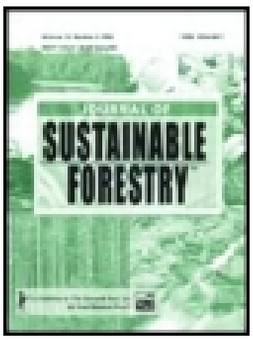

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Patterns of land use, crop and forest cover change in the Ashanti region, Ghana

Michael O. Asibey [a], Kwasi O. Agyeman[b], Owusu Amponsah[a], and Theophilus Ansah[a]

[a]Department of Planning, College of Art and Built Environment, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana; [b]Department of Planning and Development, Christian Service University College, Kumasi, Ghana

ABSTRACT

This paper examines the factors which have interacted to alter patterns of land use, crop preference and forest cover between the pre-colonial and post-colonial periods, using the multi-case study and political ecology approach in the Ashanti region, Ghana. The paper observed that changes in land use, crop preference and change in the structure of forest cover are driven by four major factors: a) economic conditions, b) state incentives, c) natural and agro-ecological conditions, d) social factors. The results point out that cocoa was the main source of livelihood for farming households in the region until the 1980s when several farmers switched to oil palm because of its perceived ecologic viability and higher economic returns. The conversion greatly altered the landscape of the region. While highlighting the difficulties posed by uncontrolled land use, crop and forest cover changes, the study concludes that interventions such as promoting sustainable agricultural practices, drought and disease-resistant crop varieties with shorter gestation periods, and environment-friendly off-farm and off-season economic activities are significant in managing and addressing the challenges that result in loss of forest cover.

KEYWORDS

Cocoa; crop preference; forest cover; land use; political ecology

Introduction

Land use and forest management remain central to achieving the United Nations' Sustainable Development Goals (SDGs). The SDGs 2 and 15 aim to ensure sustainable management of forests: (i) goal 2 seeks to end hunger, achieve food security and improved nutrition and promote sustainable agriculture; and (ii) goal 15 seeks to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and biodiversity loss (United Nations [UN], 2016). On the above, Swamy, Drazen, Johnson, and Bukoski (2018) note that forests are inextricably linked to the livelihoods of human communities from local to global scales. This is because they serve important building blocks for sustainable, safe, healthy, and equitable societies (Bukoski, Broadhead, Donato, Murdiyarso, & Gregoire, 2017). Therefore, conservation sometimes directly opposes both development and the use of natural resources (Bukoski et al., 2017; Malhi, Gardner, Goldsmith, Silman, &

CONTACT Michael O. ASIBEY asibeymichael@yahoo.com Department of Planning, College of Art and Built Environment, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

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Zelazowski, 2014). According to Seymour and Busch (2016), rapid population growth results in complex trade-offs between conservation of forests and the extraction of their resources. This, among others, presents a major challenge towards sustainable forest management and achieving the targets of the related SDGs. This calls for global attention considering the argument of Swamy et al. (2018) that forest management has both direct and indirect influence on the attainment of the SDGs.

Owing to the above, regional level land-use cover change (LUCC) research has become a major focus within environmental geography (Adjei, Buor, & Addrah, 2014; Bhawana, Tiejun, & Popular, 2017). For LUCC research to be effective and sustainable, global models need to recognize regional variability in land uses and their changes over time to promote sustainable livelihood conditions. The nexus between forest cover change and livelihood activities is critical because of the multipath nature of land cover trajectories, which are defined by their distinctive sequence of land-use stages (Aide et al., 2013; Toure et al., 2016). A given initial forest cover condition can diverge into one of a set of alternative end cover options. Furthermore, different initial or intermediate forest cover can, in turn, converge into smaller end-forest cover types, depending on the sequence of dominant livelihood activities (Toure, Stow, Clarke, & Weeks, 2018). Several factors are known to cause alteration in the regional landscape and consequently influence the sustainability of livelihood practices over time; social, ecological, cultural, physical, economic and political processes (Adjei et al., 2014; Toure et al., 2018).

Similar to other countries in sub-Saharan Africa, Ghana has over the years experienced extensive LUCC as a result of several factors. Most related social science studies in Ghana have focused on the influence of population growth on LUCC (Benza, Weeks, Stow, Lopez-Carr, & Clarke, 2016; Oduro, Ocloo, & Peprah, 2014). For instance, according to the United Nations Population Division (2017), rapid population growth (from 6 million people in 1957 to an estimated 29 million in 2017) has led to important LUCC transformations and impacted the spatial configurations of cities. Similarly, whereas Owusu and Yankson (2017) affirmed that urbanization in the largest cities is taking place at the urban periphery outside of the traditional urban core areas, Stow et al. (2016) analyzed the relationship between population growth and LUCC change in southern Ghana at the census district level between 2000 and 2010. Other studies on LUCC also emphasized loss of biological diversity through deforestation and forest degradation which threatens not only the sustainable and harmonious development of the global ecosystem but also their economic and environmental value for human sustenance (Kobayashi, 2004 cited in Awortwi, 2010; Baatuuwie, Asare, Osei, & Quaye-Ballard, 2011). There are studies showing that regional analyses of deforestation have revealed forest cover loss across broad land-use categories in the country (Baatuuwie et al., 2011; Stanturf et al., 2011).

Inasmuch as these factors are important in shaping understanding on LUCC, what is emerging from the literature is the lack of clarity and very little empirical studies on how state interventions, in particular, have altered land use and crop preferences as well as the composition of forest cover over the past decades. In addition to these interventions, other factors that could also result in changes in land use preferences, crop production patterns, and forest cover are unknown. Using the Ashanti region of Ghana as a case, this paper adopts a political ecology approach to examine the economic conditions, state incentives, natural and agro-ecological conditions, land tenure and social conditions and extent of their influence on patterns of land use, crop and forest cover change.

Agricultural interventions and implications for land use and land cover change in Ghana

From a historical narrative, the beginning of the 21st century marked a change in political leadership as well as interventions to improve the livelihoods of households in Ghana. Market-oriented policies were pursued in the year 2000, which were accompanied by various special initiatives to address economic growth and poverty reduction. The persistent high levels of foreign debt led the state to join the Highly Indebted Poor Countries (HIPC) initiative, to reduce Ghana's debt burden. In addition, the government became part of the New Economic Partnership for African Development (NEPAD) and became a signatory to the Africa Growth and Opportunity Act (AGOA) to promote sound economic management for increased productivity of the public sector, private sector growth, and sustainable livelihood opportunities for poor people in the country. The AGOA formed the context for the Ghana Poverty Reduction Strategy (GPRS I and II) programmes that focused on assisting economically vulnerable groups to engage in sustainable livelihood activities and provide social and health services.

The initiatives resulted in improvement in the country's macroeconomic performance. The average annual GDP growth was 5.1% between 2000 and 2006, and real GDP grew continuously, driven by the increased output of the agricultural sector (NDPC, 2006; (2007); NDPC, 2008). Consequently, the contribution of the agricultural sector to GDP rose to 38% due to productivity increases and favorable international prices for cocoa. The key agricultural policy during the period was framed under the President's Special Initiative (PSI). It included the promotion of oil palm cultivation by providing incentives of up to 25% in the form of hybrid seedlings and other production inputs. Cassava cultivation was also supported by financial, material and scientific support for large-scale production to supply starch to the textile industry. Non-traditional crops such as tropical vegetables, tomatoes, and fruits for export markets were also provided with incentives. Cocoa production received government support in the form of mass spraying of cocoa farms, market-based producer prices, and special input packages for cocoa farmers to rehabilitate old cocoa farms (Asante, 2012). Cocoa remained a major share of Ghana's merchandise exports, despite variations in harvest quantities and market prices; cocoa beans along with cocoa butter paste, provided between 18% and 59% of export revenue in the 2000 to 2006 period (World Trade Organisation [WTO], 2008).

The periods between 2006 and 2015 witnessed the implementation of several interventions to improve upon agricultural productivity. Ghana's GPRS I and II were launched as blueprints for the country's development to make available the necessary impetus to improve the wellbeing of Ghanaians economically, socially and politically (Government of Ghana [GoG], 1996; 2003). The strategies, set out to achieve the goals of the policies among others included: sound and sustainable management of the environment; promotion of commercial agriculture using environmentally friendly technologies; agro-based industrial expansion; and promotion of exports based on diversification and competitive advantages. The performance of macroeconomic indicators of the policies showed positive trends, with improvements in GDP and agricultural output (NDPC, 2004, 2005, 2006, 2007, 2008, 2009, 2010).

Subsequently, the Ghana Shared Growth and Development Agenda (GSGDA I) was implemented over the 2010–2013 period to address the macroeconomic and structural

challenges which limited the economy's capacity to promote sustainable improvements in the livelihoods of people. The government, among other themes, adopted the "Accelerated Agricultural Modernisation and Sustainable Natural Resource Management" as a means of improving upon agricultural productivity and growth. Assessment of the targets at the end of the framework, however, showed a decline in real GDP growth from 7.1% in 2013 to 4.0% in 2014 as well as a reduction in per capita GDP by 23% from US$1,841 in 2013 to US$1,417 in 2014 (NDPC, 2015).

In the quest to become a middle-income status country, consolidate the gains made in the development efforts and address the weakness identified in its development process, the just ended national development policy framework, the GSGDA II (2014–2017) was launched. It focused on "achieving sustained macroeconomic stability while placing the economy on a path of higher growth in order to attain an appreciable per capita income by 2020". Consequently, the priority areas for policy interventions included among others "accelerated agricultural modernization and natural resource management" (NDPC, 2013). The agricultural modernization strategy hinges on increased land under irrigation, increased mechanization, and value addition to traditional crops such as cocoa, expanding cash crop production and strengthening support to the private sector. Smith and Darko (2014) indicate that activities of such nature have the potential to improve the living conditions of smallholder farmers as well as cause great alterations in the landscape; land use, crop production, and forest cover. Adopting a political ecology approach, this paper examines the influence of government interventions on land use, crop preference, and forest cover in the Ashanti region of Ghana. Specifically, the paper investigates:

- the ways in which state incentives have redefined agricultural practices and livelihood strategies in the region; and
- the views of stakeholders on other economic and socio-ecological factors that have resulted in changes in land use, crop preference, and composition of forest cover in the region as well as implications on sustainable management efforts.

Conceptual overview of political ecology

The study adopts a political ecology approach (see Blaike and Brookfield, 1987; Robbins, 2004) to examine the processes that have shaped changes in land use, crop preference and forest cover change in the Ashanti region of Ghana. Blaike and Brookfield (1987, p. 17) describe the approach as interdisciplinary, which combines "the concerns of ecology and broadly defined political economy" to understand diverse ways of land degradation and social marginalization that are interlinked in particular regions and places. It involves examining how activities occurring at different geographical levels and hierarchies of the socio-economic organization interact with environmental processes of change to produce varied ecological landscapes and social contradictions. The approach is adopted on two grounds: (i) First, its focus on understanding environmental variability and spatial variation which provides a better understanding of the environmental, economic and socio-political processes that contribute to landscape changes in the region; and (ii) Second, its focus on examining interactions between political, economic, and environmental processes across the different spatial levels, which open up new ways of reconstructing past landscape changes through historical patterns.

The historical frame of reference extends from the late 1600s to the present and is divided into four phases, marked by important political, and economic conjunctures. The first phase, 1680 to 1807, marks the rise of the Ashanti nation-state, its political expansion, and control over the regional economy, and engagement with the trans-Atlantic slave trade until it was officially abolished in 1807 by European governments. The second phase is from 1807 to 1900, which marks the changes in the Ashanti regional economy after abolishing the slave trade, the organization of economic activity under the Ashanti rule, and the expansion of British influence in the Gold Coast. The third phase, which is from the 1900s to 1957, marks changes in economic activities and institutional regulation of land and natural resources under British colonial rule in the region until its end in 1957. The last phase, from 1957 to the present, marks the post-colonial era and examines the economic strategies, land use preferences and forest use policies pursued by governments of present-day Ghana. This fourth phase is distinguished by the events that occurred particularly in the 1980s – fiscal crisis and structural adjustment, droughts, and widespread forest fires in the central zones – which had direct effects on the sustainability of livelihood activities, cultivation practices, and land control strategies pursued by households.

To contribute to the wider understanding of this subject matter, the study focuses on the Ashanti region of Ghana, a greater part of which falls within the moist semi-deciduous rainforest zone, noted for its long-standing engagement in resource extraction and export crop production.

Materials and methods

Study setting

The Ashanti region, the third largest region in Ghana, is found in the forest agro-climatic region in the southern part of the country. It occupies 24,389km^2 (10%) of the total land area of Ghana. The zone is floristically divided into rain forest (covering 750,000 hectares) and semi-deciduous forest (covering 740,000 hectares) (Statistics, Research and Information Directorate (SRID), 2001). The zone is characterized by high rain forest interspersed with patches of mangrove forest with a large expanse of high tropical forest and semi-deciduous forests (Oppong-Anane, 2001). The growth of the vegetation is supported by favorable climatic conditions, characterized by an average daily temperature of 27°C coupled with a double maxima rainfall pattern from April – July and September – November. This pattern is, however, changing rapidly due to global warming and its consequences (Ministry of Food and Agriculture (MoFA), 2010).

The zone has a high and well-distributed annual rainfall range of 1,500 and 2,200 mm. Major staple crops grown in the region are cassava, plantain, yam, cocoyam, maize, and rice. These are grown mostly for subsistence. The most important cash crop is cocoa and other major cash crops comprise citrus and oil palm. The northeastern part of the region has vast land suitable for crop cultivation. The soil in the northeastern part of the region is suitable for cocoa, coffee, black pepper, sweet berry, ginger, citrus, cocoyam, banana, rice, sugarcane, and vegetable cultivation. The climatic conditions of the region permit successful cultivation of many annual tree and food crops. The Ashanti region was by far the top producer of cocoa beans until the mid-1960s. By the middle 1980s, the Western region

caught up with Ashanti region in cocoa bean production. At present, the Western region accounts for over 50% of Ghana's total in cocoa bean production, which is far beyond that of Ashanti region (18%) (Ministry of Environment, Science, Technology and Innovation (MESTI) and Town and Country Planning Department (TCPD), 2013). Cocoa is a shade-dependent crop which is grown under forest cover (SRID, 2001). Forest farming in the region (cultivating crops under a forest canopy which is intentionally modified or maintained to provide shade and habitat to favor growth and enhance production levels) is the predominant system for cultivating food crops. Patterns of land use, crop preference and forest cover are noted to have changed dramatically over the years, a phenomenon caused by several factors.

Methodology

Design and sampling

The study adopted a multi-case research approach to understand ongoing agricultural activities, as well as the factors that have resulted in changes in land use, crop preference and forest cover in the Ashanti region. The underlying principles of "how" and "why" type of questions (Yin, 2014) were taken into account. The study is oriented towards having an empirical inquiry that investigates a contemporary phenomenon within its real-life context in order to have a deeper understanding of the phenomenon in question.

The study population comprise farming households in six major agricultural-dominated areas of the Ashanti region (see Table 1 and Figures 1 and 2): the Bekwai area, where farmers grow a combination of cocoa, oil palm, and food crops; Manso Nkwanta, which has predominance of cocoa and food crop cultivation; Obuasi, where farmers cultivate cocoa and oil palm; Dwaben/Juaben, with oil palm and food crop cultivation; Offinso, where farmers engage in oil palm, food crop and other non-traditional export vegetable cultivation; and Mampong/Mampon, which has large tracts of mono-cropped maize, yam, cassava, and oil palm.

Due to the absence of a sampling frame of farming households, respective District Agricultural Extension Agents (DAEAs) were consulted to identify and interview

Table 1. Distribution of respondents in the sub-region of Ashanti.

Sub-Region	Number of Respondents		Land Uses
Bekwai (Amansie)	8	4	Cocoa
		1	Oil Palm
		3	Food Crop (mixed)
Manso Nkwanta	9	6	Cocoa
		3	Food Crop (mixed)
Obuasi	10	5	Cocoa
		5	Oil Palm
Dwaben/Juaben	9	6	Oil Palm
		3	Food Crop (Mixed)
Offinso	8	5	Tomato (Monocrop)
		2	Oil Palm
		1	Food Crop (Mixed)
Mampong	16	5	Maize (Monocrop)
		5	Yam Monocrop
		5	Cassava Monocrop
		1	Oil Palm
Total	**60**	**60**	

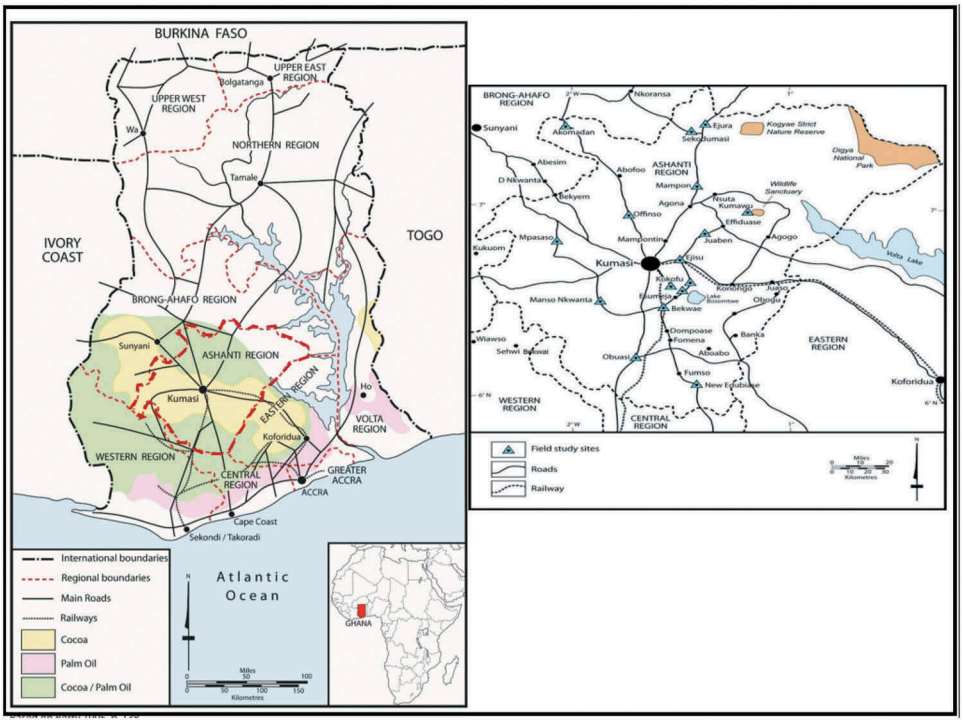

Figure 1. Geographical location of settlements visited for surveys.
Source: Ministry of Food and Agriculture, 2015

respondents in each of the six areas based on the types of crops they cultivated and the length of stay in the respective study areas (from 1980 to the present). The purposive and snowball sampling techniques were thus employed to identify the respondents for the study. A total of sixty (60) farming households engaged in a different combination of crop production were selected and interviewed across the selected areas. The units of inquiry for the study were farming household heads and in many cases, other household members were in attendance and offered comments to aid the discussions. In the absence of the head, the next of kin was interviewed for the relevant data.

Data collection tools and processes

A range of basic resource data on land, crop, and forest resources were obtained from published government economic review documents and regional and district reports (annual progress reports and field reports). Additionally, a number of published (journal or scholarly articles) and unpublished documents were reviewed for relevant data. In addition, the authors conducted personal interviews to ascertain responses to changing (market) demands, government policies and ecological conditions, as well as the perception of farmers on the effects of land and crop conversion and forest cover change in the region.

Semi-structured interviews were used to gather data on farmers' views on past and present cropping patterns and factors influencing changes in land use and crop

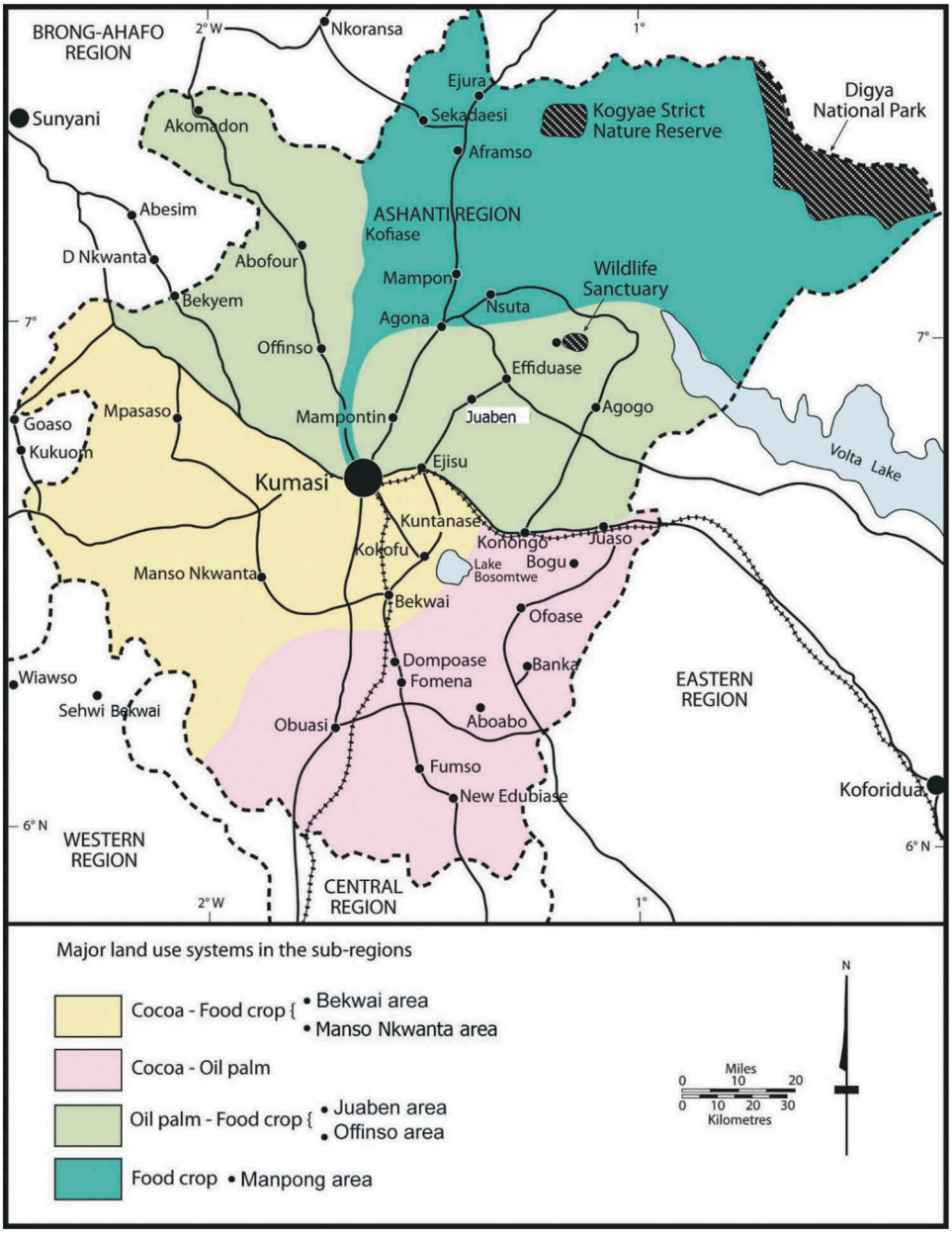

Figure: 2. Geographical distributions of major crop land uses.
Source: Ministry of Food and Agriculture, 2015

production, as well as the reasons for crop conversion. The relevant groups interviewed at the local level were the respective DAEAs and the District Agricultural Development Unit (DADU). At the regional and national levels, the relevant bodies consulted were the Forestry Commission (FC), Environmental Protection Agency (EPA) and MoFA. Data were obtained on land use systems, patterns of land conversion and preferences, and changes in forest cover over the period. In addition to the one-on-one interviews, six focus

group discussions (FGDs); one in each study area; were undertaken. The average number of participants of the FGDs was eight, which was informed by the work of Asibey, Agyeman, and Yeboah (2017). The authors ensured the representativeness of farmers cultivating the respective crops in the study areas.

In gathering relevant primary data, respondents were first asked to recall and describe the changes in cultivating major crops, and the factors that influenced changes in land use and cultivation patterns from 1980 to the present. The weakness of this approach is that an interviewee can influence the research outcome since recollecting events over such long periods is difficult. To address this inherent weakness, we consulted various scholarly articles and reports or documents from the relevant institutions to better understand and explain the phenomena. It should be emphasized that the pattern of cultivation and forest cover composition for the period before 1950, and between 1950 and 1980, were examined through extensive desk studies to better understand the events that could help the respondents recall their experiences. The major factors were classified under four themes: 1) economic, which includes profitability in terms of production costs, commodity prices, and labor cost; 2) government policy (incentives and support given for cultivation of particular crops); 3) natural events, such as droughts, decreasing soil fertility, bushfires, erratic or diminished rainfall, pest infestation or disease outbreaks; and 4) other social factors such as prestige associated with growing particular crops, and easy access to additional cultivable land.

Following on from these discussions, farmers were asked to describe the kind of crop conversions they might undertake, and the factors that would influence possible conversions. Finally, the perspective of farmers on future patterns of forest cover in the Ashanti region was obtained. Both historical analysis and field-based surveys provided deeper insights into the relationship between land use conversions, agricultural production and forest cover change. This allowed a way of advancing the debate beyond general statements regarding deforestation and focusing on a closer understanding of the dynamics of how forest cover change occurs, how farmers modify or re-organize their preferences for production as a result of market demand, government policies, and natural events, among others.

Analytical methods

We used thematic analysis and content analysis to assess the responses. The perception of farmers on factors that result in changes in land use, crop preference and forest cover was assessed under the four major themes stated earlier. A list of factors was obtained from secondary sources, following which farmers were asked to state and describe the factors that have resulted in changes in land use, crop preference, and composition of forest cover, over the period. Quotations were further used to support the assertions made by respondents. The perceptions of farmers on future patterns of forest cover in the Ashanti region were similarly assessed by asking farmers to state and explain how the identified factors could result in changes in future land use and forest cover, and indicate how they could influence the sustainability of their livelihoods, or otherwise. The analysis was done based on context, consistency, intensity, and specificity of responses to the questions.

A scale of measurement of profitability was developed to better understand how farmers make decisions about changing their land use from one crop type to the other. Farmers assessed and ranked, in order of profitability, the production of specific crops (cocoa, oil palm and commercial food crops) (see Table 6). This served as an indicator of the possible

pattern of crop changes which could be made by farmers in each sub-region. The model used for the assessment was: **Ps×R = V**. The profitability scale (Ps) had three levels: 5 (highly profitable crop); 3 (moderately profitable crop); and 1 (marginally profitable crop); '**R**' represents the 'number of respondents'; and '**V**' is the value obtained when profitability level is multiplied by the number of respondents. Based on the score obtained, farmers performed a final assessment of 'profitability' on market prices and government incentives, given the prevailing ecological conditions.

Results and discussion

Crop production patterns

Cocoa has been the primary cash crop and source of foreign earnings to Ghana's GDP since the 1950s (Essegbey & Ofori-Gyamfi, 2012; MESTI and TCPD, 2013), but has been unsustainable. Other researchers (e.g. Adomako-Sarfoh, 1971; Arhin, 1986) note that over the past decades, the Ashanti region was noted for the cultivation of cocoa until a decline in the early 1980s. This was confirmed by all farmers who indicated that the major farming activity in their respective areas before 1980 was cocoa cultivation (see Table 2) and remained the dominant crop until the 1980s, after which it declined significantly in areas north of Kumasi. The decline was attributed to the emergent need to cultivate oil palm, which was deemed economically lucrative and viable. This was confirmed during interactions with the DAEAs and from the review of relevant reports (particularly annual progress reports of the DADU). This finding is consistent with earlier studies which showed that the production of oil palm, over the years, has and continues to generate enough revenue to aid the development of an economy (Abdullah & Sulaiman, 2013; Bajpai, 2015; Franco, Shaker, Kalubi, & Hostettler, 2017 in sub-Saharan Africa; Ng, Rahman, & Koh, 2014 in Nigeria; United Nations Development Programme [UNDP], 2015 in Indonesia). Around the Manso-Nkwanta and Obuasi areas, interview findings showed that farmers began to combine and/or replace the cultivation of cocoa with commercial food crops (yam, plantain, cassava, and cocoyam) and oil palm. FGD with farmers in Manso-Nkwanta revealed that:

> "*most of the oil palm plantation before 1950 was based on harvesting in secondary forest and farms and did not involve production from dedicated oil palm plantations .. households' harvesting of oil palm from such areas declined during the 1960s and 1970s and began to be replaced by oil palm plantations around Fumso and Juaben…*".

Widespread cultivation of oil palm began during the 1980s and has since spread across the south-eastern parts of the region and across most of the areas lying between Mampong

Table 2. Farmers' responses on major crops cultivated over the time period.

	1980–1995		1995–2010		2010–2015	
Time Period/Crop	n*	%	n*	%	n*	%
Cocoa	55	92	50	83	50	83
Oil palm	36	60	50	83	50	83
Food crop	60	100	60	100	60	100
Other crops	20	33	5	8	5	8

*Where n = number of respondents who reported the crop as a major crop.

and Kumasi (See Figure 2). All farmers indicated that subsistence production of food crops such as plantain, cocoyam, yam, and cassava has always occurred over the period. Discussions with the DADU and DAEAs revealed that before the 1950s, commercially oriented food crop production existed especially in the north-eastern parts of the region. Commercial food crop cultivation had steadily increased over the years and almost every part of the region had areas devoted to commercial production of traditional food crops as well as non-traditional crops such as fruits (such as *Musa paradisicum [plantain], Artocarpus integra [jackfruit], Citrus limonium [lemon], Magnifera indica [mango], and Citrus aurantium [bitter orange]*) and vegetables (mainly *mainly Lactuca sativa [lettuce], Xanthosoma sagittifolium L. [arrowleaf elephant ear], Allium cepa [onion], Brassica oleracea var. capitata L. [cabbage], Capsicum annum [pepper], Cucumis sativus [cucumber] and Lycopersicon esculentum [tomato]*) for export markets (See Table 2). Additionally, maize cultivation, which was restricted to the north-eastern parts of Ashanti until the 1980s spread southwards to the oil palm cultivated areas between Kumasi and Mampong during the 1900s and on to the present. The region thus witnessed changes in the patterns of crop production over the period. The foregoing implies that the range of livelihood support provided by forests underpins economic growth, poverty alleviation, and sustainability of the environment.

Factors influencing patterns of crop production

Discussions with farmers showed that economic factors were predominant in influencing farmers' decision to cultivate a particular type of crop (See Table 3). Respondents indicated that cocoa was an extremely profitable crop before the 1950s and well into the 1960s. Discussions with the DADU showed that the profitability of cocoa declined during the 1970s and 1980s due to poor producer prices, which influenced cocoa farmers to turn to other commercial crops such as oil palm for increasing incomes. Mikell (1989), Okali (1983) and Takane (2002) note that these periods were difficult times due to high inflation rates coupled with poor cocoa producer prices. Many farmers hence concentrated on food crop production to support their families. During the 1990s and 2000 onwards, the profitability of cocoa, oil palm, and commercial food crops improved (Breisinger, Diao, & Kolavalli, 2007). Some farming households hence invested more resources into cultivating these crops as well as fruits and vegetables for export.

Government incentives were regarded as less important before the 1960s. The State provided little incentives or support to farmers during these periods; where even

Table 3. Perception of farmers on factors influencing past crop production, N = 60.

	1980–1995		1995–2010		2010–2015	
Time period/Factors	N	%	N	%	N	%
Profitability	25	42	28	47	38	63
Government incentives	10	17	6	10	17	29
Natural Events	20	33	21	35	2	3
Other factors	5	8	5	8	3	5
TOTAL	**60**	**100**	**60**	**100**	**60**	**100**

º *Profitability* (Economic): – market commodity price; production costs, labor costs.
º *Government incentives* (Government policy): – Government support services; producer subsidies.
º *Natural events* (Ecological): – Drought; fires; poor rainfall; pest infestations, other climatic events.
º *Other factors*: – social prestige; easy access to forest land; suitable land

government price support for cocoa was deemed very poor (Adomako-Sarfoh, 1971). However, during the 1970s, the government's '*Operation Feed Yourself*' Programme provided incentives to farmers to expand food crop production, and to also take up oil palm cultivation (Khor, 2006). Respondents noted that since the 1990s, the government's support services to cocoa farmers and for commercial food crops had helped improve farming activities.

Respondents (farming households and institutions) indicated that gaining access to secondary forest areas for cultivation was easier under the family land system before the 1950s, but changed over time. Until the 1980s, there was high *social prestige* in growing cocoa because of its profitability and income generating capacity (Breisinger et al., 2007; Takane, 2002), which allowed farmers to invest in their ward's education and improve their social status. Since the 1980s, cocoa cultivation no longer had the prime social prestige because oil palm and large-scale food crop cultivation had become profitable. These factors adversely affected the sustainability of cocoa production and management of lands.

Government incentives in the form of production inputs (financial commitment, material, and scientific support) and hybrid seedlings were also noted to have significantly affected crop profitability, as similarly indicated in other works (see NDPC, 2010, 2013; Smith & Darko, 2014). Farmers, who benefited from these incentives were motivated to engage in large-scale production at relatively cheaper costs. These were deemed necessary in promoting sustainable agricultural production and livelihoods of farming households. These resulted in increased production, diversification of economic activities, change in the regional landscape and the natural environment and improvement in the general wellbeing of farming households.

Natural events also contributed significantly to crop production within the ecological landscape. The major natural event that affected cocoa production, specifically before 1950, was the swollen shoot disease (Benneh, 1973), which was confirmed by the DAEAs. The droughts of 1973/74 and 1983/84 and accompanying bushfires that plagued the country were also identified to be major influential natural events that altered cropping patterns (see Table 4). After the drought and bushfires, many farmers converted some of their damaged cocoa lands to expand food crop cultivation. Whereas many farmers in the northern part of the region continued to convert their cocoa farms to food cultivation after the 1983/84 drought and extensive bushfires, farmers in the southern sub-regions converted some of their cocoa plots to oil palm cultivation. Almost every respondent mentioned bushfires, unseasonable rains and longer drought as the major natural factors that influenced crop production (see Table 4). Many indicated that after the drought and bushfires, farmers in the northern sub-regions such as Offinso and Juaben shifted to the annual cultivation of savannah crops such as yam and maize. In the southern sub-regions

Table 4. Natural events that influence crop production in the past, N = 60.

Events	Number	%
Bushfires	58	97
Unseasonal rains	55	92
Longer drought	43	72
Reduction in stream size	32	53
Reduction of secondary forest area	27	45

however, cassava and plantain, along with oil palm and fruit crops (bananas and citrus) increased alongside cocoa.

Farmers who were engaged in cocoa production further indicated that secondary forests had reduced since the 1980s and that there were almost none left for starting new cocoa plantations. Even older cocoa plots, which had developed significant secondary forest cover over several decades, had been converted to oil palm or food crop production (see Figure 3). According to the DAEAs and DADU, large-scale oil palm and intensive food crop cultivation did not allow for long fallow periods or emergence of sufficient secondary forest cover because these crops do not thrive with tree cover like cocoa. Nonetheless, farmers mentioned that the shift to oil palm and vegetable crops had increased the amount of work involved in clearing bushes and weeding compared to cocoa and subsistence food crop cultivation. A major reason for the total absence of trees on all farms was noted to be the historical separation of timber and crops tenure. This finding has both positive and adverse influence on land use, soil and forest cover as well as SDG 15.2 target for promoting the implementation of sustainable management of all types of forests, restoring degraded forests and substantially increasing afforestation and reforestation globally. This implies the need to build awareness on the importance of sustainable management practices to restore degraded forests and enhance soil conditions for future crop cultivation.

Farmers' perception of forest cover change

Forest cover is significant to the protection of waterbodies, flora and fauna (Bhawana et al., 2017; Ekpe, Hinkle, Quigley, & Owusu, 2014; UN, 2016), and a key driver to reducing greenhouse gas effects (Boafo, 2013; International Electrotechnical Commission [IEC], 2013). Hence, the depletion of forest cover has an adverse effect on the ecological landscape. The study revealed that there were significant areas of fairly dense secondary forest cover in the Ashanti region before 1950. Interviews with all relevant institutions showed that forest farming (cultivating crops under a forest canopy which is intentionally modified or maintained to provide shade and habitat to favor growth and enhance production levels) was the predominant system for cultivating food crops. Cocoa farming fit well within this system and existing climatic conditions. However, after 1950, harvesting of commercial timber was promoted, which culminated into the reduction of secondary forest cover (off-reserve areas) in the region, which was reiterated by the FC. Cocoa farming in the region thus resulted in the depletion of dense forest cover as showed in other studies (Food and Agricultural Organisation [FAO], 2006; IEC, 2013). According to Perera (2001), clearing of land for tree crop production destroys secondary forest cover; thus, the need for sustainable management efforts. During the 1960s and 1970s, the widespread cultivation of cocoa resulted in food shortages; which became precarious during the 1973/74 drought. This led farmers to increase food crop production.

According to the DAEAs, the launching of the '*Operation Feed Yourself Programme*' in 1972 motivated farmers to devote more of their lands to food crop cultivation. Farm laborers from regions north of the region who worked as caretakers in cocoa plantations began to cultivate maize and cassava. Areas outside cocoa plantations, used for food crop production, gradually developed patches of 'open' secondary forest and savannah woodlands. Farmers thus reported a drastic change in the landscape during

the 1980s, which was confirmed by the relevant institutions covered by the study. The general economic situation of the whole country was bad with many inhabitants in financial difficulties (Arhin, 1988; Mikell, 1984). Hence, several natural areas were destroyed by small-scale illegal mining and intensive harvesting of trees for timber and fuelwood.

Furthermore, the long drought and bushfires during the 1980s were further noted to have accounted for the destruction of secondary forest cover. Farmers who could not afford to rehabilitate their cocoa farms shifted to oil palm production. According to them, the conversion resulted in the increase of weedy bush (such as *Chromolaena odorata* as described by Awanyo, 2001) and unwanted tree species, and tall savannah-type grasses. Forest cover change between 1990 and 2015 has, therefore, continued the trend set during the 1980s. The study identified that the dense secondary forest cover that existed well before 1950 has since changed to very small patches of forest with more savannah woodlands and grasslands (see Figure 3(a–c). The continuous and intensive cultivation of food crops, especially in the northern parts has led to a substantial reduction in the density of tree cover.

Available data show that the most obvious land cover change in Ghana is the major increase in agricultural land in all regions of Ghana. The rate of agricultural expansion is argued to be unprecedented in the country's history, overrunning many of the other land cover types, including Ghana's savannas, woodlands, and forests. From 1975 to 2000, agricultural lands expanded from 13% to 28% of Ghana's total area (Ministry of Environment, Science, Technology and Innovation (MESTI) and Town and Country Planning Department (TCPD), 2013). In just the years from 2000 to 2013, agriculture continued to expand rapidly, reaching 32% of Ghana's land area. According to the FC, savanna areas in Ghana experienced a large loss, from about 51% to 40% of the total land area from 1975 to 2013.

Discussion with the DAEAs and FC revealed that degradation of forests was another important land cover change in Ghana. The forest class (represented primarily by Ghana's dense evergreen rainforest and moist-deciduous forest) shows a small decline in area; a reduction of 5% (from about 16,400 km^2 in 1975 to 15,500km^2 in 2000). This decline accelerated rapidly between 2000 and 2013, as forests were reduced by an additional 20% due to urbanization and intense human activities (Oduro et al., 2014; Toure et al., 2018). The degraded forest, which occurs mainly in the off-reserve areas, represents a vegetation type that was derived from the dense and deciduous forests, modified by human activity. Also, the traditional slash-and-burn method of agriculture, logging, annual wildfires, and open cast mining are the major disturbing factors that have diminished vegetation extent and composition in the southern ecoregions (Toure et al., 2016). Degraded forests continued to decrease in area, losing 17% of their cover between 1975 and 2013. The expansion of cocoa farms, other crops, and fallow lands represents the primary driver of the decline in the degraded forest area. The foregoing shows a significant decline of 25% of forests over the 38-year period. Hence, Ghana is continuing to lose its forest resources at an unsustainable rate.

According to the FC and DAEAs, the efforts of successive governments to address deforestation have yielded only limited successes, primarily because many of the initiatives were misguided and/or failed to deal with deforestation as a complex, dynamic and

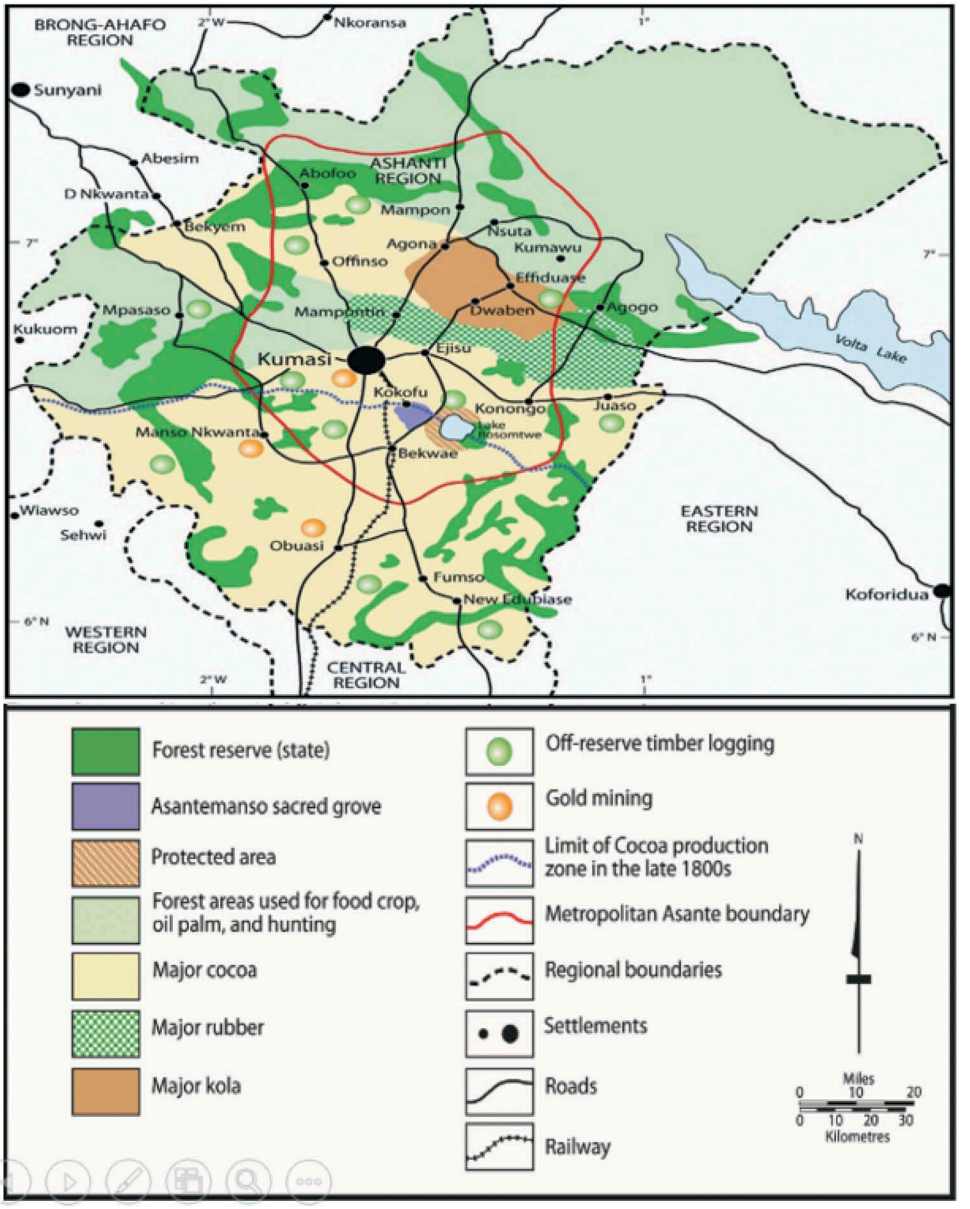

Figure 3a. Forest cover and land use in the Ashanti region, 1900–1957.
Source: Ministry of Food and Agriculture, 2015

interlinked process. In addition, attempts to address deforestation have stalled due to lack of collaborations between stakeholders and policymakers (Boafo, 2013). A more effective approach will therefore require an extensive inclusion of the different stakeholders, good cooperation between the stakeholder groups, including the integration of sustainable livelihood activities into national forestry policies.

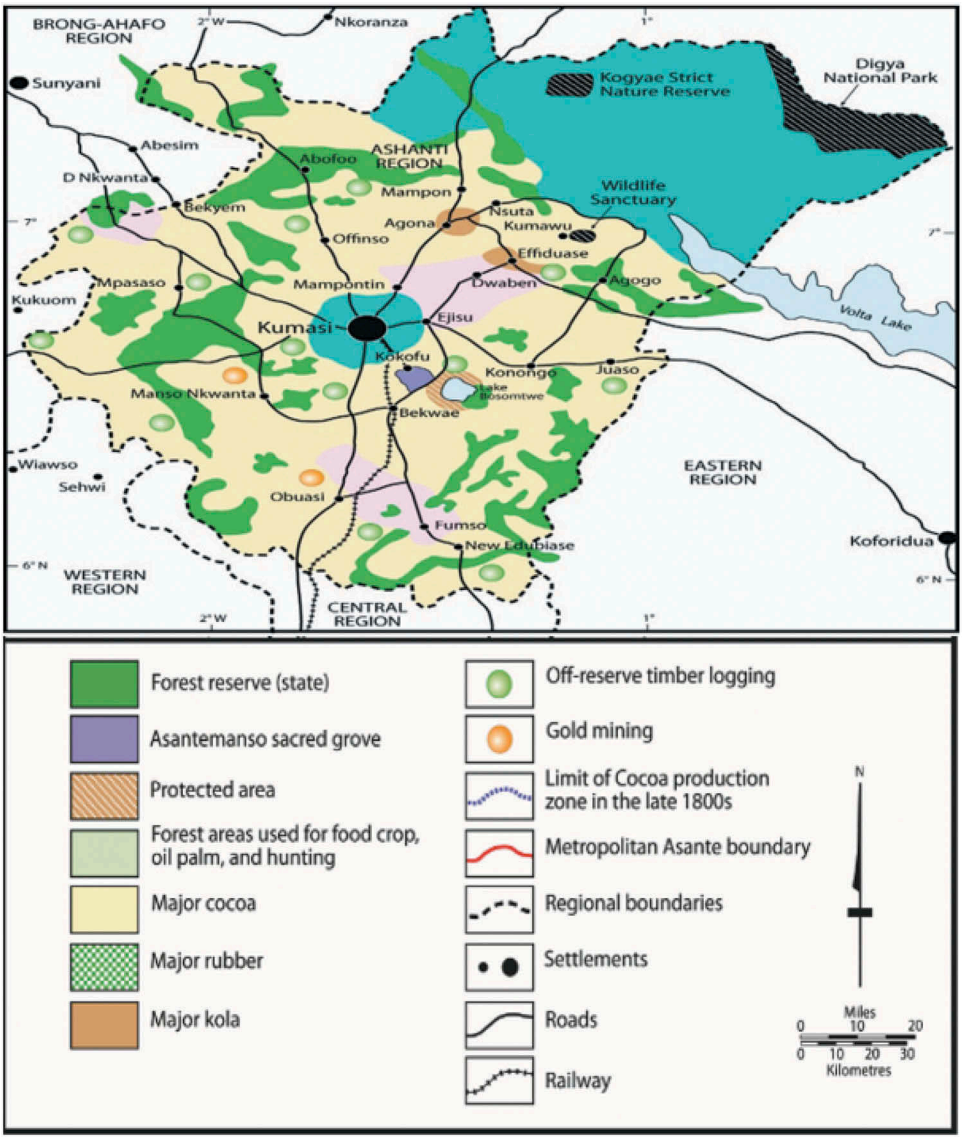

Figure 3b. Forest cover and land use in the Ashanti region, 1957–1983.
Source: Ministry of Food and Agriculture, 2015

Preference for cultivating current crops

Approximately 6 out of 10 households involved in cocoa production have been in the activity for over 25 years, while those in oil palm and food crop production have been involved for between 10 and 15 years. Farmers discussed the factors influencing their preference for the particular mix of crop production. Profitability of crops served as enough motivation for farming households to engage in large-scale crop production; which however meant clearing farmlands and cultivating at the fringes and inside forests.

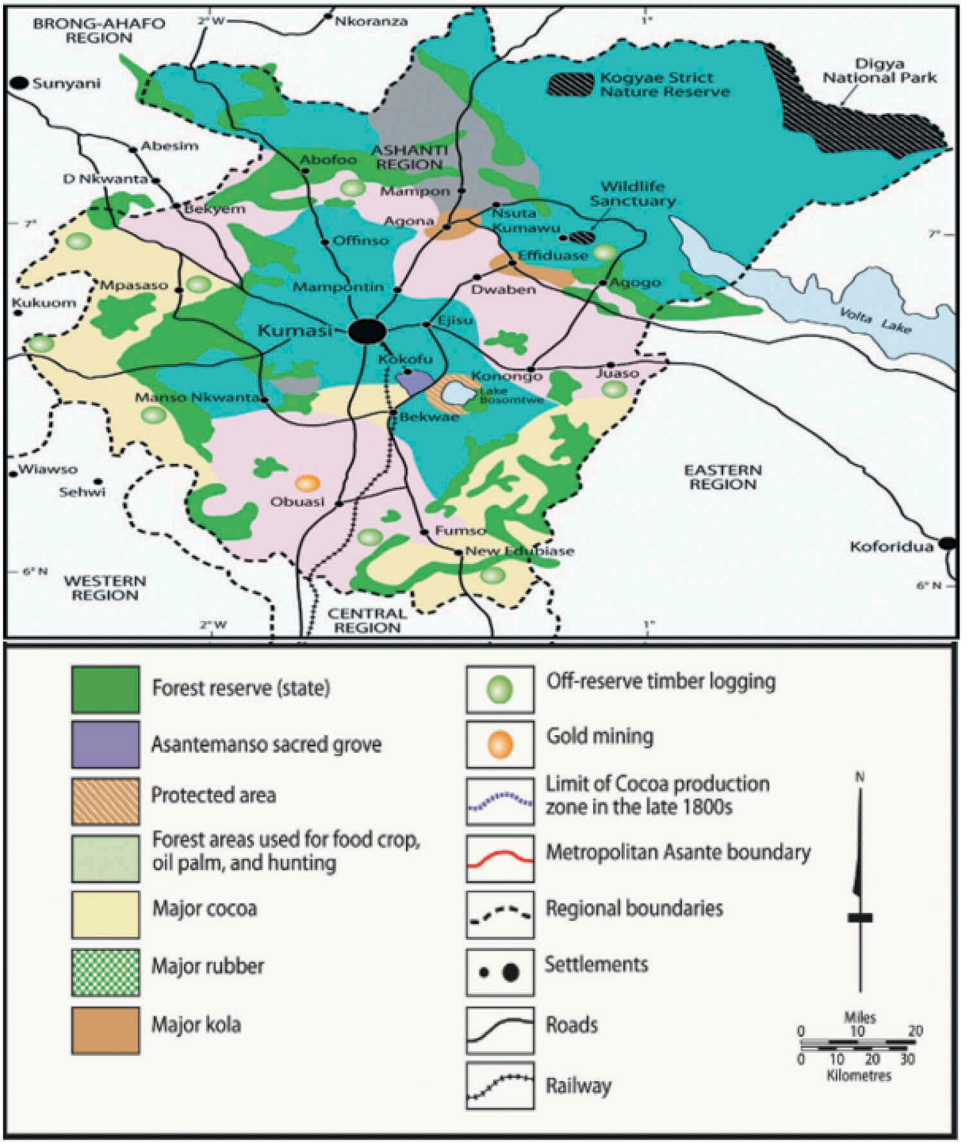

Figure 3c. Forest cover and land use in the Ashanti region, 1983–2000.
Source: Ministry of Food and Agriculture, 2015

This greatly altered the regional landscape (Finegan, 1992; Perera, 2001). Additionally, government support under the Presidents' Special Initiatives (PSI) also played an important role in farmer's preference for crop mix. The PSI was introduced in mid-2001 as an opportunity to create a 'Golden Age of Business' stimulated by public–private partnerships. It was a response to the country's continuous dependence on a few export commodities (mainly cocoa and gold) and international aid to achieve a more sustainable economy by employing available abundant natural resources to diversify the economy, increase the speed of development and achieve more equitable growth (Asante, 2012). The

PSI however came to a halt by the end of 2007 due to implementation, institutional and financial challenges (Asante, 2012).

Farmers engaged in cocoa farming indicated that improvement in economic incentives (increase in the producer price of cocoa since 1985) encouraged them to rehabilitate old cocoa farms to take advantage of better commodity prices. The then government's initiatives such as mass spraying of cocoa trees, rehabilitation of roads in cocoa growing areas, and special packages for cocoa farmers such as scholarships for their children and best cocoa farmer awards; also significantly stimulated production. Discussants in a FGD at Obuasi indicated that:

> *"…. these measures added to the social prestige that has long been associated with the cocoa industry, i.e. cocoa farmers are most respected in societies because they contributed significantly to the GDP and were able to provide good quality education for their children. The main concerns regarding natural factors for cocoa production are however the erratic rains and the reduction in long fallow in the off-reserve and secondary forest areas, both of which affect the expansion of cocoa farming".*

Oil palm and commercial food crop producers also indicated that both profitability and government incentives have been crucial determinants of their decision to cultivate the crops. One respondent from Juaben remarked that:

> "*the PSI for oil palm, cassava, and starch production were extremely important factors ever since I took up farming*".

Discussants in Bekwai reiterated that:

> "*The building of feeder roads and rehabilitation of regional road networks under the PSI improved profitability as it has increased the number of middle-women traders coming to their villages to purchase oil palm fruits and food crops".*

Respondents involved in oil palm and food crop cultivation also mentioned that natural factors such as disease and pest infestations have not been problematic because of state's provision of pest and disease resistant hybrid seedlings, which corroborates the assertion of confirming similar findings of Smith and Darko (2014). The major challenge was however reported to be the erratic nature of rainfall pattern coupled with the unavailability of irrigation systems. Farmers cultivating vegetables stated that erratic rains (irregular and unpredictable rainfall for corp production) had an adverse impact on stream size and could cause problems for people cultivating near streams.

> "…al*though there have not been any major natural events such as a drought or bushfire, the rains do not come normally as expected, and this sometimes affects crop production..*" remarked by a respondent.

Interviews with farmers further showed that increased competition among traders led to offers of higher prices for farmers than before. This provided the necessary economic incentives to continue producing these crops. Unlike before, farmers reported that the rural banks now offered loans to small farmer groups, which acted as a catalyst to expand crop production. About 40% of the farmers reported that they had taken loans from rural banks to expand their production.

Land use and tenure patterns and sub-regional variations

The right to own land and tenure arrangements have implications for applying and implementing state interventions (Asumadu, 2003; Lawry et al., 2016). Land tenure arrangements were revealed to be major contributory factors to crop production patterns and land use preferences. The basic principle in most communities in Ghana is that ownership, tenure arrangements, and use are purely customary and are controlled by the traditional authority (Amoako & Adom-Asamoah, 2018). In other words, ownership to land as well as its utilization does not rest on the developer exercising brute force, nor providing evidence of rights sanctioned or guaranteed by the government or state apparatus. Ownership to and utilization of land rather depend on the principle of acknowledging that land is the legitimate property of local communities, where rules on the acquisition and transmission of these rights are explicit.

Farmers were thus asked to describe the land tenure arrangements in their farm-based activities, and how these affected production and land use patterns in their respective sub-regions. All respondents indicated that they had a combination of family land (*de facto* freehold), leasing and share-cropping arrangements. Most cocoa farmers maintained freehold plots but also continued to have *abusa* (breaking into three (3) or 2:1 or 1/3) share-cropping agreement with caretakers. Approximately 22% of the farmers acquired lands from other farmers on either leases under 'land-plus-crop' sharing system or through outright purchase. The land-plus-crop sharing system has become common among farmers involved in cultivating tree crops such as cocoa and oil palm. Under this tenancy agreement, the tenant cultivated the land for a number of years, using their own resources until trees reached their fruit-bearing stage. The farm was then shared between the tenant and the landowner on a 50:50 *or abunu-like* basis. This tenure system was deemed attractive to both landowners and prospective caretaker farmers because it ensured longer-term security for the tenant and the landowner, where each had a new tree crop farm(s) and a steady source of income. The implication of the foregoing is that the tenure arrangement system has a significant influence on land use and crop preference since the motivation to engage in farming or use of land lies in the type of agreement between the caretaker and owner of the land (Lawry et al., 2016).

Assessing the profitability of crops

In order to gain a better understanding of how farmers make decisions about changing their land use from one crop type to another, the authors asked farmers to assess and rank, in order of profitability; the production of cocoa, oil palm, and commercial food crops. Based on their responses, a scale of measurement of profitability was developed as earlier indicated. The results showed that the possible land use conversion in the Bekwai sub-region, based on profitability, may be from cocoa to commercial food crops (see Table 5). In this context, farmers assessed 'profitability' in terms of both market prices and government incentives, given the prevailing ecological conditions.

In the Bekwai, Manso Nkwanta, Offinso, and Mampong sub-regions, it was revealed that it was more profitable to engage in commercial food crop production, while the cultivation of oil palm was more profitable in the Obuasi and Juaben sub-regions. The difference between Bekwai and Manso Nkwanta sub-regions and the Mampong and

Table 5. Farmers' response on potential crop conversion based on profitability.

		Cocoa				Oil Palm				Food Crop				
		Profitability Scale (Ps)				Profitability Scale (Ps)				Profitability Scale (Ps)				
Crop/Sub-region	Number of Respondents (R)	5	3	1	Ps×R = V	5	3	1	Ps×R = V	5	3	1	Ps×R = V	Possible land use change based on profitability
Bekwai	8	4	2	2	**28**	3	2	3	**24**	5	3	–	**34**	Cocoa to food crop
Manso-Nkwanta	9	5	1	3	**31**	2	5	2	**27**	7	1	1	**39**	Cocoa to food crop
Obuasi	10	5	4	1	**38**	6	4	–	**42**	2	7	1	**31**	Cocoa to oil palm
Juaben	9	1	8	–	**29**	7	1	1	**39**	5	4	–	**36**	Cocoa to oil palm
Offinso	8	–	3	5	**14**	3	4	1	**28**	8	–	–	**45**	Cocoa to food crop
Mampong	16	1	9	5	**37**	3	7	6	**42**	11	3	3	**67**	Cocoa to food crop
TOTAL	**60**													

*__Measurement of Profitability Scale (Ps)__: highly profitable-5; moderately profitable-3; marginally profitable-1; R = number of respondents; V = value

Offinso sub-regions is that the former two are considered part of the moist semi-deciduous forest zone, and have been major tree crop producing areas; while the latter two sub-regions form part of the forest-savannah transition zone, and engaged largely in the production of commercial food crops. It could thus be implied that none of the respondents in the sub-regions deemed current cocoa cultivation profitable and so would convert from cultivating cocoa (which has been the major crop produced over the years) to either oil palm or food crop cultivation. The study, premised on the foregoing, sought to further identify and assess factors that could influence crop conversion. Table 6 presents a summary of the weights assigned by respondents to the factors that might influence them to change from the production of one major crop to another.

For farmers in cocoa production, the potential change is likely to be towards oil palm. This shift is mainly due to the immediate profits to be obtained from crop production (with their shorter gestation periods), and support from the government under its economic diversification policy and promotion of non-traditional crop exports. Conversion from cocoa to oil palm production is also deemed an attractive option because oil palm now has an established and ready market with the pharmaceutical, cosmetics and edible oils manufacturing companies and has also become an important export commodity (Asibey, Yeboah, & Adabor, 2018). Under the PSI, oil palm growers were offered hybrid seedlings and other production inputs of up to 25% to cultivate oil palm. The natural factors influencing potential conversion from cocoa to either oil palm or commercial food crops are that these are less likely to suffer long-term damage by bush fires since they are more resistant to fires than cocoa. Farmers noted that the reduction in off-reserve forests makes it difficult to expand cocoa cultivation, but would however not be a problem with regards to converting cocoa to oil palm or food crop farms.

Respondents in Bekwai, Manso-Nkwanta, Juaben, and Offinso stated that market prices for the tree crops and on continuing government support were the major determinants of the possible conversion of commercial food crops to tree crops such as oil palm or cocoa. Discussions with farmers, DAEAs, and officials of the FC revealed that this option was still attractive and relevant to farmers who regard tree crops as providing long-term and sustainable financial security and support in their old age. However, farmers from the Offinso and Mampong areas considered it viable to reconvert their commercial food crop areas to cocoa or oil palm. According to the respondents, the agro-ecological conditions in their areas had become more conducive for food crop cultivation.

Lastly, respondents cultivating oil palm stated that it would not be profitable to make such a shift given the current economic policy of the government and ecological conditions. They pointed out that setting aside profitability and government incentives, the

Table 6. Factors influencing potential crop conversion, N = 60.

	Profitability		Government Incentives		Natural Events	
Factors Influencing Crop Conversion	n*	%	n*	%	n*	%
Cocoa to Oil Palm	35	58	15	25	60	100
Cocoa to Food Crop	40	67	15	25	60	100
Oil Palm to Cocoa	–	NP	–	NR	–	–
Oil Palm to Food Crop	–	NP	–	NC	–	–
Food Crop to Cocoa	40	67	10	17	60	100
Food Crop to Oil Palm	45	75	10	17	60	100

NP = Not Profitable; NR = Not Realistic; NC = Not Conducive
*Where n = number of respondents who reported the crop as a major crop.

ecological conditions in oil palm fields would not be conducive for cocoa or food production. This is because old oil palm fields require a substantial amount of investment in soil improvement through manuring, mulching, and fallowing to prepare the land for cultivating cocoa or commercial food crops (Asibey et al., 2018).

Conclusion

Considering the global call to ensure the conservation, restoration and sustainable use of forests as well as promoting sustainable management of all types of forests, halting deforestation and restoring degraded forests (UN, 2016), this paper sought to examine the factors which have interacted to alter patterns of land use, crop preference and forest cover between the pre-colonial and post-colonial periods, using the multi-case study and political ecology approach in the Ashanti region, Ghana. Despite the many policies, plans, and programmes aimed at managing land use and forest cover, findings from this study show marginal success. Four key factors were revealed to have greatly altered the structure of the forest cover as well as patterns of land use and crop preferences in different ways across the Ashanti region: (i) profitability of crops; (ii) government support or incentives; (iii) natural events such as diseases, drought and bushfires, among others; and (iv) other social factors such as prestige associated with growing particular crops, and easy access to additional cultivable land.

Findings from the study further showed that farming households who took up cocoa cultivation from the early 1900s onwards regarded it as a tree crop, appropriate for the agro-ecological conditions, compatible with their system of forest farming, and providing good economic returns for improving the household situation in the immediate term and also a source of long-term security of income for their old age. Cocoa farmers were reluctant to convert to other crops even when there were downturns in prices during the 1960s and difficult economic conditions in the 1970s. Although government producer prices were low and incomes of cocoa farmers declined, cocoa cultivation was still regarded with prestige and as the backbone of the country's economy. It was only until the 1980s and 1990s that farmers began to shift from cocoa to cultivating other crops. After the long spell of drought in the early 1980s and subsequent bushfires, extensive areas of forest and cocoa farms were destroyed. The economic and agro-ecological conditions in the aftermath of the bushfires were such that most farmers had little choice but gradually convert their cocoa farms to food crop and/or oil palm production. The study further showed that the growing economic and agro-ecological conditions have greatly altered the structure of the forest cover as well as patterns of land use and crop preferences in different ways across the Ashanti region. Forest farming for the cultivation of cocoa and food crops are no longer economically viable due to changes in land and soil conditions.

The declining economic situation of the country resulted in the loss of natural habitats which were destroyed by small-scale illegal mining, intensive harvesting of trees for timber and fuelwood. Economic factors, natural events, and government policies were revealed to result in the development of patches of 'open' secondary forest and savannah woodlands. This further resulted in a drastic change in the landscape. Most importantly, natural events such as drought, fires, erratic rainfall, and pest infestations; also destroyed crops and large tract of lands and forests, causing changes in the landscape. Also, traditional and

unsustainable practices such as the slash-and-burn method of agriculture were noted to have contributed to the diminished vegetation extent and composition in the southern ecoregions.

Premised on the above, the study calls for interventions such as: promoting bushfire management practices, promoting sustainable agricultural practices, promoting drought and disease-resistant crop varieties with shorter gestation periods, promoting of environment-friendly off-farm and off-season economic activities, restoring the forest cover, effecting institutional change to mainstream environmental and climate change concerns in all farming activities and investing in research and development. These are significant in managing and addressing the challenges that result in loss of forest cover. Lastly, the study suggests the need to mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to advance such management, including for conservation and reforestation.

Premised on the above findings, the study concludes that efficient and sustainable management systems will occur when conscious attempts are made to understand and appreciate the factors and extent of their influence on patterns of land use, crop and forest cover change towards attaining the SDGs. Also, prospects of ensuring sustainable forest and land use management are achievable if the key challenges revealed by the study are addressed and the most sustainable approach adopted in improving upon agricultural practices.

ORCID

Michael O. Asibey http://orcid.org/0000-0002-5534-2695

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