THE LINKAGES BETWEEN SOIL DEGRADATION AND LAND TENURE ARRANGEMENTS. A CASE OF CROP FARMING IN THE SEKYERE WEST DISTRICT OF ASHANTI REGION

By

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Hereby declare that this submission is my own work towards the MA and that , to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the university, except where due acknowledgement has been made in the context

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Abstract

Land tenure arrangement affect farmers' resource management, agricultural production and soil management in the Sekyere West District. The purpose of the study was to explore how land tenure arrangements can contribute to soil degradation. Data collected from the focus group discussions and interviews were analysed in the light of the propositions formulated based on the study objectives. It was discovered that there is a direct link between tenure security and soil degradation in the Sekyere West District. Tenure insecurity is the main institutional constraints that inhibit soil conservation investments in the study area. Moreover, the study revealed that, the type of farming practice is not always determined by tenure status but rather the type of crops cultivated also influences the type of farming technique a farmer employs. Further, the trend in farmland ownership has not changed in the study area. What has rather changed is the relationship between tenant farmers and landowners in terms of farmland acquisition. The conclusions drawn from interviews concerning land tenure and soil conservation were that unsustainable farming practices were not employed by tenant farmers alone. Evidence from the study indicates that the link between tenure security and overexploitation of soil resources is complex and varies among land users. Long-term investments in land, such as soil conservation practices are highly dependent on the level of security, which is measured in the duration a farmer expects to till a parcel of land. The study recommends that policies aimed at improving the literacy level of peasants should be encouraged in the Sekyere West District since literature confirms that there is a positive relationship between the adoption of improved farming techniques and literacy. Also, there should be awareness among land tenure institutions so that lease durations would be such that the time horizon is sufficiently long enough to enable

the holder to recoup with confidence the full income stream generated by the investments put into the land.

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Dedication

First to the loving memory of my late grandmother

Nana Ataa Abena (Martha Akyiaa)

Then to

Mrs. Rita Yembilah Barre,

For your encouragement

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CHAPTER ONE

INTRODUCTION AND RESEARCH PROBLEM

1.1 General Introduction

Land degradation as a result of soil nutrient mining and soil erosion has negative results on crop productivity and food security and is a major problem in most Sub-Saharan African (SSA) countries (Sonneveld and Keyzer, 2003; Nakhumwa, 2004).

As is presented in Table 1.1, the percentage contribution to Gross Domestic Product (GDP) by each sector of Ghana's economy over the years show that agriculture has consistently contributed over 35% of GDP with the services and industrial sector contributing less than 30% each, except for 2007 where the services sector contributed 30.6% to GDP (GoG, 2008).

Table 1.1: Percentage Contribution to GDP by Sector, 2005-2007

Sector	**Share of GDP**			**Contribution to Growth**		
	2005	**2006**	**2007**	**2005**	**2006**	**2007**
Agriculture	36.0	35.4	34.7	1.5	1.6	1.4
Industry	25.1	25.9	26.0	1.9	2.5	1.7
Services	29.9	30.0	30.6	2.1	2.0	2.5

Source: GoG: 2008 Budget Statement

Currently, the agriculture sector employs about 60% of the workforce aged between 15 and 64. Peasant farmers dominate the sector accounting for about 80% of the total agriculture production. The country's GDP growth rate is 5.6% with the agriculture sector contributing 46.7% of the total growth in GDP (GoG, 2008). Agricultural intensification is therefore a prerequisite for economic development. However, soil degradation has become the basic challenge constraining food crop

farmers from achieving an acceptable level of food security. Improved agricultural technologies have been promoted among food crop farmers by government and non-governmental organizations in an attempt to address the declining agricultural productivity and improving food security. The benefits from improved agricultural technologies would not be realized unless accompanied by soil conservation measures. Farmers incentive to invest in soil conservation and soil fertility enhancement practices in Ghana and elsewhere in SSA countries have been constrained by a combination of unfavorable biophysical environment, population pressure , the institutional set up and short-term household objectives (Reardon and Vosti,1995; Pender et al., 2001; Sonneveld and Keyzer, 2003).

Land tenure may be defined generally as being the set of relationships concerning the acquisition, use and transfer of land and the allotment of its product (Crocombe, 1974; Barnes, 1985; Opadeyi, 1995). West (2000) realised that land tenure systems exercise dominant control over the interests to be enjoyed in land and the ways in which labour and capital are applied to land. International conventions such as the Sustainable Development (Agenda 21) Conference in Rio de Janeiro (UNCED, 1992), the Habitat II Conference in Istanbul (UNCHS, 1996), and the World Food Summit in Rome (FAO, 1996) have all reiterated the need to incorporate land tenure issues, such as access to land, into development programs.

Every year, nearly 17 million hectares of tropical rain forests are destroyed, thousands of irreplaceable plant varieties are lost, and millions of hectares of land turn into deserts (Wilson, 1994). According to the 1994 UNICEF State of the World's Children report, "Land cleared by burning forest, loses its stability and fertility within a very few years; steep hillsides quickly become eroded without investments in soil conservation; marginal agricultural lands gradually become

infertile when those who farm them can afford neither fertilizer nor fallow periods..." (UNICEF, 1994 cited in Wilson, 1994: 104).

Soil stability and fertility on rain-fed agricultural lands, with little or no fertilizer use, can be restored by leaving farmland to fallow for a time period, typically 15-20 years. However, when the fallow period for land under intensive cropping is shortened, it weakens the natural ability of soil to recover its fertility, leading ultimately to land degradation, lower crop productivity, and reduced incomes (GEF, 2003).

Agricultural productivity and food security in Sub-Saharan Africa are jeopardized as a result of continuous decline in soil fertility, defined as "a net decrease in available nutrients and organic matter in the soil" (Scherr, 1999: 50), and caused by the continued nutrient mining of already degraded soils by farmers in their effort to increase output (Diagana, 2003).

Soil nutrient depletion resulting from soil mining or the practice of growing crops with insufficient replacement of macro-nutrients removed from the soil is an important problem in low income countries (Bishop and Allen 1989; Stocking 1987). This is a fundamental biophysical constraint to steady growth of food production and a very serious cause of soil degradation (Donovan and Casey, 1998).

Evidence from around the world indicates that lengths of fallow and population density are negatively correlated (Turner, 1999). Similarly, a table of frequencies between population density and cropping frequency in 52 cases in Sub-Saharan Africa implies that cropping frequency and population density are positively correlated (Pingali, and Binswanger, 1988).

It has become a luxury for farmers to allow land in fragile areas to recover between crop rotations as population increases (Wilson, 1994). Long-term fallows or

shorter improved fallow techniques have been increasingly discarded or reduced because of pressure on the land from high population densities (Drechsel et al., 2001).

Deforestation and inappropriate agricultural practices pose a serious threat to land productivity. Farmers abandon degraded cropland and then move to new lands for cultivation as land productivity declines. Unless there are investments in soil conservation, the process will repeat itself in a vicious circle with cultivation, causing land degradation, and then the search for new cropland (Barbier, 2000).

Land degradation is an amalgamated term, with no single readily identifiable feature, but describes how one or more of the land resources soil, water, vegetation has changed for the worse (Stocking and Murnaghan, 2001). Land degradation generally signifies the temporary or permanent decline in the productive capacity of the land. Another definition describes it as, "the aggregate diminution of the productive potential of the land, including its major uses (rain-fed, arable, irrigated, rangeland, forest), its farming systems (e.g. smallholder subsistence) and its value as an economic resource"(Stocking and Murnaghan, 2001:7).

The link between degradation and its effect on land use is central to nearly all published definitions of land degradation. Land degradation is, however, difficult to grasp in its totality. No single measure could be used to capture the productive capacity of land. Therefore, in trying to quantify the productive capacity of land, certain indicators of land degradation are used. An indicator such the piling up of sediment against a downslope barrier signifies that land degradation is occurring upslope. These indicators are variables which may show that land degradation has taken place. These indicators are not themselves degradation but rather indicate the

presence of degradation. Similarly, declining crop yield may depict an instance of depleting soil fertility through land degradation (Stocking and Murnaghan, 2001).

The poor are particularly dependent on agriculture, and mainly on annual crops which generally degrade soils more than perennial crops. The poor often till common property lands which generally suffer greater degradation than privately managed land, and because they often lack the capacity to make land-improving investments, the poor tend to suffer more than the non-poor from soil degradation (Scherr and Yadav, 1997).

Scherr and Yadav (1997) further revealed that, in West Africa, the proportion of children who died before the age of five was highest (more than 30 percent) in areas with high soil degradation. This work will focus on the ramification of land tenure arrangements, soil degradation, reduced vegetative cover and nutrient depletion in the Sekyere West District of Ashanti Region, Ghana.

1.2 Statement of Problem

Farming is a threat to the natural environment in developed as well as developing countries, but the human stakes are now much higher in the developing world, where food needs are acute and populations growing rapidly. More than 700 million people in developing countries do not have access to sufficient food supplies to meet their needs for a healthy and productive life. Besides, population growth demands the developing world to feed 88 million additional people every year (Paarlberg, 2001).

Batjes (2001) estimated that, degraded soils amount to about 494 million hectares in Africa. Further estimates revealed that 65 per cent of Sub-Sahara agricultural lands are degraded because of soil erosion and physical degradation. Lal

(1995) discovered that, in Africa, crop yield reductions due to past erosion may range from 2 percent to 40 percent, with a mean of 8.2 percent for the continent and 6.2 percent for Sub-Saharan Africa. He projects that, if accelerated erosion continues unabated, yield reductions by the year 2020 may be 16.5 percent for the continent and 14.5 percent for Sub-Saharan Africa, suggesting that the land could practically lose all its productive potential if soil degradation continues unabated. Scherr and Yadav (1997) also conclude that if erosion at this rate continues unabated, yields may decrease by another 16.5 percent in Asia and 14.5 percent in Sub-Saharan Africa by 2020. This will further worsen food insecurity in many countries and hence deepen poverty in many SSA countries including Ghana.

Stocking (1987) and Bishop and Allen (1989) in their research have shown that soil nutrient depletion as a result of soil mining or the practice of growing crops with insufficient replacement of macro-nutrients removed from the soil is an important problem in low income countries. In the Sekyere West District, the situation is not different. Fertilizer usage is minimal and this is a major feature of food crop cultivation in the district.

Mortimore (1993) stated that increase in population density will eventually bring a corresponding increase in the frequency of land cultivation; this will further lead to the shortening of fallow period which hitherto had been used to replenish soil fertility. With the shortening of fallow period, soil fertility is bound to decline and this will reflect in declining crop yields. This will spark a chain reaction and virgin lands will be brought under cultivation, leading to accelerated soil degradation. This becomes a major concern when one considers the current trend in population growth in the Sekyere West District. With teeming population growth and continuous land degradation, the problem envisaged here is how this production task can be met if

environmentally destructive farming practices should be made to continue. This is best seen in the light that the Food and Agriculture Organization of the United Nations (FAO) estimates that, up to 80 percent of the land in Africa is threatened by degradation, as rural people put their own short-run survival ahead of long-run natural resource sustainability (IFPRI, 1995).

There is already growing concern that degradation of agricultural soil resources, that is, a decline in long-term productive potential of agricultural land is seriously limiting production in the developing world, and that the problem is getting worse (UNEP 1982; UNCED 1992). In response to these concerns, international programs are being developed or proposed to combat soil degradation (FAO 1992; IFAD 1992; World Bank 1997). Efforts are being made to monitor soil degradation more systematically (ISRIC 1998). However in Ghana and the Sekyere West District in particular, little is being done to evaluate the extent of the problem let alone to check this problem of soil degradation.

Agriculture accounts for the highest land use in developing countries and this probably makes it the single most predominant influence on environmental quality. Environmental concerns associated with agriculture relate mainly to the sustainability of the resource base for agricultural production, that is soil quality, protection of biodiversity and natural habitats, and environmental services of resources influenced by agricultural land use (Scherr, 2000). In the Sekyere West District, the situation is not different; agriculture accounts for the main landuse and also employs the highest percentage of the population. Therefore, issues pertaining to agricultural land use should be taken seriously in the district.

Land tenure defines farmers' access to land resources. Thus, it conditions the decisions they make about how to use land and the kinds of investments to make.

Insecure tenure arrangements contribute to declining soil fertility and hence land degradation. Ill-defined property rights and insecure tenure rights have also reduced the incentive for farmers to undertake soil fertility-enhancing investments. Secure tenure arrangements can help induce investment in soil fertility to reap the long-term reward of sustained high crop yields and greater profits (Gruhn, Goletti and Yudelman, 2000).

Hopkins, Berry, and Gruhn (1995) observed that in Niger, secure land for growing millet accounted for 90 percent of manured fields. From their study, they observed that secured fields received an average of 307 kilograms per hectare of manure, while unsecured millet fields received only 186 kilograms per hectare. The Sekyere West District is a destination for many migrant farmers with no secured title to cultivated lands mainly used for maize cultivation; this makes it a problem, if land degradation should be halted.

The traditional techniques for renewing soil fertility in the Sekyere West District, such as slash and burn and long fallows, are not as feasible as they could have been with low population. Land is kept under constant cultivation in subsistence production, and incomes are such that land can no longer be taken out of production for substantial periods to allow for natural nutrient replenishment. Regenerative long-term fallows or shorter improved fallow techniques have been progressively abandoned or reduced under the pressure of high population densities (Drechsel et al., 2001). Moreover, no major research has been done in the Sekyere West District on the relationship between land degradation and tenure security, placing emphasis on the effect tenurial arrangement has on farmland degradation. This research therefore sort to fill this gap.

In view of the above submission, some key research questions to which the research intends to answers include;

i. What is the level of awareness among farmers concerning farmland degradation?
ii. How does tenure arrangement influence soil improvement investments decision making among different cropland users?
iii. To what extent does farm size correlate soil conservation practices?

1.3 Objectives of the Study

The central theme and focus of this work is to explore how land tenure arrangements contribute to soil degradation. Specifically, the study attempts to:

a. Determine the trends in farmland ownership and acquisition in the Sekyere West District of Ashanti Region
b. Demonstrate how the duration of lease affects soil improvement investment decisions
c. Ascertain whether farmlands given out under insecure tenure arrangements are more likely to be degraded.
d. Assess the bottlenecks in the land tenure arrangements in the Sekyere West District of Ashanti Region

1.4 Rationale for the Study

This study was devised based on some injustice meted out on the environment as a result of insecure tenure arrangements, population growth and ignorance. Since the survival of man to a larger extent, depends on the bounties of the environment, practices and attitudes which contribute to the destruction of the

environment cannot be ignored. Since much of land usage in rural Ghana comes under food crop farming; insecure rights over land used for crop cultivation could reduce the incentive for sustainable usage of the land. Based on these, this study seeks to find the connections between tenure arrangements and soil degradation in the study area.

1.5 Organisation of the Study

This thesis is composed of five chapters. Chapter two begins with the introduction of study area. It provides background information on the area surveyed. The chapter further presents the research methodology adopted in this study. It presents sources of data, sampling design and sampling methods. It also presents, the methods of data collection, including sample size and the type of data that was collected through focus group discussions. This chapter concludes by presenting the methods of data analysis. Chapter three consists of the review of relevant literature relating to the study. It further presents the conceptual framework adopted for this study. Chapter four presents the findings of this study along with the analysis, discussion and interpretation of the impact of land tenure security on soil degradation among food crop farmers. It examines the relationships between land tenure status and involvements in soil conservation activities. Finally, Chapter five summarizes the findings and presents conclusions, and recommendations.

1.6 Limitation of the Study

The research design adopted in this study had two limitations. First, the study used focus group discussions and key informants as the main source of primary data for land tenure arrangements. This inevitably gave rise to the question of interviewer

bias. Second, no statistical comparisons could be made because the study methodology only generated qualitative data, and the results are less accurate than they would have been using quantitative data.

CHAPTER TWO

STUDY AREA AND METHODOLOGY

2.1 Introduction

This chapter introduces the characteristics of the Sekyere West District. The features discussed are grouped under the physical, demographic social and economic characteristics of the study area.

2.2 Features of the Study Area

2.2.1 Location and Size of the Sekyere West District

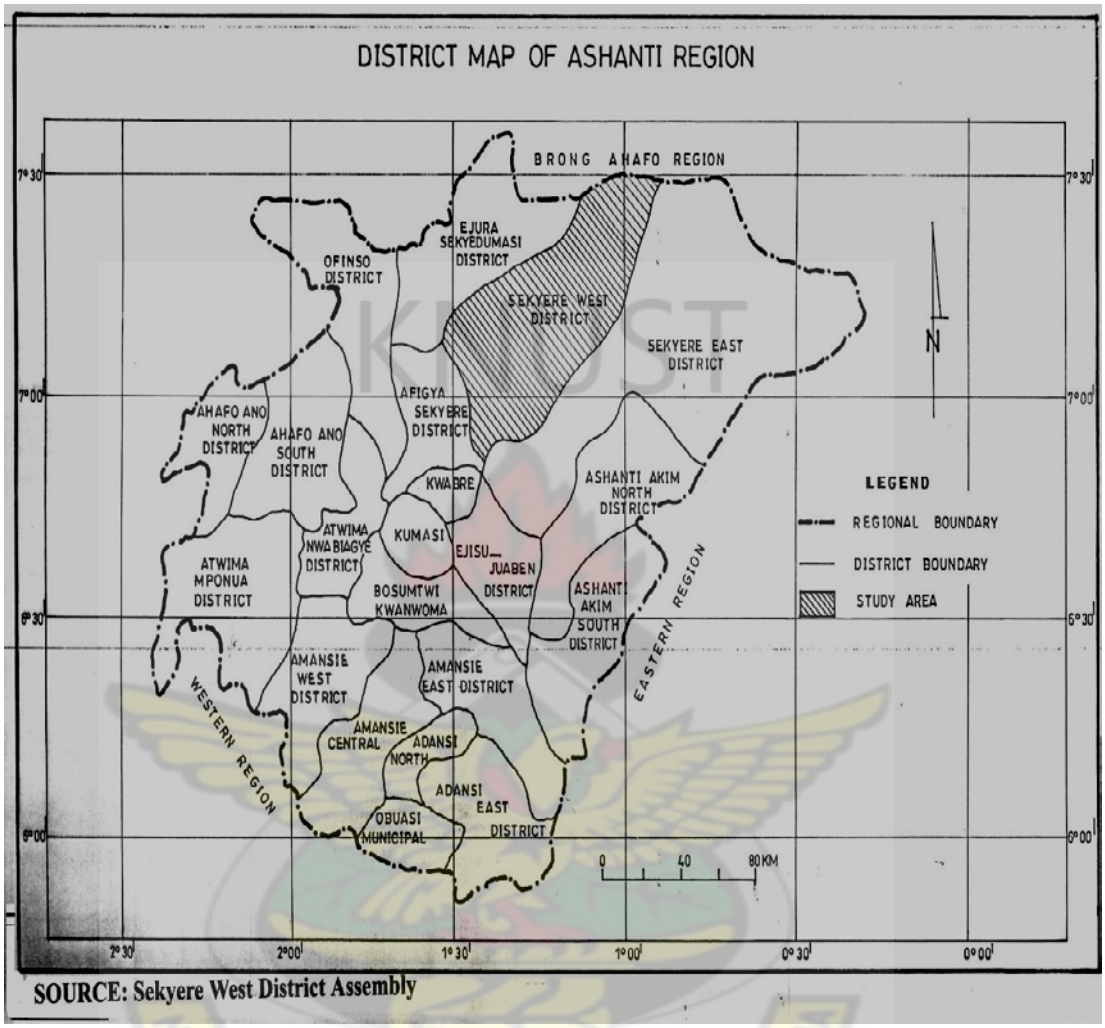
The Sekyere West district is located in the northern portion of the Ashanti region of Ghana (Fig.2.1). It is one of the 21 administrative districts of the Ashanti region. The District is partly situated on the Mampong Scarp. The district is situated approximately between Latitudes 6^0 55' - 7^0 33' North of the equator and Longitudes $0^0$55' - $1^0$30' West of the Greenwich Meridian. The Sekyere West District occupies a total land area of 2,345 km^2, accounting for about 9.6% of Ashanti Region's total land area (GSS, 2000). The Sekyere West District is bordered to the north by Atebubu District, to the south by Afigya Sekyere District, to the east by Sekyere East District and to the west by Ejura Sekyedumasi District (Fig. 2.1). The district capital Mampong, is located 51 km north-east of Kumasi the regional capital and it is situated along the Kumasi-Yeji trunk road (Fig. 2.2).

2.2.2 Climate and Vegetation

Temperatures in the Sekyere West District are generally high, with a mean temperature of 26^{o}C. The highest temperature figures occur between March and June and the lowest between November and January. Humidity is high averaging

about 85% in the south but decreases towards the savanna belt. The average annual rainfall is about 1430mm.

Fig. 2.1: District Map of Ashanti Region Showing Sekyere West District



Two main airmasses, Tropical Continental (cT) and Tropical Maritime (mT) airmasses affects the district. The warm but moist mT which originates from the Atlantic Ocean and the warm, dry and dusty cT from the Sahara Desert approach the tropics from opposite sides of the equator and flow towards each other into a low pressure belt known as the Inter Tropical Convergence Zone (ITCZ). The slow and irregular north-south oscillations of the ITCZ gives rise to the regime of wet and dry seasons.

The Tropical Continental Airmass which originates from the Sahara-Arabian desert brings harmattan to the district. This is experienced between November and February and it is associated with dry and cool winds.

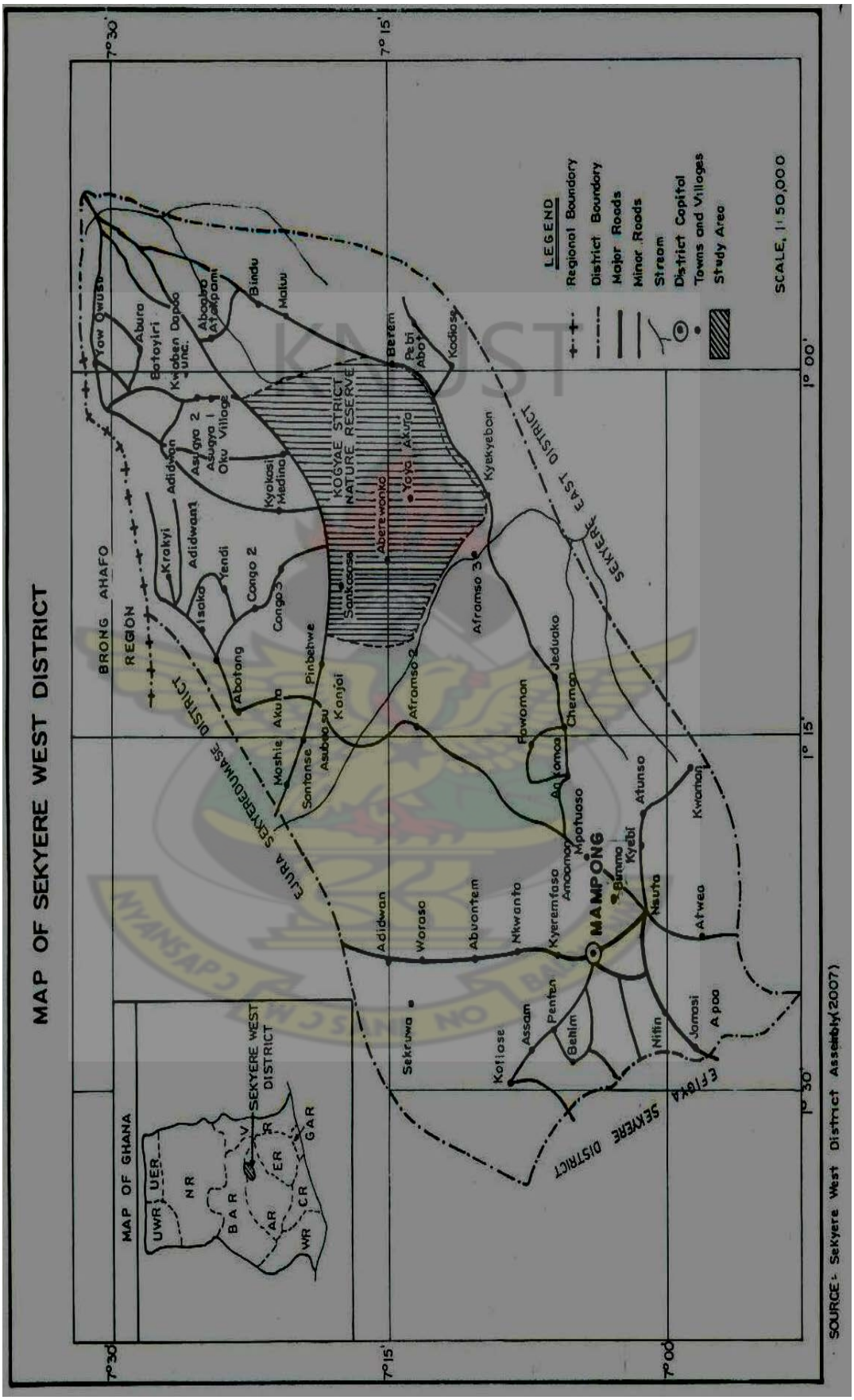
The Tropical Maritime due to its origin brings rain to the district. Rainfall in this district is double maxima ranging between 1250mm and 2000mm. Rainfall starts in May-June peaking in June and the second regime September to October (Dickson and Benneh, 1988).

The district lies within the Wet Semi Equatorial Forest Zone. The original vegetation associated with the district comprised semi deciduous forests in the south and west and guinea savanna in the east and north. What presently exists is dry semi deciduous forest. The only climax vegetation of the district can be found in the Kogyai Nature Reserve covering an area of 115 km^2 (SWDA, 2004).

2.2.3 Topography and Drainage

The Sekyere West District is fairly drained by several streams and rivers. Some of the major streams that drain the district are Afram, Sene, Asesebonso and Chirimfa. Even though the district is drained by several streams and rivers, the water bodies experience seasonal flow. Most of the rivers and streams dry up during the dry season and the few which do not dry up, reduce in volume considerably. Flooding during the rainy season is common. The district exhibits an undulating landscape with isolated hills. The land rises from about 135 metres to about 2,400 metres above sea level (SWDA, 2004).

Fig. 2.2 Sekyere West District Map Showing the District Capital and the study communities



2.2.4 Geology and Soil

The geology of the district is made up of Upper Voltaian series mainly of sandstone, shale, and mud stone. Savannah ochrosols are found in the northern and eastern parts whiles forest ochrosols are found mostly in the southern and western parts. The soil is well drained, lateritic in nature and moderately fertile since it developed from Precambrian rocks of Birimian formation. This has made the land relatively suitable for all farming activities (SWDA, 2004).

2.2.5 Demography

The ethnic composition of the district is such that the majority (92%) are Akans and natives of the district. In terms of religious faith, Christianity dominants in the district accounting for about 88% of the entire population. Islam accounts for 11% and traditional religion, 1%. The total population of the district was estimated at 143,206 with 71,378 being males and 7,1828 females as of 2005. The sex ratio is almost balanced around 99.3-100.8 (GSS, 2005).

The economically active population was estimated at 84,925. About 36% of the district's populations were children below 15 years. The dependency ratio is high ranging between 1: 2 in urban centres and 1:3 in the rural areas. According to the Census Report of 2000, the growth rate of the district was 1.4% making it lower than the regional average of 3.4% and the national average of 2.7%. The population density of the district was 61 persons per square kilometer. This is below the regional figure of 131 persons per square kilometer and also lower than the national figure of 73 persons per square kilometer.

A greater proportion of the population-about 64% lived in small settlements while the remaining 36% lived in a few urban where population exceeded 5000 inhabitants (GSS, 2002).

According to the Ghana Population and Housing Census Report, as at 2000, illiteracy rate of the district was 37%. This was higher among females than males.

2.2.6 Social and Economic Infrastructure

The Sekyere West District has 203 basic schools made up of 122 primary schools and 72 junior high schools. It has 4 senior high schools, 1 vocational, 2 teacher training colleges, 1 midwifery training school and a university (University College of Education Winneba, Mampong Campus). About 39% children of school going age are out of school (Sekyere West District Assembly, 2004).

The district has 1 government hospital, 7 health centres, 3 maternity homes and 5 private clinics. From the geographical distribution of health facilities, people from the Afram Plains section of the district do not have access to the health facilities which are mostly located in the southern part of the district. The district capital, Mampong and few other towns have access to pipe borne water. Under the World Vision International and Community Water and Sanitation Programmes wells and bore holes were provided to serve most of the communities which hitherto had no safe source of drinking water. Most of the communities lack electricity supply. This facility is mainly restricted to some few communities along the major roads in the district. It was estimated that only 27% of the population enjoy electricity power (SWDA, 2004).

Only major towns and villages are linked with relatively good road networks. However, the Afram Plains section of the district is inaccessible most of the time

especially during the rainy season. The total road network of the district is approximately 510 kilometres. There is one major highway linking Kumasi and Yeji that passes through Mampong. There are 318.2 kilometers of the second-class road and 144.8 kilometers of the feeder roads in the district (SWDA, 2004).

2.2.7 Economy

The major economic activity in the district is agriculture which employs about 62% of the population. The service sector employs 17%, commerce 12% and small-scale industries 9% (GSS, 2002).

Major farming systems in the district are the traditional bush fallow and shifting cultivation, the latter which is gradually dying out because of land scarcity. Agriculture in the district is rainfed. Streams and rivers in the district mostly dry up during the dry season making it impossible for any serious irrigational works. Most farmers use traditional hand tools like cutlasses and hoes for their cultivation. Major crops cultivated include cassava, maize, yam, plantain, cocoyam, cowpea, groundnuts, onions, tomato, garden eggs, carrots, cabbage, citrus and oil palm. Poultry and livestock production is also practiced in the district. The commercial centres where harvested crops are sent to are Mampong, Kofiase, Nsuta, and Jeduako.

2.3 RESEARCH METHODOLOGY

2.3.1 Introduction

This section describes data sources, the target population, variables used as well major analyses procedures employed in the study

2.3.2 Sources and Types of Data Used

Both primary and secondary sources of data were used in this research. The secondary sources of data were obtained from various institutions and organizations such as the Ministry of Food and Agriculture (MoFA). Other secondary sources of data included information from textbooks, magazines, articles, reports from the various institutions. Information from credible internet sites were greatly used. These information reviewed entailed relevant concepts, ideas and opinions on the subject matter, as have been expressed by different authors The primary data on the other hand included data obtained from direct field study. It included interviews, focus group discussions and data obtained from observational procedures.

2.3.3 Sampling Techniques

Qualitative research methods were employed. The choice of this technique was because, land degradation is a multidimensional phenomenon and different people have different perceptions about this phenomenon (Stocking and Murnaghan, 2001). The knowledge of the observable environment is often very detail and the poor people who live within these environments stand at a better position to enlighten anyone on the challenges and opportunities it provides (Chambers, 1983).

Because of the nature of the research, the study employed the non probability sampling technique. In view of this, purposive or judgmental sampling was employed to arrive at the sample size, reflective of the entire population. Tenant farmers and landowners were intentionally selected to replicate the qualities or the characteristics required. The snowball sampling technique was further used to identify all farmers who match the categories needed. Identifying one tenant farmer

therefore, helped in identification of other tenant farmers. The same (snowball) technique was used in selecting landowners in all the communities for the study.

In the focus group discussions, participants were of homogenous characteristics. This was to limit the study to selected individuals who met the criteria (tenant farmers as one group and landowners as another). The views about the world and our environment are better brought to the fore with the use of qualitative research. Numbers do not give much insight into such phenomena, rather the quality of details provided, is what matters. In view of these focus group discussions became the best option.

Focus group discussions made up of six to eight (6-8) respondents were separately conducted in groups comprising landowners as one and tenant farmers as another group. Additionally, direct field observation was a key element in the data gathering process. Images were also used to present the extent of soil degradation in the Sekyere West District.

2.3.4 Sampling Design and Sampling Size

In selecting respondents, farmers were grouped into two;

a) Farmers who till their own land, also called landowners

b) Farmers who are under various tenure arrangements, also called tenant farmers

In selecting spatial units and individual respondents, probability and non-probability sampling techniques were used. Stratified sampling method was employed, this was because, the nature of the research called for the division of the of the study area into various subgroups or strata according to various homogeneous characteristics (tenant farmers and landowners) from which further samples were

taken. Some settlements with relatively serious cases of soil degradation were purposively selected as part of the sample.

Because of the nature of the research, which is basically qualitative, the depth of information obtained was of prime importance instead of the ordinal numbers. Tables 2.1, 2.2, 2.3 and 2.4 summarize the composition of the respondents in the research areas.

Table 2.1: Gender Composition of Landowner Respondents for the Study Area

Landowners		
	Gender	
Community	Male	Female
Aframso	5	3
Amoaman	7	1
Assam	4	4
Bimma	5	3
Bosomkyekye	7	1
Nkwanta	5	3
Sekruwa	6	2
Woraso	7	1
Total	**46**	**18**

Source: Field Data 2007

Table 2.2: Age Cohort and Literacy Levels of Landowner Respondents for the Study Area

Age Cohort	**Number of Respondents**	**Education**	
18-30	4	None	42
31-40	7	MSLC	18
41-50	18	JSS	4
51-60	14		
61-70	16		
71-80	5		
Total	**64**		**64**

Source: Field Data 2007

The study covered a total of eight (8) communities. These communities were Aframso, Amoaman, Assam, Bimma, Bosomkyekye, Nkwanta, Sekruwa and Woraso. These communities were selected purposely to reflect the types of dominant

land tenure systems in the areas, be it ownership and contractual tenureship. They were also selected to ensure even distribution across space. In each of the eight (8) communities, two focus group discussions were conducted with each focus group consisting of six (6) to eight (8) members.

These consisted of farmers who till their own land as one group and those who are under various tenure arrangements as another group. The information generated during the community focus group discussions were sometimes not sufficient. In view of this, sixteen (16) key informant interviews were conducted, with two in each community representing the two groups. The key informants, because of their specialised knowledge, position and background, age and experience regarding issues of land tenure and its degradation, provided information which did not arise during the focus group discussions.

Table 2.3: Gender Composition of Tenant Respondents for the Study Area

Landowners		
	Gender	
Community	Male	Female
Aframso	8	0
Amoaman	8	0
Assam	5	1
Bimma	6	2
Bosomkyekye	6	2
Nkwanta	6	1
Sekruwa	8	0
Woraso	8	0
Total	**55**	**6**

Source: Field Data 2007

Table 2.4: Age Cohort and literacy Levels of Tenant Respondents for the Study Area

Age Cohort	**Number of Respondents**	**Education**	
18-30	2	None	52
31-40	10	MSLC	8
$41-50	21	JSS	1
51-60	19		
61-70	8		
71-80	1		
Total	**61**		61

Source: Field Data 2007

2.3.5 Methods of Data Analysis

Since the study was basically qualitative relying on the views and informant interview outcomes, the analysis focused on the reconstruction of the descriptions that were offered. However, there were cross referencing from various respondents with different established facts on the subject matter. With this, presentation of findings and discussions were done concurrently. Where quantitative data could be extracted from the interviews and focus group discussions, tables were generated with it to enhance presentation of the results.

CHAPTER THREE

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

3.1 Introduction

Land degradation generally signifies the temporary or permanent decline in the productive capacity of the land. An alternate definition describes it as, "the aggregate diminution of the productive potential of the land, including its major uses (rain-fed, arable, irrigated, rangeland, forest), its farming systems (smallholder subsistence) and its value as an economic resource" (FAO, 1995 cited in Stocking and Murnaghan, 2001: 7).

Land degradation induced by man's land use practices is central to most published definitions of land degradation. According to Stocking and Murnaghan (2001), several natural factors such as steep slopes, high intensity rainfall and soil organic matter influence the likelihood of the occurrence of land degradation. These make some environments naturally more susceptible to land degradation than others. Although land degradation is defined by reference to productivity, its effects may include economic stresses and loss of biodiversity, diminished food security and reduced calorie intake which have a direct bearing on poverty (Stocking and Murnaghan, 2001).

Some forms of land degradation could be reversed by changes in land management techniques. More serious forms of degradation such as salinity may however be awfully expensive to reverse or for practical purposes irreversible. Soil erosion, when serious and prolonged, is effectively irreversible because, in most circumstances, the rate of soil formation is so slow. The rate of soil formation in warm climates for just a few centimeters of soil may take thousands of years and in

cold, dry climates it may take even longer period. Soil loss through erosion however happens faster; up to 300 times faster where the ground is bare (Stocking and Murnaghan, 2001).

3.2 Causes of Land Degradation

It is acknowledged that land degradation processes are not always induced by man but rather can take natural forms. However with these, the rates of regeneration are often at par with the degradation processes. In the natural state, the rate of water erosion under natural forest corresponds with the subsoil formation rate, hence there is always equilibrium. This boils to the point that accelerated land degradation commonly transpire after human intervention in the environment. However, the effects of this intervention are determined by the type of natural landscape. Overgrazing of rangeland; over-cultivation of cropland; waterlogging and salinization of irrigated land; deforestation; and pollution and industrial causes are the most frequently recognised main causes of land degradation (Stocking and Murnaghan, 2001).

Within these mentioned categories, myriad of individual causes could be identified. These causes may include the failure to undertake soil conservation measures and the conversion of unsuitable, low potential land to agriculture. Economic and social conditions also encourage land users to over-cultivate and deforest. It is possible to distinguish between two types of land degrading actions. The first is unsustainable land use. This refers to a system of land use that is wholly inappropriate for a particular environment. It is unsustainable in the sense that, unless corrected, this land use or indeed any other could not be continued into the future (Stocking and Murnaghan, 2001).

Unsustainability has the implication of being irreversibly degrading. Many 'badlands' (extremely bare, devegetated and eroded slopes) are effectively irreversible. However, a large input of technology could start a rehabilitation process, if enough time and resources were to be devoted to the process however such an initiative could be economically demanding. Inappropriate land management techniques also cause land degradation, but this degradation may be halted or even reversed if appropriate management techniques are applied. The effect of a land degrading process differs depending on the inherent characteristics of the land, specifically soil type, slope, vegetation and climate. Thus an activity that, in one place, is not degrading may, in another place, cause land degradation because of different soil (Stocking and Murnaghan, 2001).

3.3 The Concept of Land Tenure

Land tenure refers to the manner in which and the period for which rights in land are held (Bohannan, 1988). The tenure of land consists of a set of rights which may vary across communities. According to Nankumba (1986), the word tenure implies that land can be held. It consists of a relationship between a person or a group of persons and a parce1 of land. However tenure can also be the relationship between a person or a group of persons and another person or group of persons. In it totality, this aspect of tenure implies a relationship between a person or a group of persons in relation to land.

The relationship between a person and another person or, a person and land, can be considered in terms of rights and obligations. Rights here may be seen as access rights; that is control or exclusion rights and use rights or benefits. Similarly, obligation may include the way the parcels of land are used within the social,

ecological and political norms, and this may include the care and the type of investment in land by the land owners. Therefore, obligations may be to another person or persons or to the land (Nankumba, 1986).

Based on the above discussion, and for the purpose of this study, the concept of land tenure may be define as: ‘a way in which people hold or own land; the rights and benefits that accrue from such holding or ownership, and the obligations that arise therefrom’ (Brook-Taylor, 1977:14).

The first part of the definition that is ‘a way in which people hold or own land’ connotes mode of acquisition or means of access to land. The second aspect of the definition that is ‘the rights and benefits that accrue from such holdings or ownership’ implies the types of rights and finally, 'obligations that arise therefrom' refers to the responsibilities of the land owner in terms of the use of land and land-based resources. Obligation is multi-dimensional; it could refer to the relationship between the owners of land and the parce1of land as well as the responsibility of land owners in meeting the ecological, social and legal norms.

3.3.1 Property Rights and Land Tenure Institutions

Libcap (1989: 1) defined property rights as "social institutions that define or delineate the range of privileges granted to individuals to specific assets, such as parcels of land or water." In the case of this study, social institutions refer to land tenure institutions.

Therefore, such tenure institutions provide or recognize a bundle of rights by making regulations that give the holders or owners of tenure rights over the benefits of land. The land tenure institutions directly determine the access to land or mode of acquisition and in some cases control, benefit and management (Libcap, 1989).

Like any other property rights institutions, land tenure institutions range from formal arrangements, including constitutional provisions, statutes, and judicial rulings, to informal conventions and customs regarding the allocation and use of property (Libcap, 1989).

3.3.2 Tenure Security

Place, Roth and Hazell (1994) define tenure security to exist when an individual perceives that he or she has rights to a piece of land on a continuous basis, and that, he or she is free from imposition or interference from outside sources, as well as ability to reap the benefits of labour and capital invested in the land, either in use or upon transfer to another holder.

As discussed earlier, land tenure institutions determine a way in which people hold or own land, the rights that accrue from such holding or ownership, and the obligations that arise therefrom. Therefore it could be said that, individuals' tenure security is determined by institutional changes, since institutional changes influence land ownership patterns or the four aspects of land ownership; that is, nominal title, control, benefit and management (Place, Roth and Hazell, 1994)

This means that the concept of tenure security is not static but rather changes with the nature of institutional change. Institutions change; whether the changes are spontaneous or through modern land laws in order to accommodate social, economic and political changes. However, the degree of individuals' security in their tenurial arrangement depends on why the changes are required, and how the changes are put into practice. If the changes are not conceived well, they may create more insecurity than the tenurial security they intended to create (Place, Roth and Hazell, 1994)

To sum up, the security of tenure partly depends on the process of land tenure institutional change. In other words, the security of tenure depends on the degree of involvement by the concerned parties in the process. However, three major indicators can be derived from the above tenure security definition. These are: (i) clear and adequate definition, (ii) provision of sufficient duration of rights, and (iii) dependability or assurance in exerting rights (Place, Roth and Hazell, 1994).

'Definition' is the type of 'land ownership rights' that may come out of the processes of institutional change. It refers to the first two aspects of our land tenure working definition, that is, 'a way in which people hold or own land and the rights and benefits that accrue from such holdings'. This means that tenure security largely depends on the clarity and adequacy of the newly defined land tenure arrangements themselves. 'Clarity and adequacy' in defining the types of land tenure arrangements are vital for the success of institutional changes in providing the necessary security to the concerned parties.

Land tenure arrangements involve a variety of rights, including access, exclusion or the right to exclude non-owners from access, the right to sell or otherwise transfer the resource to others from time to time (Libcap, 1989). This includes not only the type of care that the owners may have to adopt in their use of land or the type of conservation practices, but also the type of rights they may have to exclude others. The community plays an important role with respect to defining the rights of control over, and access to, land resources (Bromley, 1991). This also includes the recognition of the authority of such institutions by members of the community or by a society at large

Duration is the length of time that a given right is legally or socially valid. The economic dimension requires, in addition, that the time horizon be sufficiently

long to enable the holder to recoup with confidence the full income stream generated by the investment. As land rights are generally secure for the season, tenure insecurity tends to be less important for short-term inputs or than for capital long-term improvements with benefit streams stretching far into the future (Place, Roth and Hazell, 1994).

The dependability of the land-tenure institutions is crucial to all aspects of land tenure arrangements. It also refers to dependability of the land itself. This means that dependability is multidimensional. It has sociopolitical, economic, legal and ecological dimensions. In socioeconomic terms, dependability refers to whether or not all concerned parties in the social group would agree to a new set of definitions of land tenure arrangements, both in terms of adequacy and duration. Even if the new sets of rights are defined through negotiations, some parties may be harmed by the new definition of social norms and political power (Place, Roth and Hazell, 1994)

3.3.3 Tenure Security in Traditional Customary Tenure Systems

Generally, access to a portion of the communal resources is mediated through membership in a social group, the allottee has possession and use of the land as long as it is being cultivated. The heirs would normally be given the land that was cultivated at the time of his or her death, unless the rights of access are subject to a periodic rotation (Biru, 1988; Cohen, 1980).

Possession of land by an individual (or family) is conditional upon his/her bringing it under actual cultivation. For farmers, land does not have intrinsic value; it only forms a material base upon which human labour can be exercised. "What entitles the peasant to receive the harvest produced by a given piece of land is not the

fact of owning or possessing the land but, rather, the fact of having made it fruitful through his own labour efforts " (Raynaut, 1976 cited in Platteau, 1992:88)

In traditional customary systems, therefore, the concept of land rent as understood in the Western legal system is meaningless. The principle of inalienability of the lineage land patrimony is more strongly adhered to because an important symbolic meaning is attached to it. Indeed, in so far as the land is emotionally identified with the ancestors, whom it is believed to provide with an everlasting shelter, the objective of keeping it under the control of the community is viewed as an infallible way of maintaining the community's social integrity. Even if the lineage territory comprises more land than can be cultivated by its members, the surplus land is entrusted to the chief who has to keep it on behalf of the whole social group (Platteau, 1992).

Therefore, under the traditional system of property rights, lineage membership is both a sufficient and necessary condition for institutional and tenure security. It is sufficient because no member of the group can go without land. Guaranteed access to land for every resident household is the main method through which people are insured against the risk of hunger. It is necessary because land cannot be alienated outside of the community. In addition, the community holds revisionary rights in land to the extent that the rights to land revert to the community when it is no longer cultivated (Platteau, 1992; Biru, 1988; Bates, 1984).

3.3.4 Management of Land Resources

Land resource management refers to the obligations that arise from ownership over the parce1 or parcels of land. It refers to the management aspect of the land tenure concept (Place and Hazell, 1993). In other words, it refers to the

behaviour of those who have the rights over use of the land-based natural resources that is, person-to-land relations. In the context of farming, it refers to management of land-based resources such as soils, water and forests by the individual households for direct production activities. In economic terms, management of natural resources refers to the use of a bundle of rights or the mode of resource exploitation in the production process in order to draw economic benefits from it (Place and Hazell, 1993).

3.4 Land Tenure and Soil Management

Land tenure delineates farmers' right to use land resources. Thus, it conditions the decisions they make about how to use land and the kinds of investments to make. Insecure tenure arrangements also contribute to declining soil fertility and hence land degradation. Ill-defined property rights and insecure tenure rights have also reduced the incentive for farmers to undertake soil fertility-enhancing investments (Gruhn, Goletti and Yudelman, 2000). Farmers with secured tenure arrangements would therefore investment in soil fertility to reap the long-term reward of sustained high crop yields and greater profits. Hopkins, Berry, and Gruhn (1995) noted that in Niger, secure land for growing millet accounts for 90 percent of manured fields. From their studies, it was evident that the propensity for farmers to invest in fertility improvements was high with secured lands. They observed that secured fields received an average of 307 kilograms per hectare of manure, while unsecured millet fields received only 186 kilograms per hectare.

Farmers may adopt new investment strategies such as the adoption of new technologies which may be in irrigation, drainage, soil conservation structures, and use of chemical fertilizers. They may also abandon traditional technologies or

strategies such as fallow periods and the application of manure. Land-use changes that result from the restructuring of landholding are of several types. They include the duration and amount of land in fallowing practices, cropping patterns (types of crops grown, multiple cropping, intercropping), and agroforestry (Clay, Guizlo and Wallace, 1994).

Hardin (1968) emphasized that farmers overuse a commonly-held property to compete with other. Clark (1974) argued that investments in land productivity are more likely to occur when owners farm their own lands. Other researchers however countered this assertion. Guillet (1981) and Trivers (1971) advocate that farmers do not have to degrade common property, in many areas, strong social and cultural sanctions and a communal ethic can persuade farmers to sustain rather than degrade the land.

Boserup (1965, 1987, and 1990) argues that the tenure system will evolve naturally from communal to individual property owing to population pressure and the need for agricultural intensification. Boserup acknowledged that this evolution in land tenure is necessary before countries can achieve significant gains in agricultural output. The moment intensification reaches a point where land improvements are necessary; the tenure security of private property would make it possible for farmers to get credit to finance these improvements. However, as individual owners acquire land, there is the tendency for concentration of land in the hands of a few. This will eventually lead to rental and share arrangements between large landowners and those without sufficient productive land. Renters are less likely to make long-term investments, increasing the potential for soil degradation.

Morris, Tripp and Dankyi (1999) observed that in Ghana fertilizer use among maize farmers is much correlated with land tenancy arrangements. Fertilizer use is

highest on owned land accounting for 23.3%, with rented land receiving 9.3%, and lowest on sharecropped land with 4.3%. These results suggest that farmers are more likely to invest in fertilizer if they believe they will be able to capture the benefits generated by the investment, that is, yield increases resulting from enhanced soil fertility, including yield increases that would be realized in future cropping seasons because of residual effects of fertilizer in the soil.

Stonich (1989) in her examination of tenure in southern Honduras found that rented lands were the most degraded. She realised that renters lack security of tenure; most have access to parcels for no more than three years at a time. This gives them little incentive or means to invest in costly soil conservation technologies. In the study, it was realized that tenant farmers rarely fertilize fields but burn them before cultivating, a labor-saving but highly detrimental practice.

Migot-Adholla, et al., (1990) divulged that, in Ghana, soil investment behavior depends on the security of land tenure. Farmers are considerably more likely to improve lands they own, or for which they have long-term use rights, than lands they operate under short-term use rights. In comparison to Ghanaian farmers, Kenyan farmers report higher security of land tenure and, in turn, a greater willingness to invest in their holdings.

Similar evidence from elsewhere in SSA suggests that the causality may run the other way, that is, investment may be undertaken to enhance tenure security rather than as a response to higher levels of tenure security (Besley, 1995; Sjaastad and Bromley, 1997). Brasselle et al., (2002) reported that in Burkina Faso, land-related investment appears to be undertaken primarily to increase tenure security rather than as a consequence of more secure rights.

In 1988, the World Bank and Rwanda's Service des Enguetes et des Statistiques Agricoles (SESA) conducted a joint study on the effects of land tenure on agricultural production in three regions of Rwanda. Researchers wanted to learn how tenure arrangements influence farmer investments in their holdings and how such investments in turn affect crop yields. Consistent with findings from Honduras, Ghana, and Kenya, Blarel (1989) reports that Rwandan farmers were far more likely to invest in their own fields than in fields rented from others.

On the other hand, there are findings that challenge the argument that tenant farmers invest less in improvements and prefer alternative ownership arrangements. Yoshinori and Hayami (1989) found one such example in a study of tenurial arrangements among small farmers in Java. Converse to previous statements, sharecropping, as practiced under certain conditions, was not a disincentive to investment.

Ervin (1982) examined the relationship between tenancy and soil conservation investment in the United States. He cautioned against automatic approval of the view that renters and sharecroppers have little or no incentive to invest in soil conservation. He acknowledged that, there was no consistent relationship between soil conservation investments and tenancy. However, factors such as whether a particular tenant is a family member rather than a neighbor or aspires to purchase or inherit the land can have significant implications on investment. This study suggests that the stability of tenure, rather than ownership, is the more important factor conditioning farmers' decisions to invest in soil productivity.

Cook and Grut (1989) also disputed the assumption that land ownership encourages investment in their review of agroforestry practices in Sub-Saharan

Africa. The economic argument may seem especially convincing for investments in agroforestry that bring in return over a longer time period. This review concluded that, tenure issues may have more to do with customary rights over land use than with formal laws and regulations and that the evidence is not entirely clear whether individual ownership motivates farmers to invest in agroforestry technologies for soil conservation. The question is therefore not collective versus individual ownership or even ownership versus rental. Rather, it is more a question of obtaining stable, long-term use rights. These are rights which will permit farmers to draw benefits from their investments over the long term. Farmers' ability to recover investments in soil productivity do tend to be less certain when they collectively own the land or operate it under a lease agreement. However, the literature shows that neither constitutes a necessary nor a sufficient condition for low levels of investment.

Land tenure plays an equally important role in land-use patterns as land management practice. Land-use patterns, like investments, often reflect the stability of use rights. Farmers operating under long-term use rights are more likely to plant perennial crops, produce wood, or hold the land in long fallow. Farmers sharing land or renting under short-term agreements are less likely to plant for the long term (Clay, Guizlo and Wallace, 1994).

Once more, if farmers are not assured of reaping the longer-term benefits, they will use their holdings to maximize near-term returns Farmers in such situations discount the future at very high rates, thereby reducing the incentive for long-term investments in improved soil fertility. For example, the importance of security of tenure has emerged in studies of indigenous agriculture in the Amazon region. Alcorn (1990) observes that the security of tenure there has traditionally encouraged a long-fallow agricultural system. Newer with limited security of tenure have

however developed an extractive, short-term agricultural system, resulting in rapid depletion of soil nutrients and increased erosion (Schmink and Wood, 1987).

Reviewing data from 37 countries in Sub-Sahara Africa (Drechsel et al., 2001), confirmed a significant relationship between population pressure, reduced fallows and soil nutrient depletion. This indicates a generally unsustainable nexus between population, agriculture and environment that leads through a downward spiral into a poverty trap, instead of the Boserup mechanism of population-driven intensification.

Many farmers in Sub-Sahara Africa live on the edge of survival and therefore have been claimed to have myopic time preferences and high discount rates. Hence, it has been argued that these farmers may rationally choose to depreciate their soil resources, when short-term survival is at stake (McConnell, 1983; Diagana, 1999). However, Moseley (2001) challenged the conventional wisdom of high discount rates by the poor by pointing to observed evidence from the food security and famine early warning fields in Africa that the poor often knowingly eat less in the present in order to preserve productive capital and improve their chance of producing food in the future.

3.5 Population Pressure and Soil Management

Farmers operating small plots of marginal land often lack education and knowledge of how their management degrades soil productivity. Thus, they may take actions that degrade soil resources in many areas (Stoorvogel , Smaling and Jensen, 1993).

Farm size can affect land management in many ways. Large landholders are often more able than small landholders to maintain traditional fallowing practices.

Large landholders can afford the luxury of setting aside a large portion of their holdings for non-food uses such as pasture or woodlot and other land-use practices that help control soil loss and fertility depletion. Furthermore, since these large landholders are often farmers who are also relatively wealthy, they can invest more in inputs that will raise their long term productivity (Grabowski, 1990). Large landholders can also endure the short-term consequences of taking land out of production to create space for anti-erosion technologies such as grass strips, trees, and hedge rows. Conversely, small farms in densely-populated regions of the world have a relative abundance of labor to construct and maintain terraces, hedge rows, drainage ditches, and other soil conservation measures. And those with small holdings often need more careful management with the related improvements in productivity. Their lower production level puts them closer to the margin and at greater risk should portions of their holdings fail to produce adequate yields (Clay, Guizlo and Wallace, 1994).

Boserup (1965) maintains that as population density increases and land becomes scarce, fallow periods must be shortened, and levels of investment in productive technologies must increase if populations are to avoid the hardships of migration and declining standard of living. Although Boserup uses length of fallow as the key variable in defining the degree of intensification, inputs such as fertilizers, irrigation, and soil conservation are examples of technologies that substitute for long fallow periods.

Empirical support for Boserup's paradigm has been reported by Maro (1988) who describes several changes in investment and land use which have occurred in Tanzania as a result of decreased farm size. Complex networks of irrigation channels

form the basis for agricultural intensification in one area, while farmers have terraced steep slopes in other.

Riddell and Campbell (1986) provide further evidence from their work in the Mandara mountain region of Cameroon where high population densities and small farm sizes have made the development of intensive farming systems a necessity. A complex farming system has evolved based on soil-building strategies, integration of animal husbandry with cultivation, and soil conservation. Absurdly, problems of soil degradation have begun to emerge as more people leave the mountains to farm on the lowlands. A decline in population density from out-migration has curtailed labor available for soil conservation and manuring activities, labor necessary for maintaining the system's productivity. They acknowledged that "Traditional technology that keeps tropical soils in near-continuous production requires dense populations to ensure adequate labor. The Mandara material suggests that these systems collapse as soon as population density is reduced below some critical threshold" (Riddell and Campbell, 1986: 86).

Stonich (1989) concludes that large and medium holders in Honduras can leave land in fallow for longer periods. They are also more likely to invest in soil conservation measures than are farmers with relatively limited land resources. Ford (1990) reports similar findings from densely populated Rwanda. The observation that smaller farms rely less on fallow periods supports Boserup's hypothesis. This highlights Boserup's failure to account for other intermediate effects, such as variations in income and land ownership, both of which emerge from resource scarcity.

Liverman (1990) in his observation also realised that small farmers in the state of Sonora, Mexico are more likely to be affected by drought than large holders.

He acknowledged that it is because small holders; who are often poor, are less likely to invest in soil conservation and inputs such as fertilizers, seeds, and irrigation technologies. Conversely, in many parts of Central and South America, where labor inputs are the crucial factor, it is common to find an inverse relationship between farm size and intensity of land use (Williams, 1977). Khusro (1964) has documented the same relationship in India.

Farmers also intensify agricultural production through multiple cropping, increasing the number of cropping cycles per year. Boserup (1987) describes multiple cropping as a strategy to increase yields in the face of declining holdings. She defines it as one of the highest degrees of agricultural intensification. Usually larger landholders use it as they can afford increased labor costs and the necessary inputs of fertilizers and irrigation. Farmers often compensate by reducing the diversity of crops and land uses when introducing multiple cropping strategies. Increased labor and inputs for multiple cropping may reduce investments in lower-yielding crops that are integral to the long-term vitality of the agroecosystem.

Intercropping is a strategy where multiple crops are grown interspersed on the same plots. Besides raising yields without purchased inputs, benefits of intercropping include soil moisture retention, erosion control, and fewer weeds and pests. Risk minimization is an important adaptation to population pressure that is especially crucial in drought-prone areas. However, as farmers adopt higher technology strategies, they may be less apt to pursue intercropping. Generally, large holders who utilize imported, modern farming practices reduce the diversity of species they plant (Clay, Guizlo and Wallace, 1994).

Boserup (1976) asserts that the environment deteriorate when population increases, by natural growth or immigration, until it exceeds the carrying capacity of

the land under that system. This could happen as pastoral societies overgraze grasslands while other groups cultivate steep hillsides, resulting in soil erosion. However, she acknowledged that sustained demographic growth does not always lead to environmental degradation. She says, "The possibility exists that the population, when it outgrows the carrying capacity of the land with the existing subsistence technology, may change to another subsistence system with a higher carrying capacity" (Boserup, 1976: 25).

Implicit in Boserup's argument is the assumption that extensive adaptation can continue indefinitely and under conditions of population pressure never experienced in human history. Nonetheless, Boserup does not explicitly address the ability of ecological systems to adapt to changing human uses. Increasingly, ecologists are concluding that, despite the resilience of nature, agro-ecological systems have limited capacity to adjust to rapid changes in human land use. Traditional agricultural systems develop over long periods and may be best suited for the environments from which they have arisen. The loss of land can devastate agricultural systems that depend on crop diversity. For example, reduced fallow periods in slash and burn agriculture can lead to wholesale abandonment of the agricultural system and a loss of ecological stability (Fearnside, 1985).

Agroecological systems represent a set of interactions between human land uses and nature. The kinds of adaptations Boserup describes are a departure from the agroecological system as a critical component for the success of farming. Agroecosystems may, simply, be unable to adjust to the rapid and radical adaptations that Boserup asserts are a necessary part of coping with increased population pressure. Consequently, we may have to accept a measurable degree of environmental deterioration. Boserup's perspective on environmental degradation

emphasizes declining levels of commodity production. As long as production increases to meet the needs of the growing population, people perceive degradation either nonexistent or irrelevant.

What is not taken into account is how changes in land use and investments may affect the potential for sustainable production. Even with adaptations in the farming system towards greater intensification and higher production, degradation may still be occurring. Stocking (1984) in his review of soil erosion and productivity commented, "The loss may be hidden: compensated for by additional inputs, especially fertilizers; or covered by extra labor or bringing more land into production; or simply tolerated as ever-declining agricultural production..." (Stocking, 1984: 9).

Some researchers have emphasized the advantages to land fragmentation. These advantages include the farmer's ability to exploit a greater diversity of agroecological conditions. This, in turn, helps sequence crops and reduces the risk of total crop failure (Bently, 1990).

Igbozurike (1970) contends that fragmentation is actually beneficial to small farmers in West Africa simply because agroecological diversity allows for a greater number of farmers to survive. This occurs although very small field sizes may limit options for crop types and the introduction of mechanized production. How farmers view the trade-offs undoubtedly affects land use, investment strategies, and the process of land degradation. Trade-offs include the greater flexibility (control over a larger number of micro-environments) compared to increased costs (time and labor spent traveling from one parcel to another). However, the research literature on fragmentation concentrates on the effects of declining farm size.

A few empirical studies have shown how fragmentation influences land use, investment strategies, and productivity. Migot-Adholla, et al., (1990) in a study, observed that, in the Anloga area of Southern Ghana farmers are more apt to invest labor and capital in fields that are closer to their homes, usually built up on sand bars. Because of the location of these fields on the sand bars, they are more prone to damage from heavy rains. Therefore, they require more investment in flood prevention and repair. Susceptibility to rain damage may be one important factor in the farmer's decision to invest in nearby fields.

Higher investment in nearby parcels also reflects the higher productivity and importance of sand bar agriculture. Pingali and Binswanger (1988) in their study of the returns to investments in soil conservation also realised similar trend. Their findings support the conclusion that farmers usually get higher returns from their investments in closer locations. Thus, despite the advantages of greater agro-environmental diversity, there may be good reason to believe that farm fragmentation prohibits farmers from enhancing productivity. The greater level of investment and the increased risk of investing in distant parcels may diminish the incentives for certain types of conservation investments. Farm fragmentation, as a demographically-induced change in landholding structure is, therefore, fundamental to our understanding of how population pressure could result to land degradation.

Increasing cultivation of marginal lands and their subsequent degradation is a phenomenon common to densely-populated countries around the globe (Gregersen, et al., 1992). In many arid and semi-arid areas, and in most forest ecosystems in the tropics and semi-tropics, the problem is acute (Getahun, 1991). In the absence of sufficient off-farm opportunities, rural populations look to the process of ecological

expansion, the exploitation of resources formerly outside of their immediate environments (Hawley, 1950).

Migration onto marginal lands, seen here as a significant change in the structure of landholding, is well recognized for its impact on the environment (Hecht, 1985; Millikan, 1992). Research on the conversion of marginal lands, and on the destruction that often follows, has focused on two substantive issues. The first arises from increased competition between herders and cultivators. As a result, pastoral systems have changed in several environmentally-important ways. Competition has forced pastoralists onto drier, more fragile lands. In addition, their integration with cultivation systems has declined as in Rwanda (Rwamasirabo et al., 1991). The second is the process of deforestation. Reduced forest cover results primarily from the conversion of forest lands for agricultural purposes and from increased demand for fuelwood (Clay, Guizlo and Wallace, 1994).

According to Clay and Lewis (1990), in Rwanda, increasing land scarcity from population growth has forced many farmers in recent decades to depart from their traditional agricultural system. Historically, Rwandan farmers settled along the upper ridges of their hillsides. Here the soils were more fertile and cultivation was simpler than it was farther down on steeper slopes and in marshy valleys. As preferred lands along upper slopes became occupied, young farmers had to choose. They could either cultivate smaller and less fertile plots farther down the hillside or migrate elsewhere in search of sufficient land.

Moran (1987) examined the implications of converting fragile forest land to cultivation in the Amazon region. The forest canopy formerly protected the soil, but loss of nutrients and erosion has now degraded the land. Reasons for degradation and

exploitation of these fragile Amazonian lands vary, but all seem to link to demographic pressure.

Fearnside (1985), Schmink and Wood (1987) realised that short-term intensive cultivation and large pasture tracts for cattle have replaced indigenous agriculture based on long fallow cycles. Hecht (1985) links deforestation in the Amazon to policies intended to encourage migration to the region. Millikan (1992) draws attention to increased rural unemployment and landlessness, two symptoms of population pressure, in a study of environmental degradation in the region.

Campbell (1981) focused on increasing land use pressure, resulting partly from population growth, in a study of marginal rangelands in Kenya. Campbell realised that land-use competition between herders and cultivators continues to threaten the ecological stability of fragile lands and contributes to desertification. Mwalyosi (1991) also identified competition between herders and cultivators as the immediate cause of land degradation in other semi-arid regions of Africa. Demographic pressure was seen as the precipitating cause.

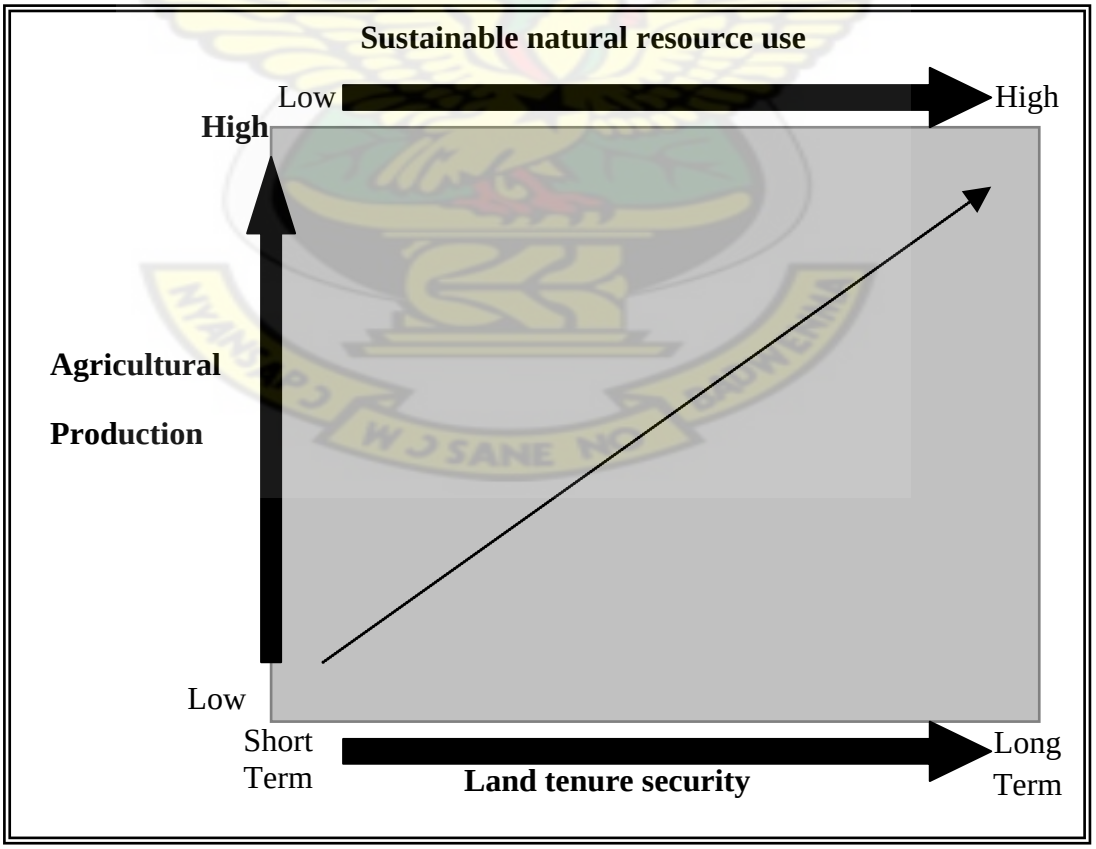
From the literature reviewed, it could be deduced that, the views that land degradation occurs as a direct result of demographic pressure is a sweeping statement of what is actually a very complex link. There is no strong correlation between human populations and their environments but rather the intervening processes create the context within which land degradation occurs. The research literature substantiates that it is not just the ownership rights that determines environmental deterioration but rather, it is the stability of use rights that counts. Tenure security is a precondition to long-term soil improvement investments, irrespective of whether ownership is in individual or collective hands. As fields are increasingly farmed

under short-term lease agreements, conservation technologies will become even less favorable to tenant farmers. The net result will be an acceleration of Soil degradation.

3. 6 CONCEPTUAL FRAMEWORK

This section attempts to build a conceptual analysis of the linkages between land tenure security and sustainable agricultural production. Land tenure security is often seen as a precondition for intensifying agricultural production and is increasingly stressed as a prerequisite for better natural resource management and sustainable development. The literature suggests that increased security of tenure in productive resources leads to enhanced and sustainable agricultural production (Maxwell and Wiebe, 1998; von Maltitz and Evans, 1999).

Fig. 3.1: Linkages between Land Tenure Security, Agricultural Production and Sustainable Natural Resource Use



Source: Adapted from Maxwell and Wiebe (1998) and von Maltitz and Evans (1999)

The likelihood for farmers to make medium to long term land improvement investments tends to be high if their tenure is secured, this is because they will be more likely to benefit from whatever investment they might go into (Roth and Haase, 1998).

Enhanced tenure security will lead to higher investment and higher agricultural production. Maxwell and Wiebe (1998) acknowledged that, whether the frame of reference for the system of land tenure is communal or individual, there is widespread evidence that secure property rights are linked to a higher propensity to invest in tree planting, manuring, soil and water conservation (Maxwell and Wiebe, 1998).

3.7 PROPOSITIONS

Based on the survey of literature, the following propositions have been made with respect to the study:

- There is a negative relationship between tenure security and soil degradation
- There is no correlation between the duration of lease and soil improvement investment decisions

CHAPTER FOUR

LAND TENURE SECURITY: LOCAL PERSPECTIVE

4.1 Introduction

This chapter presents data relating to this study. It consists of six sections. Each section comprising perspectives from tenant farmers and perspectives from landowners and is followed by a discussion to highlight salient points.

Land tenure defines farmer's access to land resources. It conditions the decisions they make about how to use the land and the kind of investments to make. It is often assumed that security of land tenure will enable the rural poor to improve their livelihoods as well as foster more sustainable agricultural practices. Secure land rights are said to have positive impact on the alleviation of poverty, this is because, it gives the farmer better control over their investments in the land (Clay, Guizlo and Wallace, 1994).

In their quest for survival, the poor often have little choice but to use their limited resources extensively. Insecure land tenure rights, lack of access to information and agricultural inputs often forces poor farmers to adopt survival strategies with short-time horizons. Although secure land tenure rights alone cannot guarantee sustainable land management, it can be a great incentive. Farmers with long-term access to land have a greater incentive to sustain the land and develop ways of preserving and regenerating it (Quisumbing et al., 2002).

Security of land tenure is one of the important factors in the mitigation of soil degradation. The lack of clear land tenure systems encumbers the implementation of long-term soil conservation practices. Secure access to land is essential for the land users to be enthusiastic about investing in activities that conserve and/or improve the

land; since the benefits from such investments usually take several years before their impact become manifested.

4.2 Trends in Farmland Ownership and Acquisition

In all the study communities, land remains within the control of the lineage and as such, families try to prevent alienation of land to third parties. The inheritance system in the study area is matrilineal, whereby succession and inheritance of property are determined through the female bloodline.

It was a common practice that, irrespective of the number of years a "stranger" has been settled in the area, he or she is still considered as such. This affected arrangements for acquiring land endowments. It was made known that, in the past, when land was generally abundant, migrant settlers gained access to land relatively cheaper in the study communities by presenting drinks to the chief after which the chief releases land out to the migrant. In some instances, the host family provided farmlands to such tenants instead of the chief. It was observed that, immigrants now obtain rights of access to land through tenancy agreements, ranging from sharing of output proceeds to leaseholds involving payments in cash. These rights are short-term and relatively insecure. Furthermore, tenants' rights of access to trees and other non-timber resources are often restricted by the landowners. This in a way explains the unwillingness among tenant farmers to engage in agroforestry in the study area.

The narrative summarizes the trend by tracing the land relations from the past to the present. From this 72-year old man at Bimma, the picture could be seen:

> *"Even though I cannot remember when this cash land rentals started, it has not been that long. It was not like this about 20 years back. When we were children, the migrants were coming from the North to farm here, but they were not paying anything. We were*

housing them and even sometimes clothing and feeding them till they have enough for themselves. The truth is, during those days our population was not that large, hence we could afford to give land out for free. In those times all they had to do was to help us on our farm sometimes. But now things have changed drastically, no one will be willing to give land out for free if you are not from his family or a native of this community. As for the natives in this community, all of us are related through inte-marriages. In those times we were able to regulate what they do on our lands. They were not cutting down all the trees on our land before cultivating their crops. I could remember things were much different from what we are experiencing now. Not most of the migrant farmers who pay with cash think they have bought the land for that period they have rented the land so they could do anything they wish to get their money back. It is just like those who are under fixed output per acre. Whatever you tell them is nothing to them. But one thing which can never change in this community is that, no migrant can own farmland and even transfer it to his or her next of kin, like it is done for residential plots".

The conflicts over land leased out to migrants were mentioned in communities like Nkwanta, Sekruwa and Amoaman. At Amoaman, some youth could not agree with their family heads for renting lands out to migrants while they did not have enough to farm on. The conclusion drawn from this was that, land could not be owned by migrants in any of the study communities and even lands rented out could be called back when any member of the land owning family was in need of farmland to till. Thus, as indicated by Platteau (1992) and Biru (1988); members of land owning families are guaranteed access to land as insurance against the risk of hunger and that land cannot be alienated outside of the community. In addition, the land owning families hold revisionary rights in land to the extent that land could be reverted to the family when the need calls for it.

Quisumbing et al., (2002) noted that the proportion of land acquired through purchase from individuals was between 4 and 5% in Ghana, however this proportion has been growing with time, while the area acquired through rental markets was as much as 18 .8% among migrant farmers.

In the study area, land either belongs to the community or family and individuals have a usufructuary right, that is the individual citizen enjoys cultivation right and even the right of transmitting his or her individual enjoyment right either by gift, will or inheritance to others in the family. Property rights are vested in the group while individual has only use-right. The individual derives his/her right to use farmland from his/her membership to the owning group. Access to farmland is practically free for such members of the owning family.

Table 4.1: Sources of Farmland to Tenant Farmers

Community	From Family Heads	From Chiefs	Total
Aframso	5	3	8
Amoaman	7	1	8
Assam	6	0	6
Bimma	7	1	8
Bosomkyekye	7	1	8
Nkwanta	5	2	7
Sekruwa	6	2	8
Woraso	3	5	8
Total	**46**	**15**	**61**

Source: Field Data 2007

From Table 4.1, it could be observed that, prospective tenant farmers acquired farmlands from either the chief and heads or elders of land owning families. It came out that the majority of tenant farmers obtained farmlands from heads of land owning families. Farmlands in most of the study communities belong to clans and such land divided among family members. From Table 4.1, it could be deduced that, the commonest mode of access to farmland was through the heads or members of land owning families. Forty six respondents obtained farmlands from family heads and 15 acquired theirs from chiefs. From this, it can be observed that, except for Woraso where most of the land belonged to the chief of Nintin, majority of tenant farmers obtained their farmlands from heads and members of land owning families. At Assam, none of the tenant farmers acquired their farmland from the chief, at Bosomkyekye and Bimma the source of acquisition was not much different.

Even though there used to be other types of sharecropping like the *abuno* and *abusa*, these systems have changed entirely to a money system economy where the ability to pay for a parcel of land in cash dictated who gets a farmland. With this cash system, rental prices were related to the value of land and its productive capacity in relation to other lands. This means rental charges however depreciate over time. Lease with rent payments in cash or in-kind including payments with farm output or revenue from such sales were also common in all the study communities. However, most landowners preferred cash rental to sharing output or revenue from sales. The words of a 64-year old man epitomized the reasons for this choice;

> *"If I wanted to get crops, then I think the best thing for me to do is to cultivate the land myself. It is when I am hard pressed for money that I rent out my land".*

Conflicts in relation to access to land and its control have also been on the increase in some of the communities visited. Some younger men were known to have contested the legitimacy of transactions carried out by their family heads and demanded that those agreements be revoked. In an instance at Bimma, one of the study communities, some elders had lost their authority, because they were perceived as having profited personally from such land rentals at the cost of family inheritance. In other situations, a ban had been imposed by local people on the sale of land to strangers. In all the study communities it is forbidden for migrants to own land. Lands are therefore not sold but rather rented out to prospective farmers for fixed periods of time. As such, farmlands are only considered a rental or loan, which can be called back by the landowner when needed. Again children of a migrant tenant can not inherit lands hitherto operated by their parents.

4.3 Land Tenure Security and Soil Improvement Investments

The relationship between the security of land tenure and agricultural productivity has been the focus of many past researches. Researchers such as Bromley (1991), Coase (1960), and Platteau (1992) have all pointed out a direct relationship between insecure land rights and lower agricultural productivity. This they observed from farmers' unwillingness to invest in land maintenance and improvement, and their lack of collateral for credit which can be used to purchase improved inputs and fertilizers.

Secure long-term land-use rights through ownership or lease are generally regarded as a necessary precondition for prompting farmers to invest in the improvement of their farmlands, particularly for some of the more costly soil conservation practices. Short-term land-use rights discourage investment since the long-term return is not guaranteed for the farmer. Cook and Grut (1989), report that the same argument may be especially cogent for investments in agroforestry, the returns to which are generally accrued over a longer time horizon. It was discovered that, tenant farmers in most of the study communities were reluctant to embark on agroforestry, this they claimed did not only compromised on their crop yields in the short run, but also the returns on such investment in the long run will not benefit them since their use rights are often for only one to two planting seasons.

From Table 4.2, agroforestry was not a common practice among tenant farmers in all the communities selected. The farmers explained that, teak which was often used for agroforestry in the study area, takes over ten years to mature. Moreover, crops could not be inter-planted with teak after five years. Therefore, when the teak is even planted, they will lose ownership of the land before the trees could be harvested. The contrast was clear with landowners, of which 28% of the

landowners interviewed had plots of farmlands inter-planted with teak. At Assam, the proportion was even higher. Six (6) out of the 8 respondents representing 75% were into agroforestry (Table 4.2). The landowners explained that, they owned the land and were sure that even if they do not live to harvest the teak, their descendants would still benefit from it; a situation which is uncertain or impossible for tenant farmers.

Table 4.2: Respondents Engaged in Agroforestry

Community	**Agroforestry**	
	Tenants	**Landowners**
Aframso	0	2
Amoaman	0	0
Assam	0	6
Bimma	0	0
Bosomkyekye	0	3
Nkwanta	0	4
Sekruwa	0	1
Woraso	0	2
Total	**0**	**18**

Source: Field Data 2007

From this 51-year old tenant farmer at Woraso, his expression in the following sums his position on the above situation.

> *"It is both costly and time consuming to embark on agroforestry and if I cannot even get access to my own investments in the future why should I do it now".*

Such perceptions of tenant farmers towards long term soil improvement investments were shared by all the tenant farmers interviewed at Amoaman.

Migot-Adholla, Hazell, and Place (1990), writing on the investment behavior of farmers in Ghana, reported that, investment behavior of farmers is highly dependent upon the security of land tenure. Farmlands cultivated by owners or those with long-term use rights are considerably more likely to be improved than those operated under short-term use rights. This was true not only for investments in

fertilizers, but also for investments in tree crops as well. These findings validate the third objective of the study which sought to ascertain whether farmlands given out under insecure tenure arrangements were more likely to be degraded. Panayotou (1993) similarly acknowledged that, farmers who engage in long-term soil conservation may sacrifice immediate income for the promise of better soil fertility and increased crop yield in the future. As was indicated at Woraso by a 51-year old tenant farmer, when there are no guarantees that farmers who rent land will reap the benefits of long-term soil conservation, tenant farmers are expected to use management strategies that maximize short-term production even if this compromises future soil fertility. This means that, when the duration of lease is short, all investments made would be what could be reaped in the shot run. This to a greater extent goes contrary to the proposition of this study, that '*there is no relationship between the duration of lease and soil improvement investment decisions'*. Thus it negates that proposition.

Nowak and Korsching (1983) and Schertz and Wunderlich (1981) both discovered that farmers who owned land used a broader number of management strategies and adopted best management practices earlier than farmers who rented. There were isolated instances which defied such findings, as stated earlier, the relationship between the landowner and the tenant could serve as a catalyst in determining the investment behaviour of tenant farmers. At Bosomkyekye, a classic example was realised. The management strategies adopted by one particular tenant farmer was far better than what most landowners tilling their own lands were using. He pointed out that*; "they see me as one of them"* this gave a general feeling that, a farmer's status as tenant farmer alone is not a sufficient condition to determine whether such farmer would embark on unsustainable soil management practices.

This helped in assessing whether farmlands given out under insecure tenure arrangements are more likely to be degraded. With this, it became clear that generalizing a farmer's status alone is a sufficient condition became questionable.

Considerable amount of variation exists in land tenure arrangements among the areas under study. Land use and soil degradation are highly influenced by the nature of tenure on a particular parcel of land. The study revealed that certain types of tenure had strong effects on the processes of soil degradation.

As a result of population increases and its associated farmland scarcity, the presence of crops that a particular family member has planted on an undivided family lands (unshared family land) is what establishes continuing rights over that piece of land for the farmer, this has resulted in reduced fallow periods or sometimes land that is never fallowed.

Table 4.3: Sources of Farmland to Landowners

Community	Inherited	Unshared Family Land	Total
Aframso	3	5	8
Amoaman	6	2	8
Assam	7	1	8
Bimma	5	3	8
Bosomkyekye	5	3	8
Nkwanta	4	4	8
Sekruwa	8	0	8
Woraso	8	0	8
Total	**46**	**18**	**64**

Source: Field Data 2007

From Table 4.3, 28.1% of the respondents tilled unshared family lands. Though no financial commitments are made before acquiring such farmlands, the uncertainties of losing it in the near future tend to be high. Once a parcel of land is left uncultivated for over two seasons, other family members could ask for the same parcel of land to farm on. This has made the management strategies on such lands not so different from those cultivated by tenant farmers. Such farmlands are put

under continuous cultivation to prevent other family members from entering it. The resulting effect is degraded land. This means that, security over a particular parcel of land is not only an issue for tenants in the study area but also natives who do not wholly have secure land right over the land they till.

In all the study communities, it became clear that security over a particular piece of land is as important as ownership in determining whether farmers husband land for future production. In areas where farmers felt they do not have the security of long-term use over the land, they treated the land as if they have short-term investment horizon.

Table 4.4: Duration of Lease of Farmland among Tenant Farmers in the Study Area

Community	**Duration of Lease (in planting season)**			
	1-2 (1 yr)	**2-4(2 yrs)**	**over 4 (2yrs)**	**No. of respondents**
Aframso	6	0	2	8
Amoaman	7	1	0	8
Assam	2	3	1	6
Bimma	8	0	0	8
Bosomkyekye	2	3	3	8
Nkwanta	5	2	0	7
Sekruwa	6	2	0	8
Woraso	5	3	0	8
Total	**41**	**14**	**6**	**61**

Source: Field Data 2007

The duration of lease and future assurance to till the same piece of farmland, formed the main basis of tenure security in the study area. From table 4.4, 67.2% of the farmers were on farmlands rented for between one to two planting seasons; coinciding with one calendar year. Only 9.8% of the respondents had their farmlands rented to them for over four planting seasons. At Bosomkyekye, all the three farmers with rent agreement of over four planting seasons, made known that, this was even to enable them offset the cost in stumping the farmlands which runs several hundreds of

new Ghana Cedis. With this the uncertainty of recouping the investment capital is even highly unknown among such farmers.

The study revealed that, land that is rented out was often the most degraded land. This was evident in communities like Sekruwa, Woraso and Amoaman. Landowners unanimously attributed the high levels of soil degradation in these communities to farmland rentals. All the 8 landowners from these communities interviewed were of the view that, the tenant farmers employed unsustainable farming methods in tilling the land. These findings lend further support to the third objective of this study which aimed at finding out '*whether farmlands given out under insecure tenure arrangements are more likely to be degraded'*.

In these communities, a large proportion of their farmlands were rented out to migrant farmers. The terms of rental were such that the tenants did not find it economic to embark on any sound soil management practices. The duration of lease was often one to two planting seasons. Since the returns on most soil improvement investments are often reaped in the long run, tenants with short-term lease did not find it economic to invest in the land in the short run. Moreover, owner-occupiers frequently chose their worst land to rent out. These were often farmlands that were already eroded and are of very low productivity, that demands high labor inputs in order to develop an appropriate planting surface for crops, and return from the land often relatively little.

In the case of the few who had to pay from the sale of produce, owners also frequently demanded they plant crops that could be harvested all at once such as maize so that the crop could be sold and proceeds shared. Table 4.5 shows the distribution of farmers under various tenure arrangements. The study revealed that, 72.1% of the tenants paid cash for the parcels of land they farmed on, another 16.4%

of the respondents were to give a fixed output per acre to their landowners (two maxi bags of maize per acre). Only 11.5% had entered into agreements where parts of the cleared farmland were given to their landowners.

At Assam, one of the study communities, the contrast was clear. As much as 87.5% of the landowners there tilled their family lands they had inherited. This had provided a secure tenure for the farmers to embark on long term soil improvement investments.

Table 4.5: Farmers under Various Tenurial Arrangements

Community	Sharing Cleared Farmland	Cash Rental	Fixed Output Per Acre
Aframso	0	8	0
Amoaman	1	6	1
Assam	4	2	0
Bimma	2	3	3
Bosomkyekye	0	5	3
Nkwanta	0	7	1
Sekruwa	0	6	2
Woraso	0	7	0
Total	**7**	**44**	**10**

Source: Field Data 2007

The Table 4.6 shows the adoption of mulching among landowners and tenants in the study area.

Table 4.6: Adoption of Mulching Among Farmers in the Study Area

Community	Mulching	
	Landowners	Tenants
Aframso	4	2
Amoaman	2	2
Assam	8	6
Bimma	5	4
Bosomkyekye	1	0
Nkwanta	0	0
Sekruwa	0	0
Woraso	1	0
Total	**21**	**14**

Source: Field Data 2007

There was a clear disparity in the adoption of the use of mulch between landowners and tenant farmers. It was however interesting to note that, the use of mulch was a function of the type of crops cultivated. Farmers at Assam explained that, the use of mulch on their mounds was a way of ensuring higher yields since the mulch helped retain soil moisture. It was therefore not surprising that at Sekruwa, Nkwanta and Bosomkyekye the adoption of mulching was almost zero. The major crop cultivated in these communities was maize; which the farmers believe does not need mulch to do well.

Though the farmers at Assam admitted cutting down trees during the land preparation stage, this was minimal compared with communities where farmers had insecure tenure. It became clear that farmers acknowledged the importance of secure rights in soil improvement investment decisions. A 53-year old Landlady in this community had a striking opinion;

> *"My farmlands were handed down to me from my mother, and I hope to do the same to my children. I have to make sure I just do not destroy it and make it lay waste. We feed ourselves from these farmlands and if I should destroy it where would I feed myself from. The land is mine and I have to make sure I take good care of it".*

Farmers were aware of the impact of bad farming practices on soil degradation and this to a larger extent was seen as a function of tenure security. In the same community most farmers practiced crop rotation and mixed cropping; a situation where more than one crop is cultivated on a single plot.

Plate 1 shows a plot of land used for crop rotation. With this farming method, the maize which uses nitrogen is grown alongside legumes, the legumes have root nodules containing bacteria. These bacteria are capable of converting atmospheric nitrogen, which cannot be used by the plants, into nitrate (NO_3^-), a form that can be used. This means that a single plot of land could be used for a very long time.

Plate 4.1: A Plot of Land Used for Crop Rotation

Source: Field Data 2007

Table 4.7: Distribution of Farmers Engaged in Crop Rotation and Mixed- Cropping

Community	Crop Rotation		Mixed-Cropping	
	Landowners	Tenants	Landowners	Tenants
Aframso	0	0	5	0
Amoaman	3	2	8	3
Assam	3	1	8	5
Bimma	2	2	8	6
Bosomkyekye	2	0	8	0
Nkwanta	0	0	8	0
Sekruwa	0	0	4	0
Woraso	0	0	5	0
Total	10	5	54	14

Source: Field Data 2007

As indicated in Table 4.7 above, crop rotation was not common among both tenant and landowners. From the table, 15.6% of the landowners practiced crop rotation whiles the figure was only 8.2% with regards to tenant farmers. Mixed-cropping was concentrated among landowners. Also, 84.4% of the landowners practiced mixed-cropping while 23% of the tenants also engaged in this farming practice. The highest proportion of tenant farmers at Assam and Bimma practiced mixed-cropping. At Assam, out of the 6 tenant farmers interviewed, 5 of them were into mixed-cropping. This deviation from the normal trend where tenants do not

engage in mixed-cropping was attributed to the origin of the tenant farmers in this community and the main crops cultivated. It was pointed out that, the tenant farmers in this community were mostly natives of the district and they tend to cultivate staple foods like cocoyam, maize, pepper and other crops which form part of their everyday diet. As depicted in Table 4.7, in communities like Woraso and Nkwanta, Bosomkyekye and Aframso, the tenant farmers mainly cultivate maize and do not inter-plant with other crops.

In the study communities, the willingness of farmers to embark on any activity which did not directly improve crop yield in the short-run but whose benefit could be reaped in the future, depended on the duration they expected to be on that particular parcel of land. This was evident from the number of tenant farmers who practiced mixed-cropping and crop rotation. As illustrated in Table 4.7, the proportion of tenant farmers who practiced mixed-cropping was only 23%. It was widely acknowledged that good soil management practices are directly related to productivity. However, the returns on most of such practices are not realized immediately. Therefore, farmer's willingness to embark on such practices depended on the security of the tenure. At Amoaman, a 53-year old tenant famer had this striking comment;

> *"I have been farming in this area for over 15 years; I came to Amoaman about 7 years ago. I know how the landowners are. As for me all I do is to make sure that I get the maximum yield while I am still on the land. The land is rented to me twice a year. I just have to make sure I get everything I spend on the land in that same year. This is because I might not get the same land back the following planting season. The relationship between most of us tenant farmers and the landowners is like someone who has rented out a shirt to another person, if this person does not know when the owner of the shirt will come for it, he will only make sure he wears the shirt so much that if the owner should come for it, the one who rented the shirt will still not lose. I do not think the one who has rented the shirt will wash the shirt not knowing when the owner will come for it. May be once you wash it and owner sees It, he*

might become jealous of his own shirt and come for it that very day so that he will use it himself."

This trend of ideas with respect to the insecurity of tenure among farmers at Amoaman was high. Out of the 8 tenant farmers interviewed at Amoaman, 7 of them had their farmlands rented to them for one to two planting seasons. When asked whether they would expected to till the same land for the next three years, none of the tenants could be certain with that. This reflected the extent of soil degradation in the area. The sampling of ideas in this community showed that, tenant farmers were more willing to extract the maximum benefit from the land in the short-run.

Table 4.8: Duration Tenants Expect to Remain on Farmlands in the Study Area

	Duration of Lease(in planting season)			**Expectation**
Community	**1-2**	**2-4**	**over 4**	**Use for Next 3 years**
Aframso	6	0	2	4
Amoaman	7	1	0	0
Assam	2	3	1	1
Bimma	8	0	0	3
Bosomkyekye	2	3	3	3
Nkwanta	5	2	0	1
Sekruwa	6	2	0	1
Woraso	5	3	0	3
Total	**41**	**14**	**6**	**16**

Source: Field Data 2007

Out of the 8 tenant farmers interviewed at Amoaman, all of them cultivated maize using the same cultivation methods. Farmers were of the view that, maize planted under shade yielded little. They therefore resorted to the cutting down of trees that hindered direct sunlight to the maize and sometimes left only tree of high economic value and those too big to fell with simple implements. The land preparation method therefore involved the clearing of everything on the land before the maize is planted. This cultivation method left the land bare after the maize is harvested; a precondition for soil erosion.

Plate 4.2 shows a plot of land which had been used for maize cultivation. There is not a single tree left on the stretch of land. Once the matured maize is harvested the land is left bare, making it easy for agents of erosion to set in.

With regard to migrant tenant farmers, the trend was not different in a number of farms visited at Amoaman. All the farmers interviewed had a common reason for cutting down most trees before cultivation.

Plate 4.2: A Plot of Land Used for Maize Cultivation

Source: Field Data 2007

One respondent indicated that;

> *"If I should plant my maize under a tree the stems will be slim and will not be able to yield much. So if I should have ten trees on my*

farm it will mean my entire farm will be full of trees and my crops will not do well"

Since the farmers were of the view that maize does not do well under shade, when asked whether mixed cropping could help solve the problem by planting other crops which could do well under shade instead of maize, this farmer was interested only in the short-term returns he would make from the maize since he rented the land for only two seasons. With this particular farmer, it was ironical that he had to rest under a tree on a different plot of land whenever the sun was up and he was tired.

While it is axiomatic that renters typically do not want to invest in the land they work, it was found that in some areas the case was different. As indicated earlier, at Bosomkyekye, a migrant who has been staying there for over forty years practice a better soil management than even most of the landowners. However, this was done in the light that he was accepted as one of the locals and he was assured on secured rights. On the other hand, as pointed out in Amoaman, unfortunately, this had sometimes resulted in owners taking the land back, because they expect it to become more fertile or valuable as a result of the better soil management implemented by the tenant. To this 52-year old man;

"Look, we came all the way down here to farm. I have stayed and farmed in most of the villages around here. All the land owners are almost the same; they will never give you any good land to farm on. When they realize what they gave you is even better than they thought, they devise ways of taking it away from you."

In such a situation they get what they can out of the land without regard to maintaining its future production potential. If farmers felt they had security of use over a long period, they treated the land as if it was their own.

4.4 Population Pressure, Farmland Availability and Soil Degradation

Land is the most basic natural resource for agriculture. Ghana has a total geographical area of approximately 23.9 million hectares of which 95.4% is land and the remaining 4.6 % is inland waters. The land suitable for agricultural purposes form 59.9% of the total land area. The available agricultural land per capita has been reducing over the years. It was 1.58 hectares in 1970, 1.10 hectares in 1984 and 0.72 hectares in 2000 (MoFA, 2001). However the rate of agricultural land usage has been increasing. The agricultural land cultivated per capita increased marginally from 0.3 hectares in 1970 to 0.31 hectares in 2000. The suitable agricultural lands per capita, reduced by 54.4% in the 30-year period due to population increases. The agricultural land per rural inhabitant was 1.28 ha in 2000, compared with 1.62 hectares in 1984 and 2.22 in 1970 (MoFA, 2001).

According to the Ministry of Food and Agriculture (2001), the declining availability was also due to the increases in population. The farming intensity coefficient which measures the land cultivated of the total agricultural land was 0.19 in 1970 and 0.43 in 2000. The portion of the agricultural land cultivated annually increased from 2.6 million hectares or 19% in 1970 to 5.9 million hectares or 43% in 2000. The portion of the agricultural land brought under cultivation thus increased by 125% over the 30-year period (MoFA, 2001).

As pointed out by Gyasi, (1994), population growth has rendered shifting cultivation system a luxury. This was not different in the study area. Population pressured had resulted in the shifting cultivation system been modified into more settled systems, where much shorter fallows period are observed. Because of the extensive land requirements, shifting cultivation and bush fallow cannot be sustained in the study area, this is because this system is only effective under conditions of low

population pressure and plentiful supplies of land. The duration of fallow among tenant farmers and landowner is shown in Table 4.10.

4.5 Agricultural Farming Systems

The rotational bush fallow system, which is characterized by clearing and burning of the vegetative cover (Diao and Sarpong, 2001), was the dominant farming system in the Sekyere West District The clearing and burning normally destroys the vegetative cover and makes the soil susceptible to erosion and leaching leading to soil infertility. These farming systems have peculiar characteristics that have different effects on the soil.

The agricultural farming systems used in Ghana can be categorized as rotational bush fallow, permanent tree crop, compound farming, mixed farming, and special horticultural farming systems (Diao and Sarpong, 2007).

Table 4.9: On-site Effects of Agricultural Practices on Agricultural Soil in Ghana

Type of Farming System in Ghana	Farming Practice	Effects on Soil
Rotational bush fallow system	Slash and burn. Fallow periods. With or without fertilizer	Destroy vegetative cover. Expose the soil to erosion. Leaching of soil nutrients
Permanent tree crop system	Slash and burn but provide tree cover	No serious soil loss consequence identified in this system. Good forest cover
Compound farming system	Slash and burn with or without fertilizer/manure. Grazing livestock	Soil loss as a result of erosion, leaching of soil nutrients, compaction from livestock
Mixed farming system	Slash and burn with or without fertilizer/manure	Soil erosion and nutrient depletion
Special horticultural farming system	Slash and burn with fertilizer/manure And chemical application	Soil erosion, eutrophication and acidification of the soil as a result of fertilizer and chemical application

Source: Asuming-Brempong, Seini and Botchie (2003)

Soil fertility can be restored through long fallow periods; however, fallow periods have drastically decreased in Ghana in recent years owing to population pressures. The long fallow periods of 5 to 15 years or more associated with traditional shifting cultivation have now been reduced to 1 to 3 years (Acquaye, 1990; Ahenkora and Appiah 1996). The situation was not different in the study area, there was nothing like fallow among tenant farmers. Among tenant farmers, land could not be rented and made to lie idle for even one planting season. The decision to put farmland to fallow rested in the hands of landowners. The problem of short fallow's contribution to soil degradation was shared by most of the landowners in the study area. From Table 4.4, 81.3% of the landowners considered short fallow periods as a contributing factor in soil degradation.

As indicated in Table 4.10, only 18.8% of the landowners admitted having parcels of land under fallow for over the past three years. Another 18.8% had parcels of land under fallow for the past three years, while the majority (56.3%) had parcels of land under fallow for the past two years. To confirm earlier assertion that leaving undivided family lands would permit other family members to enter the same parcel of land, landowners who cultivated such family lands always had crops on their farmlands as a guarantee of continuous ownership. On the part of those on inherited farmlands, the need to get extra income always forced them into renting their farmlands out when they are not cultivating it themselves.

Even though they were not the only factors to blame, burning and lack of sufficient fallow periods were clearly implicated in the degradation of the landscape in the study area. It came out that, during the land preparation stage, clearing and burning of bush added ash to the soil which fertilizes the soil. However, they failed to acknowledge the effect such practice has on the long term productivity of the soil.

Table 4.10: Fallow Length among Landowners in the Study Area

Community	2 Years	3 Years	Over 3 Years
Aframso	3	2	0
Amoaman	5	1	1
Assam	3	1	4
Bimma	6	3	3
Bosomkyekye	4	2	0
Nkwanta	5	0	0
Sekruwa	6	0	3
Woraso	4	3	1
Total	**36**	**12**	**12**

Source: Field Data 2007

The use of both organic and inorganic fertilizer among farmers was not encouraging. Most of the farmers admitted not using any inorganic fertilizer to replenish the soil nutrient. Where fertilizers were even applied, the quantities were far below the recommended quantities. The main inorganic fertilizers used by the farmers in the study area were NPK and Sulfate of Ammonia. NPK was applied first and sulfate of ammonia used for dressing. NPK application among landowners was 53.1% while for tenants it stood at 47.7%. Even though the farmers were not sure of the farm size and NPK quantity ratio, the farmers admitted applying quantities below the recommended volume of 247 kg per hectare of fertilizers as starter and another 247 kg as dressing (MoFA, 2001). That is, even though the proportions of farmers using NPK appeared high, the actual quantity of NPK per hectare was far low. The application of sulfate of ammonia was far low among both landowners and tenant farmers. The figure stood at 37.5% for landowners and 31.1% for tenant farmers. It was recounted that, land left to fallow were those that were too poor or production could not possibly be sustained year after year or farmers had enough land that they could afford to fallow, the latter of which it is becoming a luxury.

Crop rotation is a technique that replenishes soil nutrients without the use of synthetic fertilizers. In crop rotation, a field is used for one to several years to grow

one type of crop, such as maize followed by a season in which a legume is planted (Encarta, 2007). Legume roots harbor beneficial bacteria that incorporate nitrogen from the air into the soil enriching the soil and reducing the need for nitrogen-containing fertilizers.

It was surprising that though farmers were aware of the importance of crop rotation in ensuring continuous soil fertility, most were reluctant to practice it. As indicated in Table 4.7, 8.2% of the tenant farmers practiced crop rotation while 15.6% of the landowners engaged in this type farming. It came to light that, tenant farmers were those not willing to employ this farming technique. As pointed out by one tenant farmer at Sekruwa;

> *"I am interested in just maize and nothing else. I do not think I will stay on my land for long, so why do I have to think of beans or something else when I know it is maize which will sell better. If I should get the same piece of land to farm on next season, I think it will be better to buy some fertilizer and apply than to wait till the beans mature before I could plant my maize."*

Crop rotation also conserves nutrients since the roots of the first crop may be near the surface and the second crop's roots may be deeper, so that nutrients are drawn from different depths in the soil (Encarta, 2007)

The responses on mixed-cropping were equally discouraging. While this was practiced by 84.4% of the landowners, only 23% of the tenant farmers employed this farming method.

4.6 Impact of Farming Systems on Soil Productivity

Since the 1970s, scientists in Africa and in the third world as a whole have been paying closer attention to improving the indigenous farming techniques, which are based on the recognition that the only truly effective way of controlling erosion is the maintenance of vegetative soil cover during the rainy season. These techniques

include mixed cropping, crop rotations, no-tillage or minimal tillage among others (Gyasi et al., 1990).

In the Sekyere West District, it was realized that, different groups of people practiced different farming techniques to suit their needs. It was observed that, 32 out of 61 of the tenant farmers were basically migrant tenant farmers from the Northern part of the country practiced only mono cropping; mostly maize. Another 12 were from beyond Northern Ghana with similar farming technique. Their farming techniques included the use of hoes and occasionally tractors to plough the land. This farming method defy the rule of both no-tillage and minimum tillage. With this farming method, trees and stumps were removed before ploughing could be done. This exposed the soil making it vulnerable to erosion. At Amoaman, a 62-year old landowner lamented;

> *"I am not trying to speak against the migrant farmers here, but I think the truth is just one. If you should visit a farmland which has been used by some of these tenant farmers for just two farming seasons, you will weep. I remember when one of them came and rented my uncles land; he was even uprooting the cocoyam on the land with his hoe. The hoes they use destroy the land so much, yet it will be an argument if you say that to them. After they leave the land the next thing you will see will be grass. We do not know whether the come here with the grass".*

Similar opinions were shared at Woraso. There was a general concern among the land owners regarding the disappearance of trees and cocoyam on the farmlands they rent out to tenant farmers. Thus, a direct link was drawn between farming techniques and future soil productivity.

The combination of the fast growing Leucaena plant with crops such as yam has the advantage of maintaining the fertility of the soil while at the same time providing trees for fuel wood. However, none of the two groups practiced this.

Mixed cropping, another traditional farming practice was common among natives, and most often not practiced by tenant farmers. While this was practiced by 84.4% of the landowners, only 23% of the tenant farmers employed this farming method. This was because most of the natives were into subsistence farming. Therefore they cultivated all they needed on a single plot of land for easy access. The decision to practice mixed cropping was therefore not based on the knowledge about its sound farming practice.

4.7 Improving Soil Fertility Artificially

Ghana lacks the resources to produce fertilizers and for that reason imports all its fertilizer requirements annually. Some of the fertilizers Ghana imports include variations of NPK, Urea, Ammonium Sulphate, Muriate of Potash, Potassium Nitrate and Single Super Phosphate (Seini and Nyanteng, 2003). The importation and distribution of fertilizers have been privatised since 1990. The total volume of fertilizers imported annually fluctuates widely. In the first half of the 1990s, the average volume of fertilizers imported annually was 23,594 metric tons, about 39% lower than were imported in the second half of the 1980s. However, in the second half of the 1990s, the average volume imported annually increased to 33,379 metric tons (Seini and Nyanteng, 2003).

These volumes of different fertilizers imported into the country were applied mainly in the production of rice, cotton, pineapple and vegetables, mainly tomato. Few farmers are now beginning to apply fertilizers to their maize farms. In the cultivation of roots, tubers and plantain fertilizers are generally not applied. The volume of fertilizers imported annually did not reflect the agricultural land cultivated and was a fraction of the requirement. In the 1990s the availability of fertilizers per hectare of cereal land was 22 kg per hectare in the first half and 27 kg per hectare in

the second half. These volumes were highly inadequate given the recommended volume of 247 kg per hectare of fertilizers as starter and another 247 kg as side dressing. In spite of the inadequate volume of fertilizers imported annually, there are times when they were not all used up (MoFA, 2001). Drawing conclusion form the above data, it is not a surprise that most farmers in the Sekyere West District did not apply fertilizer to improve soil fertility and even when they did, the quantities often far below the recommended ratio.

4.8 Farmers' Awareness of Soil Degradation

It was a general belief that cropland productivity has been decreasing over the years. Most landowners were well informed about the depletion of soil nutrients and attributed the reduction in crop yield to it.

Table 4.11: Landowners Perceptions on the Causes of Soil Degradation

Community	Farmland Rentals	Bad Farming Method	Low Fertilizer Application	Short Fallow	Natural Process	Total
Aframso	6	4	3	6	2	8
Amoaman	8	6	4	6	1	8
Assam	3	2	0	7	0	8
Bimma	4	3	0	6	4	8
Bosomkyekye	5	6	3	8	0	8
Nkwanta	6	5	5	8	0	8
Sekruwa	8	8	4	5	1	8
Woraso	8	7	6	6	0	8
Total	**48**	**41**	**25**	**52**	**8**	**64**

Source: Field Data 2007

It was made known that, the traditional method of ensuring continuous soil fertility is to practice shifting cultivation or long bush fallow, however, due to pressure on land as result of population increase, this practice is no longer sustainable. Words of a 63-year old landowner at Assam summarised the fertility problem in her community and how this is affecting productivity;

> *"I remember when I was young, whenever my mother and I went to the farm to harvest cocoyam, we would only uproot a few of the*

cocoyam and I tell you; even that carrying it to the house was a problem. It was so much that sometimes we had to leave some in the farm for another time. But now, you would have to roam the whole farm to even get enough for the day. The land has become so bad".

It became quite disturbing at Amoaman, when the degradation of the soil was attributed to the way migrant farmers tilled the land. As depicted in Table 4.4, all the 8 landowners interviewed were of the view that farmland rentals was the cause of soil degradation in their communities while 6 believed that bad farming practices were to be blamed, they believed that, the hoe used by migrant farmers mainly from the Northern part of the country in tilling the land destroy the lands.

" ……If you should visit a farmland which has been used by some of these tenant farmers for just two farming seasons, you will weep….the hoe they use has destroyed the land so much, yet it will be an argument if you say that to them. After they leave the land, the next thing you will see will be grass".

Plate 4.3 shows farmland which had been used for maize cultivation at Sekruwa. This picture was taken some few weeks after the maize had been harvested. As shown in the picture, the land is at the mercy of the wind and rains.

Plate 4.3: Plot of Farm Land Used by a Tenant Farmer as Sekruwa

Source: Field Data 2007

This situation where the land is left bare after crops harvested was common on farmlands used for mono-cropping (maize). This farming technique was predominant among tenant farmers. It was pointed out that the tenant farmers engaged in this method because maize could easily be harvested once. In the case of under cash rental agreements, the proceeds realised after harvest and sales could be used to enter into new agreements.

What was observed was that, short-term declines in agricultural production due to soil degradation were often masked by variability introduced by other environmental factors, such as rainfall. This came to light when farmers were asked the factors that determine farm productivity. Most farmers were of the view that the rainfall pattern determines yield for a particular year. Out of the 61 respondents interviewed, only eight had different views. To this 48-year old man at Bosomkyekye;

> *"the rains could come at the right time and even rain the entire period from the planting time till the time the crops do not need any water, but if the land is dead you will get nothing. It is not just the rain the land is very important".*

Furthermore, farmers who sharecrop out their land receive reduced production divided by three so that erosion may not seem as serious a problem as it actually is.

Based on the above submission, it could be concluded that, there is a direct link between tenure security and soil degradation in the Sekyere West District. In that tenure insecurity is the main institutional constraints that inhibit soil conservation investments in the study area. The result suggested that, farmers' investment decision depends on the level of security on a particular parcel of land. since duration of lease were often too short to give tenant farmers confidence to

engage in long-term investment in soil conservation,landowners should therefore be educated on the impact of insecure tenure arrangement on sustainable resource management. With this, there should be awareness among land tenure institutions so that lease durations should be such that the time horizon is sufficiently long enough to enable the holder to recoup with confidence the full income stream generated by the investment he or she will put into the land.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The purpose of this chapter is to present a summary and conclusion of the major findings of this study. This chapter is divided into three parts; summary of findings, conclusion and recommendations. Given the critical role of land tenure arrangement in farmers' resource management, agricultural production and soil management in the Sekyere west District, the main purpose of the study was to explore how land tenure arrangements contribute to soil degradation

5.2 Summary of Findings

It was discovered that there is a direct link between tenure security and soil degradation in the Sekyere West District. Tenure insecurity was the main institutional constraints that inhibited soil conservation investments in the study area. The result suggested that, farmers' investment decisions depended on the level of security on a particular parcel of land. The third objective of the study which sought to ascertain whether farmlands given out under insecure tenure arrangements were more likely to be degraded was therefore validated.

Moreover, the study revealed that, the type of farming practice was not always a function of tenure status but rather the type of crops cultivated and the origin of a tenant farmer also influenced the type of farming technique employed.

Tenure security was based on clear definition, provision of sufficient duration of rights and assurance of existing rights. It came to light that, the type of tenure was

always known between landowners and tenants. This was seen either as sharing cleared farmlands, cash rental or fixed output per acre.

Furthermore, the study has revealed that, the trend in farmland ownership has not changed in the study area. What has changed rather is the relationship between tenant farmers and landowners in terms of farmland acquisition. Hitherto, farmlands were given to migrant tenant farmers virtually for free. This does not exist any longer in the study communities. Rather all land transfers were done for economic gains. It came out that, sharecropping like the *abunu* and *abusa*, have changed entirely to a money system economy where the ability to pay for a parcel of land in cash dictated who gets a farmland. Land is given out either under cash rentals, sharing cleared farmlands or fixed output per acre. This had also impacted negatively on the ability of the tenure institutions to regulate the activities of tenant farmers pertaining to the type of farming techniques that tenant farmers employed on rented parcels of land. This has ultimately led to unsustainable exploitation of land resources in the study area. However, it came to light that, sharing cleared farmlands were dominant among native tenant farmers who cultivated staple foods. On the other hand the migrant tenant farmers who engaged in mono-cropping; mainly maize, preferred cash rentals. These findings provided ample evidence on the existing trend in farmland ownership and acquisition in the study area which was the first objective of the study.

With regard to duration of lease as a measure of tenure security and its effects on soil improvement investment decisions, it was realized that duration of lease were often too short to give tenant farmers confidence to engage in long-term investment in soil conservation. It was realized that, though this was an issue among tenant farmers, natives who tilled unshared family lands had similar problem of continuous use-rights. This uncertainty resulted in such farmers exploiting land resources as if

they have short-term horizon. These findings did not only satisfy the objective of the second objective of the study but also negated the proposition that, *there is no correlation between the duration of lease and soil improvement investment decisions*

It became evident in the study that, tenant farmers were not willing to engage in soil improvement to enhance tenure security since the decision to remain on a particular parcel of land was the decision of the land owning authority concerned. In situation where the initial capital outlay in land preparation was high, the duration of lease was considerably longer. These outlays were mainly in stumping to enable ploughing of virgin lands.

Both natural and artificial means of soil nutrient improvements were minimal among both landowners and tenant farmers. Natural means of soil nutrient improvement in the form of long fallow was seen as the responsibility of landowners. Farmers who tilled unshared family lands did not engage in any fallow for fear of other family members entering same lands once left uncultivated for some time. Crop rotation was minimal among landowners and almost nil among tenant farmers.

This study also supports the notion that local land-tenure institutions are weak and have no capacity in terms of control and management of land. The study revealed that land tenure institutional changes that have taken place over the years have contributed to this problem and weakened the local land-tenure institutions. Cash rental of farmlands to tenants had reduced the obligatory rights of tenant farmers to farmlands. This had contributed to over exploitation of land resources in the study area. Thus, as set out in the fourth objective, the study revealed that, this is a major bottleneck in the land tenure arrangements

5.3 Conclusions

The conclusions drawn from interviews concerning land tenure and soil conservation are that both tenants and owner-occupiers employed unsustainable farming methods. Evidence from the study revealed that the link between tenure security and overexploitation of soil resources was complex and varied among land users. Long-term investments in land, such as soil conservation practices were highly dependent on the level of security, which was measured in the duration a farmer expected to till a parcel of land. In situations where farmers' insecurity was deemed high, they exploited land resources as if they had short-term horizon. This was much evident among migrant tenant farmers and natives who tilled unshared family lands. On the other hand the study provided evidence that the status of a farmer as tenant alone did not resulted in overexploitation of land resources but rather coupled with future expectation on whether investments in a particular parcel of land could be reaped.

From the findings presented in the study, there is a strong correlation between tenure security and sustainable agricultural land use. It was revealed that, the tendency for tenant farmers to embark on soil conservation investments was highly dependent on the assurance that they could till the same piece of land on a continuous basis. Duration of lease therefore formed the basis of farmers' tenure security.

In line with Maxwell and Wiebe, (1998) and von Maltitz and Evans (1999), whose ideas formed the basis of the conceptual framework for this study, it could be realized that a direct and positive relationship existed between land tenure security and sustainable natural resource use in the study area.

5.4 Recommendations

As was revealed by the study, there is a direct and positive relationship between soil improvement investments in the form of agroforestry and duration of lease. Landowners should therefore be educated on the impact of insecure tenure arrangement on sustainable resource management. With this, there should be awareness creation among land tenure institutions so that lease durations are made sufficiently long enough to enable the holder recoup with confidence the full income stream generated by the investment he or she will put into the land.

Moreover, there should be capacity building among the land owning authorities in the study area. This could be in the form of helping the land tenure institutions build the requisite legal and social framework within which land would be leased out to prospective tenants. This could help to clearly define the obligations on the part of the land user to the tenure institution and to land under cultivation. This would go a long way in reducing overexploitation of land resources in the study area.

Literature study has confirms that, the adoption of improved farming techniques is a function of the level of education. With this assertion in mind, therefore, policies aimed at improving the literacy level of peasants should be encouraged in the Sekyere West District. This education could be in the form of workshops for farmers to enhance their knowledge on farming practices and their impact on the natural environment.

It will be a good idea to introduce natural resource degradation into the school's curriculum right from the elementary school level. The effects of soil degradation on food security and well being of the rural poor could help educate children more about their environment as they grow into adulthood. In this case, if

they should drop out of school, they would at least have had an exposure to the complex interactions that go on in the natural environment they live in.

Lastly, since crop farmers' access to agricultural credit is critical to intensify their agricultural production, an in-depth study is required to find the appropriate mechanisms by which donors and national government's involvement improves access to credit for the rural poor.

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APPENDICES

Appendix I: Distribution of Agricultural Population by Region

Region	1970 Econ.Active* Rural Pop	%Agric	1984 Econ. Active* Rural Pop	% Agric	2000 Econ. Active** Rural Pop	% Agric
Western	564	75.7	426	81.5	1,226	44.9
Central	632	90.8	373	87.1	995	39.8
Greater Accra	125	65.3	111	82.9	358	44.7
Volta	796	71.6	448	80.6	1,194	39.3
Eastern	952	75.3	570	90.4	1,378	41.4
Ashanti	1042	83.2	645	88.7	1,760	43.3
Brong-Ahafo	598	99,3	462	92.6	1,137	54.9
Northern	581	96.6	360	81.1	1,337	50.3
Upper East	[802	76.7	313	72.8	776	38.3
Upper West			181	83.4	476	47.9
All	6085	82.2	828	86.5	10,638	44.4

Sources: World Bank (1978) Ghana Agricultural Sector Review;
Ghana Statistical Service (1987) 1984 Population Census of Ghana: Demographic and Economic Characteristics– Total Country
Ghana Statistical Service (2002) 2000 Population and Housing Census: Summary Report of Final Results
* Economic active is 15 years and over
** Economic active is 7 years and over

Appendix II: Population Density of Rural Area and Agricultural Land in 2000

Region	Population	Rural Population	% Rural Population	Agricultural Land Area (Ha)	Rural Pop. Density of Agric Land / Sq.Km
Western	1,924577	1,226,159	63.7		
Central	1,593,823	995,418	62.5		
G. Accra	2,905,726	358,042	12.3		
Volta	1,635,421	1,194,338	73.0		
Eastern	2,106,696	1,378,782	65.4		
Ashanti	3,612,950	1,759,885	48.7		
B-Ahafo	1,815,408	1,136,628	62.6		
Northern	1,820,806	1,337,016	73.4		
U-East	920,089	775,807	84.3		
U-West	576,583	475,735	82.5		
Ghana	18,912,079	10,637,809	56.2	13,628,179	77.7

Source: Ghana Statistical Service (2002) 2000 Population and Housing Census: Summary Report of Final Results

Appendix III: Availability of Fertilizers

Year	Total Available (mt)	Available Per Ha of Cereal Land Cultivated Land (000 Ha)	Kg/Ha	Available Per Ha of Land under Staple Crops Land (000Ha)	Kg/Ha
1970	8250	998	8.3	2068	4.0
1971	8626	957	9.0	2027	4.3
1972	12307	835	14.7	1913	6.4
1973	16931	886	19.1	1986	8.5
1974	12470	953	13.1	2102	5.9
1975	22241	806	27.6	1704	13.1
1976	43983	842	52.2	1570	28.0
1977	26334	773	34.0	1382	19.1
1978	21180	705	30.0	1378	15.4
1979	58650	835	70.2	1502	39.0
1980	60460	817	74.0	1613	37.5
1981	0	805	0.0	1572	0.0
1982	46500	788	59.0	1446	32.2
1983	0	747	0.0	1350	0.0
1984	38350	1275	30.0	3041	12.6
1985	29999	964	31.1	1901	15.8
1986	20100	881	28.8	1845	10.9
1987	38070	1127	33.8	2106	18.1
1988	39575	1088	36.4	2195	18.0
1989	65239	1210	53.9	2291	28.5
1990	44350	892	49.7	1605	27.6
1991	0	1177	0.0	2316	0.0
1992	29400	1204	24.4	2333	12.6
1993	20160	1228	16.4	2307	8.7
1994	24060	1200	20.1	2236	10.8
1995	28140	1297	26.7	2442	11.5
1996	19840	1274	15.6	2486	8.0
1997	56163	1276	44.0	2484	22.6
1998	42315	1340	31.6	2645	16.0
1999	20439	1300	15.7	2682	7.6
2000		1307		2719	

Source: Ministry of Food and Agriculture, Crop Services Directorate, Accra.