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SAVANNA PRIMARY LIVELIHOODS AT THE EDGE OF LAND DEGRADATION: LINKAGES AND IMPACTS IN GHANA

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ABSTRACT: This paper examines the complex linkages and impacts of land degradation and primary livelihood activities in Ghana, specifically the Talensi District. Though a global challenge, land degradation is a major concern in the District. This is because the processes of land degradation are closely related with the operation of primary activities, which are livelihood sources for people in the District. The study explored the type of livelihood activities affecting land degradation and the impact of land degradation on these activities in that complex interrelationship. Based on the nature of the study, a mixed research strategy was employed in the gathering, analysis and presentation of data. A sample of 150 respondents were randomly sampled and issued with structured questionnaire and semi-structured interview guide for collecting data. Participant observations were also conducted and official statistical data analyzed. The data analysis and presentation involved both inferential statistics and qualitative interpretations of field data. The research findings indicate that agriculture; hunting; illegal mining and wood fuel production relate with the processes of land degradation. Crop farming exhibits a strong interrelationship with land degradation because it is the major livelihood of people in the District. It is argued, that, land degradation has caused low crop yields because of loss of soil fertility. The impact analysis therefore indicates that, there is 'enhanced degradation' of land because of people's struggle to meet their livelihood sources affected by land degradation.

KEYWORDS: Land; Primary; Interrelationships; Agriculture; Perception; Sustainability; Savanna

1 INTRODUCTION

Sound and sustainable environmental management is one of the greatest quest humanity in this century [1]. This concern has become paramount in relation to the management of land because of its contribution to food production, preservation of biodiversity, facilitating the natural management of water systems and acting as a carbon store [2]. However, land degradation has threatened environmental management and the role of land as a vital resource environmental resource for sustainable development of livelihoods worldwide.

It is known that the phenomenon has substantially affected quality and quantity of land in 80 countries on all continents, except Antarctica, and it is especially serious in Africa where 36 countries face dry land degradation or desertification [3]. In a different assessment, the UNCCD indicates that over 250 million people are directly affected by land degradation while additionally some one billion people in over 100 countries are at risk with most of these including many of the world's poorest, most marginalized, and politically weak citizens [4]. The latest estimates by [5] and [6] indicate that 12 million hectares of global lands are transformed into new man-made deserts every year and that one quarter of the world's agricultural land is highly degraded irreversibly.

The impacts from land degradation manifests in various dimension namely desertification, soil erosion, secondary salinization and water logging [7], [8]. But to begin with, it is important to underscore what land degradation is. The scientific literature points out that, land degradation is complex and variedly understood. This is connected with the debate amongst ecologists, agronomists and economists about the 'severity, prediction and impact' of land degradation [9]. It may also be linked with the accession that the understanding of all environmental problems or challenges is complex [10].

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That notwithstanding, [11] define it as a temporary or permanent decline in productive capacity of the land, or its potential for environmental management. In a related sense, [12] see land degradation as an impairment of natural quality of soil component of any ecosystem and this is caused by one or more combination of human induced processes acting upon the land.

Even though the definition by [12] fails to capture the role of natural agents in facilitating land degradation, it is imperative to state that, focus is on human activities because there is an increased and continual recognition of human footprints on land and other natural resources across the globe [13]. Though, the dominant role played by human activities in land degradation is undoubtedly questioned, it must be noted that the processes are broad and complex and it is necessary to examine the various ramifications.

Research and policy over the years in this regard have pointed out that it is not uncommon to presume increased population as the major driver of anthropogenic land degradation. Though there is evidence and cases of positive relationships between population growth and tree degradation [14], such presumptions posit land degradation in the context of Malthusian theory, which argues increased population as the reason for the demise of natural resource [1].

But it is necessary to underscore that increased population density does not necessarily lead to land degradation but it is what the population does to the land that determines the extent of degradation [4] [9]. According to [15] and [14] changing economic activities and opportunities have become source(s) of land degradation and this affects the growth and development of local, national and global economies.

It needs to be highlighted that it is not just the operation of these economic activities per say but the "nature" of their operations. For instance, while agriculture does not necessarily lead to deforestation but how it is operated may lead to deforestation. This is because the impact of agricultural development as a cause of deforestation is tied with subsistent-oriented slash-and-bush cultivation, which involves cutting down of trees for farm lands [16].

According to [17], social and environmental conflicts, population growth, increasing urbanization and industrialization are also known to have accounted for the loss of land, forests and woodlands especially in the developing countries. And these conflicts are often regarding issues on the extent and state of ownership by local communities and formal state institutions. The UN Millennium Project, 2005a also explain that demographic change is the major driver of land cover change: its primary and most direct impact is through opening new land for agricultural, settlement and infrastructural development [18].

Apart from the pronounced impact of these economic and social drivers on land degradation, the impact from natural factors at global, national and local scales cannot be underestimated. For instance, natural forest fires are known to have influenced the state and conditions that affect the resilience of land and its related resources for sustainable livelihood developed. According to [19], the nature and extent of these natural fires have influenced the evolutionary development of climatic conditions such as drought, and to the amount of woody fuels in some ecosystems and drought with typical evidences from Australia [20] and Ghana [21].

On the local scale, it needs to be stated that, land degradation has presented considerably adverse impacts on the usability, capacity and resilience of land to support economic activities in Ghana. It is in this context that, the current study explores the type of livelihood activities affecting land degradation and the impact of land degradation on these activities in that complex interrelationship in the Talensi District of Ghana.

1.1 THEORETICAL FRAMEWORK

Following the above discussion, the theoretical framework of this study establishes that there is a "cause-effect" relationship between land degradation and savanna livelihoods. This relationship is examined by establishing the interrelationship of primary activities which are sources of livelihoods and economic gain within the study area. This is because about 500 million to 1.6 billion people living in rural areas over the globe directly and indirectly derive their livelihoods from the natural environment [22] [23].

It is also viewed that land degradation is real challenge in Talensi District because of the fragility of the environment and the connection with livelihood activities [24] [15]. It is noted according to [9] that the complex interrelationship between land degradation and livelihood activities is a matter of great concern to agronomists and soil scientist as well as development practitioners. This certainly should be of greater concern in the wake of the global call to sustainable environmental management and the need to eliminate degrading processes that reduce the quality of land most irreversibly, since it is a non-renewable resource at human time-scale and this has the capacity to affect human economic activities. Such considerations are much needed for the development of rural districts like the Talensi District because most of the livelihood activities are predicated on natural environment. This is depicted in figure 1.

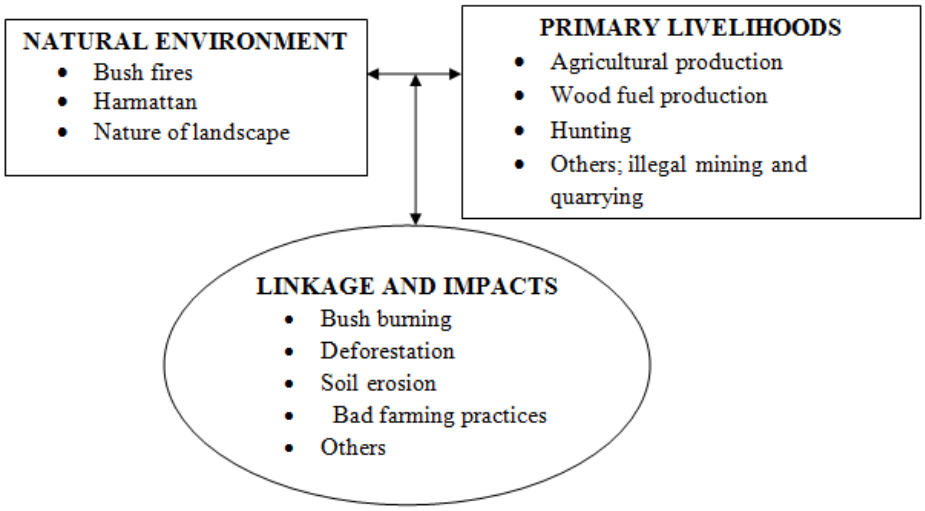

Figure 1: Land Degradation and Livelihood Development: Linkages and Impacts (Author's Construct: Adapted from the Literature Review)

2 PROFILE OF THE STUDY AREA

The Talensi District (TD), located in the Upper East Region, lies between latitude 10^0 15′ and $10^0$60′ North of the Equator and longitude 0^0 31′ and 1^0 05′ and West of the Greenwich Meridian with a total land area of 912 km^2. The population of the district is estimated at 100, 879 with a density of 111 people per square kilometer [24].

Though located within one of most deprived environments of Ghana, the District abounds in natural resources, such as forest, gold, arable land, mountains, hills, and wildlife. The vegetation type in the district is the guinea savannah woodland, with economic trees like the Shea butter (Vitellaria paradoxa); Dawadawa, Baobab (Andansonia digitata) and Acacia sp.; Neem (Azadirachta indica) and Mango (Magirifera indica) being prevalent. It is noted human efforts to utilize the resources have resulted in environmental problems detrimental to the survival of the ecosystems and also for human and physical development.

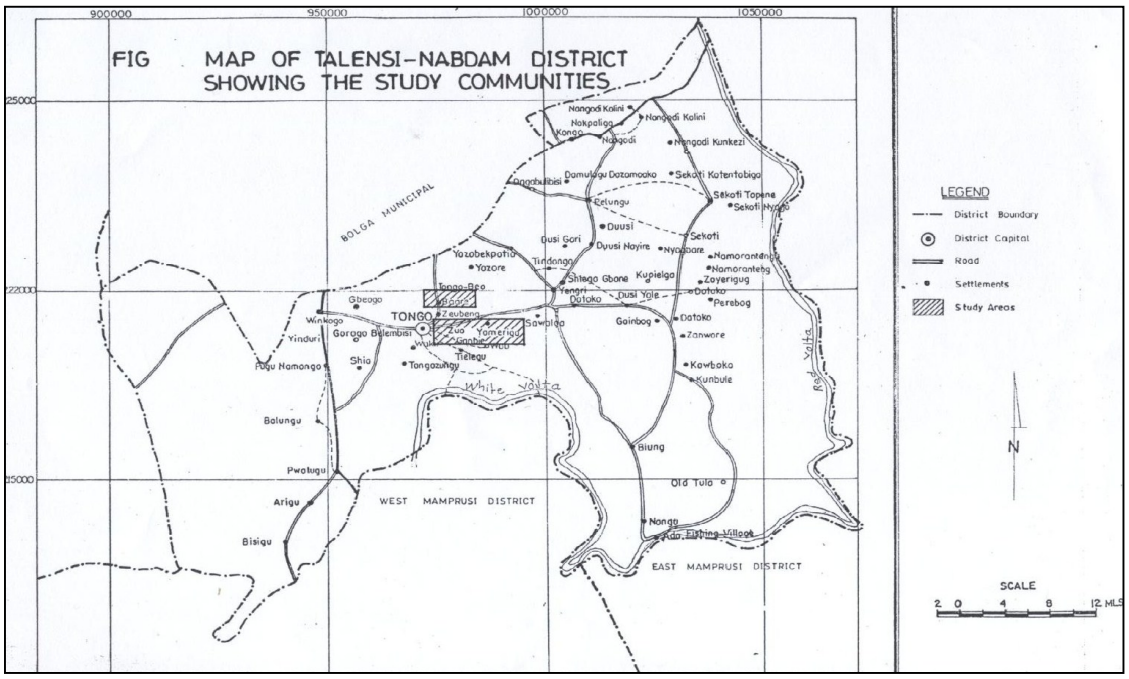

Figure 2: A map of the Talensi district showing the sampled communities in shades

Source: *Department of Geography and Rural Development, KNUST*

3 RESEARCH METHODS

The cross-sectional design was used for this study. The data collected was from both primary and secondary data types; derived from field survey and desk-top studies of official statistical data, peer-reviewed articles, among others. For the field survey, the data was collected at more than one case at a single point in time in order to collect a body of quantifiable data in connection to the two variables which are examined to detect a pattern of association [25]. Though this cross-sectional design emphasizes quantification, a mixed research strategy is used, that involves qualitative methods, for triangulation.

A purposive sample of 140 household pre-coded questionnaires was administered to respondents from five communities namely; Baare, Zeubeng, Gbeogo, Wakii and Yameriga, based on the proportional sizes in terms of area and population. These communities were selected because of the intensity of land degradation incidence caused by operations of economic activities.

The scope of questions addressed were in line with the research objectives. Ten (10) Semi-structured interviews were also conducted with officials of the District Department of Food and Agriculture as the key informant. The semi-structured interviewing provided qualitative data which was also augmented by participant observations. The quantitative data collected were captured and analyzed using the statistical tools in the Statistical Package for Service Solution (SPSS) and qualitative data were analyzed thematically.

4 RESULTS AND DISCUSSIONS

This section presents the research results which are discussed in tandem with the reviewed literature and background of the study. The essence of these findings cannot be overemphasized because of the implications for policies on sustainable land use and economic development at local, regional and global levels. The discussion is organized in threefold- the first part looking at the perception of land degradation and the second part examines the major livelihood activities in the study and the last part considers the nexus between land degradation and livelihood activities.

4.1 PERCEPTION OF LAND DEGRADATION IN TALENSI DISTRICT

As pointed out earlier land degradation is variedly understood hence the study first sought to establish the local perception of the concept. The research findings generated varied views. For the clarity in explanation, these viewpoints are categorized and discussed under three dimensions of land degradation; *severity; prediction; and impact*. According to [9] the three elements are often used by ecologists, agronomists and economists in their attempt to explain land degradation.

In terms of *severity,* it is realized that [11] define land degradation as a temporary or permanent decline in productive capacity of the land, or its potential for environmental management. It is observed from this definition the severity is measured as to whether there *temporary degradation* and *permanent degradation*. The difference lies in the fact that, a land undergoing temporary degradation still has greater resilience (productive capacity) than the one undergoing permanent degradation.

In relation to the household respondents, they expressed their understanding based on their level of knowledge and experience on the changes that has occurred on the land; not considering the absolute change but the relative changes built on their perception of the landscape profile. This was because most of the household respondents did not understand the technicalities of measuring temporary and permanent degradation as postulated by [11]. Therefore, questioning in this regard sought to identify how they perceived the rate and extent of degradation in their communities as a useful guide to severity. Their opinions were rated from very severe, to severe and less severe. Based on this, 50% of the household respondents opined the land has experienced very severe degradation, 48% observed severe degradation while the remaining 2% observed the land to have experienced less severe degradation.

These rates completely point out land degradation is a real challenge in the district because with the study sample 98% of the household respondents acknowledged the extent of degradation be occurring between severe and very severe and that should be a matter of concern for sustainable land management. This therefore requires responsive and pragmatic actions to combat or minimize the effect on livelihoods which are predicated on land development. In observing the reasons offered to buttress their arguments, it is noted there is a close linkage between identified responses and the value a respondent places on the land and this is in turn related with the livelihood activity one engages in.

The *predictability* element of land degradation was approached by discovering the factors which are direct and indirect sources of the processes of land degradation. As observed in the literature, it was clearly stated that human activities more importantly influence the processes of degradation [13], [12], [15], [9], though the role of natural factors cannot be

completely ruled out. Therefore the views expressed by household respondents on the *prediction* of land degradation were delineated into two broader categories namely human activities and natural factors. This is illustrated in table 1.

Table 1: Predicting the sources of land degradation in Talensi District

Category	Frequency	Percent (%)
Human activities	123	88
Natural factors	17	12
Total	**140**	**100**

Source: *Author (Fieldwork, 2014).*

From table 1, it is reasoned that human activities are producing a toll of processes which directly and indirectly contribute to land degradation within the district. Respondents acknowledged that their land-use activities of varying intensities, has contributed substantively to the severity of land degradation being experienced in the district. For instance, an official at the Agriculture Development Unit, stated his understanding of land degradation as,

'*The destruction of crop or farm land to a point where its value is lost such that it can no longer support the growth of crops'* (Field interviews, 2014).

It is emphasized therefore of the need to redirect current land-use practices towards sustainability in order to secure hope of future land usage and management. This is very vital because extreme climatic regimes and fragile geological formation of soil; are phenomena of the district by virtue of its location within the semi-arid region [24]. Though it is easy to underestimate the influence of natural factors as a vital source of local level degradation, it is imperative to note these work in directly and indirectly with the human influences to activities to cause a continuum of ecological alteration from slight to extreme, especially in arid and semi-arid [26].

The last element on the perception of land degradation is the impact. The impacts from land degradation manifests in various dimension namely desertification, soil erosion, secondary salinization and water logging [7] [8]. In relation to the Talensi District, it was pointed out by respondents and observed personally that there is evidence of visual and physical degradation of the landscape. But a more generic impact as expressed by majority of the household respondents and key informant is the loss of soil fertility or nutrients. This is viewpoint is acclaimed because most of the respondents are farmers and the output from crop production is directly linked with the availability of soil nutrients. This is typified in the following definition of land degradation according to an official at the Agriculture Development Unit as;

'*The excessive use of land for cultivation of crops, livestock rearing and any other practices that reduce the fertility of land without replenishment, leaving the land bare at the mercy of the weather*' (Field interviews, 2014).

Though it is difficult to measure accurately the loss of soil fertility because of changing dynamics of soil with location [27], it is imperative to note that the environmental and economic impacts of loss of soil fertility such loss of soil through erosion, reduced crop yields and incomes for households are identifiable in the communities. While it is generally recognized that most the understanding of land degradation from the impact dimension generally connote "declining productivity of land" [4] [15] [12] [7] [8], in relation to the Talensi district, there seems to be common understanding of its impact as loss of soil fertility, which is a more specific element under the productivity of land. This makes land degradation a confined environmental problem (location specific) must be amended to appropriate technical solutions in the local context [10].

It also helps to clear the doubts regarding the explanations of 'productivity of land', because such a definition is very broad since it encompasses biological, physical and chemical elements of land and this according to [9] has often attracted debates from agronomists, economists and soil scientists. Based on the above analysis, from the Talensi district, it is underscored that land degradation thus perceived as the series of anthropogenic activities coupled with natural influences that cause the destruction of land through loss of soil fertility as well as visual and physical derangement of landscape aesthetics.

4.2 MAJOR LIVELIHOOD ACTIVITIES IN TALENSI DISTRICT

In the Talensi district, it is identified primary economic activities sustain livelihoods and economic development and these livelihood options do subsist on natural resources including land. The major primary economic activities identified include crop farming, livestock rearing, wood fuel production, hunting, illegal mining, gravel and sand winning and quarrying. This is illustrated in table 2.

Table 2: Major Economic Activities in the Talensi District

Type of Economic Activities	Frequency	Percent (%)
Agricultural production	121	86.4
Wood fuel production	8	5.7
Hunting	4	2.9
Others	7	5
Total	**140**	**100**

Source: *Author (Fieldwork 2014).*

It is identified from table 2, that the most predominant livelihood activity is agricultural production as indicated by 121 household respondents (86.4%). This is practiced in two fold namely crop farming and rearing of livestock. The crops that are mainly farmed are food crops which include Maize (*Zea mays*), Millet (*Pennisetum americanum*), Rice (*Oryza sativa*), Groundnut (Arachis hypogaea), Soya beans (*Glycine max*), and Sorghum (*Sorghum vulgare*). These crops are cultivated across the various communities in the district.

Based on the expressions of the respondents, it was realized that, crop farming is much practiced as compared with livestock rearing. The reasons offered are related with the fact that crop farming is the main source of most households' food supply hence it is much preferred. Also, respondents argued that the rampant occurrence of bush burning (*a major process of land degradation as will be discussed later*) destroys the land of the needed pasture for grazing animals especially during the dry season. This has therefore affected the rearing of livestock in the communities.

The high response for agricultural production is because it contributes substantively to household livelihoods development through food supply and income generation. It was however observed that these benefits from agricultural production within the respective communities are engendered towards the males. This is because most of the farms and livestock are owned by the males with their female counterparts only performing assisting roles in farm management except a few who exercise direct ownership. The reasons offered relate with the system of land tenure as practiced in Northern Ghana which accords males with inheritance of arable land than females. As a result, within the household, the males receive the highest share especially income. In comparison it was argued that in terms of agriculture, the livelihood outcomes for the male and female headed households in the communities vary greatly to the advantage of men.

Wood fuel production is yet another major economic activity carried out in the district. Generally, in Africa, more than 80% of rural households depend on wood fuel for their energy requirements and it also serves as source of lucrative local trade [28] and these reasons are similarly expressed by the household respondents engaged in this study. Respondents also identified that inadequate access to alternative energy sources such as Liquefied Petroleum Gas (LPG) and electricity which are scarce in most rural districts in Ghana including the Talensi district accounts for their reliance on wood fuel for household energy supply.

Hunting is also practiced as a primary livelihood activity though by a few people as indicated in table 2. Those who are engaged in this activity expressed that it is a viable source of calories in the form of bush meat for their households' protein requirement, even though the amount derived is insignificant and have to be supplemented with other sources. Lastly, from table 2, 7 respondents (5%) stated to be engaged in other primary livelihood activities. The major examples mentioned under this category included illegal mining- "galamsey"; gravel and sand wining; and quarrying. The individuals who are engaged in these explained that they have derived substantive income from participating in these.

4.3 NEXUS BETWEEN LAND DEGRADATION AND LIVELIHOOD ACTIVITIES

This section now examines in *tandem* the linkages and corresponding impacts of the interrelationship between land degradation and livelihood activities. It needs to be stated that, the accession by [14] that there is relationship between changing primary activities and land cover changes proved to be true with the findings from the Talensi district. As stated earlier, the identified primary livelihood activities do subsist on natural resources including land, and these activities undoubtedly have influenced at length the various processes of land degradation occurring in the district as shown in table 3. It is also noted that, occurrence of these degrading processes have produced adverse effect for the sustainability of primary livelihood activities in the studied communities.

Table 3: Major processes of land degradation in Talensi District

Major causes of land degradation	Frequency	Percent (%)
Bush burning	62	44
Deforestation	32	24
Soil erosion	30	21
Bad farming practice	12	9
Others	2	2
Total	**140**	**100**

Source: *Author (Fieldwork, 2014).*

From table 3, 44% identified bush burning as the most recognized process of land degradation in the district. The occurrence and resulting impact of bushing burning as a process of land degradation is interrelated with peculiar economic activities namely agricultural production, wood fuel production and hunting which are engaged by the local people. Agricultural production is argued by most respondents to be the main sources of bush burning.

Ref. [29] explains that the role of agricultural production in the development of bush burning as a degrading process results from traditional land clearing methods. Majority of the crop farmers acknowledged cultivating on the subsistence level and therefore practice "slash and burn" in preparation of their farmlands being sowing. In a related sense, bad farming practices are highlighted by some respondents as a process of land degradation resulting from directly crop farming in the district. In line with this, it was discovered that most of the arable lands are cultivated continually every year with the same crop types, even though the farmers agreed that, there is either less or no effort to replace the loss soil nutrients either organic matter or chemical fertilizers.

Also, it was observed that because of bush burning, most cultivated lands in the communities are also often left bare or with little surface covering during the dry season as shown in figure 3.

Figure 3: Land bare and impoverished soil from bushing and bad farming practices

Source: *Author (Fieldwork, 2014).*

This practice has facilitated the degrading processes that result from natural factors particularly the impact of wind- the severe North-East Trade, which manifests strongly within northern zones of Ghana and the West African sub-region in general. Cumulative, slash and burn cultivation and bad farming practices have accounted for the loss of soil fertility which is identified by most of the respondents as the generic impact of land degradation as stated earlier.

The interrelationship between agriculture and land degradation in the communities has impacted greatly on local level crop productivity. This is because about 73% of the crop farmers engaged in the study argued to experience reduced crop yield which is attributed to the loss of soil fertility and probably loss of arable land due to erosion. The official statistics on the cultivated areas (measured in hectares) and the average yield (measured in metric tons per hectare) of major food crops in the Talensi district concurrently convey to the claim by the farmers. It is evident from figure 4 that there are observed

reduced crop yield for most of the food crops particularly millet (*Pennisetum americanum*) experienced reduced yields between 2008 and 2010.

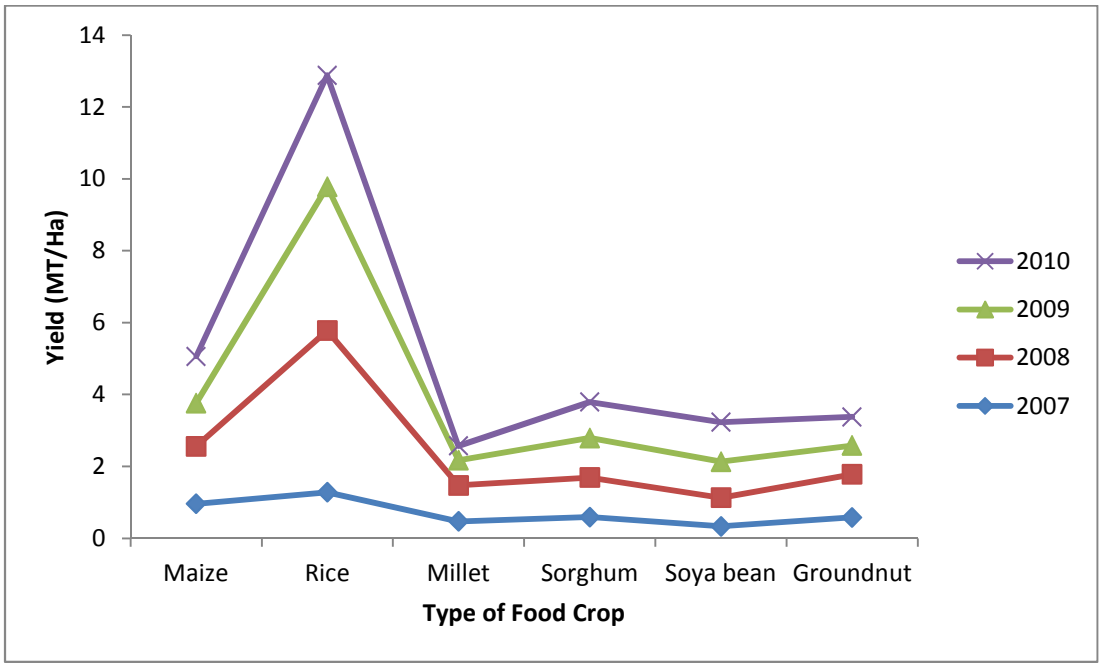

Figure 4: The Yield per Metric tons of Major Food crops in Talensi (Source Agriculture Development Unit (MOFA, Talensi District, 2011).

Considering the general decline in agricultural yields of major food crops, it was established that there are serious food security challenges in the district. This is similar to the view expressed the [15] the linkages between agricultural production and land degradation affect local level sustainable development through food insecurity. Even though agriculture is the dominant livelihood activity within the district as a whole, it is not sustainable and this could aggravate household poverty especially, among the food crop farmers. This is because sustainable livelihood development (in terms of food and income) is essential for poverty reduction. Apart from the impact on households and individuals, reduced crop yields could affect local development efforts in the district, because it is argued agriculture contributes about 75% of the Local Gross Domestic Product (LGDP) [24].

Based on the above analysis, it is evident that the need to ensure food security through improved agricultural productivity is paramount. It is proposed that, two conventional means; agricultural extensification (extensive agriculture) and intensification (intensive agriculture) can be employed in this regard. A perceived and anticipated challenge recognized in employing the former strategy is the fact that expansion of current cultivated areas to include new arable lands may encroach largely to marginal areas like the hill slopes and forested areas particularly at Wakii and Yameriga because of their proximity to these marginal lands. This could lead to enhanced degradation because peoples' attempts to eke a living might lead to encroachment on marginal lands [22].

This is clearly evident in the Talensi district, because of the farmers who are now currently engaged as wood fuel producers and hunters opined that in some case the use of fire has resulted in bush burning and this destroys the fragile ecological system especially the development of trees and shrubs. [19] have explained that depending on the nature and extent of these fires, they can influence evolutionary development of climatic conditions such as drought, and to the amount of wood fuels in some ecosystems and drought. Thus, it is worth noting that the erratic rainfall patterns and increased intensity of drought conditions prevalent in the district are as a result of a seemly evolutionary climate being developed and influenced by bush burning.

Other related effects of bush burning as identified by respondents is the destruction of crops especially in communities around the forested zones, particularly, Yameriga and Wakii. It is also stated that, continuous bush burning has contributed to weakening the soil structure and this facilitates other processes of land degradation like water and wind erosion which are prevalent in the district.

Deforestation is another recognized process of land degradation in the district. It was established that the local level deforestation results directly from human activities in the various communities. The two renowned factors that are source of anthropogenic deforestation include agriculture and wood fuel production and these have substantially affected the savannah vegetation of wood lands and shrubs most especially in two of the studied communities, Yameriga and Wakii.

Though there are no statistics or accurate measurements to estimate the rate and extent of deforestation in the district, it is must be stated the effects of global warming (a major effect of deforestation) are evidently visible and are known to affect the livelihood activities of local people particularly agriculture. This according to [16] manifest in the frequency and severity of drought increases. It is also observed that the removal of trees affected the visual and physical derangement of the landscape aesthetics. Farmers complained of increased evapo-transpiration which contributes to increased dryness of the land and this has also affected crop farming.

Though the signs of desertification are already visible in the Northern savannah regions, it must be stated that the Talensi district stands a greater risk because as [26] point out, intensive crop cultivation coupled with loss of tree cover and extreme climatic variation are known factors influencing desertification. The loss of Shea butter *(Vitellaria)* a valuable economic tree is very much noted in some communities. Another likely impact is the apparent reduction in household energy supply because wood fuel is the predominant energy source being used by many households and small scale food vendors. This can result in increased cost (time and money) because the search for alternatives like LPG and electricity, (which are often very scarce in rural areas in Ghana) is timing consuming and their price charges are relatively high, thus straining demand on households' incomes in the district.

It is inferred from the above analysis that in the Talensi district, there are critical dilemmas to be sorted by both the local people and institutions of forest governance to ensure local sustainable forest management. Thus, it may be appropriate to adopt strategies that support specific changes that will lead to a greater role for enhancement of forests and tree resources and in the development of livelihoods for poor people [22].

Soil erosion is another process identified by 21% of the household respondents and is believed to manifest strongly from agricultural production. As noted earlier, agricultural activities notably intensive cultivation and bad farming practices have facilitated erosion of surface soils. This has often caused the loss of nutrients to support crops and vegetation growth [30]. It is important to state that the resulting impact from soil erosion should not be down played because, Lal (1998) opines that on a global scale, the annual loss of 75 billion tons of soil and its fertility cost the world about US$400 billion per year, or approximately US$70 per person per year [9].

This study is limited in its findings of not being able to estimate the tons of soil and its fertility is being lost in the district each year through the process of erosion. However, official statistics from the Agriculture Development Unit at the District Assembly revealed that there has been decrease in the total cultivated areas for some of the major food crops particularly soya bean and this could be accounted for by the incident of soil erosion. This is shown in figure 5.

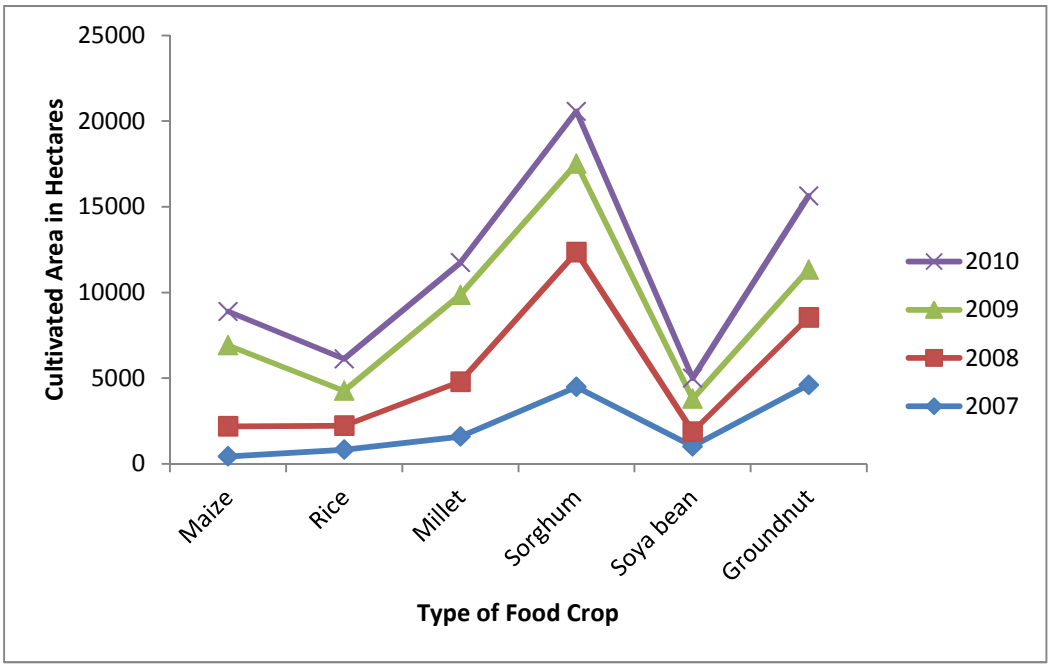

Figure 5: The Cultivated Area in Hectares of Major Food Crops in Talensi (Source Agriculture Development Unit (MOFA, Talensi District, 2011).

It is also inferred that economic development; of individuals, households and the local economy are being challenged critically because the loss of arable land and soil fertility invariably affects livelihood development and poverty reduction efforts as explained earlier. The process of soil erosion is also linked with the operation of illegal mining, gravel and sand wining, and quarrying. Illegal mining is noted to be the prime source of soil erosion in Yameriga where it is practiced.

The methods used are unscrupulous and are adopted without due consideration of soil and geological conditions. According to [31] these conditions should be considered before carrying out any modern mining processes. The surface mining has also contributed to the visual and physical derangement of the landscape as shown in figure 4. In addition, it is argued by such mined lands become impoverished and there is also massive loss of habitats for both plant and animal communities.

Figure 6: Degraded land from Illegal mining activities

Source: Author (Fieldwork, 2014).

There is also evidence of increased soil erosion especially along hill slopes more at Wakii, where the quarrying is being carried out. Other effects from quarrying like increased noise, dust and pollution which could affect animal and plant communities [23] are also noted by respondents in this community. The process of soil erosion is also connected with gravel and sand wining, which is practiced predominantly at Gbeogo.

Figure 7: Gullies formed from excessive sand winning

Source: Author (Fieldwork, 2014).

While economic activities like mining and quarrying (including gravel and sand wining) require license to operate, as a way of permitting processes of good corporate citizenship [23], such processes are currently not pursuit particularly in relation to gravel and sand wining in the district. And though pragmatic measures are being adopted to curb both the current and anticipated degradation, there is a huge challenge because the operations of these activities produce concurrent economic benefits and negative destruction or loss, hence may be considered "necessary evils".

5 CONCLUSION AND RECOMMENDATIONS

Land degradation is a threat to ensuring environmental sustainability, a global call in this 21st Century in the face of dwindling resources. It is a pervasive environmental problem in the Talensi district, because large portion of the landscape has experienced severe to very severe degradation. Though local climatic variations and geological formation might have influenced the processes, human livelihood activities are very much noted to be highly linked with the degrading processes discovered in this study. Based on the findings, land degradation is conceptually defined as the series of anthropogenic activities coupled with natural influences that cause the destruction of land through loss of soil fertility as well as visual and physical derangement of landscape aesthetics.

It has also being established that agricultural production (crop farming and livestock rearing), wood fuel production, hunting, illegal mining, gravel and sand winning, and quarrying are the identified primary livelihood activities that sustain household livelihood outcomes and economic development in the Talensi district. Because these livelihood options of households subsist on natural resources including land, a "cause-effect" interrelationship is created between the processes of land degradation (which are identified bush burning, deforestation, soil erosion, and bad farming practices) and these activities. Thus, there is the need to review priorities towards local level sustainable development which is critically being affected. And this should include strategies that support specific changes that will lead to a greater role for enhancement of natural resource base and forge the development of livelihoods for poor people.

Diversification of livelihoods and economic development through the Secondary and Service industries are good options to reduce further stress on arable land which is continually becoming infertile. It proposed educative strategies should be formulated and implemented by the District Agriculture Development Unit and Soil Research Institutes, to help farmers reduce the current risk and/or enhance soil fertility. Appropriate application of fertilizers; organic manure, mulching, avoidance of slash and burn cultivation and promotion of agro-forestry can help improve the yield of crops and enhance surface land cover.

Local level environmental management strategies must incorporate due processes to license and ensure good corporate citizenship especially for livelihood activities such as wood fuel production, illegal mining, gravel and sand winning, and quarrying which destroy the aesthetic beauty of the landscape. Also, responsibilities of institutions of resources governance like the Land Commission, Forestry Commission and traditional rulers (Chiefs and Tindanas) should be made formidable not only at the national level but more importantly within the local governance structures in Ghana.

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