmers with formal education tend to be more efficient in food crop production due presumably to their enhanced technical competence which enables them produce close to the frontier output. The results across the state present a picture of highly literate farmers were below50 years. This showed that large proportions of the farmers were still in their

farming household heads. This, added to farming experience over the years, may have enabled the farmers to understand new farm production technologies which improved their yield considerably.

Cropping Patterns among Maize and Sorghum Based Farmers in Niger State

The results from Table 2 show the predominant cropping patterns that maize and sorghum based farmers across Niger State cultivated. It showed that farmers in the State cultivated several crops in diverse combinations on their farms ranging from 0.5 to 5.5 hectares in size. Less than 10% of these were planted with maize and sorghum as sole or mono-crops. While 47 and 26 plots out of the total 868 plots were planted with sole maize and sole sorghum, respectively, jointly accounting for 8.42%. The remaining 91.58% was planted with several combinations of crops. Yusuf *et al.* (2008) emphasized that growing crops in a mixture is a farming practice that is common among farmers of the tropics. This is evident amongst farmers in Niger State growing as many as a mixture of six (6) and an average of three (3) crops on the same plot for maize/sorghum based crop farmers.

Results from Table 3 shows that most farmers in the study area believed they derived more income from growing more than one crop on a plot which serves as incentive for the extensive practice of mixed cropping systems across the State. This agrees with the findings of Onyenweaku and Nwaru (2005) and Tanko *et al.* (2011). The farmers who have limited access to many plots of land engaged in the cultivation of mixture of several crops on the same farmland in the quest to provide all of the food consumed by their families. Thus, the desire to produce most of the food consumed by the household further becomes an incentive to the practice of mixed cropping production system by the maize and sorghum based farmers in Niger State. The farmer therefore rarely cultivates maize or sorghum as sole or mono-crops but would combine these with diverse types of crops for security or insurance of investment. The farmers had limited access to many plots of land, but for those with more than a plot of land, these were in different locations which could lead to reduced productivity as time and energy is wasted or expended in moving from one plot to the other.

Factors influencing choice of enterprise among maize and sorghum based farmers in Niger State

Table 4 presents the results of the multinomial logit analysis showing the factors that influence the choice of cropping system or enterprise among maize/sorghum based farmers in Niger State. Majority of the maize/sorghum based farmers chose maize and sorghum crop mixture as their preferred cropping pattern. The coefficients were estimated with respect to the maize/sorghum mixture enterprise as the reference group i.e. group 2. Results from Table 4 revealed that the likelihood ratio (Chi square) value was 327.82 which was significant at 1% level of probability with the pseudo R^2 value of 0.2864 confirming that all the slope coefficients were significantly different from zero. The pseudo R^2 value of 0.2864 obtained indicated a relatively good-fit for a multinomial logit model as Zepeda (2001), Rahji and Fakayode (2009) and Ojo (2013) reported pseudo R^2 values of between 0.25 and 0.3665 which represented a relatively good-fit for a multinomial logit model. While most of the variables significantly influenced the farmer's choice of enterprise from across the six different groups, certain variables showed more influence across more groups.

The number of plots at the farmer's disposal influences the farmers' choice of all of the five enterprise groups with respect to the reference group. While the coefficients of number of plots for sole maize (2.4001) and sole sorghum (0.1654) were positive but significant only for sole maize at 0.1%, they were negative and significant for sorghum/other crops, maize/other crops and for maize/sorghum/other crops enterprises. This is an indication that as number of plots at farmers' disposal increases; they are more likely to choose sole cropping systems laying credence to the assertion by Oladele *et al.* (2008) that many farmers lack adequate productive lands for their farming activities thereby serving as one of the reasons for cultivating mixtures of two or more crops on the same plot.

The income derived from the preferred chosen enterprise, farming experience, distance of farmland from farmer's home and membership of association or co-operative all have significant coefficients for three out of the five cropping patterns with respect to the maize/sorghum mixture which is the reference group. Age of the farmer, educational level, extension contact and crop yield from the chosen enterprise have significant coefficients for two out of the five cropping patterns with respect to the reference group i.e. maize/sorghum mixture.

Table 5 shows the estimated marginal effects and the quasi – elasticities estimated for the significant variables from the multinomial logit model for factors influencing the choice of enterprise among maize/sorghum based farmers in Niger State. The quasi-elasticities represent the percentage point change in the probability of choosing an enterprise upon a one percent increase in the explanatory variables or factors influencing the choice of enterprise. The partial elasticities of income (-1.49), crop yield (-1.23) and membership of association (1.82) for sole maize are elastic. This means that a one percent change in these explanatory variables leads to a more than proportionate change in the probability of classification into the other groups relative to the reference group. The partial elasticities for number of plots (0.16), farming experience (-0.96) and distance of farmland from home (0.54) were all inelastic for sole maize which was an indication that the probability of classifying the farmers into any particular group was not greatly affected by marginal changes in these variables. A one percent change in these variables leads to a less than proportionate change in probability of classification into the other groups relative to the reference group.

CONCLUSION AND RECOMMENDATION

This study concluded that the derivation of more income from mixed cropping and the desire to produce most of the food consumed by the household against the backdrop of limited access to productive farmlands served as incentives for the extensive practice of mixed or multiple cropping systems across the Niger State. Number of plots at the farmers' disposal, income derived from the chosen enterprise, farming experience, distance of farmland from farmer's home and membership of association or co-operative all significantly influenced the farmers' choice of enterprise. The study therefore recommended the strengthening of effective extension programmes and farm advisory services, farmer based organizations like associations and cooperatives, as well as a holistic system of inputs supply and distribution to ensure that farmers get the complete package of relevant production inputs at the appropriate times and at affordable prices in order to boost food production.

REFERENCES

Alene, A. D., Manyong, V.M., Tollens, E. & Abele, S. (2007). Targeting agricultural research based on potential impacts on poverty reduction: Strategic program priorities by agroecological zone in Nigeria. *Food Policy,* 32(3): 394–412.

Ahmadu, J. & Alufohai, G. O. (2012). Estimation of Technical Efficiency of Irrigated Rice Farmers in Niger State. *American-Eurasian Journal of Agriculture & Environmental Sciences,* 12 (12): 1610-1616.

Amos, T. T., Chikwendu, D. O. & Nmadu, J. N. (2004). Productivity, Technical efficiency and cropping patterns in the savanna zone of Nigeria. *Journal of Food Agric. Environ.* 2: 173-176.

Basant, R. (1997) "Technology Strategies of Large Enterprises in Indian Industry: Some Explorations" *World Development,* 25(10): 1683 -- 1700.

Chukwuji O. C. (2008) Comparative analysis of enterprise combination costs and returns in cassava-based food crop farming systems in Delta State, Nigeria. *ARPN Journal of Agricultural and Biological Science,* 3(4): 27 – 32.

Food and Agricultural Organization (2001). Maize in Human Nutrition. In: Chianu, J.N. (ed). Food and Agricultural Organization Paper. 50/1 Rome, Italy.

Greene, W. H. (1993). *Econometric Analysis.* 2nd eds. New York. Macmillan Publishing Company (791 pages).

Holt, J. (2007).Preliminary Livelihoods Zoning: Northern Nigeria. A Special Report By United States Agency for International Development (USAID) The Famine Early Warning Systems Network (FEWS NET).

National Population Commission (NPC), (2006) Provisional Figures of the National Population Census, 2006.

National Research Council (NRC), (1997). *Lost Crops of Africa; Grains,* Washington D.C., National Academy of Sciences.

Niger State of Nigeria (2008) Official Diary of Niger State of Nigeria 2008.

Njoku, M. E. (2005). Effect of agricultural productivity on consumption, nutrition and health status of rural households in Abia State, Nigeria. Unpublished PhD. Dissertation, Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.

Ofor, M.O., Ibeawuchi, I.I & Oparaeke, A.M. (2009). Crop Protection Problems in Production of Maize and Guinea Corn in Northern Guinea Savanna of Nigeria and Control Measures. *Nature and Science.* 2009;7(12):8-14. (ISSN: 1545-0740)

Ojo, M. A. (2013).Analysis of production efficiency among small scale Yam and Cassava farmers in Niger and Kogi States, Nigeria. Unpublished PhD. Dissertation, Department of Agricultural Economics and Extension Technology, Federal University Technology, Minna, Niger State, Nigeria.

Olanipekun, A. A. & Kuponmiyi, F.A. (2009). The contribution of livelihood diversification to rural household welfare in Ogbomoso agricultural zone of Oyo state, Nigeria. *Nigerian Journal of Rural Sociology*, 11 (2): 18-26.

Oladele, O. I, Oladipo, O. A. & Ogunlade, I. (2008). Unintended consequences of arable crop technology within farming systems in Oyo state, Nigeria. *Indian Journal of Traditional Knowledge*, 7(3):

Onyenweaku, C.E. & Nwaru, J.C. (2005). Application of stochastic frontier production function to the measurement of technical efficiency in 429-443.

food crop production in Imo State, Nigeria. *The Nigerian Agricultural Journal, 36:1 - 2.*

Rahji, M .A.Y. & S.B. Fakayode (2009). A Multinomial Logit Analysis of Agricultural Credit Rationing by Commercial Banks in Nigeria. *International Research Journal of Finance and Economics* 24(8): 90-100.

Tanko, L., Baba, K.M. & Adeniji, O.B.(2011). Analysis of the competitiveness of mono- crop and mixed crop enterprises in farming system of smallholder farmers in Niger State, Nigeria. *International Journal of AgriScience* 1(6): 344-355.

World Bank (2013). *Nigeria Population Growth.* Washington D.C.: World Bank.

Yusuf, O. Sanni S. A., Ojuekaiye E. O., & Ugbabe O. O. (2008). Profitability of egusi melon (*Citrullus Lanatus* Thunb. Mansf) production under sole and mixed cropping systems in Kogi State, Nigeria. *Journal of Agricultural and Biological Sciences*, 3(2):14-22

Zepeda, L. (2001). "Agricultural Investment, Production Capacity and Productivity" in *Agricultural Investment and Productivity in Developing Countries,* L. Zepeda, editor. Rome: FAO, 2001.