AN EVALUATION OF NIGERIAN TIMBER PRODUCTION AND FOREST RESERVES: FOCUS ON ECONOMIC IMPLICATIONS OF FOOD SECURITY, 1981 - 2014

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ABSTRACT

The place of timber and forest reserves to national development cannot be neglected. This study evaluates level of timber production and forests reserves as well as its implications for food security in Nigeria from 1981 to 2014. The objective of the study is to evaluate the significant impact of timber production and forests reserves on food security in Nigeria. In an attempt to examine this, error correction model diagnostic tests process ECM, ADF unit root test, Structural VAR approach, and Co-integration test were employed in the data analysis. The research findings revealed that timber production and forests reserves have significant impact on food security in Nigerian economy within the period under review. In the light of the research findings, the researcher recommends that Timber production and forests reserves should be strengthened to increase the effect of forests reserves on food security in the country. This can be achieved through increased productivity and the development of agriculture value chain in federal government policy and implementation process.

Keywords: Timber production; forests reserves; food security; economy; Nigeria

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1. INTRODUCTION

Forests are local or regional segments of landscapes in which biological and ecological conditions dominate over the built environment in the form of trees and plants. The area is dominated by generally perennial plants characterized by a large woody stem and a large woody root system found within the ecosystem. Ecology on the other hand is a science that studies the ecosystems. Within the ecological system is the complex structure, functions, interactions and patterns of change over time that are dominated by trees. Forest ecology is the study of these tree dominated landscape units.

Forest reserves are portions of state lands where commercial harvesting of wood products is prohibited in order to capture elements of biodiversity that can be missing from sustainable harvested sites. Small (patch) reserves will conserve sensitive, localized resources such as steep slopes, fragile soils, and habitat for certain rare species that benefit from intact forest canopies (Usman & Adefalu, 2010). Forest reserves are areas of land that are protected and managed in order to preserve a particular type of habitat and its flora and fauna which are often considered rare or endangered (Farlex, 2014). They areas of forests which are reserved and managed for conservation and to provide special opportunities for study or research.

Reserves allow people to experience and to understand how forest ecosystems function when timber and other wood products that are normally extracted for human use remain in place. While it is important to have the great majority of forestland open to the sustainable harvest of wood products in order to support human society; it is equally important to retain portions of our forest landscapes in a condition where all components of the ecosystem remain in place. Forest reserves allow us to more fully assess human impacts on harvested sites, and may provide insights into how extractive management of harvested forestlands can be improved (Anderson & Bernstein, 2003).

Humans have depended on forests for a remarkable variety of products, services, and other benefits, which include food security. Food security exists when majority of the people, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Again, food availability addresses the "supply side" of food security and is determined by the level of food production, stock levels and net trade.

With rapid economic growth and technological changes, they have refined and added to the values forests make available. Even as deforestation has accompanied early stages of

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economic growth (Richards & Tucker, 1988; Tucker & Richards, 1983); advanced levels of economic development are associated with forest transitions and increased forest cover.

Historically, forests have played a major role to influence patterns of economic development, supporting livelihoods, helping in fostering economic change, and promoting sustainable growth. For the millennia before the industrial revolution, forests, woodland, and trees were the source of land for cultivation and settlement, of construction materials, of fuel and energy, and indeed of food and nutrition as well (Williams, 2002).

The extended use and exploitation of forest resources even before the industrial revolution had led to efforts to conserve forest areas and plant new trees in specific regions of the world. Forests continue today to provide the high levels of commercial benefits to households, companies, and governments that formed the initial impetus for protective statutes and policies.

It is based on above importance of forests that the United Nations mandated that 25% of the surface area of every country should be conserved under permanent forest cover as the minimum ecological requirement for the socio-economic survival of the country (Bugaje, 2007). It is in compliance with the above mandate that forest and forest reserves are found in different countries of the world.

However, in northern and other part of Nigeria, forests and forest reserves have presently become security threats. This is because forests and forest reserves have become habitats of insurgents and terrorist, from where they launch attacks. It has also become hideouts for armed robbers and kidnapers who launch attacks on travelers/traders, as well as abode of cattle rustlers and camping sites for unknown gun men to launch attacks on fellow human beings.

However, in the last fifty years, changing views about the importance of forests and its relationship to human society have been associated with corresponding changes, which focused more on how forests are managed. Earlier efforts to manage forests for sustained yields of commercial timber, in many countries were replaced in the 1970s and 1980s by the watchwords of sustainable forest management and ecosystem management as the multi-functional nature of forests and woodlands became obvious. Increasing levels of deforestation despite efforts to reduce and reverse forest loss led many governments and international agencies to attempt policy experiments that would have a positive influence on net deforestation (Bugaje, 2007).

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The growing recognition of the importance of biodiversity and of forests as the reservoirs of terrestrial biodiversity led to a rapid and unprecedented expansion of protected areas such that they now cover more than 10% of the global land surface. At the same time, the integral connection between forests and the livelihoods of poor, marginal, and indigenous groups found greater emphasis all through the 1970s and beyond.

As a result, policy efforts have attempted to recognize and create a role for these groups in the management of forests and the distribution of benefits from forests. Terms such as social forestry, community forestry, and participatory forestry have tried to capture some of the ways people have been involved in forest use and governance to make them more equitable and effective. In many developing countries, policies to decentralize forest management, often result to increasing fiscal strains upon governments, have also gone hand in hand with efforts to include people in at least some aspects of forest management.

It is indeed true that in recent months, there has been an upsurge of global rhetoric about food shortages with the attendant rise in food prices in various parts of the world, including in countries which, hitherto, were regarded as food secure leading to violent mass protests in several countries. Thus, world leaders in general resorted to the now age old appeals calling for urgent action to cope with the serious challenges posed by food insecurity in various parts of the globe, especially in developing countries.

It is generally agreed that food insecurity is the most serious manifestation of absolute poverty which afflict an estimated 1.2 billion people around the world, and it is a potent cause of social unrest around the world. It is even argued that situations of aggravated poverty and hunger are fertile grounds for breeding various forms of crimes including the sophisticated forms of terrorism within and across national borders (Abdullahi, 2008).

In Nigeria, reactions to the recent hue and cry on the global food crisis were expectedly varied. While most official circles would not agree there is, at present, a food crisis in the country, there is a significant informed agreement that Nigeria is indeed "food insecure". Thus it is necessary to make a distinction between 'food crisis' and "food insecurity". Food crisis exists when an entire nation or section(s) of if, for whatever causes, is engulfed by severe food shortages, which result into famines and even lead to massive dislocations of communities without an apparent national capacity to cope with the problem (Abdullahi, 2008). But food insecurity deals with the lack of reliable access to sufficient quantity of affordable quality food that would promote the good life of man in a given geo-political environment.

There is need to evaluate the extent to which these forests reserves really do protect the forests and deliver food security benefits to Nigerians. Hence, there is need to further evaluate the level of timber production and forests reserves as well as of its implications to food security in Nigeria from 1981 to 2014. Nigerians have been suffering from serious food security problems that resulted from environmental degradation primarily because of the rapid growth in population which has not only brought about gross encroachment and damage to natural forest and timber, but also to other wildlife, land, air and aqua culture due to unacceptable culture of environmental manipulation in the human community (Harvey, 1998).

Thousands of years of cutting and burning, especially in Africa, have so transformed the vegetation that it bears little resemblance to its original forest state in which tree cover was probably denser than it is today. Concerns are rising about the rapid rate of tropical deforestation, which is the temporary or permanent clearance of forest, for agricultural, food and other purposes. The main cause of deforestation in tropical forests is clearing for infrastructural development, and industries buildings, which affect agricultural need for feeding the growing population and weakens quest to earn foreign exchange from export of cash crops (Husain, 1989).

Every year about 6.1 million hectares of tropical moist forests are destroyed (Husain, 1989). If the present rate of deforestation of 6.1 million hectares per year were to continue indefinitely, the tropical moist forests would be completely cleared in 170 years. Cote d'ivoire and Nigeria annually lose about 5.2 per cent of their forests, while in Costa Rica, Sri Lanka and EI Salvador the rates are 3.6 per cent, 3.5 per cent and 3.2 percent respectively (Omiyale, 2001).

Out of the total land area of 923.768 km2 in Nigeria, forests account for only 9.61%; 48.53% grassland; 1.05% fresh and inland wetlands; 0.3% tree crop plantations and 20.33% farmlands. Within the past 20 years, an estimated 43. 48% of the total forest ecosystem has been lost through human activities. Between 1980 and 1990, the annual rate of deforestation averaged 3.5 % and the forest area declined from 14.9 million to 10.1 million hectares. This leads to the loss of not only the woods/ timbers and non-wood forest products but also its vital functions in moderating local climate, controlling water and wind erosion and its insurance of a continuous flow of clean water in rivers and streams (Nwoboshi, 1989).

Omiyale (2001) further stressed that this has led to soil degradation, water contamination, and microclimate change, drying up of rivers and lakes and the depletion of

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wildlife. For now, barely 5.34 % of the total land area of Nigerian is under forest as against the international requirement that 25 % of the total land area of each country should be under forest (Popoola & Akande, 2001).

Since prehistoric times, forest serves various purposes and will continue to do so as long as life continues on this planet. The forest houses and protects game, stabilizes the environment, prevents soil erosion and serves as a source of food security and medicinal plants for curing diseases (Abbiw, 1989).

At independence, up till the mid -1970s there were strong trends that Nigeria was, and could remain, largely a self -sufficient nation in terms of the food requirements for its citizens. Before the mid-1970s, Nigeria produced all her food needs and had surpluses for its promising agro-industries, and for exports. The country's forest product imports were very small for the special taste of expatriates and some Nigerians who acquired habits for exotic foreign made forest products and food paid for them.

From less than N1billion in the early 1970s, our present forest products and food import bills stand at a staggering N400 billion per annum and it is made up of such items like sugar, rice, milk, wheat, maize, beef, poultry, fish etc. This phenomenal increase in food import is a clear indication that domestic agricultural output is not keeping pace with Nigerian domestic needs for essential food items and raw materials for domestic agro-industries (Abdullahi, 2008).

Surely at the level of Nigerian development (or under-development), the country cannot afford the expensive luxury of using our much needed scarce foreign exchange on goods that the country was in a much better position to produce than those countries from where the country import them. Therefore, the need to evaluate the level of timber production and forests reserves is of important implication to ecological issues and food security in Nigeria from 1981 to 2014. Hence, there is need to investigate into the following research questions:

1 Has timber production and forests reserves significantly impacted on food security in Nigeria?

2 What is the long and short-run adjustment culture between timber production, forests reserves and food security in Nigeria economy?

The major objective of this study is therefore to evaluate the level of timber production and forests reserves as well as its implications for food security in Nigeria from 1981 to 2014. Specifically, the study aims at:

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1   Evaluating the significant impact of timber production and forests reserves on food security in Nigeria and

2   Examining the long and short-run equilibrium adjustment ratio between timber production, forests reserves and food security in Nigeria

2.   THEORETICAL REVIEW

The economists' use of the term 'social' should not be confused with other social scientists use of the term. In economics, such an approach is premised on a recognition that the market does not always work to allocate resources effectively because, on the one hand of imperfect competition caused by monopolistic structures and practices and, on the other, because of market failure, where non-excludability and non-rivalry in consumption lead markets to undersupply certain types of good and service.

The typical contemporary mainstream economic position on forests is that there is a range of values associated with forests that create different degrees of difficulty in their measurement (Turner, 1993; Stewart-Roper & Park, 1999). These include; use values which can be direct or indirect, non-use values, also embodying existence values, which include option values bequest values. Some economists would also argue that there are, in addition, intrinsic values in nature – a right for natural phenomena to exist that is independent of any direct or indirect value derived from that use.

Traditionally, forest economists have tended to look almost exclusively at use values and, within this, predominantly and understandably at timber values. This has focused their attention on modeling the relationship between the biological production possibilities and the economic context, leading (hopefully) to better decision-making about rotation length, harvesting strategy etc. This is the domain of production economics.

The broadening of forest economics into the field of applied environmental economics is a logical step forward in seeking out the wider socio-economic values attributable to forests. The substantial work that has been conducted in this field in relation to forestry, which involves estimating monetary values for non-market goods and services such as biodiversity and landscape, water quality, flood and avalanche protection and carbon storage, is evidence of a broadening of economic analysis (Stewart-Roper & Park, 1999).

Some of these developments in methods have been controversial, for at least two reasons. First, some critics have argued that it is not possible to reduce certain values to the measuring rod of money (Lawrence, 2004). Second, others, usually from within the discipline

of economics have argued that the methods used are not always sufficiently robust or accurate. Within the rapidly developing field of environmental economics, there are two central concepts of interest to natural resource managers.

The first of these is critical natural capital and the second is the precautionary principle. Critical natural capital can be seen as the keystone species and natural processes on which human and planetary life ultimately depends. Where irreversible adverse changes might occur, or where there are major uncertainties about adverse environmental effects, it is argued that a precautionary approach should be adopted to ensure that critical natural capital is not eroded or damaged.

However, there are also other strands of economic analysis that are relevant to forestry. There is a growing body of work that explores the regional impacts of forestry. Typically these have been constrained in looking only at employment and income creation at regional or national level arising from the wood supply chain, both upstream and downstream from the forest. Forestry activity does not take place unconnected to other economic activities and, from a regional development perspective, these other connected activities need to be explored to obtain insight into the wider economic impacts of forests.

Until recently, there has been no attempt to formally connect such economic analysis (often within the input output (I-O) or Keynsian framework) to the amenity goods and services provided by forests. In recent work for the UK Forestry Commission, Slee, Evans and Roberts (2003) have developed techniques for exploring the wider sub-regional economic consequences of what they term 'shadow values' or the halo effect.

These are not the shadow values of traditional cost-benefit analysis, but the 'real' economic values of jobs and income arising because certain types of firm, most especially tourist and recreation businesses, operate under a beneficial shadow or halo effect from the surrounding forests. This shadow effect is well illustrated by the case of a mountain biking trail developed in state forests in North Wales, which now draws an annual injection into the local economy of £4 million through expenditure at camp sites, hotels, etc.

Although the case of tourists and recreationists is perhaps the most obvious example, the value of trees and forests in creating more highly valued residential space is also important. Especially in more developed countries, tree-rich areas are likely to attract commuters and retirees into an area who would not otherwise be there. As indicated in hedonic pricing studies, residential property values are enhanced (Morales, 1980; Tyrväinen, 1999; 2000). In addition,

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spending in shops and for other goods and services will re-circulate and leak out of local economies to varying degrees, thereby creating multiplier effects.

Meanwhile, a few of the important drivers for change include: forest cover loss and environmental change from agricultural expansion, socio-cultural changes and changes in income, market access and market integration

Forests are a considerable source of biodiversity and, as such, are inextricably linked to people's food security, nutrition and health in a number of fundamental ways. While previous work has examined the links between forests and human health, much of the focus has been on the contributions of forest biodiversity to plant based pharmacopoeias, the correlations between forests and disease and more recently between forests and physiological well-being (Anyonge et al., 2006; Colfer, 2008; Colfer et al., 2006; Karjalainen, Sarjala & Raitio, 2010; Olson et al. 2010).

Building on existing work examining the relationships between forest, food security and human nutrition (Pimentel et al., 1997; Falconer, 1990) this special issue contains a set of papers that explore these linkages and their implications. The contributions range in perspective from global overviews of the role of forest biodiversity in agriculture and food security, the health impacts of forest use on women, to regional comparisons analyzing bush meat consumption and trade in Amazonia and the Congo, and the effects of sedentarisation on nomadic tribes in Borneo and West Africa.

Two case studies offer detailed examination of the causes and consequences of changing patterns of forest use within Tanzania and Cameroon. Furthermore, payment for environmental services (PES) is examined as one potential tool to promote conservation while improving livelihoods in Chinantla, Mexico.

The most widely used definition of food security states that: "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. Household food security is the application of this concept to the family level, with individuals as the focus of concern" (FAO, 2003).

Broader than other definitions, which often place heavy emphasis on calories with little attention to other components of food essential to health, this definition emphasizes that access to food is as important as food availability. Food security is therefore often linked to the ability to purchase as well as produce food, and to avoid or offset both chronic (long term and

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persistent), cyclical and transitory food insecurity (where a particular shock leads to food shortage or sudden rise in prices) (see Sunderland-Groves, 2010).

Food-insecure households may live where there is enough food, but they lack income or 'entitlements' (production, trade, labour ortransfer-based) to get it. Food-insecure people may live in food-secure households, due to household preferences or gender or age discrimination (Pinstrup-Andersen, 2009). The FAO definition also emphasises that food security includes nutrition security; access to food which ensures adequate macro- and micronutrient intake without excessive intake of calories, fats or refined sugars.

Forests contribute to food security in many diverse ways including through its protective environmental role and provision of ecosystem services. This stresses the importance of forest cover in: maintaining the soil and water base that underpins sustainable agriculture; providing habitats conducive to the biological interactions that maintain crops and livestock; and in mitigating impacts of climate change and extreme weather events at the landscape scale (Seymour, 2011; Sunderland-Groves, 2010). The Millennium Ecosystem Assessment also highlights the contributions of these ecosystem services to human health and wellbeing (http://www.millenniumassessment.org/en/Synthesis.aspx).

However, the shift from hunting to farming and the correlated sedentary lifestyle accompanying agriculture is considered one of the major epidemiological transitions in the history of humanity (Popkin, 2001). According to Dounias and Froment, the abundance of meat is a sign of health and well-being; shortage is associated with "meat hunger" a condition, which saps strength and vitality not only of the hunter but of the whole community. Cultures reliant on hunting often use associated collectivist social regulations for sharing food and mutual aid that generally disintegrate in sedentary communities, which become increasingly individualistic and opportunistic.

In the shift to sedentarisation, diets in many rural areas of developing countries have become heavily based on starchy staples such as maize or cassava, with low intake of animal sources foods (meat, eggs, milk, etc) (Stephenson et al., 2010). Low intake of such foods can result in inadequate intake of protein and inadequate intake and low bioavailability of many micronutrients as well (Murphy & Allen, 2003).

The hunting, consumption and trading of bush meat in West Africa and Latin America illustrate several features of changing dietary patterns. Bush meat remains the principal source of animal protein in many tropical forested landscapes, and especially in the Congo and

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Amazon basins with vulnerability to hunting depending upon habitat and species With low barriers to entry, and requiring labour inputs that can be easily reconciled with the agricultural cycle, trading bush meat is easily incorporated into livelihoods that are more secure if based on a range of activities (Brown & Williams, 2003).

In the Congo and Amazon basins as well as Chinantla, Mexico, many of the frequently hunted species are secondary forest species or agricultural pest species with high reproductive capacity. While bush meat is an important commodity in West Africa, it is far less commonly sold in Amazonian markets, due in large part to the widespread prevalence of cattle ranches and consequent availability of beef for a broad swath of society.

In the East Usambara Mountains of Tanzania, Powell et al. (2010) found that households who lived in close proximity to the forest were more likely to use foods from the forest, and those who did consumed more animal source foods. While hunting is dominated by men, the processing and trading is predominantly carried out by women. Though bush meat forms an important part of their diets, recent studies in West Africa have found that income from bush meat sales was particularly important for the poorest households, and was often given higher priority by them than their own consumption (De Merode, Homewood & Cowlishaw, 2003).

In addition to the acknowledgement of reflexivity, social theorizing is often explicitly engaged in trying to improve the condition of mankind. Much research takes place within an action research or constructivist format with researchers engaging with practitioners both to understand their actions and outcomes and to create alternative and better futures (see for example Röling & Wagermakers, 1998).

Much work on social values requires the identification of different stakeholder groups with an interest in forests. In both developed and developing countries there have been wide-ranging attempts to elicit stakeholder values (Richards & Tucker, 2003). Stakeholders can be defined as 'groups or organizations that have an interest in or are active players in a system such as a forest' (Lawrence, 2004).

Property rights necessarily mediate the capacity of different stakeholder groups to shape forest outcomes, but in an era of low profitability of the timber-related market elements and a rise in the relative importance of non-market elements of value of forests, the intermediation of the state through policy and regulatory instruments can be profoundly important.

Stakeholders can and will engage rent-seeking behaviour, seeking enhancement of those forest outputs that interest them, and neglecting those outputs which offer little interest.

Wiersum (1998) has argued that as foresters move from being resource managers to facilitators there is a need for them to better understand the perceptions and attitudes of different stakeholders. He notes that 'the role of foresters is changing from an 'inform and educate' model, whereby professionals managed forests for the public good, to a model of facilitation and negotiation with foresters setting goals, managing and monitoring together with the public with a focus on both the ecosystem and social concerns of the various interest groups' (Wiersum, 1998). Other studies of forestry include the comparative work of

Hellström and Rytilä (1998), based on case study and comparative methods that explore different layers or levels of conflict between different stakeholders in both France and Sweden. Out of the resolution of such conflicts, better multifunctional management should emerge. Koch and Kennedy (1991) and Kennedy and Koch (2004) have advocated a shift from a narrowly productivity model of forestry to one that embraces the plurality of values derived from forests.

Paradoxically, they term the utilitarian-productivity model 'sacred deer, water or tree stuff'1, and identify an alternative human ecology perspective, which they advocate as the basis for contemporary forestry education. Their 2004 paper builds on recognition in their 1991 paper that the communication of values via the economic system is partial and that the non-utilitarian values are seen to be increasing in importance. They trace a transition towards a more people-friendly forestry in which the multiple values of different stakeholders are expressed through economic, political legal and socio-cultural systems.

A principal challenge arising from this more complex mix of socio-economic values is how to mediate between competing claims over a resource, whether or not it is in public or private hands. This shift to a post-industrial, multi-purpose forestry reveals the significant upward shift in values of old growth forest in the post productivity phase.

Regulatory instruments are those such as laws and designation orders (often with associated sets of rules) that specify how forests should be managed and exploited and lay down a list of 'dos and don'ts', i.e. actions that must be undertaken and those cannot be undertaken. Examples of regulatory instruments include national park (and other types of) designations at national level, and EU regulations (for example under Habitats and Species

Directives), which prescribe certain obligations on governments to protect particular species and habitats within the EU.

Environmental protection is carried out predominantly through regulatory instruments, and many environmentalists are profoundly mistrustful (or disbelieving) of economic logic and its consequences on environmental decision-making. From a social sciences perspective, the regulatory process is one that is driven more by political than economic logic. Indeed, from an economic perspective, regulation can be seen as illogical, in that sometimes the opportunity forgone by the regulation (say timber exploitation) is greater than the value of what is being regulated (say the biodiversity values).

Economic instruments are regarded (by economists) as more efficient forms of shaping environmental decision-making than regulatory instruments. Economic instruments are those that penalize the generator of negative amenity (typically pollution) or reward the provider of positive amenity. Such instruments can thus overcome the problem of market failure and are argued for by bodies such as the OECD (OECD, 1999).

Typical examples of economic instruments are pollution taxes, set at a level that reflects the economic cost of the damage arising from the pollution, or environmental payments to farmers or forest owners for providing environmental goods or services. Such instruments follow the 'polluter pays' or 'provider paid' principles. Although economic instruments have the merit of increasing economic efficiency, they depend on full knowledge of the environmental costs and benefits and an ability to apply such instruments at reasonable cost. In many situations, neither condition is fulfilled.

Suasive instruments are those in which the various stakeholders can be persuaded of the merits of particular courses of action. In both developed and developing countries a more participatory approach to forest management has emerged which challenges the professional timber producing forestry discourse with an array of different values, ranging from the recreational to the spiritual. Central to these new approaches is the negotiation of outcomes through recognition of competing claims.

3. EMPIRICAL REVIEW

Evidence from two case study areas in England shows that the so-called shadow values are substantially greater than the timber values.This is also likely to be the case in high amenity areas, in tourist areas and in peri-urban areas. Natural forests might be expected to exhibit higher levels of these shadow values, although there may be limitations imposed on

development as a result of legislation protecting such forests from exploitation, either directly or nearby, which might compromise the high capacity to marketwise the natural values.

Further evidence from an EU study (Mantau et al., 2001) shows that where property rights can be established, there is substantial scope for market development of environmental and recreational goods and services. Such enterprises may be based on water quality, recreational facilities or even mushroom picking permits.

The possibilities can be constrained by the existing system of property rights but more often the lack of entrepreneurial vision and marketing skills of forest owners. Such opportunities indicate the wider socio-economic values of forests beyond timber production. Saastamoinen (1997) has estimated that of the total value of forests in Finland in the late 1990s, only about two thirds of the total derives from timber production. Other market elements such as berries and mushrooms and non-market elements such as recreation and carbon storage account for the rest. Exploration of the full suite of economic values thus increasingly exposes forests as multifunctional resources with many facets of economic value.

Powell et al. (2010b) examine the relationship between people's dietary diversity and forest cover and use in a mountain area in Tanzania. Although most of the wild foods in the diet were collected on farm land, villagers consuming wild foods from forest areas were found to have better diets. The amount of forest cover within a 0.5–2 km radius of the house was strongly associated with the likelihood of forest food use, suggesting that use seemed to be conditioned by both availability and access to (in terms of time and user rights) forest areas.

Several of the papers in this issue explore social and cultural aspects of changing relationships between forests and human health. The subsistence and life-way transitions associated with sedentarisation described by Dounias and Froment (this issue) provide an example of major rearrangements in social and cultural structures, which are permanently altering people's relationships with forests.

Examples from West Africa and Borneo chronicle the impact which drastic alterations of forest ecosystems have had on forest-reliant hunter gatherers. The authors describe the "mis-adaptation" which indigenous groups suffer including nutritional disorders, phycho-cultural ill-being, and discrimination, erosion of collectivity and mutual aid and mental diseases.

They note, "declining diets and increasing illnesses are symptomatic warnings of these ecological and socio-cultural mis-adaptations that former hunter-gatherers currently pay to achieve their share of modernity" Laird, Mclain & Wynberg (2010) compare and contrast

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established practices of resource management and use by indigenous and other long established populations with those practiced by migrant newcomers, in a well endowed area in the Mount Cameroon region in West Africa.

Their findings show that indigenous livelihoods draw upon management of a broader range of habitats and species than migrants, and have a much greater use of forest products in the subsistence component of their livelihoods, due to their superior knowledge of the resource.

Decline in use of forest food can also occur due to decline in knowledge about its use. As children spend more time in school, rather than in the fields and the bush, opportunities to learn about wild foods are reduced. A move to a more settled lifestyle is a widespread change that can separate people from knowledge about the food sources they used to be familiar with.

Poorer knowledge about which plants can be consumed, and which cannot, constrains people's use of these foods even when the latter are still available and important for dietary balance. Vinceti et al. (2008), report that "the erosion of traditional knowledge about forest biodiversity has been observed to affect food choices considerably and to lead to dietary simplification and negative repercussions on human health".

4. METHODOLOGY

For this study, Ex Post Facto Research Design fits perfectly. This is because the study attempts to explore cause and affect relationships where cause already exist and cannot be manipulated, but rather to use what already exist and look backwards to explain why. In the study the economies of Nigeria were examined. The study perceives the impact of timber production and forest reserves on food security in Nigeria economy in the function as postulated by the theoretical foundation and espoused in analytical framework explored in chapter two.

Variables employed for the study include: Gross domestic food production (GDFP) as the explained variable, total timber forest products (TTFP), total forest reserves percentage to gross domestic product (TFRG), Commercial Bank loan to agriculture and forestry sector (CBLF) are the explanatory variables. Annual data on these variables, for the period of 1981 - 2014, were sourced from the Central Bank of Nigeria (CBN) statistical bulletin 2014.

This research work is fundamentally, analytical and descriptive as is embraces the use of Co-integration test, and error correction model diagnostic tests process, with secondary time series data to determine if hypotheses stated in section one of this study holds for Nigeria economy. E-views 7.0 econometric package was employed in the analyses.

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4.1. Model Specification

From theory the possible growth promoting roles of timber production and forest reserves on food security in Nigeria, this study and its data analysis is modeled in an aggregate production function framework. The standard *APF* model will be extensively used in econometric studies to estimate the impacts of timber production and forest reserves on food security in Nigeria. The aggregate production function assumes that, along with "conventional inputs" of labour and capital used in the neoclassical production function, "unconventional inputs" like timber production and forest reserves may be included in the model to capture their contribution to food security. The APF model has been used by Feder (1983), Fosu (1990a).

The factors of production and the production technology determine the level of output in an economy which can be summarized as:

$$Y_t = A_t L_t^{\beta_i} K_t^{\beta_2} e^{\varepsilon_t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.1$$

Where *Y* denotes the aggregate production of the food security at time *t* and *K, L, A* denotes the amount of capital stock, labour stock and total factor productivity (TFP) respectively. Assuming constant technology, any increase in the amount of labour and/or capital will increase the level of output in the economy. In this case, *'A'* captures the total factor productivity (TFP) of growth in output not accounted for by increase in labour and capital. Since this study seeks to investigate the impacts of timber production and forest reserves on food security through changes in *TFP*, we assume therefore that *TFP* is a function of timber production and forest reserves products and other factors. Thus, it is assumed that;

Gross domestic food production (GDFP) as the explained variable, total timber forest products (TTFP), total forest reserves percentage to gross domestic product (TFRG), Commercial Bank loan to agriculture and forestry sector(CBLF) Exchange rate (EXR),

GDFP = (TTFP, TFRG, CBLF,)

$GDFP_t = \beta_0 + \beta_1 TTFP_t + \beta_2 TFRG_t + \beta_3\, CBLF_2 + \mu_t \ldots 3.2$

By substituting (3.3) into (3.2), we obtain;

$GDFP = L^\alpha K^\beta TTFP^{\beta_1} TFRG^{\beta_2} CBLF_2{}^{\beta_3} \ldots.. 3.3$

From (3.3), the specific operational model for *GDFP* for Nigeria in an estimable econometric form is:

$InGDFP_t = \beta_o + \beta_1{}^{InLt} + \beta_2{}^{InKt} + \beta_3{}^{InTTFPt} + \beta_4{}^{TFRGt} + \beta_5{}^{CBLF\,t} + \varepsilon_{t2i} \ldots(3.4)$

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Where all variables are as previously defined except ε_t, which represents the white noise error term, *t*, is time and *In* denotes natural logarithm.

The study also uses vector autoregressive model and Vector error correction model. The model is based on 2 lags of each endogenous variable. In a VAR model, each variable is in turn explained by its own lagged value, plus current and present value of the remaining variables. The VAR model present all variables as dependent variables which have the dynamic power to reflect impact of random disturbance on the variables, thereby modeling every endogenous variable in the system as a function of the lagged value of all the endogenous variable in the system. The VAR model presented here is composed of four variables, namely: Gross domestic food production (GDFP) as the explained variable, total timber forest products (TTFP), total forest reserves percentage to gross domestic product (TFRG), Commercial Bank loan to agriculture and forestry sector (CBLF).Thus, this research work adopts the above modified model.

4.2.   Empirical Results

The paper examines timber production and forests reserves is of its important Implication to ecological issues and food security in Nigeria economy, the study uses time series data for the period 1981 to 2014. The choice of the period of study is based on data availability.

4.3.   Unit Root Test Results

Table 1: (ADF) unit root test

Series	ADF Test Statistic @Level	ADF Test Statistic @1st Difference	5% critical values	Order	Remarks
GDFP	-4.539537	-3.872045	-3.568379	I(0)	Stationary
CBLF	- 4.067576	-6.748613	-3.568379	I(0)	Stationary
TFRG	- 7.149956	-5.820001	-3.568379	I(0)	Stationary
TTFP	-4.487612	-5.552740	-3.568379	I(0)	Stationary

Sources: Researchers compilation E-view (version 7.0)

Table: 2 Co-integration Tests

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.641476	64.80009	47.85613	0.0006
At most 1 *	0.433460	31.97576	29.79707	0.0276
At most 2	0.305471	13.79313	15.49471	0.0888
At most 3	0.064350	2.128456	3.841466	0.1446

Table 3: ECM Result

Dependent Variable: LOG(GDFP)

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
Method: Least Squares				
Date: 10/04/16 Time: 18:37				
Sample (adjusted): 1983 2014				
Included observations: 32 after adjustments				
C	5.370385	0.142011	37.81676	0.0000
LOG(CBLF)	0.306427	0.066983	4.574661	0.0001
D(TTFP)	0.045861	0.018214	2.517914	0.0180
D(TFRG)	0.000299	0.002727	0.109637	0.9135
ECM(-1)	-0.754003	0.157897	-4.775288	0.0001
R-squared	0.899036	Mean dependent var		6.645354
Adjusted R-squared	0.884078	S.D. dependent var		0.973976
S.E. of regression	0.331612	Akaike info criterion		0.772899
Sum squared resid	2.969098	Schwarz criterion		1.001921
Log likelihood	-7.366389	Hannan-Quinn criter.		0.848813
F-statistic	60.10554	Durbin-Watson stat		1.898413
Prob(F-statistic)	0.000000			

5. DISCURSION

The augmented Dickey-fuller (ADF) unit root test with constant and trend level was employed in this study in order to eliminate the spurious content in those variables. Thus, below are the figure and value of ADF -statistic at 5 percent critical value

The table 1 was used to test the stationary state of the above variables. Stationary, means to remove or adjustment of trend in the time series in econometrics. Any model in a given study that did not test or adjust the trend (i.e. stationary) in the variables, the result of such model is called nonsensical or superiors result if used for prediction or forecasting, will be miss leading.

The above unit root test shows that these variables; Gross domestic food production (GDFP) as the explained variable, total timber forest products (TTFP), total forest reserves percentage to gross domestic product (TFRG), Commercial Bank loan to agriculture and forestry sector (CBLF) were stationary (i.e. they are free from unit root syndrome), at level, and also at first difference with the ADF application.

Thus, since their ADF statistical value are (4.539537GDFP, 4.067576CBLF, 7.149956TFRG and 4.487612TTFP) when compared were greater than the 5% critical level (3.568379). In fact all the variables were stationary both at level and first difference. In other words, these variables were statistically significant in absolute terms at 5% levels of significance. Thus, it means that the Gross domestic food production (GDFP) as the explained variable, total timber forest products (TTFP), total forest reserves percentage to gross domestic

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product (TFRG), Commercial Bank loan to agriculture and forestry sector (CBLF) that exhibited unit root has been removed after the ADF test at the both level and first difference.

The implication is that these variables were stationary. However, it was found from the ADF results with trend and intercept indicated that the time series are integrated of order 1(0) for all the variables. Thus, the linear combination of series integrated of the same order is said to be co-integrated. In other words, the variables tested, were all stationary at level and also at first difference order or at integration of order zero and one (i.e. I(0) and I(I)).

We then conclude that the difference in trend and intercept (unit root in these time series (variables) used has been removed. In order wards, we reject the null hypothesis and accept that the variables were all stationary. Again, been stationary, implies that these variables are co-integrated since the all have the same order of integration. This instigated the researcher to carry out the co-integration test and other estimations models, in order to analysis the nature of short and long-run relationship among the variable for each of the models.

5.1.   Co-integration Test

Under the Johansen Co-integration Test, there are two co-integrated vectors in table 2. In Johansen's Method, the eigen-value statistic is used to determine whether co-integrated variables exist. As we can see from the eigen-value statistics values, here only the absolute values of (TTFP) variable was found to not be different from zero values while the eigen-value coefficients of these variables (GDFP, CBLF TFRG) were different from zero. Again, (GDFP and CBLF) Trace statistic values were greater than the 5% level of critical value (i.e. 64.80009GDEP > 47.85613, 31.97576CBLF > 29.79707) while total timber forest products (TTFP), and total forest reserves percentage to gross domestic product (TFRG), (13.79313TTFP < 15.49471, 2.128456TFRG > 3.841466) were less than the 5% critical value.

We therefore conclude that there exists long-run relationship co-integration among two variables. In other words, the null hypothesis of no co-integration among the variables is rejected since at least two among the variables in the four equations at 5% was statistically significant. The test result shows the existence of a long-run equilibrium relationship among the variables.

5.2.   ECM

The co-efficient of the ECM stood at 0.754003 indicates a speedy adjustment of 0.8% per annum in table 3. This implies that following short-run disequilibrium, 8% of the adjustment from the long – run of timber forest products sectoral in Nigeria will takes places

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at a period up to eight years, this could be as a resulted of timber forest products level and fiscal policy instrument applied in Nigeria.

The above result shows that the Adjusted R^2 is 0.884078. This shows that the model explains about 88% of the total variations in Gross domestic food production (GDFP) in Nigeria economy which was explained by the independent variables during the period of the study. The implication of the result is that the adjustment period of six years if all things be equal, will increase the Gross domestic food production (GDFP) thereby led to food security and economic stabilization in the Nigerian economy.

The coefficient of the constant term shows positive; this implies that at zero performance of the explanatory variables used that is, timber and forest related variables such as total timber forest products (TTFP), total forest reserves percentage to gross domestic product (TFRG), Commercial Bank loan to agriculture and forestry sector (CBLF) the Gross domestic food production (GDFP) stand at 5.370385 with t- statistic 37.81676 percent.

The coefficients of timber and forest related variables such as total timber forest products (TTFP), total forest reserves percentage to gross domestic product (TFRG), Commercial Bank loan to agriculture and forestry sector (CBLF) has a positive linear relationship with Gross domestic food production (GDFP) of the Nigerian economy. It means that if the Growth rate timber forest products (TTFP), total forest reserves percentage to gross domestic product (TFRG), Commercial Bank loan to agriculture and forestry sector (CBLF) in Nigeria increases, then Growth rate of Gross domestic food production (GDFP) will increases by (0.306427, 0.045861, 0.000299 and 0.754003) respectively thereby increasing the level of economic stabilization and food security in the Nigerian economy. Thus, the outcome of this result is in line with initial expectation because, theoretically the sign of the explanatory coefficients were expected to be positive.

The implication is that an economy with a positive increase in Growth rate of her timber forest products (TTFP), total forest reserves percentage to gross domestic product (TFRG), Commercial Bank loan to agriculture and forestry sector (CBLF) will have enabling Gross domestic food production (GDFP) rate that will rapidly and simultaneously expand the forest reserves investment sector and real sector which in the long run will lead to food security and economic stabilization of such nation.

If this holds, then Nigerian economy will always and equally experienced higher aggregate output contribution and affected by forest reserves sector which will impact on real

economic sectors through the increase and steady supply of raw material to other sectors. Thus, these variables were statistically significant to the study at 5 percent significance level.

The f- ratio, which is the joint test of significance of all parameter estimated in the model, was statistically significance at 5 percent level. The calculated value of f- ratio is at (60.10554), greater than the Tabulated or f- critical value of 3.32. While the Durbin-Watson statistic stood at 1.898413 implying no auto correlation in the model.

5.3.   Null Hypothesis I

Timber production and forests reserves has no significant impact on food security in Nigeria economy

Comparing the t-statistic of equation (i.e. table 4) for all the variables and the critical value at 5% level, the result shows that the variables did have the expected signs and also does passed the test of significance at 5 % level of significance expect total forest reserves percentage to gross domestic product (TFRG). Thus, the t-value of the other variable including the ECM was; (i.e. 37.81676GDFP, 4.574661CBLF, 2.517914TTFP and 4.775288ECM) were greater than the 5% critical value (2.45). However, since the values appear to be significant, we therefore reject the null hypothesis one of this study and accept the alternative hypothesis. In other words, Timber production and forests reserves have significant impact on food security in Nigeria economy within the period under review**.**

5.4.   Hypothesis III

There is no long and short-run equilibrium adjustment ratio between timber production, forests reserves and food security in Nigeria

However, the results presented in table 3 and 4 above show both the short and long-run results for the preferred models. Model 2 (i.e. ECM) shows the estimates of the level growth in Timber production and forests reserves exogenous factors in first difference, with an ECM term that captures both the long-run and short-run effects on food security in Nigeria economy.

Exogenous factors Timber production and forests reserves activity increases with the increase in current levels of timber forest products (TTFP), total forest reserves percentage to gross domestic product (TFRG), Commercial Bank loan to agriculture and forestry sector (CBLF), implying that the Gross domestic food production (GDFP) is significantly influenced by exogenous factors established by timber production and forests reserves activities in Nigeria.

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Since the ECM (-1) was consistent with the assumed negative values, it is significant at 5% level of significance. It therefore, follows that the ECM could n e g a t i v e l y correct any deviations from long-run equilibrium relationship between Gross domestic food production (GDFP) and timber production and forests reserves and other explanatory variables. The co-efficient indicates a speedy adjustment of 4% of its t- statistic which is short for it to adjust or correct.

This implies that following short-run disequilibrium, 0.5% of the adjustment at the long – run takes places within eight years. We therefore reject the null hypothesis one and accept the alternative hypothesis that says that "There is long and short-run equilibrium adjustment ratio between timber production, forests reserves and food security in Nigeria which stood at 8 percent.

6. CONCLUSION AND RECOMMENDATIONS

In recent times, there has been increasing pressure to increase investment in timber production and forests reserves due to the need to attain food security and other MGDs among other things. The importance of agriculture development in ensuring food security, poverty reduction and the economic growth hinges on the fact that 70% of the population is employed in the agriculture sector but the fact remind that this sector contributed just about 30% to GDP in Nigeria.

The sector's role of food production, provision of resources for other sectors is about 85%, creation of viable market and domestic savings gives credence to its importance in economic growth. Also, Nigeria's natural endowments in agricultural timber production, forests reserves extensive arable land, water, human resources, and capital highlight the potential of agriculture timber production and forests reserves in economic transformation.

In view of the existing controversy among development economists on the role of agriculture as a precondition for industrialization and economic growth, we explored the contributions of timber production and forests reserves to economic growth. This study provides evidence that timber production, forests reserves contributes significantly to food security in Nigeria. The trend of contributions observed also highlights the responsive nature, the buffer role and the resilient nature of timber production and forests reserves;

Finally, we find that there is long and short-run equilibrium adjustment ratio between timber production, forests reserves and food security in Nigeria, which stood at 8 percent. This supports the notion that lack of investment in the sector may be responsible for the slow growth

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experienced in Nigerian timber production and forests reserves. Again, found that Timber production and forests reserves have significant impact on food security in Nigeria economy within the period under review.

We therefore reaffirm that Timber production and forests reserves is an engine of economic growth in Nigeria and efforts should be made to add value to the sector through increased investment. Based on the evidence from this study, we also recommend that the linkages between agriculture Timber production and forests reserves and other sectors be strengthened to increase the effect of forests reserves growth on food security across the sectors. This can be achieved through increased productivity and the development of agriculture value chain and federal government policy guide and enforcement.

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