AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Food Insecurity, Family Structure and Agricultural Productivity: the role of Social Capital in Nigeria.

Oluyemisi Kuku
Iowa State University
yemik@iastate.edu

Saweda Liverpool
International Food Policy Research Institute
S.Liverpool@cgiar.org

Selected Paper prepared for presentation at the Agricultural & Applied Economics Association 2010 AAEA, CAES, & WAEA Joint Annual Meeting, Denver, Colorado, July 25-27, 2010

Copyright 2010 by Oluyemisi Kuku & Saweda Liverpool. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

> "Whereas economic capital is in peoples bank accounts and human capital is inside their heads, social capital inheres in the structure of their relationships. To possess social capital, a person must be related to others, and it is those others, not himself, who are the actual source of his or her advantage."- (Portes 1998).

Introduction

In the African context, the family is the most important unit in an individual's life. In addition to the important socialization role the family plays, particularly in the absence of social welfare programs, it also provides a social safety net for members. In Nigeria, as in many other African countries, the concept of the family transcends the nuclear family (regardless of its structure), as the extended family concept is very strong (Ipaye, 1983).

Recently, there has been an increased interest in the relationship between family structure and persistent poverty in the western world. The structure of the typical American family has evolved over the past few decades, with cohabitation and single parenthood now generally accepted as normal family forms (Mclanahan and Casper, 1995; Martin, Emery and Peris, 2004). The consequences of these changes for social welfare indicators like poverty and food insecurity have also been well established as individuals in single parent or cohabiting homes are more likely to experience poverty and food insecurity (Mclanahan and Casper, 1995; Manning and Brown, 2006).

There are very few studies of this nature in Africa in general, and in Nigeria in particular, largely because of the paucity of adequate data to address these kinds of issues (Mberu, 2007). There is however some anecdotal evidence that the structure of the family in Africa is changing to mirror what obtains in the west; with the family evolving from extended to nuclear family types, and also from polygamous to more monogamous family structures (Muga & Onyango-Ouma, 2009). In addition there is greater diversity in the different forms of family structures that exist as there is now a non-trivial growing incidence of divorce, cohabitation and single parenthood, although most single parents of both sexes in Nigeria are still widows and widowers (Mberu, 2007)

Meeting the food needs of families in Sub-Saharan Africa is a serious challenge. This challenge emerges due to widespread poverty and conflict (Misselhorn, 2004; Smith et al., 2000; Oldewage-Theron, et al., 2006); drought, famine and other negative weather patterns exacerbated by global climate change (Rosenzweig et al. 2001); degradation and deforestation (Baro and Deubel, 2006), increased food prices due to the growth in demand for biofuels (Trostle, 2008) and low agricultural productivity (Byerlee, 2007). These factors have combined to restrict access to food for many in developing countries. Of the estimated 923 million undernourished people in the world, about 200 million of them in Sub-Saharan Africa (FAO, 2008). In Nigeria, an estimated 8 percent of the 140million strong population was estimated to be undernourished in the 2004-2006 period (FAO, 2009).

One factor that has been found to have the potential to mitigate food insecurity is social capital (Walker, et. al, 2007, Martin et. al, 2004). Social capital refers to the set of supportive interpersonal interactions that exist in the family and community (Isreal, Beaulieu and Hartless, 2001). At the household level, social capital can be defined as the relationship between different family members that determines how individual members can take advantage of whatever financial and human capital other family members possess (Astone and Mclanahan, 1991;.Martin et. al, 2004). At the community level, social capital can be defined as having relational, material and political elements. Distinguishing between household and community level food insecurity is particularly important in many African countries where family plays a prominent role in the life of the individual. In times of financial hardship, food shortages or severe illnesses, various studies in Africa have shown that the family and community sources of social capital that households have access to make a big difference in their abilities to surmount these adverse events (Mtika, 2001; Kaschula, 2008; Muga & Onyango-Ouma, 2009).

In the current empirical literature however, there has been very little emphasis on the role that family structures and associated social networks play in either exacerbating or mitigating extreme poverty and food insecurity in Africa in general and in Nigeria in particular. Also, very little known about how shifts in family structure towards a more western model have affected the food insecurity status of families nor if there has been an increased role for community level social capital with this change . Furthermore , there is no real information on the strength of social capital associated with different family structures.

As part of a comprehensive approach to examining the relationship between family structure, community social capital and food insecurity, we examine the relationship between these variables and agricultural productivity. For many rural households (the majority of households in this study), it is incomplete to talk about food insecurity without examining agricultural productivity. Nigeria, like most countries in Sub-Saharan Africa, is a predominantly rural society, with majority of its citizens deriving their livelihood from agriculture and allied activities. Thus their level of agricultural productivity will be linked to their levels of food insecurity. Higher agricultural productivity translates into larger food supplies, possibly lower food prices for net buying households (and consumers generally) or lower food expenditures for rural farm households. Furthermore, higher agricultural productivity means higher incomes, and thus improved ability to purchase food and other basic necessities (Wiebe, 2001). Consequently, agricultural productivity is also adopted as an outcome measure. Its relationship to family structure and social capital as well as its impact on food insecurity are explored.

This study aims to explore whether certain family structures in Nigeria are more likely to experience extreme poverty and food insecurity, or be more efficient in their use of agricultural inputs to produce crops. We also investigate if there has been a shift in importance from family level social capital to community social capital due to changes towards more western lifestyles. In particular, is the family still the strongest source of

social support in alleviating food insecurity in Nigeria? Thus, the paper attempts to achieve the following objectives:

1. To identify family arrangements that are more vulnerable to poverty and food insecurity
2. To explore the importance of community level social networks
3. To identify family arrangements that are more efficient in agricultural production
4. To estimate the relationship between food insecurity and agricultural productivity in rural households.

Background

Family Structure

There is an exhaustive literature on the marked changes in family structure that have taken place in the United States. In general, dramatic increases in divorce, nonmarital childbearing and cohabitation have led to significant increases in non monogamous family structures (Cancian and Reed, 2001; Manning and Brown, 2006). Several studies point to the consequences of these changes for social welfare. In particular, children in these non traditional households generally experience more economic hardship than those in monogamous households and are more likely to experience food insecurity and poverty (Mclanahan and Casper, 1995; Manning and Brown, 2006; Nord, Andrews and Carlson, 2009).

The structure of the African family is in many ways different from what obtains in most parts of the west. While western societies generally tend to consider households within a nuclear context (distinguishing more between nontraditional and monogamous households), the concept of the extended family and its importance is pervasive in Africa. Though there is some evidence that the extended family system is declining in influence, this family system was widespread and efficient, ensuring the welfare of all family members, including the elderly and the very young (Muga & Onyango-Ouma, 2009). Family structure in Nigeria has traditionally been defined in modern history as consisting of two main structures – the monogamous and polygamous. Single headed households exist in Nigeria but these are predominantly widows and widowers although a growing incidence of divorced and never married single headed households exist. (Mberu, 2007). However, very few empirical studies on family structure in Nigeria exist that distinguish between the nuclear and extended family structures.

While evolution and changes in family structure in Nigeria has not been rigorously tracked, anecdotal evidence points to some shifts towards more western family structures in Nigeria. For instance in the 1970s, it was estimated that about half of men in South Western Nigeria were engaged in polygamous unions (Ipaye, 1983). However, based on survey data from the 2004 Nigerian Living Standards Survey, only about 10 percent of households in the same region were reported to be polygamous. On a national scale, about 15 percent of surveyed families were polygamous in structure; about 63 percent were monogamous with never married single parents accounted for about 4 percent of the

sample. It could therefore be argued that there appears to have been a shift towards monogamy from a polygamous family structure.

Food Insecurity

In general, food insecurity can be defined as the uncertainty of having, or the inability to acquire, enough food for all household members to sustain active, healthy living because of insufficient money or other resources (Nord, Andrews & Carlson, 2008). Food insecurity in the developing world is different compared to what obtains in developed countries. Household food insecurity in developing countries is commonly measured through consumption and anthropometric measures, and is often used interchangeably with similar concepts such as poverty, malnutrition, and hunger (Coates et al. 2006). While hunger and malnutrition can be seen as extreme forms of food insecurity, there are also households that are food insecure and are not immediately experiencing malnutrition, hunger or starvation.

There are a variety of methods for assessing food insecurity in Africa. As with changes in family structure, measuring food insecurity remains a challenge due to a lack of sufficient nationally representative data collected at the household or individual level (Smith, et al., 2006). This has led to the utilization of a variety of methods to assess food insecurity, making it difficult to have a clear comparative picture of the state of food insecurity . These methods include measures based on national food supplies (Naiken, 2003) and anthropometric methods (Marcoux, 2002; Madise et al., 1999). In addition, particularly in emergency situations, the coping strategies Index is a quick and easy tool for early warning and food insecurity monitoring and assessment. It is generally used to measure short term responses to adverse events or shocks (Devereux, 2001; Maxwell and Caldwell, 2008). These activities range in intensity from activities like food rationing or drawing down savings, to more permanent strategies like the sale of assets. More recently, attempts have been made to develop measures for developing countries patterned after procedures utilized in the United States (Wunderlich and Norwood, 2006; Nord et al., 2002; Melgar-Quinonez, et al., 2008).

Food insecurity in Nigeria

While it is difficult to properly conceptualize the nature of food insecurity in Nigeria, some anthropometric and food supply measures have been used to begin to quantify its scope. Regardless of how food insecurity is measured, it is clear that Nigeria faces a major food insecurity problem. When food insecurity is measured by national food supplies, records show that the country has a supply shortfall, as about US$3.0 billion and US$3.99billion, were utilized on food importation in 2007 and 2008 respectively. This amounts to import costs representing about 8 per cent of total foreign exchange disbursement(CBN, 2009). When food insecurity is measured by anthropometric measures and macronutrient deficiencies, 42 percent of children were stunted, while 25 percent were underweight and 9 percent wasted in 2003 (Akinyele, 2009). For under-five children, 38 percent were reported stunted, 29 percent underweight and 9 percent wasted in the same period (Akinyele, 2009). More specifically, about 30 percent of children

under 5 surveyed in 2003 were found to be vitamin A deficient, while about 25 percent of children and 20-40 percent of adult females were reported to suffer from iron deficiency in the same period. In addition, about 25 percent of children were found to suffer from iodine deficiency, while 20 percent of children under 5, 28.1 percent of mothers, and 44 percent of pregnant women were found to be zinc deficient.(Akinyele, 2009). In general, several studies of pregnant women in different parts of the country found unacceptably high levels of malnutrition (Idowu et. al, 2005; Ekejindu et al. 2006; Maziya-Dixon et. al. 2003).

Agricultural Productivity

Agricultural productivity plays an important role in food insecurity discussions because higher agricultural productivity translates into larger food supplies and possibly lower food prices for consumers or lower food expenditures for rural farm households (Wiebe, 2001) Furthermore, higher agricultural productivity means higher incomes, and thus improved ability to purchase food and other basic necessities. This is particularly important for numerous rural households who are not only more likely to be food insecure but who earn majority of their livelihoods through agricultural production. Agricultural productivity is measured here as the ratio of agricultural output to agricultural inputs. It may be defined in general terms as the ratio of the value of total farm outputs to the value of total inputs used in farm production (Olayide and Heady, 1982). Though productivity, often used interchangeably with efficiency can be viewed from different angles, an increase in farm output can result from 1)an increased quantity of inputs, with no change in output per unit of input; 2) an increased productivity of inputs with no change or a decrease in quantity of inputs; or 3) a combination of changes in inputs and productivity(Nkonya et al, 2009).By the definition of productivity employed here, higher output, with higher input costs does not necessarily translate to higher productivity.

Agricultural productivity in Nigeria:

Agriculture still remains a crucial sector, employing over 70 percent of the Nigerian labor force and serving as a potential vehicle for diversifying the Nigerian economy and enabling economic development. With a very diverse agroecology, Nigeria has numerous farming systems including: Pastoral, Agro-Pastoral (millet/sorghum), Irrigated, Cereal-Root Crop Mix, Highland Temperate Mix, Root Crop, Tree Crop, and Coastal Artesian Fishing (FAO 2001). Consequently, it also has a broad range of agricultural commodities, with the main ones being cassava, maize (corn), cocoa, millet, palm oil, peanuts, rice, rubber, sorghum, and yams(Liverpool et al, 2009).

However, Nigeria's agricultural productivity remains generally low. This is largely the result of a production structure dominated by subsistence and semi-subsistence smallholders (cultivating no more than 3 ha); poor access and limited adoption of production-enhancing inputs (improved seeds, fertilizer and irrigation); dependence on labour-intensive, low input-output technologies; high levels of post-harvest losses due to poor handling, inadequate development of agro-processing as well as poor rural

infrastructure (particularly rural roads and storage facilities); and limited access to marketing opportunities (Sackey, 2010).

As we seek to understand the relationship between family structure and food insecurity, it is important, particularly in rural areas, where agricultural production is the major source of livelihood, to understand if any of these family structures are more likely to be more or less productive than others. This might be due to their differential access to various types of inputs or technologies or differential access to varying qualities of inputs. It might also be due to differential ability to utilize their available resources. If extended family structures or polygamous structures where one is likely to have larger pools of labor to draw from (particularly if it is believed that family labor is more efficient than hired labor) are more productive in agriculture then it is important to understand and prepare for the possible consequences of the changing family structure in Africa and its implication on family and national food security. Similarly if single headed households (who have been shown to experience higher levels of poverty and food insecurity in the west) are also less productive in agriculture in Nigeria, then particular attention might be needed for members of such households to increase their efficiency in agricultural production. This is very important in Nigeria where it has been shown that majority of single headed households in the country are widows and widowers (Mberu, 2007) who are more likely to be elderly (thus less physically active). While numerous studies have focused on various drivers of agricultural productivity, little empirical work has been done on the link between family structure and agricultural productivity. Understanding the link between family structure and agricultural productivity, particularly among rural households is important for policy makers as potential strategies for improving food security in rural areas can be better developed and implemented if targeting particular sub-groups within the population is necessary. .

Food insecurity, agricultural productivity, family structure and social capital

Evidence from the United States shows the important linkage between family structure and the welfare of individuals within the family. Generally, food insecurity in the US has been found to be strongly associated with poverty, minority status and single parent families (Nord, Andrews and Carlson, 2009). In Africa in general, and Nigeria in particular, there are very few studies that relate family structure to any kind of social welfare indices utilizing rigorous statistical methods. Mberu (2007) is the only empirical study that we have come across in Nigeria which provides evidence of the differential effect of family structure on living conditions, with particular emphasis on single headed households. Using data from the 1999 Nigeria Demographic and Health Survey, Mberu finds a significant disadvantage for single adult headed households regardless of sex, compared to two parent households. He also finds that extended family presence plays a mitigating role in female headed households.

While social capital is viewed and used differently across and within the sociology and economic literature, it is generally accepted that social capital stands for the ability of actors to secure benefits by virtue of membership in social networks or other social

structures. Associations/interactions within the institution of the family as well as those between individuals in a household and their peers, as well as community organizations provide a clear example of the complexity and dynamics of the social processes that produce the potential benefits from such associations. Consequently, three main roles of social capital can be distinguished; First the nurturing concept of social capital within the family. Second we have the function of social capital within the family as a source of network-mediated benefits which lie beyond the immediate family. The third aspect of household social capital, more pertinent among rural agricultural households, is the labor augmenting role of family and networks in the presence of poorly functioning labor markets. All three of these aspects of social capital within the family are important for household welfare and food security. While the nurturing component of social capital reveals the role that family structure can play in the perpetuation (or prevention) of intergenerational poverty, the second and the third aspects highlight the role that the family members and the networks that individual household members have access to could be beneficial to the overall wellbeing of the household. This could be through the provision of household members access to employment opportunities or various resources (.e.g. input and output markets for agricultural households) information and/or support in the event of a shock. It is also important to note that the effect of Social capital effect on social welfare often transcends access to resources, as there is evidence of a positive relationship even after controlling for income (Martin et al, 2004).

While potentially useful, social relationships also have the potential to hamper household welfare. Close family or intergroup ties of the kind found in families or high solidarity communities can lead to a free-riding problem, as lazy household members can infringe on the resources of the successful ones backed by the groups shared normative structure (Portes, 1998). Within the agricultural context, larger households, with limited non labor resources or low levels of human capital might serve as a drain on household resources rather than serve as a source of additional revenue generating potential. While this might limit the positive impact of social capital within the family, this is also an example where social capital available to household members due to networks of other members could affect the overall welfare outcome of the household.

In terms of food insecurity or agricultural productivity and family structure, social capital has the power to mitigate shocks to income and food supplies in times of crises. Generally, the severity of the shock to income and food supplies and what coping strategies families may choose to utilize to cope in trying times may depend primarily on the strength of the social networks they have access to. Very little is known about the strength of social capital associated with different family structures and how the shifts in family structure towards a more western model has affected the food insecurity status of families. For instance, with regards to polygamy, it might logically be assumed that this family structure creates a larger pool of individuals that can provide support for each other and provide financial, social and labor support when needed. On the other hand, there is some evidence of separate spousal budgets in many polygamous homes (Caldwell, Orubuloye and Caldwell, 1992; Desai, 1992). In these arrangements, individual wives have primary responsibility for taking care of their children, and there is no resource sharing across co-wives. For instance, polygamous women in Udu local

government in Nigeria were found to contribute more to the food security status of their dependents than monogamous women whose husbands were more likely to provide for them (Meludu et. al, 1999).

Thus we investigate these relationships with the aim of providing useful information to policy makers as they work to help the more vulnerable members of society cope with poverty and food insecurity.

Data and estimation procedure:

Data

The data used for this study are from The Nigeria Living Standard Survey (NLSS). The NLSS was part of the efforts of the Nigerian Federal Government to provide statistical information on the prevalence of poverty in the country. The survey was designed to collect information needed to identify and classify target groups and provide basic welfare indicators for monitoring poverty alleviation programs. To achieve the above stated objectives, in-depth data were collected from the household head or suitably knowledgeable household members on the following key elements: demographic characteristics, educational skill and training, employment and time use, housing and housing conditions, social capital, agriculture, income consumption expenditure and non-farm enterprise. Information was collected from 19158 households and over 92,000 individuals. The analysis was however carried out at the household level.

We have two measures of food insecurity; a subjective measure of food insecurity and poverty, based on the coping strategies concept[1], and a more objective measure based on the percentage of total household expenditure spent on food. The food insecurity and poverty measure is captured via the "social capital and community participation" module of the Nigeria living standards survey. This module details the coping strategies that individuals utilize to deal with short term income and food shocks. These range from reducing the number of meals consumed, to selling assets like cars or cattle. The subjective measure was derived by combining information from two questions: First, respondents were given several coping strategies and asked to rank the three most important strategies that they utilized to cope in times of need. There were five food related options on the list of strategies, namely: Working on food-for-work program, Relief food, Free food from the government, Eating wild food only, Substituting ordinary meals with mangoes, pumpkin, sweet potatoes etc, and Reducing the number of meals or food in-take. If any of these options were chosen as a coping strategy, they were used to create a dummy variable for primary, secondary and tertiary coping strategies respectively. The three strategies were then combined into a food coping strategies index.

We recognize that this index may be inadequate as a measure of food insecurity. Therefore, since food insecurity, even in developed countries, is generally associated with individuals living at or near poverty (Martin et. al, 2004; Oldewage-Theron et.al,

[1] The coping strategies index is designed to measure short term responses to adverse events or shocks (see Devereux, 2001 for more information)

2006) we combine this variable with a self assessed measures of poverty. Respondents were asked the question "Do you consider your household to be Very Poor, Averagely Poor or Not Poor?" Combining the food coping strategies index with the self assessed poverty measure, we categorize our sample into food secure (FS) and food insecure (FI) households. Food insecure households are those where respondents reported two or more food coping strategies and considered themselves to be very or averagely poor.; otherwise, they were considered to be food secure.

The more objective measure of food insecurity is derived by dividing total food expenditure in a month by total household expenditure in the same period. Total household expenditure comprises total non food expenditure, monetary value of home produced food consumption, and total food expenditure. Based on guidelines suggested by by Smith and Subandoro (2007), a household is considered food insecure if they spend 75 percent or more of their total household expenditures on food.

The agricultural productivity measure is calculated as the ratio of total output of all household crops to agricultural inputs (Nkonya et al, 2009). This means that differences in productivity across households will depend upon differences in the types and quantities of inputs used and attaining maximum resource productivity will imply obtaining the maximum possible output from the minimum possible set of inputs. Thus, as was explained in Nkonya et al, (2009) optimal productivity of resources here implies an efficient utilization of resources in the production process and thus efficiency and productivity are synonymous in this context. We use the agriculture module of the NLSS dataset to generate this measure. The total value of annual crops produced was calculated for each household. Similarly, total cost of production was calculated from the section on agricultural costs and expenses. Data on the value of household labor was not available. Consequently we run two different models; one without accounting for household labor, just controlling for household size and another estimation where values for household labor were estimated as the difference between required labor given land size and hired labor. The average man days per unit of land was based on rates estimated in the 2006 Field situation assessment of agricultural production in Nigeria and *"Labor requirements for production of various food crops In Nigeria*" derived from an International Livestock research Institute (ILRI) document[2] for all households with a hectare of land. This information was then used to impute the necessary man days required by different households using the impute command in STATA11. The results are almost identical thus the model with imputed values is not presented.

Similarly no land costs were directly available. Representative zonal land rents were calculated as the average of the state rental rates per hectare stated in the Fadama 2 dataset[3]. Data on rental rates were not available for fadama states in the North Western (NW) and there was no fadama state in the South South (SS) zone. Thus the average of

[2] The document is available at http://agtr.ilri.cgiar.org/library/docs/X5458E/x5458e04.htm

[3] Fadama 2 is a dataset that accompanies the implementation of the second phase of the national fadama development project in 12 states in Nigeria. It has data on crop production as well as on post harvesting activities for farmers and farmer groups in the 12 states.

the rental rates for the North East and North central was used for the NW and the average of the rental rates of the South East (SE) and South Western (SW) zones were used for the SS. These rental rates were then applied to household land size and added to the household rental costs, where applicable, to give the total land costs.

Estimation Procedure

We use maximum likelihood estimation procedures to estimate the effect of family structure on a household's probability of facing food insecurity while controlling for potential household demographic as well as social capital variables via a probit model, as seen in equation (1). In addition, we use Ordinary Least Squares (OLS) to estimate the relationship between agricultural productivity, family structure and social capital variables (equation 2). In order to investigate the relationship between food insecurity and agricultural productivity, we utilize an instrumental variables probit approach. IVprobit[4] is very similar to two stage least squares, except that it allows for a categorical dependent variable (food insecurity in this case). This approach is necessary because food insecurity and agricultural productivity are likely to be jointly determined, as unobserved economic and household variables that lead to food insecurity are also likely to affect the level of agricultural productivity. The first stage of this process is presented in equation 2, while the functional form of the second stage is shown in equation (3).

$$FInsec_h = \Phi (\boldsymbol{\beta}'\mathbf{X}_h + FS_h + SC_h + u_h) \quad (1)$$

$$AP = f (\boldsymbol{\beta}'\mathbf{X}_h + FS_h + SC_h + \mathbf{Z_h} + u_h) \quad (2)$$

In equations (1) and (2), h refers to the household, X is a vector of household demographic characteristics, $FInsec_h$ and FS_h are measures of household food security and family structure respectively and SC_h represents household social capital. In addition, in equation (2) , Z refers to a vector of household farm and inputs characteristics including whether or not the land is owned or rented, use of irrigation, use of fertilizer, the value of the household farm, and total livestock unit[5]. Equation 2 also represents the first stage of the IVprobit estimation of the relationship between family structure and agricultural productivity. This stage is presented separately because of the important policy implications likely to be derived in an agricultural productivity regression.

Family structure includes polygamous, single parent and widowed and never married households (with monogamous households as the excluded category). SC refers to social capital and it includes both community and family social capital variables. Community social capital is proxied by household access to credit outside the family and active

[4] This is the instrumental variables probit estimation done using the ivprobit command in the statistical software package, STATA.

[5] Tropical livestock unit (TLU) is a common unit used to describe livestock numbers of various types as a single figure that expresses the total amount of livestock a household owns. See http://www.fao.org/ag/againfo/programmes/en/lead/toolbox/Mixed1/TLU.htm from the Food and Agricultural Organization (FAO) for more information.

participation in politics (participating in elections) while household social capital is captured by whether the household is extended or nuclear, in addition to other family structure variables. We control for as many household characteristics as possible including the education of the household head as well as household size and income. Controls for regional dummies for each of the six geopolitical regions in the country are also included to capture region specific characteristics, such as culture, and also distinguish between rural and urban areas.

It might be suggested that family structure would be endogenous in this system of equations because people might select into certain family structures for reasons that might correlate with their food insecurity status, for instance, access to education, or lack of economic resources. For this reason, we test for exogeneity of the family structure variables in each model of food insecurity and agricultural productivity.. Majority of the single parent households in our sample are widows and widowers (72%), a situation not normally based on choice, so we assume that single parent household structure is exogenous. For the polygamous family structure, an argument could be made for the probability that households could select into polygamous or monogamous family structures based on several factors – like income, religion, education etc. However, given that we have control variables for these factors, endogeneity problems should not arise. For completeness, we conduct various tests to check the exogeneity of the polygamous family structure variable. We use the instrumental variables(IV) framework and also manually conduct the Durbin-Wu-Hausman test of endogeneity.

Within the IV framework, we used a 2 stage least squares (2SLS) approach and the corollary for binary endogenous variables (treatreg in stata 11) to test for the exogeneity of family structure in the agricultural productivity and food insecurity estimations. Results for the agricultural productivity estimations are presented here. For both of these estimations, we used religion as an instrument for polygamous family structure. This is based on the argument that while polygamous structures are more commonly associated with certain religions, there is no reason why religion, in and of itself should affect agricultural productivity. For the endogeneity test associated with the 2SLS model, with a p value of 0.315 associated with the F statistic, we fail to reject the null hypothesis, HO: variables are exogenous. These conclusions were upheld by the Durbin-Watson test where we fail to reject the null hypothesis that the error term associated with the first stage regression of polygamy on religion and other exogenous variables in the second stage estimation of agricultural productivity was significant. This involved including the predicted error from the first stage as an explanatory variable in the second stage regression of agricultural productivity on its associated controls, including polygamy. The results of the test of the significance of the predicted error term were F(1, 2898) = 2.58 with Prob > F = 0.1083. Consequently we fail to reject the null that the predicted error was equal to zero, implying exogeneity. The final test used was the treatreg estimation to account for the fact that our potentially endogenous explanatory variable was binary. The associated wald test of the independence of the 2 equations in the 2stage estimation approach yielded the following results. HO: equations are independent (rho = 0). With a $Chi^2(1) = 0.12$ and an associated $p > Chi^2 = 0.7320$, we fail to reject the null hypothesis that the equations are independent, a further indication

of exogeneity. Similar tests were conducted for the food insecurity specifications with similar results. Consequently the rest of this study assumes family structure to be exogenous and thus uses robust ordinary least squares (OLS) estimation models to account for non constant variances[6].

Finally, to test the relationship between food insecurity and agricultural productivity, we present the functional form of the second stage of the IVprobit specification.

$$FInsec = \Phi (\boldsymbol{\beta}'\mathbf{X}_h + AP^*_h + FS_h + SC_h + u_i) \quad (3)$$

Where AP* refers to household agricultural productivity (instrumented), and all other variables are as earlier defined. We use the vector of household farm and input characteristics as instruments in our system of equations. While we expect that fertilizer use or land ownership could directly affect agricultural productivity, we do not expect that they are directly related to food security as defined for the purposes of this study.

Results

In table 1, we present descriptive information about the households included in the survey for both the full sample and the rural sample. By the subjective measure of food insecurity and poverty, almost 20 percent of the sample is food insecure. In contrast, a significantly greater proportion of households (60 percent) spend more than 75 percent of their household expenses on food. These proportions are consistent for both the rural and the full sample. The mean level of agricultural productivity for rural households is 1.248, implying that on average; the sample seems to be efficient in input use. In terms of family structure, 63 percent of the sample are monogamous, 15 percent polygamous, and 4 percent are single parents.

In terms of social capital, about 11 percent of the households have an extended family member, while almost 80 percent have access to credit outside the household, and about 2 percent participate in local elections. For the rural sample, we add a fourth social capital variable, membership in a rotating savings and credit association, of which 14 percent of our household heads are members.

Information for other household characteristics reveal that the average age of the household head is 47 and they have an average of 14 years of schooling. Their, spouses tend to have about 13 years of education .The average household income is roughly 84 thousand naira (,the equivalent of about $600 a year). In addition each household is made up of about 5 people. This translates to a yearly per capita income of about $120, less than a dollar a day. Twenty four percent of the full sample live in urban areas, just about half were employed in the formal sector, and about 13 percent of rural households are headed by women.

[6] Similar tests were run for single parent households and also confirmed exogeneity.

Food insecurity

Table 2 presents results on the predictors of food insecurity for both measures. We consistently find that all family structures and family types are equally likely to be food insecure, as there is no significant relationship between food insecurity and family structure. In addition, having an extended family member in the household does not significantly affect food insecurity. The type of social capital that has a significant mitigating effect on food insecurity is access to credit outside the home. Households that have access to credit are significantly less likely to report food insecurity, and this is consistent across both measures.

We also find that lower income households with less educated household heads and spouses are more likely to be food insecure using the coping strategies measure. The heads of these households tend to be employed in the formal sector, most likely low paying jobs. In addition to these variables, households who spend more than 75 percent of their expenditure on food are likely to have older households heads not employed in the formal sector. They also tend to live in smaller households in rural parts of Southern Nigeria.

Agricultural productivity:

Table 3 provides evidence that family structure matters for agricultural productivity. Polygamous households and households headed by widow(er)s exhibit significantly lower levels of agricultural productivity than other family structures. We find a negative relationship between input use, land ownership and agricultural productivity. As was found in Tella (2006) and Adewuyi (2002), the negative effect of fertilizer might be due to inappropriate use of the input or the extremely high costs faced by rural farmers to procure it. Similarly, the negative coefficient on land size contributes to the lack of consensus on the effect of land size on agricultural productivity. Nkonya et al's 2009 review of the literature on productivity drivers cite studies like Lau and Yotopolus (1971) which found that small farms attained higher productivity levels than larger farms in India. In terms of community social capital, membership in a local rotating savings and credit association is also significantly negatively associated with productivity. This is possible if cash from such revolving credit structures is generally being invested in small scale businesses or other non farming activities. Access to credit shows no significant effect on productivity. These results indicate that poorer households with smaller land holdings in rural Nigeria tend to be more productive than farmers with larger landholdings, and the limited effect of credit might be a reflection of the limited availability of resources that small holders contend with which forces them to minimize their use of expensive inputs but still demonstrate higher levels of efficiency compared to larger farmers

Agricultural productivity and food insecurity

Finally in table four, we present the 2SLS estimation results on agricultural productivity and food security. We find a strong positive relationship between food insecurity and agricultural productivity. There are several reasons why this result may hold.

First, a positive relationship between expenditure measure of food insecurity and agricultural productivity means that individuals still spend a lot of money on food, regardless of how efficient they are on the farm. This may mean that they are not producing food crops, and are focusing more on cash crops, or it may mean that the smallest, subsistence farmers who we have found to be more efficient are still not able to produce enough to meet their food needs. This is consistent with the findings in table 3. Being poor, they may be less likely to have access to various technologies (fertilizer, improved seeds etc) thus having lower input costs. However, the return for the use of these inputs by their richer counterparts, who are more likely to use them, is not maximized. This explanation is supported by the fact that the use of fertilizer is consistently negatively associated with productivity

A second reason might be the limited access of poorer households to markets and/or efficient post production systems of storage or processing. Though they may not be able to produce excess despite higher relative efficiency, limited access to markets translates to lower prices (from traders or hasty sales soon after harvest, during glut times) and consequently lower incomes. This same limited access to output markets also means these households are likely to face higher prices for what they purchase on the market. Ultimately, these farmers with lower incomes are still likely to face uncertainty about food and or be more adversely affected by negative shocks.

A similar and consistent result is also found for the coping strategies and poverty measure of food insecurity, which might also be similarly interpreted: Individuals who are poor by their own self assessment and have to shift around food resources in time of need, have to do so even when they are "more efficient" in their use of their resources for crop production. This result is once again indicative of the low quality of inputs, challenges of input use (timely access at affordable prices) and the consequent outputs; leading to a situation where even the more productive rural farmers cannot meet their food needs. There are a few changes when these results are compared to those found in table 2. While family structure variables still generally have no effect on food insecurity, the exception is in households headed by widow(er)s who are now significantly less likely to report food insecurity by the subjective measure. In addition, looking at the same measure, there is now a positive association between food insecurity and being involved in local elections .This relationship might be driven by the likelihood that individuals involved in politics might be less likely to be fully involved in agriculture. However, the former result of access to credit being negatively associated with food insecurity, still holds. Compared to table 2, results for the expenditure measure of food insecurity remain generally consistent, although access to credit and education of household head are no longer significant predictors of food insecurity

Discussion and conclusion

The purpose of this study was to examine the relationship between household welfare (captured by food insecurity and agricultural productivity), family structure and social capital. We explored the strength or weaknesses of social networks / social capital associated with the different prevailing family structures in Nigeria; which family arrangements are more vulnerable to food and income shocks and which family structures are more efficient in crop production. While the findings reveal no differential impact of family structure on food insecurity regardless of measure, this might be due to very high levels of poverty in the country – as about 64 percent of households are estimated to be below the international poverty line of $1.25 per day (UNDP, 2009). If all household types are equally likely to be poor, it may be difficult to identify differential impacts of family structure on measures of social welfare like food insecurity.

Our study reveals that majority of Nigerians currently live in monogamous and nuclear family setups. Findings also reveal that the extended family is no longer the powerful source of positive social capital that it might have been in the past and polygamous families are not more efficient than monogamous families in crop production as might be expected due to larger family size. The most consistent source of social capital that made a difference for food insecurity is access to credit outside the home. The profile of individuals more likely to be food insecure and poor, regardless of family structure is also very consistent: poorly educated individuals, who live in rural areas, and lack access to credit.

The results in this study imply that there has been a shift from the more communal styles of living to a more western and individualistic value system. While this change in family structure does not appear to have increased the likelihood of individuals being food insecure by our measures, it is still a source of concern. If this shift can be interpreted as a move towards family playing less of a role in social welfare provision, then government may have to play a bigger role in taking care of its citizens to prevent destitution from lack of social support. From the results it is clear that education and access to credit are key factors to prevent food insecurity. Consequently the Nigerian government has a role to play in mitigating the consequences of food insecurity and poverty by ensuring provision of affordable and accessible education as well as ensuring improved access to credit, particularly for poor rural dwellers, enabling them to engage in activities that can better their lot and afford them freedom from a life of food insecurity and poverty. The conclusions on agricultural productivity and food security have significant implication for national food security and the appropriate path for Nigerian agriculture to address this issue. Given that agriculture still remains the primary activity of a significant proportion of the population, there is a need to better understand why larger farms are less productive and how this can be addressed. What roles, if any, do inefficient use of inputs or labor shortages driven by increasing rural-urban migration play? Similarly, if smaller, poorer farmers are more efficient than richer farmer but still poor and food insecure, there is a need to understand why this is the case. If low input use is a key factor, then strategies to increase stallholder access to these inputs alongside strategies to ensure that they are properly used is important.

Finally, there is also a need to develop more rigorous, consistent, and longitudinal measures of food insecurity to in order to properly capture the incidence and persistence of the food insecurity problem. The wide variation in the proportion of households identified as food insecure by our two measures of food insecurity – 20 percent vs. 60 percent, highlights the very nature of this measurement problem.

In future research, we intend to probe these issues further by exploring different measures of food insecurity and separating food insecurity from poverty. We intend to further explore possible differences between male and female headed single headed households. We also intend to explore the role of family structure and social capital on the intensity of food insecurity using alternative model specifications which enable a richer analysis than the simple probits utilized in this analysis. We further intend to expand our analysis of family structure and agricultural productivity using alternative measures of agricultural productivity. We will explore further the negative relationship between land size and productivity within the context of Nigeria's rapid rural-urban migration and the implication of additional(less) resources (financial and labor) on the crop choice and labor allocation of rural households.

Table 1: Descriptive statistics

	Full Sample	Rural Sample
Variable	**Percentage/Mean**	**Percentage/Mean**
Dependent variables		
Food insecurity (coping strategies measure) (1/0)	0.188	0.197
Food insecurity (expenditure measure) (1/0)	0.578	0.593
Agricultural productivity		1.248
		(1.659)
Independent variables		
Family structure		
Polygamous household (1/0)	0.150	0.160
Single Parent household (1/0)	0.040	.0399
Widowed household (1/0)	0.115	0.114
Never Married household (1/0)	0.064	0.053
Monogamous household (1/0)	0.625	0.633
Social capital		
Extended family (1/0)	0.110	0.107
Access to external credit (1/0)	0.778	0.792
Participation in elections (1/0)	0.014	0.014
Membership in rotating savings and credit association (1/0)	0.350	0.140
Household demographic information		
Age of household head	47.424	47.336
	(14.596)	(14.526)
Household size	4.831	4.886
	(2.909)	(2.866)
Education of household head	13.536	12.790
	(5.591)	(5.423)
Education of spouse	12.743	12.088
	(5.348)	(5.243)
Household income (Naira)	83261.700	66920.08
	(127310.100)	(101586.3)
Urban (1/0)	0.243	0.000
Head employed in formal sector (1/0)	0.482	0.430
Female headed household (1/0)	0.145	0.134
Land and other inputs		
Use of Irrigation (1/0)		0.006
Fertilizer use (10)		0.349
Tenure (1/0)		0.513
Household farmland value (000 Naira)		158.451
Household non farm income (000 Naira)		9.143
Tropical livestock unit		0.709

Geographical Zones		
South South	0.150	0.162
South East	0.141	0.162
South West	0.159	0.082
North Central	0.181	0.190
North East	0.168	0.189
North West	0.199	0.215
Observations	19158	14487

Note: Standard errors of continuous variables in parentheses

\

Table 2: Probit regression results for Food insecurity, family structure and social capital (full sample)

	Food Insecure (coping strategies measure)	Food Insecure (expenditures measure
Family structure		
Polygamous (1/0)	-0.097	-0.072
	(0.064)	(0.052)
Single Parent household (1/0)	-0.078	0.465
	(0.498)	(0.431)
Widowed household (1/0)	0.403	0.128
	(0.373)	(0.371)
Social Capital		
Extended family (1/0)	-0.043	0.055
	(0.061)	(0.051)
Participation in elections (1/0)	0.017	0.201
	(0.159)	(0.134)
Access to external credit (1/0)	-0.209***	-0.089**
	(0.046)	(0.040)
Other household characteristics		
Age of household head	0.000	0.006***
	(0.002)	(0.002)
Household Size	-0.010	-0.014
	(0.009)	(0.007)*
Education of household head	-0.021***	0.004
	(0.005)	(0.004)
Education of spouse	-0.013**	-0.010**
	(0.005)	(0.004)
Total household income (000 Naira)	-0.0003**	-0.0005***
	(0.0001)	(0.0001)
Urban (1/0)	-0.032	-0.090**
	(0.048)	(0.040)
Head employed in formal sector (1/0)	0.078*	-0.102***
	(0.042)	(0.036)
Geographical Zones		
South South	-0.219***	0.265***
	(0.079)	(0.065)
South East	0.134*	0.448***
	(0.081)	(0.070)
South West	-0.126	0.290***
	(0.083)	(0.069)
North Central	0.002	0.434***
	(0.078)	(0.066)
North West	-0.042	0.055
	(0.079)	(0.065)
Constant	-0.231*	-0.059
	(0.124)	(0.104)
Observations	6041	6041

Notes: Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: OLS regression results for Agricultural Productivity, Family Structure and Social Capital (Rural sample)

	Agricultural productivity
Family Structure	
Polygamous household (1/0)	-0.180**
	(0.090)
Widowed household (1/0)	-0.206*
	(0.112)
SingleParent household (1/0)	0.162
	(0.147)
Social Capital	
Extended family (1/0)	-0.027
	(0.078)
Access to external credit	-0.026
	(0.066)
ROSCA membership (1/0)	-0.168**
	(0.083)
Land and other inputs	
Use of irrigation (1/0)	-0.278
	(0.345)
Use of fertilizer (1/0)	-0.204***
	(0.067)
Land owned (1/0)	-0.186***
	(0.054)
Total Livestock Units	-0.005
	(0.011)
Household Farm value (000 Naira)	0.000*
	(0.000)
Other household characteristics	
Age of household head	0.003
	(0.002)
Female household head (1/0)	0.129
	(0.109)
Household size	0.035***
	(0.011)
Education of household head	-0.016***
	(0.005)
Household Non Farm Income (000 Naira)	0.000
	(0.001)

Geographical Zones	
South South	-1.134***
	(0.117)
South East	-1.259***
	(0.114)
South West	-0.767***
	(0.143)
North Central	-0.788***
	(0.109)
North West	0.063
	(0.119)
constant	1.953
	(0.173)
N	3630
Rsquared F=16.69, P>F=0.000	0.086

Notes: Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: IVprobit regression results for Food insecurity, using predicted value of Agricultural Productivity (Rural sample)

	Food Insecure (coping strategies measure)	Food Insecure (expenditures measure
Agricultural productivity	0.367***	0.444***
	(0.148)	(0.077)
Family Structure		
Polygamous household	0.021	0.019
	(0.078)	(0.065)
Single Parent household	0.106	-0.160
	(0.151)	(0.120)
Widowed household	-0.234*	0.070
	(0.144)	(0.096)
Social Capital		
Access to external credit (1/0)	-0.165**	-0.044
	(0.068)	(0.051)
Extended family (1/0)	-0.074	0.045
	(0.066)	(0.055)
Participation in elections (1/0)	0.282*	0.196
	(0.166)	(0.153)
Rotating savings and credits association (1/0)	-0.035	-0.082
	(0.089)	(0.077)
Other Household Characteristics		
Age of household head	-0.002	0.001
	(0.002)	(0.002)
Household size	-0.013	-0.014*
	(0.010)	(0.008)
Education of household head	-0.009	0.004
	(0.007)	(0.004)
Household income (000 Naira)	0.000	0.000**
	(0.000)	(0.000)
Head employed in formal sector	0.037	-0.087**
	(0.046)	(0.042)
Geographical Zones		
South South	0.212	0.673 ***
	(0.195)	(0.077)
South East	0.590***	0.960***
	(0. 160)	(0.073)
South West	0.231*	0.433***
	(0.139)	(.092)
North Central	0.246*	0.413***
	(0.151)	(.087)
North West	-.247**	-0.021
	(.098)	(0.067)
Constant	-1.120	-0.836

Notes: Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

REFERENCES

Astone, N. & Mclanahan, S. (1991). Family Structure, parental practices and high school completion. American Sociological Review, 56, pp. 309-320.

Adewuyi, J. (2002) Resource-use productivity on food crop production in Kwara state, Nigeria. Unpublished PhD thesis, Department of Agricultural Economics, University of Ibadan

Baro, M., Deubel, T., (2006). Persistent hunger: perspectives on vulnerability, famine and livelihood security in Sub-Saharan Africa. Annual Review of Anthropology 35, 521-538.

Bourdieu P. (1985). The forms of capital. In Handbook of Theory and Research for the Sociology of Education, ed. JG Richardson, pp. 241-58. New York: Greenwood

Burt R. (1992). Structural Holes, The Social Structure of Competition. Cambridge,MA: Harvard Univ. Press

Caldwell, J., Orubuloye, L. & Caldwell, P. (1992) Fertility decline in Africa: A new type of transition? Population and Development Review, 18 (2), pp. 211-242.

Cancian, M. & Reed, D. (2001). Changes in Family Structure: Implications for Poverty and Related Policy. (pp69-96). In S. Danziger & R. Haveman (Eds.), Understanding Poverty. Cambridge, Massachusetts: Harvard University Press.

CBN (2009). CBN Draft Annual Report for the year ended Dec 31st 2008.

Coates, J., Frongillo, E,. Rogers, B., Webb, P., Wilde, P. & Houser, R. (2006). Commonalities in the experience of household food insecurity across cultures; what are the measures missing? *Journal of nutrition, 136,* 1438S – 1448S.

Desai, S. (1992) Children at risk: The role of family structure in Latin America and West Africa. Population and Development Review, 18 (4), pp. 689-717.

Devereux, S. (2001) Livelihood Insecurity and Social Protection: A Re-emerging Issue in Rural Development, Development Policy Review, 2001, 19 (4), pp.507-519

Food and Agricultural Organization (F.A.O) (2008). The State of food insecurity in the world, 2008. Rome

Food and Agricultural Organization (F.A.O) (2009). The State of food insecurity in the world, 2009. Rome.

Garasky, S., Stewart, S., Gundersen, G., Lohman, B. (in press). Toward a fuller understanding of nonresident father involvement: An examination of child support, in-kind support, and visitation. Population Research and Policy Review.

Greene, W. (2003). Econometric Analysis. Upper Saddle River: Prentice Hall.

Hayase, Y. & Liaw, K. (1997). Factors on polygamy in sub-Saharan Africa: findings based on the demographic and health surveys. The Developing Economies, XXXV-3 (September 1997): 293–327

Ipaye, B (1983) Stability and change in the Nigerian family International Symposium on the Child and Family in a Changing World; Munich, Germany

Isreal, G, Beaulieu, L. & Hartless, G. (2001). The influence of family and community social capital on educational achievement. Rural Sociology, 66, 45-68.

Lau, L. J. and P.A. Yotopolous. (1971) A test for relative efficiency and application to India agriculture. American Economic Review Vol 61, pp 92-109.

Loury GC. (1977). A dynamic theory of racial income differences. In *Women, Minorities, and Employment Discrimination,* ed. PA Wallace, AM La Mond, pp. 153.86. Lexington,MA: Heath

Kenney, C. (2008). Father doesn't know best? Parents' control of money and children's food insecurity. Journal of Marriage and Family, 70, 654-669.

Kashula, S. (2008). Wild foods and household food security responses to AIDs: evidence from South Africa. Popul Environ. 29, 162-185.

Madise, N., Matthews, Z., Margetts, B.(1999). Heterogeneity of child nutritional status between households: A comparison of six Sub-Saharan African countries. Population Studies 53(3), 331-343.

Marcoux, A. (2002). Sex Differentials in Undernutrition: A look at Survey Evidence. Population and Development Review 28, 275-284

Martin, M. T., Emery, R. E., & Peris, T. A. (2004). Chapter 16: Single-parent families: Risk, resilience, and change. (Pp. 282-301). In M. Coleman & Ganong, L. (Eds.), Handbook of Contemporary Family: Considering the Past, Contemplating the Future. Thousand Oaks, CA: Sage Publications

Martin, K., Rogers, B. Cook, J & Joseph, H. (2004). Social capital is associated with decreased risk of hunger. Social Science and Medicine 58, 2645-2654.

Manning, W. & Brown, S. (2006). Children's economic wellbeing in married and cohabiting parent families. Journal of Marriage and Family, 68, 345-362.

Maxwell, D. & Caldwell, R.(2008). The Coping Strategies IndexField Methods Manual Second Edition, January. Cooperative for Assistance and Relief Everywhere, Inc. (CARE).

Mberu, Blessing (2007). Household Structure and Living conditions in Nigeria. Journal of Marriage and Family 69

Mclanahan, S. & Casper, L. (1995) Chapter 1: Growing Diversity and Inequality in the American Family. (Pp 1-45). In Farley, R. (Eds.), State of the Union America in the 1990s Volume Two: Social Trends. New York: Sage Publications.

Melgar-Quinonez, H., Nord, M., Perez-Escamilla, R., Segall-Correa, A.,(2008). Psychometric properties of a modified US-household food security survey module in Campinas, Brazil. European Journal of Clinical Nutrition 62, 665-673.

Meludu, N., Ifie, P., Akinbile, L. & Adekoya, E. (1999). The role of women in sustainable food security in Nigeria : A case of Udu local government area of Delta State. Journal of Sustainable Agriculture, 15(1), 87-97

Misselhorn, A. (2005). What drives food insecurity in Southern Africa? A meta-analysis of household economy studies. Global Environmental Change 15, 33-43.

Mtika, M. (2001). The AIDs epidemic in Malawi and its threat to household food security. Human Organization 60, 178-188.

Muga, G. & Onyango-Ouma, W.(2009). Changing household composition and food security among the elderly caretakers in rural western Kenya. Journal of cross cultural genrontology, 24, 259-272.

Nord, M., Satpathy, A., Raj, N., Webb, P., Houser, R. (2002). Comparing Household survey-based measures of food insecurity across countries: Case studies in India, Uganda and Bangladesh. The Gerald J and Dorothy R. Friedman School of nutrition science and policy food policy and applied nutrition program discussion paper No. 7.

Nord M, Andrews M, and Carlson S. (2008) Household food security in the United States. 2007, Economic Research Report No. 66, U.S. Department of Agriculture, Washington, DC.

Nord, M., Andrews, M., and Carlson, S. (2009) *Household food security in the United States. 2008*, Economic Research Report No. 83, U.S. Department of Agriculture, Washington, DC.

Oldewage-Theron, W., Dicks, E., Napier, C. (2006). Poverty, household food insecurity and nutrition: coping strategies in an informal settlement in the Vaal triangle, South Africa. Public Health 120, 795-804.

Portes, A .(1998). Social capital: Its Origins and Applications in Modern Sociology. Annu. Rev. Sociol. 1998. 24:1-24

Rosenzweig, C., Iglesias, A., Yang, X., Epstein, P., Chivian, E. (2001). Climate change and extreme weather events. Implications for food production, plant diseases and pests. Global Change and Human Health, 2, 90-104.

Smith, L., Obeid, A., Jensen, H. (2000). The geography and causes of food insecurity in developing countries. Agricultural Economics 22, 199-215.

Smith, L., Alderman, H., Aduayom, D. (2006). Food Insecurity in Sub-Saharan Africa. Research Report No. 146.: IFPRI.

Smith, L. and Subandoro, A. (2007). Measuring food security using household expenditure surveys. Food Security in Practice technical guide series. Washington DC. International Food Policy Research Institute.

Tella A.T. (2006) Technical efficiency of cassava production in Afijio local government area of Oyo state. Unpublished MSc thesis, Department of Agricultural Economics, University of Ibadan

Trostle, R. (2008). Global agricultural supply and demand: Factors contributing to the recent increase in food commodity prices. WRS-0801. Washington DC: USDA.

UNDP 2009). Human Development Report 2009, UNDP.

Walker, J., Holben, D. Kropf, M. Holcomb, J. & Anderson, H. (2007). Household food insecurity is inversely associated with Social capital and health in females with special supplemental nutrition program for Women, Infants and Children households in Appalachian Ohio. Journal of the American Dietetic Association, 107, 1989-1993

Wunderlich, G., Norwood, J. (2006). Food insecurity and hunger in the United States: An assessment of the measure. National Academies press, Washington, D.C.