NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 51 Number 3, December 2020 Pg. 126-133
Available online at: http://www.ajol.info/index.php/naj

CRITICAL PERSPECTIVES ON AGRICULTURAL LAND-USE CHANGE: EVIDENCE FROM SUB-SAHARAN AFRICA

Ihemezie, E.J., *Adeosun, K.P. and Onunka, C.N.

Department of Agricultural Economics, University of Nigeria, Nsukka
*Corresponding Authors' email: paul.adeosun@unn.edu.ng

Abstract
Agricultural Land-Use Change (ALUC) in Sub-Saharan Africa has emerged as a dynamic issue in the environment-development discourse. Unpacking what perspectives exist in scholarly publications is relevant since scholarly ideas often shape policy directions. This paper offers critical reflections on the three broad categories of perspectives on ALUC that have implications on agricultural productivity and environmental wellbeing: Agricultural land expansion, agricultural land reduction, and agricultural intensification. Different factors were found to have driven these changes in the region. They include; population growth, economic opportunities, poverty, land tenure, environmental factors, government policies, urban development, and land conflicts. The paper highlights how agriculture in the region has contributed to and has been affected by changes in the landscape over the years. It shows that the region has experienced all the three manifestations of agricultural land-use change, and has the presence of observable variation in the pattern of change across its geographical landscape.

Keywords: Agricultural land use, land expansion, land reduction, agricultural intensification, and Sub-Saharan Africa

Introduction

In recent times, the notion of Agricultural Land-Use Change (ALUC) has become a vital subject in the global narratives about intergenerational thinking and projections towards a sustainable future. As the problems of climate change, biodiversity loss, and food insecurity place the world in the middle of many crossroads, several scholars in the fields of environment, development, and agriculture have been concerned about the dangers of landscape transformation from its original usage to other uses (Karlson and Ostwald *et al*., 2014; Nkonya *et al.,* 2013; Lambin and Meyfroidt, 2011). A critical review of literature on the subject indicates that the term has been conceptualised in different ways by different authors depending on their research interest. In this paper, we identify three broad categories of perspectives on ALUC that have implications on agricultural productivity and environmental wellbeing (Figure 1). First are those who view ALUC as the expansion of agricultural lands at the expense of natural vegetations. (Gebrelibanos and Assen, 2015; Brink *et al*., 2012; Msoffe *et al*., 2011; Lambin *et al*., 2003). This perspective conceptualised ALUC as the changes in the natural landscape caused by agricultural land expansion. Second are those who conceptualised ALUC as socio-economic and environmental factors that lead to a reduction in agricultural lands (Kavitha *et al*., 2015; Shalaby *et al*., 2012).This perspective views ALUC as the reduction in agricultural lands mostly due to urban development and settlement expansion. In other words, while the former perspective views agriculture as the cause of landscape transformation, the latter perspective views agriculture as the victim. The third concept of ALUC defined it as internal changes in agricultural lands caused by agricultural activities, mostly through agricultural intensification (Montpellier, 2013; Lambin *et al*., 2000; Matson *et al*., 1997). From the above perspectives, ALUC imply how agriculture has caused or has been affected by land-use changes (LUC).

This review, which has sub-Saharan Africa (SSA) as its spotlight focuses on how agriculture in the region has contributed to and has been affected by changes in the landscape over years. SSA is well known to have experienced the highest rate of ALUC in the past three decades (Lambin and Meyfroidt, 2011), which has serious implications on food security, biodiversity conservation, and climate change. On the overall, the review aims to determine the pattern of ALUC in the region and the underlying drivers behind them.

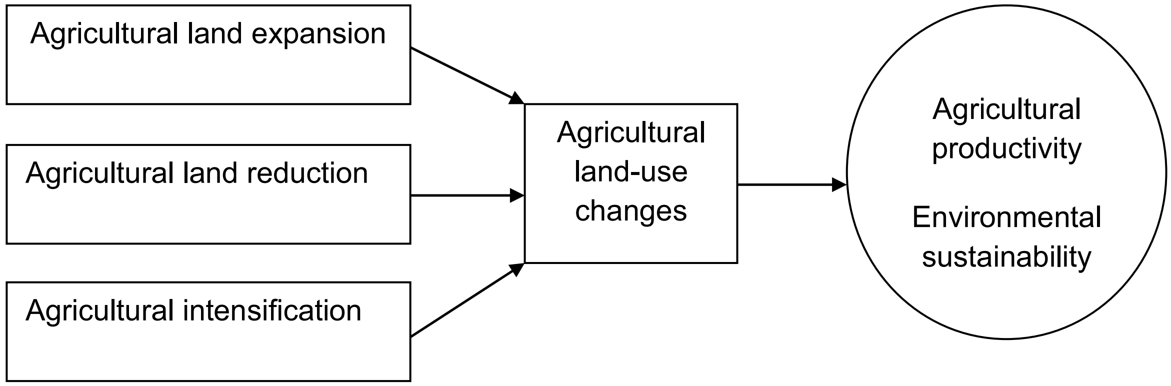

Figure 1: Three concepts of ALUC linked with agricultural productivity and environmental sustainability

The paper proceeds in five sections. The first section explores the concept of ALUC from the perspective of agricultural land expansion, and how this feed into explanations around climate change and biodiversity loss. The second section looks at ALUC from the perspective of reduction in agricultural lands, and its implications on food security in the region. The third section investigates ALUC from the perspective of agricultural intensification. The fourth section examines different perspectives on the drivers of ALUC in sub-Saharan Africa. The fifth and final section summarizes the findings of the review and suggests possible research directions.

Agricultural Land Expansion

In classical economics, land is one of the essential factors of production, and more importantly a prime input in food production. Its usage becomes more critical in the SSA where over 70% of the rural population derive their livelihood from agriculture (Food and Agriculture Organisation, 2014). According to Brink *et al*. (2012) and Lambin *et al*. (2001), as the population of the region burgeons, and the regions opens up to the global food market, more pressure is put on farmers to clear up natural vegetation for expansion of agricultural lands needed to produce more food for the growing population and to meet up with the demands of the global food market. Historically, Lambin (2010) noted that in SSA, humans have increased agricultural productivity mostly by expanding the area of cultivation, unlike in more developed countries where agricultural intensification and mechanisation is used to increase productivity. Several studies emerging from various countries in the region indicates that agricultural development (expansion and practices) has driven landscape transformation in the area more than any other factor in the past five decades. Thus, agriculture is viewed as the major cause of land-use change in the region, although, the pathways through which these changes occur differ essentially.

Researches coming out from some countries in the region reveal that foreign investments are the largest means through which natural land vegetations are acquired, cleared, and used for large scale farming (Boateng, 2013; Maitima, 2009; Wood *et al*., 2003). In East Africa for instance, Maitima *et al.* (2009) found that most national governments, in a bid to grow the economy through food exports collaborate with multinational companies to acquire large expanse of land for large scale farming. Such lands are usually natural vegetations. Another study from Mozambique has it that some international environmental agencies in collaboration with the Mozambican national government acquire and clears large expanse of natural vegetation for agro-fuel production (Janzen *et al*, 2008). In 2007 alone, the study found that about 5 million hectares of forest land in Mozambique was cleared for agro-fuel production. Wood *et al.* (2003) made a similar observation in Senegal, where about 600,000 hectares of land were mapped out for large scale irrigated agriculture meant for ethanol production for the country. In Tanzania, Msoffe *et al.* (2011) reported that between 2000 and 2008, foreign investors acquired and cleared up to 809,371.3 hectares of natural vegetation for crop production, which was subsequently used as biomass for biodiesel and ethanol production. All these studies seem to suggest that land grabbing for large scale agriculture play a key role in landscape transformation in SSA.

Furthermore, the use of remote sensing and geographical information system (GIS) technologies has improved research on ALUC. Brink *et al*. (2012) in his study of the trend of vegetation cover and LUC in SSA using satellite and aerial remote sensing uncovered that while agricultural lands have increased from 220 million hectares (mha) to 340mha between 1975 and 2007 i.e. 57% increase, natural vegetation (forest and non-forest) have decreased by 130Mha. A previous Landsat study by Gibbs *et al.* (2010) also found that in the past 25 years, agricultural lands in SSA have expanded by almost 60%, accompanied by a 0.7% annual rate of deforestation. Measuring the linear change in land use over time, Gibbs *et al.* (2010) found that the region has experienced 3Mha annual loss of forest and 2Mha annual loss of non-forest vegetations. This implies that the SSA loses about 5Mha of natural vegetation annually. This figure interestingly matches with the 5Mha annual increase in agricultural lands in the region as reported by Brink and Eva (2009), thus confirming the assertion that agricultural expansion is the highest cause of ALUC in the region.

Petit *et al.* (2001) while quantifying the process of land-cover change using remote sensing technology in Zambia, found that between 1986 and 1997, the country which is a hotspot for ALUC because of drought experience and the resultant resettlement of over 6,000 people has a 4% annual rate of ALUC, with an upward trend in cultivated area and a downward trend in natural forests. A similar study in Ethiopia by Kidane (2012) suggests that the significant change noticed in the Ethiopian landscape between 1970 and 2010 was primarily driven by agricultural expansion. This was evident from the high rate of land clearing and deforestation witnessed within the same period of study. More recent researches such as Bailey *et al* (2015) and Badjana (2015) came up with the same result that agricultural expansion has the highest percentage of change in landscape transformation. Vitteck *et al.* (2014) while monitoring land cover change in West Africa for 15 years found that within the period of study, the West African region of SSA experienced an annual rate of 0.95% loss of natural forest. Although the study did not specify factors responsible for the changes as it was beyond the scope of the study, the 0.70% annual rate of increase in cultivated land areas within the same period of the study suggests that agricultural expansion may be responsible for the loss of forest vegetation.

Although available researches have implicated agricultural expansion as the primary cause of LUC in SSA, some other studies have gone further to suggest that the pattern of change is not uniformly distributed across the geographic landscape of the region. Karlson and Ostwald (2016) discovered that the loss of natural vegetation to agricultural expansion has been more intense in the Sahel belt of SSA (i.e. West Africa). About 40% loss of natural forest vegetation to agricultural expansion was recorded in West Africa compared to about 15% loss recorded in central and southern Africa. Figure 2 shows the trend of agricultural land in West Africa, which indicates a relative increase over the years. It is therefore not surprising that the West Africa region of SSA has the highest rate of deforestation more than any other region in the SSA (Lambin et al., 2001). In fact, according to the study, at the moment, West Africa has only about 22.8% of its natural forest left. Nigeria in West Africa for instance has lost over 81% of its natural forest in the last 15 years (Lambin et al., 2001). In East Africa, rather than the conversion of forest vegetation, the trend of change has been more from the conversion of non-forest vegetation to agricultural land area. This could be attributed to the prevalence of savannah vegetation in the area. In Southern Africa, relatively low conversion of natural forests to agricultural land was recorded (Bailey et al., 2015, Petit et al., 2001, Dahlberg, 2000). Figure 3 shows the trend of agricultural land in East and Western Africa, which indicates very little increase over the years. While Bailey et al. (2015) attributed the low agricultural land expansion in Southern Africa to the fact that the area is already agriculturally dominated; hence no space for further expansion, Dahlberg (2000) traced the situation in Bostwana and Namibia to poor living condition and a consequent low population density which implied low pressure on food production. While the proximate and underlying drivers of these changes cuts across the entire SSA, the specific reason for the disparity in the pattern and intensity of change across the region remains unclear in the extant literature.

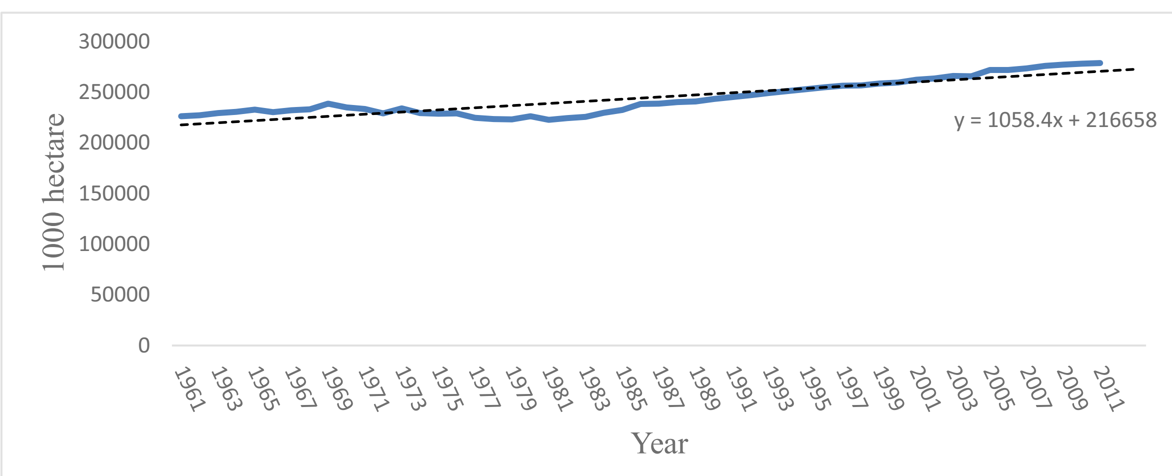

Figure 2: Trend of Agricultural land in West Africa
Source: Authors' computation from FAOSTAT, 2018

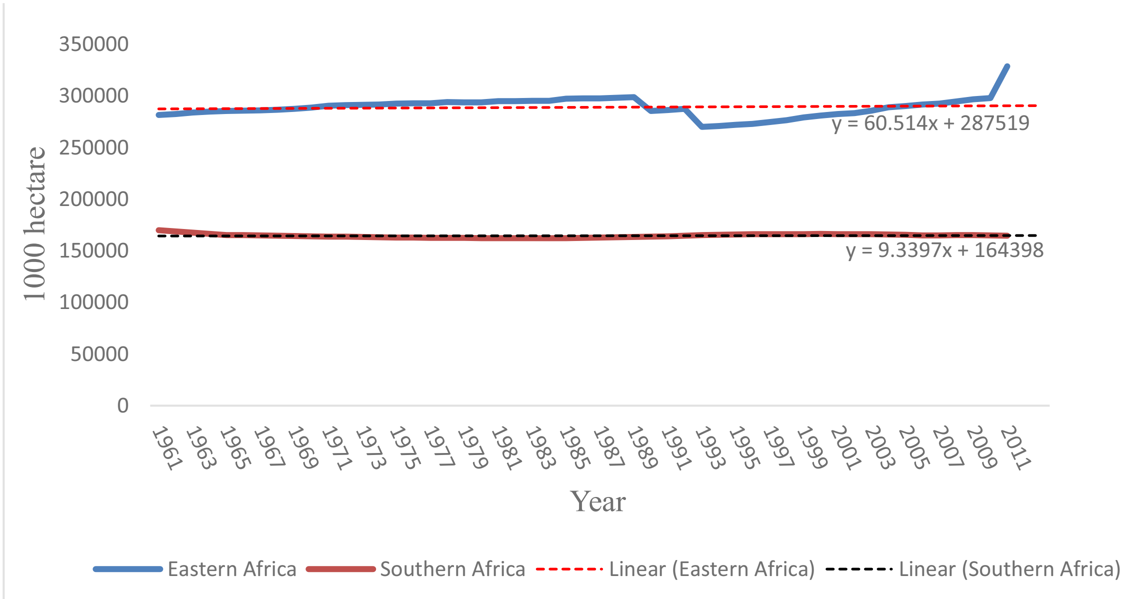

Figure 3: Trend of Agricultural land in East and southern Africa
Source: Authors' computation from FAOSTAT, 2018

However, irrespective of the disparity in the rate and intensity of ALUC in SSA, it has serious implications on biodiversity and climate change. Deforestation which normally accompanies such agricultural expansion alters the natural functioning of the earth system (Ebanyat, 2010). Apart from reducing the number of trees needed for carbon sequestration, clearing of natural vegetation or land area disrupts the wildlife habitat in such environment, almost leading to the extinction of some species (Vittek, 2014). However, the implication of ALUC is not only limited to biodiversity and climate change, some studies reveal the other side of ALUC which has serious implication on agricultural productivity and food security. Next section explores critical perspectives on ALUC which points to reduction rather than the expansion of agricultural lands.

Agricultural Land Reduction

Analysis of satellite imageries of SSA reveals that the region has also experienced rapid urban development which has significantly changed the composition of its physical landscape, including loss of agricultural lands (Kavitha *et al*., 2015; Müller and Munroe, 2014). Although urban expansion could happen on either agricultural land or non-agricultural land, the trend, especially in West African countries, tends towards agricultural lands (Karlson and Ostwald, 2016; Jianga *et al*., 2013; Atu *et al*., 2012). Although the exact figure of agricultural lands lost to urbanisation in SSA is still uncertain, there is some agreement among scholars that much of the land areas taken over by urban sprawl are agricultural lands (see for example Njungbwen and Njungbwen, 2011; Oni *et al*., 2009; Mottet, *et al*., 2006). This trend not only reduces the land available for food production but more significantly affects the livelihoods of the population who depend on it to make a living.

Several studies provide empirical evidence of agricultural land reduction. Lambin *et al.* (2000) hypothesized the competition between agriculture and urbanisation on the use of land resources, where urbanisation was found to be the key driver of agricultural land loss. Other studies have hinged on this hypothesis to study the conversion of agricultural lands to other non-agricultural uses. According to Jayne (2014), in a bid to catch up with infrastructural development, sub-Saharan Africa has witnessed a massive conversion of agricultural lands to built-up areas. Available data indicate that as at 2013, Ethiopia lost 760 hectares of agricultural land to urban development (Belay, 2014), while Ghana lost 452,200 hectares of agricultural to gold exploration (Doso, 2015). In Nigeria, Saleh *et al.* (2014) found that between 1980 and 2012, there was a reduction in the area of agricultural lands from 24,282.93 hectares to 17, 856.50 hectares, i.e. a 15.60% loss of agricultural lands within a space of 32 years. These changes were attributed to urban settlement, infrastructural development, and road construction (Saleh *et al.,* 2014).

Contributing to the discourse, Wu *et al.* (2011) noted that urban expansion and its corresponding economic development open up off-farm income opportunities which draw manpower off the farm. Atu *et al.* (2012) confirmed this assertion when he found that in Nigeria, urbanisation usually triggers rural-urban migration where rural dwellers abandon the rural areas in search of off-farm employment in developed urban centres. This has serious implication for food security. Rural-urban migration drains the rural economy which is an agrarian economy of its manpower thereby creating a shortage of labour needed for agricultural production.

Agricultural Intensification

Scarcity of land resources and the environmental consequences of agricultural extensification have been identified as two major factors that trigger agricultural intensification (Garnett and Godfray, 2012*;* Sirén, 2007). Intensification aims to increase agricultural productivity from a limited land area through increased farm inputs such as technological investments (Lambin *et al*., 2000). However, the concept of agricultural intensification has been a critical subject of debate among scholars who are concerned about environmental stewardship and human development. While some scholars have described it as one of the major strategies to achieve sustainable rural livelihoods (Matson *et al*., 2015; Montpellier, 2013), others have argued that it is one of the predominant drivers of current global environmental changes (Garnett and Godfray, 2012; Schößer *et al.,* 2010). For instance, Matson *et al*. (2015) in their argument in support of agricultural intensification as a strategy to enhance food security in SSA contend that decrease in agricultural land intensification will imply that the only means of increasing agricultural production is through agricultural land expansion which has direct consequences on the ecosystem, and long-term effect on food security. However, Schößer *et al.* (2010) in their assessment of potential opportunities and risks of agricultural intensification in SSA noted that although the use of mechanised farm tools, high yielding crops variations, pesticides, irrigation, and fertilisation have significantly enhanced food security in the region, and curtailed biodiversity destruction by agricultural extensification; the sustainability is also in doubt owing to its contribution in altering patterns of resource availability such as agricultural lands, as well as disrupting biotic interactions in the ecosystem, all of which also affects agricultural productivity. According to Lambin *et al.* (2003), heavy mechanization associated with agricultural intensification contributes to soil erosion, drives desertification, soil salinisation, and other soil degradation consequences. Furthermore, the runoff from the use of fertilizer in such farming practice is known to be one of the major causes of groundwater pollution (Calder *at al*., 1995). This implies that without some sustainable measures, intensification in agriculture may not produce any better result than extensification in term of environmental sustainability.

The apparent tension of agricultural intensification calls for a more sustainable approach to agriculture. Consequently, Garnett and Godfray (2012) recommended what they termed "*sustainable agricultural intensification*" as a new approach to navigate through the competitions in the food system in SSA. It involves striking a balance to enhance food production without cultivating more lands and disrupting ecosystem stability. In other words, it aims to simultaneously achieve environmental sustainability and food security. Although some scholars have criticised this approach as just another system of agriculture that is not different from what is currently being practised (Berakhi *et al.*, 2015; Temudo and Silva, 2012), its framework to explore a mix of strategies to fit into the biophysical, economic, cultural, and social context of the food system in SSA suggests a possible shift from the conventional approach of intensification or extensification. Furthermore, the fact that it is pro-poor and smallholder oriented, originating within the context of African agriculture to tackle the problem of low yield and environmental concerns makes it suitable to achieve sustainable food security in SSA. However, apart from the apparent factors that affect land-use through intensification, drive the conversion of agricultural lands to non-agricultural uses and the conversion of natural vegetation to agricultural lands, several other studies have found the underlying drivers of these changes in the region. The next section comprehensively explores these drivers.

Drivers of Agricultural Land-Use Change in SSA

Several factors have been identified as drivers of ALUC in SSA. While some of these factors drive agricultural land reduction (i.e. decrease in agricultural lands); the majority of them drive both expansion and reduction in agricultural lands depending on the peculiar environment where they are in operation. For example factors such as population growth, economic opportunities, poverty, land tenure, environmental factors, and government policies have been found to drive agricultural land expansion; while factors such as urban expansion and land conflicts have been implicated in solely driving agricultural land reduction.

Studies hinged on Malthusian theory attributed migration and population growth as the underlying driver of ALUC in the SSA (Iwejingi, 2011; Polyakov, 2008; Sherbinin, 2007; Sirén, 2007; Mather & Needle, 2000). Polyakov (2008) for instance found that with the current population explosion being experienced in SSA, more pressure is put on the farmers to expand their farmlands to produce more food. On the other hand, Sirén (2007) highlighted that population growth also means that more space is needed for human settlement, and most times, agricultural lands are cleared and used for building construction and other infrastructural purposes. This factor seems to be one driver that cuts across the entire region of SSA- a continuous growth in population density either through sudden migration or gradual increase in birth rate (Lambin *et al.,* 2003). In addition to the high birth rate and migration, the rising population growth rate of the region seems to be also exacerbated by the declining death rate that came with improved health services and nutrition in the last few decades (Serneels and Lambin, 2001).

However, some scholars seem not to be satisfied with the population growth explanation of ALUC in SSA. According to them, attributing population growth as the sole driver of ALUC may be too simplistic (Wood, 2004; Mertens *et al*., 2000). This is because of other exogenous factors that may drive the change. For example, Lambin *et al. (*2001) linked ALUC in the region to economic factors. In their study, they found that the tendency to expand agricultural land for food production is often exacerbated by a range of economic opportunities available to farmers. This finding was supported by Serneels and Lambin (2001) who found that Kenyan farmers were forced to expand production as a result of the global food market that opened to them.

They saw the global food market as an opportunity to increase their income from the export of cash crops. Exporting agricultural products for economic reasons thus was behind agricultural expansion at the expense of natural vegetation in Kenya. In Nigeria, the high rate of deforestation that accompanies agricultural expansion in the country was partly attributed to the global market for timber products which the country saw as an opportunity for economic growth (Ogunwale, 2015, Ademiluyi *et al*., 2008). Some other studies however linked deforestation in the country to the local demand for forest woods as an energy source (cooking firewood) (Al-Amin, 2014; Audu, 2013; Momodu, 2014). In other words, loss of forest vegetation in Nigeria is not only a by-product of global demand for timber but also local energy demand.

Related to population growth and economic opportunities are studies that ascribed ALUC to the high rate of poverty in the region (Omoboye, 2011; Omobor, 2000). Omobor (2000) for instance claimed in his study that agricultural land expansion in SSA was driven by the low capability of peasant farmers to maximise the use of the available cultivated land area. This according to him was because of their poor access to modern farm inputs such as mechanized equipment, improved seeds, fertilizers, pesticides, and other modern farm requirements that will increase production per unit of land area. Consequently, the only means of increasing production is to clear and cultivate natural vegetation. Omobor's assertion has however been described as an insufficient explanation of ALUC in SSA, as the intensification normally associated with the modern improved farming which he recommends is also an indirect driver of ALUC (Lambin *et al*, 2001). When a soil structure is destroyed as a result heavy mechanisation activity or excess use of fertilizer, the land is often abandoned to recover (fallow), and the next option is to clear new land area to continue production (shifting cultivation). Hence, both agricultural extensification and intensification are key drivers of ALUC (Wood *et al*, 2004).

Furthermore, some other studies have attributed ALUC in SSA to institutional factors such as government policies, political instability, and economic changes (Berakhi, 2015; Vittek *et al.*, 2014; Serneels and Lambin, 2011). Vittek *et al.* (2014) in their study found that in West Africa, government policies encouraged the acquisition of large expanse of natural land vegetation for the production of cash crops such as coffee, tea, cocoa, etc for export purposes. This confirms the earlier research that linked ALUC in the region to economic factors. Bailey (2015) found that the Land act of 1999 in Tanzania encouraged the leasing of a large expanse of land to multinational foreign investors for large scale farming. Confirming the assertion, Vliet *et al*. (2015) found that the government policy of collecting lands from smallholder farmers for either large scale farming or industrial purpose amounts to land grabbing which deprives the local farmers of their means of livelihood. This implies that government policies could create both opportunities to expand production through large scale farming, as well as constraints farmers' livelihoods. The decline in the cultivated land area observed in Uganda around the 1970s was attributed to the change of government (Mbanyat, 2010). According to the study, when the then president of Uganda- Idi Amin expelled foreign investors who own large expanse of farmlands, there was a significant reduction of cultivated land area, as these agricultural lands were later converted to non-agricultural uses. Similar to government policies and political instability is the nature of the land tenure system in the region. Boateng (2007) found that over the years, changes in the pattern of land ownership from communal to private ownership have contributed to the increase in the land market in the region which has given buyers the right to change the use of land as they please.

Some other authors have attributed environmental factors such as drought, desertification, soil degradation etc, as promoting variables in ALUC in the region (Lambin *et al.*, 2001; Wood, 2004). They noted that over the past few decades, there has been a drastic fluctuation in rainfall in SSA, while some other parts of the region especially East Africa have experienced long-lasting drought. This has caused farmers to also adopt new farming practices like shifting cultivation which often involves the use of natural land vegetation. Other driving factors of ALUC in SSA include land tenure system (Kindu *et al.*, 2015 and Mottet *et al.* (2006), Urbanisation (Njungbwen and Njungbwen, 2011; Saleh *et al.* 2014; Alagbe *et al.,* 2013); land conflict (Assefa and Bork, 2016; Siyum *et al*., 2015; Aklile *et al*., 2013; Abegunde, 2011), mining and exploration activities (Doso, 2015; Meisanti *et al.,* 2012, Schueler *et al.,* 2011) and institutional, cultural changes, and socio-economic factors (Alexander *et al*., 2015; Levin, 1998).

Conclusion

This review has examined different critical perspectives on the nature of ALUC in SSA and their driving forces. It shows that the region has experienced all the three manifestations of ALUC (i.e. agricultural land expansion, reduction, and intensification) in varying degrees. There seems to be an observable variation in the pattern of change across the geographical landscape of the region. Evidence coming from West Africa show that the rate of increase in agricultural land expansion is relatively higher than that of East and Southern Africa (See figures 1 and 2). Although most East and Southern African countries have experienced agricultural land expansion due to the opening of their food market to the global market, which has driven farmers in those areas to expand the cultivable area to meet global demand, the high rate of deforestation and clearing of natural vegetations for agricultural production in West Africa seems to have more impact on ALUC. Agricultural intensification on the other hand seems to cut across the entire SSA region, although at a relatively lower rate. The driving forces of these changes which are somewhat interrelated however seem to cuts across the entire region irrespective of the disparity in the pattern of changes. Examining the reasons behind the disparity in the pattern of ALUC in SSA may thus suggest a future research direction. Furthermore, the pattern of agricultural land expansion witnessed in SSA have implications for biodiversity conservation and calls for a more in-depth empirical study to better understand how the trend is affecting agricultural productivity and food security. The level of food insecurity despite the increase in agricultural land use expansion suggests low productivity among farmers in the region. As a way forward, emphasis, therefore, must be placed on technologies that will increase output per hectare.

References

Al-Amin, M. (2014). Domestic energy crisis and deforestation challenges in Nigeria. *Journal of Environment and Earth Science*, 4(2): 94-100.

Audu, E.B. (2012). Fuel wood consumption and desertification in Nigeria. *International Journal of Science and Technology*, 3(1): 1-5.

Badjana, H. M., Helmschrot, J., Selsam, P., Wala, K. and Akpagana, K. (2015). Land cover changes assessment using object-based image analysis in the Binah River watershed of Togo and Benin. *Journal of Earth and Space Science,* 10(1): 403-416.

Bailey, K. M., McCleery, R. A., Binford, W. M. and Zweig, C. (2015). Land-cover change within and around protected areas in a biodiversity hotspot. *Journal of Land Use Science,* 10(10): 1-23.

Belay. E. (2014). Impact of Urban Expansion on the Agricultural Land Use a Remote Sensing and GIS Approach: A Case of Gondar City, Ethiopia. *International Journal of Innovative Research and Development* [Online]. 3(6): 129-133.

Berakhi, R., Oyana, T. and Adu-Prah, S. (2015). Land use and land cover change and its implications in Kagera river basin, East Africa. *African Geographical Review*, 34(3): 209-231.

Boateng, B. J. (2013). Agricultural Production, Land-use/cover Change and the Desertification Debate in the West African Savannah: An Adapted Political Ecology Approach. *Journal of Art and Humanities,* 2(8): 21-35.

Brink, A. B., Eva, H. D. and Bodart, C. (2012). Is Africa Losing Its Natural Vegetation? monitoring trajectories of land-cover change using Landsat imagery. In: Remote sensing of land use and land cover. CRC Press. Pp. 369-374.

Dahlberg, A.C. (2000). Vegetation diversity and change in relation to land use, soil and rainfall —case study from North-East District, Botswana. *Journal of Arid Environment*, 44(1): 19-40.

Doso, S. (2015). Effects of loss of agricultural land due to large-scale gold mining on agriculture in ghana: the case of the western region. *British Journal of Research,* 2(6): 1-15.

Ebanyat, P., Ridder, N., Jager ,N., Delve, R., Bekunda,M. and Giller, K. (2010 Drivers of land use change and household determinants of sustainability in smallholder farming systems of Eastern Uganda. *Population and Environmen,.* 31(6): 474-506.

FAOSTAT (2018). FAOSTAT Database. http://ref.data.fao.org/database?entryId=262b79ca-279c-4517-93de-ee3b7c7cb553

Gibbs, H.K., Ruesch, A.S., Achard, F., Clayton, M.K., Holmgren, P., Ramankutty, N., and Foley, J.A. (2010). Tropical forests were the primary sources of new agricultural land in the 1980s and 1990s. *Proceedings of the National Academy of Science*, USA, 107(38): 16732–16737.

Jansen, L, J., Bagnoli, M. and Focacci, M. (2008). Analysis of land-cover/use change dynamics in Manica Province in Mozambique in a period of transition (1990–2004). *Forest Ecology and Management,* 254(2): 308-326.

Iwejingi, S. F. (2011). Population Growth, Environmental Degradation and Human Health in Nigeria. *Pakistan Journal of Social Sciences,* 8(4): 187-191.

Jayne, T.S., Chamberlin, J. and Headey, D. (2014). Land pressures, the evolution of farming systems, and development strategies in Africa: A synthesis. *Food Policy,* 48(1): 1-17.

Karlson M. and Ostwald, M. (2016). Remote sensing of vegetation in the Sudano-Sahelian zone: A literature review from 1975 to 2014. *Journal of Arid Environment*, 124(1): 257-269.

Kavitha, A., Somashekar, R. and Nagaraja, B. (2015). Urban expansion and loss of agriculture land - a case of Bengaluru city. *International Journal of Geomatics and Geosciences,* 5(3): 492-494.

Kidane, Y., Stahlmann, R. and Beierkuhnlein, C. (2012). Vegetation dynamics, and land use and land cover change in the Bale Mountains, Ethiopia. *Environmental Monitoring Assessment*, 184(1): 7473-7489.

Lambin, E.F. and Meyfroidt. (2011). Global land use change, economic globalization, and the looming land scarcity. *Proceedings of the National Academy of Science of the United States of America.* 108(9): 3465-3472.

Lambin, E. F., Geist, H, J. and Lepers, E. (2003). Dynamics of land-use and land-cover Change in tropical regions. *Annual Review of Environmental Resources.* 28(1): 206-231.

Lambin, E.F., Turner, B.L., Geist, H.J., Agbola, B., Angelson, A., Bruce, J.W., Coomes, O.T., Dirzo, R., Fisher, G., Folke, C. (2001). The causes of land-use and land-cover change: moving beyond the myths. *Global Environmental change*, 11(1): 261–269.

Lambin, E.F., Rounsevell, M.D.A., Geist, H.J. (2000). Are agricultural land-use models able to predict changes in land-use intensity? *Agriculture, Ecosystems and Environment,* 82(7): 321- 332.

Maitima, J. M., Mugatha, S. M., Reid, R. S., Gachimbi, L. N., Majule, A., Lyaruu, H. and Mugisha, S. (2009). The linkages between land use change, land degradation and biodiversity across East Africa. *African Journal of Environmental Science and Technology*, 3(10): 310-325. Available online at

http://www.academicjournals.org/AJEST
Momodu, I. M. (2013). Domestic energy needs and natural resources conservation: The case of fuelwood consumption in Nigeria. *Mediterranean Journal of Social Sciences*, 4(8): 27-33.
Msoffe, F., Mohammed Y., Ogutu , J., Kifugo, J., Leeuw, J., Gardingen, P. and Reid, S. (2011). Spatial correlates of land-use changes in the MaasaiSteppe of Tanzania: Implications for conservation and environmental planning. *International Journal of Biodiversity and Conservation*, 3(7): 280-290.
Ogunwale, A.O. (2015). *Deforestation and greening the Nigerian environment. International Conference on African Development Issues (CU-ICADI*): Renewable energy track. Nigeria Institute of Social and Economic Research (NISER).
Omoboye, I. F. (2011). Linkages between poverty and environmental degradation. *African Research Review,* 5(1): 475-484.
Omotor, D.G. (2000). Environmental problems and sustainable development in Nigeria. *Journal of Development Studies,* 2(1): 146-149.
Petit, C., Scudder, T. and Lambin, E. (2001). Quantifying processes of land-cover change by remote sensing: resettlement and rapid land-cover changes in South-Eastern Zambia. *International Journal of remote Sensing.* 22(17): 3435-3456.
Sherbinin, A., Carr, D., Cassels, S. and Jiang, L. (2007). Population and Environment. *Annual Review of Environmental Resource,* 32(1): 345-373.
Serneels, S. and Lambin, E. (2001). Proximate causes of land-use change in Narok District, Kenya: a spatial statistical model. *Agriculture, Ecosystems and Environment*, 85(21): 65–81.
Vittek, M., Brink, A., Donnay, F., Simonetti, D. and Desclée, D. (2014). Land Cover Change Monitoring Using Landsat MSS/TM Satellite Image Data over West Africa between 1975 and 1990. *Remote Sensing.* 6(1): 658-676.
Wood, E. C., Tappana, G. G. and Hadjb, A. (2004). Understanding the drivers of agricultural land use change in south-central Senegal. *Journal of Arid Environment.* 3(22): 1-18.