ISSN: 2230-9926

*Available online at http://www.journalijdr.com*

IJDR

International Journal of DEVELOPMENT RESEARCH

*International Journal of Development Research*
*Vol. 4, Issue, 12, pp. 2563-2571, December, 2014*

## *Full Length Research Article*

# BIOFUEL CROP PRODUCTION AND LARGE SCALE LAND ACQUISITION IN GHANA: IMPLICATIONS FOR LAND-USE PLANNING

**[1]Abubakari Ahmed, [2]*Issaka Kanton Osumanu, [3]Godwin Kavaarpuo, [4]Abdul-Rahim Abdulai and [5]Raqib Abu Salia**

[1]Town and Country Planning Department, Wa Municipal Assembly, Box 120, Wa- Ghana
[2]Department for Environment and Resource Studies, University for Development Studies, Box 520, Wa, Ghana
[3]Urban Systems, University of Duisburg-Essen, Saarbrücken, Germany
[4]Department of Planning and Management, University for Development Studies, Box 520, Wa, Ghana
[5]Department of Development Studies, University for Development Studies, Box 520, Wa, Ghana

**ARTICLE INFO**

***Article History:***
Received 20th September, 2014
Received in revised form
03rd October, 2014
Accepted 11th November, 2014
Published online 27th December, 2014

***Key words:***
Biofuel, Energy,
Land Acquisition,
Land Use planning,
Ghana.

**ABSTRACT**

Growing concerns of meeting the energy demands and parallel pursue of sustainable development in Ghana have shifted attention to renewable energy sources including biofuel. Land-based investments are therefore increasingly becoming attractive in Ghana and, over the years, many foreign direct investments have acquired large parcels of land for biofuel crop production. However, the current system of planning in Ghana is not ready to the remits of sustainable development from energy perspective and landscape approach evidenced by the lack of policy and institutional arrangement. This paper sought to explore the implications of biofuel crop production on land-use planning through a review of selected case studies. It was found that the land reforms and decentralized planning system are weak in addressing emerging trends of large scale land acquisition at the local level. The institutional framework for land-use planning has less provision for integrated energy planning and the current land-use practice favours only the urban areas. It is therefore imperative to revise the guidelines for large scale land acquisition to allow for decentralized energy planning, adoption of integrated energy-land use planning and scaling-up the preparations of rural land use planning.



## INTRODUCTION

Following the energy crisis in the early 2000s and the 2007-2008 world food crisis, concerns of energy security gave prospects of land-based investments, especially for agrofuels (German *et al*., 2013; Anseeuw *et al*., 2012; Cotula, 2011; de Schutter, 2011a, b; World Bank, 2011). Land-based investments are therefore increasingly becoming a booming business in sub-Saharan Africa, where it is estimated that 35% to 68% of farmland acquisitions are targeting (World Bank, 2011). Since 2000, 56.2 million hectares of land deals were recorded in Africa (Anseeuw *et al*., 2012), and in the sub-Saharan region, 21.8 million hectares of land have been acquired, an equivalent of 9.9% of the annual area harvested on the sub-continent (Schoneveld, 2011; German *et al*., 2013).

***Corresponding author: Issaka Kanton Osumanu***
*Department for Environment and Resource Studies, University for Development Studies, Box 520, Wa, Ghana*

Such investments have potentials to stimulate socio-economic development and accelerate poverty reduction in the region. Many foreign companies have, over the past five years, acquired large tracts of land across Africa for the commercial cultivation of biofuel feed stocks, particularly the oil seed bearing plant *Jatropha Curcas L.* (Cotula *et al*., 2008). This presents several risks because many countries, including Ghana, do not have comprehensive legal and institutional frameworks in place to regulate this type of land-based investment (Jumbe *et al*., 2009). Conversely, recent research suggests that agro-fuels (first-generation, particularly *Jatropha*) actually have greater aggregate environmental costs than fossil fuels (Scharlemann and Laurance, 2008) and yield less energy than they consume in their production (Shattuck 2009, 93). A Food and Agriculture Organization (FAO) study claims that "agro-fuel production cannot in any significant degree improve the energy security of developed countries – to do so would require so vast allocation of land" (Eide 2008: 4–5). A key area of concern is whether the current institutional

framework for land-use planning and planning practices in Ghana are ready for the emergence of land acquisition for biofuel crops production. Mainstream discourses underpinning biofuels in Ghana are consequently in two-folds: win-win and the populist discourses (Boamah, 2011). At the national and global levels, International Fund for Agricultural Development subscribes to the win-win situation showing biofuel production as a pro-poor development strategy (International Fund for Agricultural Development, 2010). On the contrary, Action Aid Ghana (2012a) and Oxfam International (2012) subscribe to the populist discourse expressing concerns of food security, loss of traditional livelihoods, disempowerment, sovereignty and marginalization of the rural poor. In that vein Action Aid International (2012a) noted that one of the key actors and drivers behind the recent land rush have tended to be foreign investors, usually assisted by national elites and governments desperate for foreign investments. Some evidence suggests that the government-industry alliance is driven by conflicting mandates or conflicts of interest among government agencies and representatives in large scale land acquisition (German *et al*., 2013).

Although an increasing amount of literature is devoted to characterizing this trend and the underlying factors that are driving it (e.g. Kugelman and Levenstein 2009; Cotula *et al*., 2009; World Bank, 2011; Schoneveld *et al*. 2011), strikingly little review has to date been conducted on the implications of biofuel crop production on land-use planning at the local level. This paper therefore seeks to explore the linkages between the uprising of biofuel crop production, the emergence of biofuel policy and land-use planning in Ghana at the local level. The paper contributes to the existing literature by providing a detail review of policy with links to theoretical debates and case studies of biofuel crops production in Ghana.

**Biofuel Development and Policy in Ghana**

Majority of Ghanaians in the agricultural sector are smallholder farmers cultivating mainly food crops for subsistence. Access to land, land rights and secure tenures are therefore of prime importance to their subsistence and livelihood. However, in recent times, the focus of energy investments in Ghana on large scales has targeted food crop and non-food land-based production for biofuels. Action Aid Ghana indicates that cultivating Jatropha as feedstock for biofuel production is said to require large land sizes of more than 1,000 ha for any meaningful gains from investments (Action Aid Ghana, 2012a). As at August 2009, it was estimated that collectively, a total of 1,075,000 ha of land had been acquired for biofuel feedstock plantations in Ghana, of which 730,000 ha are in the forest savannah transition zone (Action Aid Ghana, 2012a). To propel biofuel development in Ghana, a bioenergy strategy was adopted by parliament-in 2011. Also as at 2005, Ghana developed a biofuel policy recommendation document (Energy Commission, 2005). The national policy on biofuel states that (Energy Commission, 2006: 104):

"*.....government diversifies its sources of supply of transport fuels by looking at alternative fuels such as compressed natural gas and liquid biofuels"*.

The strategic objective is (Energy Commission, 2006: 104):

"*..... to secure and increase future energy security by diversifying sources of supply through fuel substitution and complementation of alternative fuels so as to achieve 10% penetration in supply mix by 2015 and 20% by 2020"*.

The policy direction implies more investment in the sector prompting large scale land acquisitions. To realize the policy objective, a road map toward evolving land use policy to identify lands for biofuel cultivation was adopted by the Ministry of Energy together with the Ministry of Food and Agriculture. Recognizing that 80% of land is owned customarily, identified spots and state interventions targeted rural poor, especially in northern Ghana where vast tracks of land are assumed to be idle or marginal. This road map expected biodiesel and gasohol blends to complement diesel and gasoline use nationwide by the end of 2008 with B5 (a mixture of 5% biodiesel and 95% diesel) and E10 (a mixture of 10% ethanol and 90% petrol). The road map further highlighted that in 2007, commercial installation of biodiesel plants could start and locally produced biofuels could be exported if domestic consumption was not ready. The key stakeholder in this process is the private sector with state's role of facilitating and establishing standards.

In 2006, the government established a National Jatropha Project Planning Committee to develop a 1,000,000 ha of Jatropha plantation in Ghana within 5-6 years. Of all the thematic areas the committee was tasked to address, which included jobs, biodiversity, water bodies, soil and forest, land-use planning was saliently omitted. In over 53 districts selected for the project, areas identified were categorised as 'marginal' or 'degraded' lands (Boamah, 2014). Elsewhere, many others have argued that nearly all the lands incorporated for biofuels have been otherwise marginal, surplus, or abandoned and no competition existed (Goldemberg *et al*., 2008; Pimentel and Patzek, 2007). Yet it is unclear what the terms marginal, surplus, degraded and abandoned actually mean when it comes to energy, because they are usually not defined or practically exemplified by the institutions proposing such locations as suitable for reducing competition with food and feedstock outputs (Kuchler and Linner, 2012), especially in rural areas of Ghana.

Similarly, there is ambiguity surrounding targets set. Scenario one assumed 10% penetration of total petroleum products by renewables to be achieved by 2015 and 20% by 2020, which connotes the country needs to develop the capacity to produce approximately 298,646,000 litres and 692,426,000 litres of biofuels respectively within the period (Antwi *et al*., 2010). On the other hand, in scenario two, if the target is to meet 10% of transport fuels in the form of diesel and gasoil by 2015 and 20% by 2020, then the country requires a production capacity of about 160,002,000 and 336,328,000 litres of biofuels by 2015 and 2020 respectively (Antwi *et al*., 2010). First implications are the quantities of land that will be required, quantity of feedstock, source of land, source of investment, mode of land acquisition, extraction efficiency, distribution, agriculture investment and food security. Taking Jatropha only as an example, with current production potential of 500lit/ha Jatropha oil per annum, 800,000 and 2,200,000 seeds (kg) will be required by 2015 and 2020 respectively to meet the demand. In terms of land size, published works on yields in Ghana are rare and comparison using other countries as

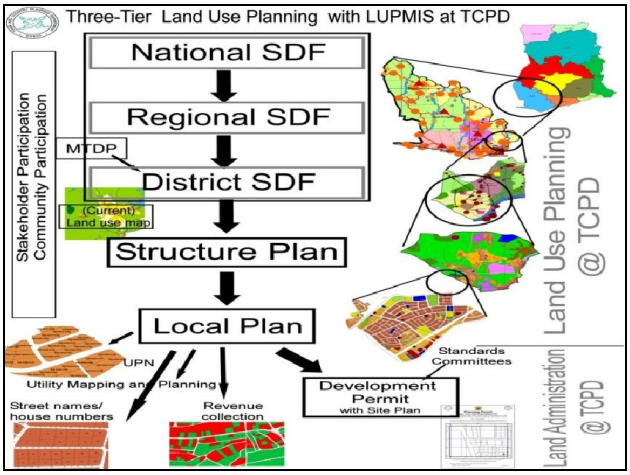
benchmarks can be misleading as there are diversities in ecosystem services such as soil, nutrients levels and pollinators. Fairless (2007) estimated the yield of Jatropha at 1,300 lit/ha. Using Fairless (2007) to put into perspective the land required, replacing 20% of petroleum consumption in 2009 (946,900,000946.9 million lit) with Jatropha requires 2,380km² (Afrane, 2012). Similarly, at the same rate, 5,326 km² will be required by 2020 to achieve 20% penetration of total petroleum by biofuel. In the scenarios above, sufficient large, medium or small scale production capacities are imperative to meet policy demands and that has implications on land and land use planning, especially zoning. It is estimated that foreign companies gained access to an estimated 1.184 million ha of land for the purpose of developing biofuel feedstock plantations equivalent to approximately 4.6% of the total land area and 8.8% of the area suitable for agriculture (Schoneveld *et al*., 2011). A compilation by Action Aid Ghana (2012b) shows that out of the 42 acquisitions captured, 18 were made by foreign companies, 9 by local investors and 3 by the Government of Ghana. Information on the remaining 12 was not available. Another key concern is what has been the zoning status and land use pattern of these lands prior to their acquisition. Two-thirds of agricultural land deals entered into by foreign investors are in countries with serious hunger problems (Oxfam International, 2012). These developments have potentials for benefits' distribution along the value chain, yet the environmental, social, health and land-use planning implications cannot be underestimated.

With the dual land administration system of formal and customary lands, large scale acquisitions are reported to have been channelled through the customary secretariat and/or traditional chiefs (Boamah, 2014). In 2010, a Bio-energy Policy was drafted which seems to be a substitution of the target of 20% by 2020 discussed earlier. From the perspective of land administration, neither the draft Biofuel Policy (2005), Renewable Energy Act 832 (Energy Commission, 2011b) nor the draft Bioenergy Strategy (Energy Commission, 2011b) addressed the key issues concerning large scale land acquisitions (Boamah, 2014). Article 41 of Act 832 states that all biofuel production must acquire relevant permits from the Environmental Protection Agency and the Ministry of Food and Agriculture. This seemingly neglects the acquisition of land use and development permit from the Town and Country Planning Department. The Act also failed to recognise the role of land use planning in biofuel production in the country. Also in the draft Bioenergy Policy, key words like 'land use' and 'planning' were mentioned once each and yet they were not used in a context relating to land-use planning for cultivating energy crops. The draft Bioenergy Policy (2010) recognized that there existed no legislation regulating large scale land acquisition for cultivating energy crops in the country. However, a guideline for large scale land acquisition has been prepared by the Lands Commission, yet there exist lapses in the guideline (Ghana Land Commission, 2012; Boamah, 2014).

## Current Framework of Land Use Planning in Ghana

A decentralized planning system has been in operation in Ghana since the early 1980s essentially to restructure the political and administrative machinery for decision-making at the local level. The system was delineated by the combined promulgation of the National Development Planning Commission Act of 1994 (Act 479), the National Building Regulations (LI 1630 of 1996), the Civil Service Law of 1993 (Act 327), the Local Government Act of 1993 (Act 462), and the National Development Planning (Systems) Act of 1994 (Act 480). Despite these legislative regimes, the current system for land use planning is still a relic of colonial planning legislation of 1945 (CAP, 84). The concept of land use planning and practice are therefore based on functionality and segregation — to provide discrete zoning (Afrane, 1993; Baffour-Awuah *et al*., 2014). The system follows a model of plan-service-develop-occupy (Nkum and Associates, 2001).

The task of land use planning is spearheaded by the Town and Country Planning Department with a three-tier system (see Figure 1). The first level is the preparation of a spatial development framework which specifies the various spatial projections and direction of spatial growth. This stage is expected to be an approach to total landscape planning yet, at the local level, spatial plans do not cover the entire district, especially the rural areas. The second level is structural plans and they serve as the main legal planning documents. They are legally binding documents approved through political and technical processes. The last level is the local plan which shows various plots and sizes with zones. Local plans categorize comprehensive land uses to parcel level. Prospective developers are required by law to obtain building permits and a development permit prior to development.




Source: Town and Country Planning Department (2012)

**Figure 1. The three-tier hierarchy of land use planning**

This process screens the proposed development to ensure that it meets the land use zoning of the proposed site and also meets the structural requirements as contained in the National Building Regulations (NBR). However, the defects in the NBR and CAP 84 in terms of energy and large scale land use development have reinforced the neglect of planning for biofuel and energy in Ghana. The myriads of rural land use planning problems are also exacerbated by the neglect of country side planning by the Town and Country Planning Department, with the existing planning practices and policies favouring urban planning. Many rural areas in Ghana do not have local land use plans to guide spatial development. Adding to this, the current approach to land use planning is piecemeal and segregated and the practice of total landscape land use planning and management is still not very effective in Ghana. Parallel to the above, in 1999, the first National Land Policy was drafted by the Ministry of Lands and Forestry. The

policy sort to address crucial land related problems such as conflict of land uses, use of unapproved schemes, lack of local land use plans, encroachment and weak land administration. One of the key policy objectives was to ensure that socio-economic activities are consistent with land use plans in the long run through sustainable land use planning (Ministry of Lands and Forestry, 1999). The policy further stated that for large scale agriculture (which may include today's biofuel crop production) land use planning should make provisions for: i) population density, growth and distribution pattern; ii) settlement location and pattern preference; iii) direction of physical growth; iv) land and environmental conservation requirements; and v) displaced persons. One key state of unease to tackle is the extent to which the recent trends of large scale land acquisitions for biofuel address these five priority concerns.

Many years down the line, Ghana's planning system has been branded as weak (Owusu, 2008). The weaknesses are observed in the failure to revise the colonial exclusionary or discrete zoning concept to reflect new and emerging substantive priorities like sustainable development. There are also mass disregard for planning regulations, traffic congestion, rapid land conversion of agricultural land at the periphery, rising tide of unauthorized developments, emergence of contemporary slums and shanty towns (Antwi, 2000; Government of Ghana, 2009). The underlining causes of these weaknesses emanates from lack of awareness of planning legislations, ignorance, low institutional capacity to undertake planning functions and political interference (Konadu-Agyemang, 2001). The rational and technical process by which planning is depicted in theory, the practice in Ghana departs significantly and decisions are rather taken through political processes. The planning practice in Ghana is an irony of planning theory given that the guidelines for land use and development planning are not grounded concretely on any planning ideology. Landlords are the initiators of land use planning, developers are the initiators of land use change and politicians are the influencers.

Socio-political discussions override technical considerations and are, sometimes, dragged to the level that consensus cannot be reached leading to incompletion of plans. The radical decentralization for local planning, however, operates within the constraints of national development planning. To overcome these challenges, a draft land use bill has since 2013 been submitted to parliament for approval and it seeks to consolidate the over 66 land laws in Ghana. These laws were designed on the basis of health, safety, economy and convenience. Parallel to this, government instigated a new reform for land use planning under the Land Use Planning and Management Project (LUMP) in 2007 and land tenure reform under the Land Administration Project in 2003. However, these reform projects fail to address the nature of the fragmented planning legislation and practice. The land tenure project could not address the emerging trends of large scale land acquisition and integrated land use planning (incorporating the substantive emerging issues like biodiversity, climate change and energy) based on the principle of 'harmony with nature'. To counteract the emergence of large scale acquisitions, the Lands Commission puts in place a guideline for such acquisitions. Apart from safeguarding the interest of landlords and investors, the guideline also seek to ensure that acquisitions are made for uses that conform to the land use plan of the areas in question. A major flaw in the guideline is the acquisition of lands in areas without existing land use plan and lack of wider stakeholder participation in the planning process.

## Selected Cases

Generally, traditional authorities seemingly use the term 'land transaction' to depict favourability whist NGOs and civil society groups use 'land grabbing' (Boamah, 2014) leading to the 'biofuel debate' in Ghana. With regards to the ongoing debate, administrators take the measure of the problem with their institutional and policy yardsticks; foreign entrepreneurs claim it is a 'friendly development'; experts and scholars seek practicable solutions, scientific relevance and a balanced view; local communities are concerned about the future utopian promises of jobs and incomes; human rights activists speak of the unanticipated perils of land reforms and strive to humanize decision making; community activists and civil society are concerned about the plight of sustainable lifestyle and livelihood; planners express concerns of land-use compatibility; and politicians pledge everything to everyone. In this section, selected case studies are discussed by focusing primarily, but not exclusively, on the land use zoning status and existence of local plans. The geographic locations of the selected areas are shown in Figure 2, whilst their characteristics are shown in Table 1. These areas are selected because of the size of land involved and the ability to have access to information.

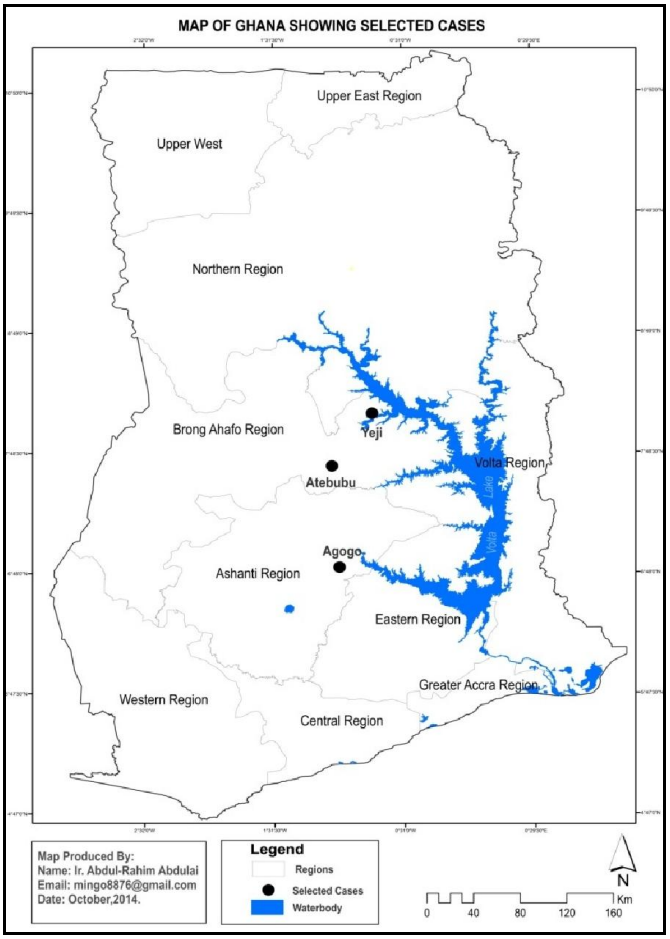



**Figure 2. Locations of the Selected Cases**

**Table 1. Characteristics of Three Selected Cases**

| | Crop | Type of land deal | Land size (ha) | Location | Current status | Existence of local plan | Covered by local plan |
|---|---|---|---|---|---|---|---|
| Case I (2007) | Jatropha/Oil palm | Lease | 32,266 | Agogo, Ashanti Region | 1,050 ha under cultivation | Yes | No |
| Case II (2009) | Jatropha | Lease | 15,000 | Yeji, BrongAhafo Region | 4000 ha under cultivation | Yes | No |
| Case III (2010) | Jatropha | Lease | 30,000 | Atebubu, , BrongAhafo Region | 500 ha under cultivation | Yes | No |

Source: Compiled by Authors

### *Case I*

Agogo is a town found in the Asante Akim North District of the Ashanti Region. Since 2008, it has been in the news for the reason that the activities of Fulani Herdsmen, who have acquired land for cattle grazing, are subletting the lands for biofuel feedstock production. Sometime in 2008, Norwegian company; ScanFuel, acquired large tracts of land, about 32,266 ha (according to Lands Commission), granted by the paramount chief involving 16 communities (Action Aid Ghana, 2012b). The Manager of the company indicated that about 19,000 ha were initially granted, but later on reduced to 13,500 ha for 50 years.

This was later reduced to 15 years and subsequently to 10 years for Jatropha plantation. The area in question was deemed as marginal lands. The community built-up area is covered by a planning scheme but the area acquired for the plantation is not covered under any local planning scheme. The zoning status, according to Lands Commission and the Town and Country Planning Department, is 'unused land'. However, the traditional land use classification by the Town and Country Planning Department seemingly categorize all farm lands, grasslands and forests (not forest reserves) as 'unused' or 'undeveloped'. Given that the company has a lease agreement with the paramount chief, it obliges the local Town and Country Planning Office in its future land use plan preparations to zone the acquired area for 'intensive agriculture' since the development preceded the local land use plan preparation.

### *Case II*

Yeji is the capital of Pru District in the Brong Ahafo Region, situated at the eastern part of the region along the Volta Lake. It is relatively sparsely populated with large stretches of uninhabited land. Land in this area falls under the custody of the Paramount Chief of the Yeji Traditional Area. Yeji is noted to be a fishing community with frequent flooding from the Volta Lake. About 4,000 hectares of land was acquired by Smart Oil Ghana Limited for the development of a Jatropha plantation. Another grant has also been made to Kiminick Estate Limited for construction of a Jatropha refinery plant. The total acquisition amounted to 15,000 ha (Action Aid Ghana, 2012b). In terms of land use planning, the District Development Planning Officer indicated that the District Assembly (local government) was not involved in the purchase arrangements. The assembly was only involved in the land title registration process as part of an assessment committee. Also, for the construction of the refinery plant, Kiminick sort permit from the assembly. In tandem to the views expressed by the Development Planning Officer, the Town Planning Officer, who is responsible for spatial and land use planning, expressed concerns of the zoning status and compatibility with land use.

### *Case III*

Atebubu is the capital of Atebubu-Amantin District. It is an urban area with varied economic activities including trading and farming. It was observed that some organizations (especially Kiminick Estates Limited and African Plantation for Sustainable Development) have acquired large parcels of land under the control of the local traditional authority and other adjoining local traditional authorities for Jatropha and Eucalyptus plantations. In 2010, Kiminick Estates Limited acquired about 34,000 hectares of land for cultivation of Jatropha in the Atebubu traditional area. In 2011, over 500 ha were cultivated and other parcels were acquired for building a biofuel processing plant. While there is a general acceptance by the local people in terms of employment prospects, most of the affected people are not satisfied with the payment of compensation, the processes of acquisition and outcomes of their displacement. In terms of land use planning, the area acquired was not covered by a local planning scheme. The lands were cadastral areas and the eucalyptus plantations never acquired a permit from the Forestry Commission.

### Implications of Biofuel Production for Land use Planning in Ghana

The sustainability of feedstock crops depends largely on the land use practices and landscape dynamics (Dale *et al*., 2010). Similarly, landscape dynamics also depend on the use to which land is put. With biofuel crop production, both direct and indirect land use changes occur. Direct changes occur when a new activity is established in an area while indirect changes occur as unintended consequences of land use decision elsewhere (Ernest and Young Consult, 2011). From landscape planning approach and perspective, the land use implication of biofuel crop production should comprehensively address issues of access to water, transportation, type of crops, farming and harvesting systems and location of refinery facilities. This section looks at the land use planning implications of biofuel crop production at the landscape level, directly and indirectly.

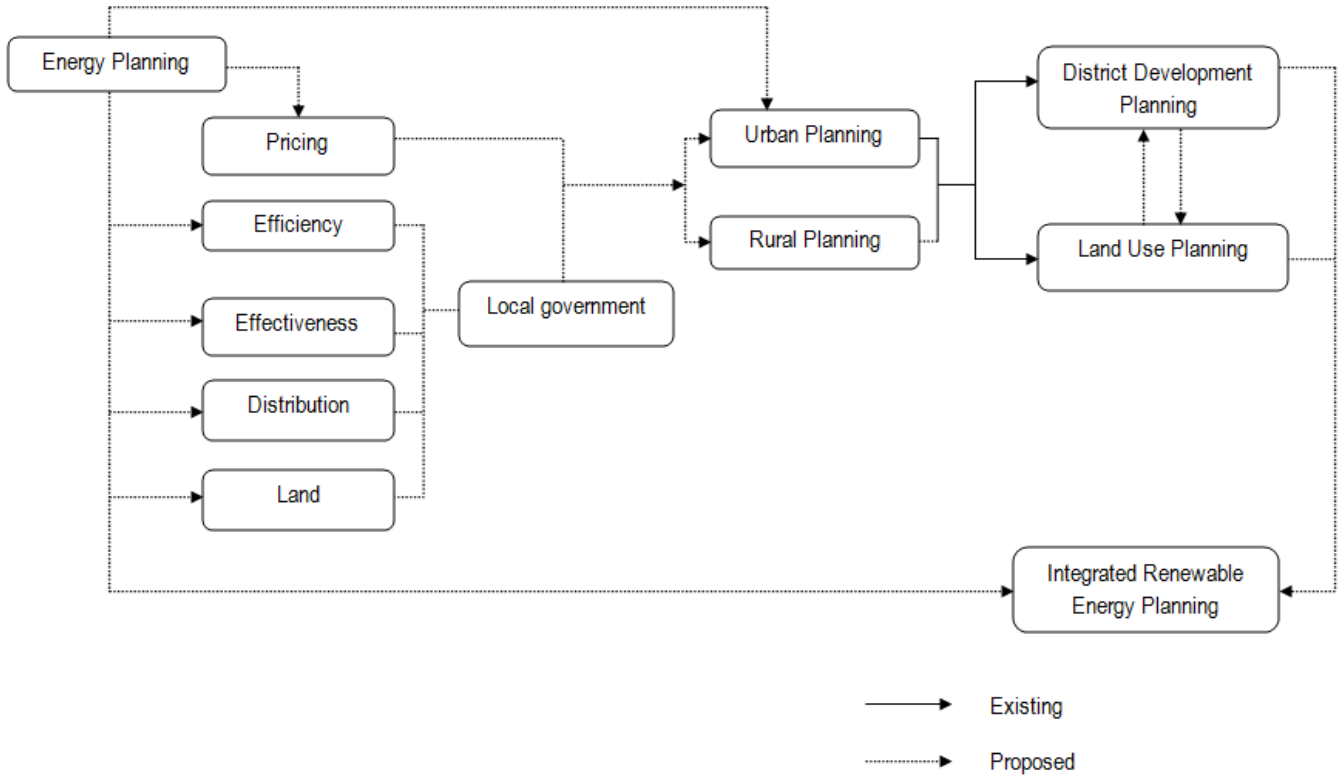



**Figure 3. Conceptual Framework for Integrated Land-Based Renewable Energy-Land Use Planning Model**

### *Land Use Provision for Water Accessibility and Transportation Networks*

In choosing a site for energy crops cultivation, access to water is a major limiting factor as some plants require more water than others. There are two issues regarding water resources: water for irrigating the crops as in *Case II* (Yeji, water from Volta Lake) and water for cooling refinery plant as in the *Case III* (Kiminick Estate Limited's Jatropha refinery plant). Using oil palm (in *Case I*) as a feedstock is noted to have high sensitivity to water and Jatropha has medium sensitivity to water (Duku *et al*., 2011). To satisfy the water resource needs of the plantation, various irrigation systems are devised by investors with a key concern of how they would be represented on land. However, land use planning for irrigation schemes are weak (Namara *et al*., 2010) and customary land tenure system has made land use planning even problematic. For instance, to draw water from the Volta Lake for irrigation of plantation in Yeji, planners are challenged with the task of creating a land use model that ensures access to water for biofuel plantation while safeguarding the other land use from the water source to the plantation. Related to water, is the issue of creating transportation access from the plantations to markets. All cases indicated that the areas are not covered by any local transportation plan, yet their acquisition necessitates the provision of roads. Of concern to land use planners is where and how to create access on land without affecting existing land uses like farmlands and nature. The best optimal locations of roads should be determined with minimal adverse effects.

### *Scaling Up Rural Land Use Planning In Ghana*

In all three cases, the rural areas where acquisitions took place were not covered by local planning schemes. Prime focus has been given to the district capitals and major towns at the expense of the rural areas. Van den Brink *et al*. (2006) noted that urban areas are favoured in terms of spatial planning while the relevance in rural areas is gradually being lost. With increasing large scale acquisition in the rural areas for biofuel, land use intensity is modified. Rural land use planning is caught between safeguarding nature, agriculture, sprawl, land conversions to biofuels crop plantations and at the same time meeting the needs of stakeholders under the current planning constrains discussed earlier. Land use planning is therefore seen in the twilight as creating space for 'agriculture versus energy versus nature'. The powerful nature of foreign direct investment for agriculture-based renewable energy is always at the opposition for space. It is unclear which direction or interest (i.e. agriculture or energy or nature) land use planning in rural areas should be favoured. It is therefore imperative to scale up the preparation of rural planning schemes to cover a wider geographic space as a way of addressing potential future conflict between agriculture, energy and nature. In responding to the aforementioned, DeFries *et al*. (2012) call for 'solution oriented' research, which links sustainable environmental solutions to social contract. Rural land use planning should be seen from the lens of social contract. Yet, Rudel and Meyfroidt (2014) analysed the nature of rural land use planning in the developing world and concluded that it is an 'organized anarchy' because of the different levels of stakeholders and interests which are often not harmonised but compete for contested rural landscape. It can be argued therefore that with the influx of investors for large tracts of land, land grabbing have changed the composition of interest in land and its governance. As a precautionary measure, land use planning needs to be proactive in choosing the best lands for specific uses in rural areas before biofuel plantations precede land use planning. To achieve this aim, it is necessary to scale up land use preparations and open for wider stakeholder participation in the planning process.

### *Need for Integrated Renewable Energy Planning and Decentralisation of Energy Planning*

From the case studies, it is observed that there exist separate planning practices for socio-economic development and land use planning at the local level whilst energy planning is largely retained at the national level. Land use and development planning for biofuel production are not well established at the local level where implementation takes place. From Figure 3, the existing framework for land use planning does not integrate energy aspects. Currently, rural and urban/regional planning is undertaken in two main domains: development planning and land use planning. The progress report on the implementation of Ghana Shared Growth and Development Agenda recognized an existing gap between land use and development planning at the local level given that coordination and collaboration between them is not well established (National Development Planning Commission, 2012). In terms of energy, issues of pricing should be addressed at the national level but distribution, efficiency and land use for energy should be the responsibility of local governments (see Figure 3).

This therefore calls for the need to decentralise energy planning in Ghana. With decentralised energy planning to the local governments, biofuel concerns can easily be integrated into the districts' development and land use plans either in urban or rural areas. Since land use and development planning are decentralised, effective integrated energy-land use planning largely depends on decentralisation of energy planning to the local governments. When energy, land use and development are all under the realm of local government, integrated planning can easily be pursued. Centralised energy planning ignores many local and rural realities and pertinent issues (Hiremath *et al*., 2007). On the contrary, decentralised integrated renewable energy planning is in the interest of efficiency, land use and distribution. As districts are acceptable local planning authorities, land use for energy planning should be the responsibility of the district assemblies.

### *Capacity Development and Scientifically Informed Practices*

From the above discussion, the current state of affairs also implies the improvement in capacity of land use planners to fully appreciate energy issues and relationship with land use. Currently in Ghana, the department responsible for land use planning (the Town and Country Planning Department) at the local level is not well resourced in terms of staff and up-to-date technologies for spatial planning (see details in Baffour-Awuah *et al*., 2014). For instance, in the Upper West Region, with 11 Municipal/District Assemblies, there exist only four spatial planners. In some cases elsewhere (Dutch planning system), it was noted that the problem solving capacity of planners have changed because of the difficulty in reaching consensus (Wolsink, 2003). Related to this, issues of biofuel also prompt a rethinking of the scale at which landscape planning takes place and the approach to be adopted. Future planning should development a capacity to plan at at the landscape level. Planning at a landscape level and adopting a conservation planning technique could be the best ways of addressing the emerging trends of large-scale land acquisitions on land use change and biodiversity. The "tyranny of small decisions" could be devastating for land resources (Odum, 1982; Kahn, 1996). In all the three cases identified, land use planning was done on piecemeal basis and did not cover the entire local planning area because of lack of capacity in terms of technical, finance, and human resource. For example, most local level land use planning offices started to apply GIS tools in 2013 and many do not have spatial planners. The overriding argument is that if the direct and indirect land use changes arising from biofuel crop production can be predicted, why can't a scenario landscape planning be a means to that end? This necessity is what Theobald (2007) called "think far and wide". In planning at the landscape level, the reward of each land depends on the choice of all. There is a need to create an interdisciplinary enterprise that links energy, land use and conservation at the landscape level. However, much depends on the awareness, technical capacity of planners and the resourcefulness of their department. In view of this, Stein (2007) advocated for the use of more accurate scientific data while Noss (2007) noted that planning cannot proceed without science. However in Ghana, political influence puts land use planning under the realm of what Duane (2007: 80) calls "good politics before good science". Niemela (1999) conclusion that few planners regard the use of scientific ecological data as an integral tool for land use planning is also relevant to the case of Ghana. The data needs for land use planning of the selected cases include existing uses, boundary and relief features thereby neglecting many scientific aspects.

## Conclusion

Investors in biofuel crop production generally have justification in areas of climate change mitigation (despite peer reviewed scientific evidence to the contrary), friendly development (despite counter claims by most human-rights organizations) and energy security (yet science claims it is tenable only with large scale land). The current land use needs for biofuel crop production, aside land for cultivation, include land use planning for access to water and transportation of feedstock. However, institutional framework and practice of energy planning and land use planning are both weak and fragmented. The sectoral planning system in Ghana has reinforced weaknesses in land use planning practices and a move towards an integrated energy-land use planning model is imperative. Adding to this, land use planning has often favoured urban areas at the expense of rural areas and the country-side. The lack of local plans in rural areas makes it difficult to check conformity of large scale land acquisition development with local planning needs. It is therefore essential to redefine the mandate of planning as a response to both problems and future needs of urban and rural areas.

Aside environmental and energy permits, developers of large scale lands acquired for biofuel in areas with or without existing land use plans should seek land use planning approval. The Town and Country Planning Department should move from the manual practice of planning by introducing Geographic Information Systems (GIS) and modelling. This technical process must check the land use requirements for access to water, transportation, provision for displaced people, land use compatibility and land use intensity. The current Guidelines on large scale land acquisition should therefore be revised through more rigorous stakeholder consultations and must be aligned to the content of the Land Use Planning Bill. With consultation from traditional authorities, the Town and Country Planning Department and local governments, the guidelines should go along with up-scaling of rural land use

planning to produce local plans for rural communities in Ghana. This will serve as a community protocol and register on how lands could be used. From the perspective of policy, the adoption of a carbon credit scheme could be an incentive towards mitigating some of the direct and indirect effects on land use change arising from crops such as emissions.

## REFERENCES


Action Aid Ghana. 2012a. Land Grabbing, Biofuel Investment and Traditional Authorities in Ghana: Policy Brief. Available at: http://www.actionaid.org/sites/files/actionaid/policy_brief.pdf (accessed on 06/19/2013).

Action Aid Ghana. 2012b. Report on Rapid Appraisal on Land Grabbing, Biofuel Investments and Traditional Authorities in Ghana. Accra: Action Aid Ghana (unpublished).

Action Aid International. 2012. From Under Their Feet: A Think Piece on the Gender Dimensions of Land Grabs in Africa. April, 2020 Brief. Johannesburg: Action Aid International.

Afrane, G. 2012. Examining the potential for liquid biofuel production and usage in Ghana. Energy Pol*.,* 40: 444–451.

Afrane, S.K. 1993. The Integration of Housing and Economic Activities: A Case Study of Low Income Settlements in Kumasi, Ghana. PhD Thesis (unpublished), University of British Columbia, Canada.

Anseeuw, W., Alden, W.L., Cotula, L. and Taylor, M. 2012. Land Rights and the Rush for Land: Findings from the Global Commercial Pressures on Land Research Project. Rome: International Land Coalition.

Anseeuw, W., Boche, M., Breu, T., Giger, M., Lay, J. and Messerli, P. 2012. Transnational Land Deals for Agriculture in the Global South: Analytical Report Based on the Land Matrix Database. Bern, Montpellier and Hamburg: CDE, CIRAD and GIGA.

Antwi, A.Y. 2000. Urban Land Markets in Sub-Saharan Africa: A Quantitative Study of Accra, Ghana. PhD Thesis (unpublished), Napier University, UK.

Antwi, E., Bensah, E.C., Quansah, D.A., Arthur, R. and Ahiekpor, J. 2010. Ghana's Biofuel Policy: Challenges and the Way Forward. *Int. J. of Ener. & Env't* 1(5): 805-814.

Baffour-Awuah, K.G., Hammond, F.N., Lamond, J.E. and Booth, C. 2014. Benefits of urban land use planning in Ghana. Geo. Forum, 51: 37–46.

Boamah, F. 2011. The relationship between land grabbing for biofuel and food security: a bane or boon? The food security implications of jatropha biodiesel project in Northern Ghana. Paper presented at the International Conference on Global Land Grabbing, Future Agricultures Consortium, Sussex.

Boamah, F. 2014. Imageries of the contested concepts of 'Land Grabbing' and 'Land Transactions': implications for biofuel investment in Ghana. Geo. Forum, 54: 324–334.

Cotula, L. 2011. The Outlook on Farmland Acquisitions. Rome: International Land Coalition.

Cotula, L., Dyer, N. and Vermeulen, S. 2008. Fuel Exclusion? The Biofuel Boom and the Poor's Access to Land. London: International Institute for Environment and Development.

Cotula, L., Vermeulen, S., Leonard, R. and Keeley, J. 2009. Land Grab or Development Opportunity? Agricultural Investment and International Land Deals in Africa. London and Rome: IIED, FAO and IFAD.

Dale, V.H., Kline, K.H., Wiens, J., and Fargione, J. 2010. Biofuels: implications for land use and biodiversity. Biofuels and Sustainability Reports. Ecological Society of America, Washington, DC.

DeFries, R., Ellis, E., Matson, P., Agrawal, A., Crutzen, P., Field, C., Gleick, P., Kareiva, P., Lambin, E., Liverman, D., Ostrom, E., Sanchez, P. and Syvitski, J. 2012. Planetary opportunities: a social contract for global change science to contribute to a sustainable future. *Bioscience*, 62: 603–606.

deSchutter, O. (2011a). The green rush: the global race for farmland and the rights of land users. *Harvard Int. Law J.*, 52(2): 503–559.

deSchutter, O. 2011b. How not to think of land-grabbing: three critiques of large-scale investments in farmland. *J. of Peasant Studies*, 38: 249–279.

Duane, T. 2007. Good politics before good science? The path to successful public conservation planning. In: Environmental Law Institute (ed.) Lasting Landscapes: Reflections on the Role of Conservation Science in Land Use Planning. Washington, DC.: Environmental Law Institute pp. 80 - 98.

Duku, M.H., Gu, S. and Hagan, E.B. 2011. A comprehensive review of biomass resources and biofuels potential in Ghana. *Renew. & Sust. Ener. Rev*., 15: 404–415.

Eide, A. 2008. The Right to Food and the Impact of Liquid Biofuels (Agrofuels). Rome: Food and Agriculture Organization.

Energy Commission, Ghana. 2005. Ghana Bio-fuels Policy*:* Policy Recommendations. Final Draft. Accra: Energy Commission.

Energy Commission, Ghana. 2006. Strategic National Energy Plan 2006 – 2020. Accra: Energy Commission.

Energy Commission, Ghana. 2011a. Bioenergy Policy and Strategy for Ghana. Final Draft. Accra: Energy Commission.

Energy Commission, Ghana. 2011b. Renewable Energy Act. Accra: Energy Commission.

Ernest and Young Consult. 2011. Biofuels and Indirect Land Use Change: The Case for Mitigation. Accra: Ghana Universities Press.

Fairless, D. 2007. The Little Shrub that could – Maybe. Nature, 449: 652–655.

German, L., Schoneveld, G. and Mwang, E. 2013. Contemporary processes of large-scale land acquisition in sub-saharan africa: legal deficiency or elite capture of the rule of law. *World Dev't*., 48: 1–18.

Ghana Lands Commission. 2012. Guidelines for Considering Large-Scale Land Transactions for Agricultural and other Purposes. Accra: Woelli Publications.

Goldemberg, J., Coelho, S.T. and Guardabassi, P. 2008. The sustainability of ethanol production from sugarcane. *Ener. Pol*., 36(6): 2086–2097.

Government of Ghana. 2009. Human Settlements and Land Use Policy and Planning in Ghana: A Policy Study. Accra: Land Use Planning and Management Project & Town and Country Planning Department.

Hiremath, R.B., Shikha, S. and Ravindranath, N.H. 2007. Decentralized energy planning; modeling and application – a review. *Renew. & Sust. Ener. Rev*., 11: 729–752.

International Fund for Agricultural Development. 2010. Global Consultation on Cassava as a Potential Bioenergy Crop. A Stakeholders Conference held in Accra between18-19 October 2010.

Jumbe, C.B.L., Msiska, F.B.M. and Madjera, M. 2009. Biofuels Development in sub-Saharan Africa: are the policies conducive? *Ener. Pol*., 37: 4980-4986.

Kahn, A.E. 1966. The tyranny of small decisions: market failures, imperfections, and the limits of economics. *KYKLOS*, 19: 23-45.

Konadu-Agyemang, K., 2001. Structural adjustment programs and housing affordability in Accra, Ghana. The Canadian Geographer, 45 (4): 528–544.

Kuchler, M. and Linner, B. 2012. Challenging the food vs. fuel dilemma: genealogical analysis of the biofuel discourse pursued by international organizations. *Food Pol.,* 37(5): 581–588.

Kugelman, M., and Levenstein, S.L. (eds.). 2009. Land Grab? The Race for the World's Farm Land. Washington, D.C.: Woodrow Wilson International Center for Scholars.

Ministry of Lands and Forestry, Ghana. 1999. National Land Policy. Accra: Ministry of Lands and Forestry.

Namara, R. E., Horowitz, L., Kolavalli, S., Kranjac-Berisavljevic, G., Dawuni, B. N., Barry, B., Giordano, M. 2010. Typology of irrigation systems in Ghana. Colombo, Sri Lanka: International Water Management Institute. 35p. (IWMI Working Paper 142).

National Development Planning Commission, Ghana. 2012. The Implementation of the Ghana Shared Growth and Development Agenda (2010 -2013); 2012 Annual Progress Report, 2013. Accra: National Development Planning Commission.

Niemela, J. 1999. Ecology and Urban Planning. Biodiversity and Conservation, 8: 119-131.

Nkum and Associates. 2001. *Towards* a Concept for Participatory Urban Planning in District Towns. Final report (Volume II) for promotion of district capitals. Submitted to programme co-ordination office (PRODICAP), GTZ and Ministry of Local Government and Rural Development, Accra.

Noss, R. (2007). Conservation thresholds: overview and commentary. In: Environmental Law Institute (ed.) Lasting Landscapes: Reflections on the Role of Conservation Science in Land Use Planning. Washington DC.: Environmental Law Institute, pp. 1-12.

Odum, W.E. 1982. Environmental degradation and the tyranny of small decisions. Bio Science, 32: 728–729.

Owusu, G. 2008. Indigenes and migrants access to land in peri-urban areas of Accra, Ghana. *Int. Dev't. Planning Rev*., 30(2): 177–197.

Oxfam International. 2012. Our Land, Our Lives, Time Out on the Global Land Rush. Oxfam International Briefing Note, October, 2012. Oxford: Oxfam International.

Pimentel, D. and Patzek, T. 2007. Ethanol production: energy and economic issues related to U.S. and Brazilian Sugarcane. *Nat. Res. Research*, 16(3): 235-242.

Rudel, T.K. and Meyfroidt, P. 2014. Organizing anarchy: the food security-biodiversity-climate crisis and the genesis of rural land use planning in the developing world. Land Use Pol., 36: 239– 247.

Scharlemann, J. and Laurance W. 2008. How green are agrofuels? *Science*, 319(5859): 43–44.

Schoneveld, G.C. 2011. The Anatomy of Large-Scale Farmland Acquisitions in Sub-Saharan Africa. Working Paper No. 85. Bogor, Indonesia: Center for International Forestry Research.

Schoneveld, G.C., German, L.A. and Nukator, E. 2011. Land-based investments for rural development? a grounded analysis of the local impacts of biofuel feedstock plantations in Ghana. *Eco. & Soc*., 16(4): 10-23.

Shattuck, A. 2009. The agro fuels trojan horse: biotechnology and the corporate domination of agriculture. In: Jonasse, R. (ed.) Agro fuels in the Americas: A Food First Book. Oakland: Institute for Food and Development Policy, pp. 89–101.

Stein, B. 2007. Bridging the gap: incorporating science-based information into land use planning. In: Environmental Law Institute (ed.) Lasting Landscapes: Reflections on the Role of Conservation Science in Land Use Planning. Washington DC.: Environmental Law Institute, pp. 52-58.

World Bank. 2011. Rising Global Interest in Farmland: Can it Yield Sustainable and Equitable Benefits? Washington, D.C.: The World Bank.

Town and Country Planning Department, Ghana. 2012. GIS Manual for Land Use Planning and Management Information System. Accra: Town and Country Planning Department Accra-Ghana.

Van den Brink, A., van der Valk, A. and van Dijk, T. 2006. Planning and the challenges of the metropolitan landscape: innovation in the Netherlands. Int. Planning Stud., 11: 147–165.

Wolsink, M., 2003. Reshaping the Dutch planning system: a learning process? Env't and Planning, A (35): 705–723.

*******