Sustainability Indicators for Natural Resource Management & Policy

Working Paper 3

Natural Resource Management and Policy in Uganda: Overview Paper

Economic Policy Research Centre

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February 2000

ISBN: 1 902518632

The effects of policy and institutional environment on natural resource management and investment by farmers and rural households in east and southern Africa

(Department for International Development Research Project No. R7076CA)

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Background To Project And Working Paper Series

This paper is one in a series of working papers prepared under a research project on '*The Effects of Policy on Natural Resource Management and Investment by Farmers and Rural Households in East and Southern Africa'*.

This is a collaborative research project implemented by Agricultural and Rural Development Research Institute[1], the Development and Project Planning Centre[2], the Economic Policy Research Centre[3], the Institute for Development Policy and Management[4] and the Centre for Agricultural, Food and Resource Economics[4]. The project is supported by the UK Department for International Development (DFID) under their Natural Resources Policy Advisory Department (NRPAD) research programme. The project commenced on 1 July 1998 and is to run for a three year period.

The overall goal of the project is for it to assist in the development of more effective, equitable and sustainable participatory management of renewable natural resources in sub-Saharan Africa. The purpose of the research is to identify the links between the sustainability of different farming systems and agricultural policy in South Africa and Uganda.

This is to be achieved through a series of case studies in Uganda and South Africa which will examine "the success or sustainability" of small and large scale systems from a range of perspectives including: farmers, communities, scientists, planners and policy makers. This will include the identification of criteria used to assess the "success" of these systems, and the adoption or development of verifiable and measurable indicators of this "success". The impacts of different polices on the degree of success of these systems will be assessed in terms of their effect on farmers' management of, and investments in, their natural resources, and in the development of sustainable rural livelihoods.

This paper '*Natural Resource Management and Policy in Uganda: Overview Paper'* is the third in the series of project working papers. It provides a review of the natural resource as well as economic and institutional environment in Uganda. There is a particular emphasis on the natural resource endowments, land use patterns and institutional setting in areas where the project's fieldwork is underway: Mukono and Mbarara districts.

This research was funded by the Department for International Development of the United Kingdom. However, the findings, interpretations and conclusions expressed in this paper are entirely those of the author(s) and should not be attributed to the Department for International Development, which does not guarantee their accuracy and can accept no responsibility for any consequences of their use.

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Project Working Papers To Date

1. A Review of Indicators of Agricultural and Rural Livelihood Sustainability

2. A Framework for Research on Sustainability Indicators for Agriculture and Rural Livelihoods

3. Natural Resource Management and Policy in Uganda: Overview Paper

4. Natural Resource Management and Policy in Eastern Cape Province, South Africa: Overview Paper

5. Stakeholder Analysis and Local Identification of Indicators of Success and Sustainability of Farming Based Livelihood Systems.

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MUKONO DISTRICT
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1. OVERVIEW OF NATURAL RESOURCE MANAGEMENT

1.1 Introduction

Uganda has a total area of 241,038 sq. km, with a land area of about 236,000 sq. km comprising cultivated areas, arable but uncultivated land, rangelands, mountains and built up areas. 16% of the total area constitutes water and swamps while 7% is under forests. Rainfall averages 900-1,300 mm per annum and the favourable climate over much of the country allows the cultivation of a variety of tropical and subtropical crops throughout the year. Over 88% of Uganda's population lives in rural areas and are engaged in agriculture (MAAIF, 1996).

Uganda's GDP is generated mainly by the exploitation of natural resources and the whole agricultural sector (cash and food crops, livestock, fisheries and forestry) is based on using or harvesting the natural resources. In 1986 agriculture accounted for 58% of GDP and in 1998/99 accounted for 43%. Of the 43% contribution to GDP of agriculture, food crops account for 71%, export crops 5%, while livestock, fisheries and forestry sectors account for 17%, 4%, and 3% respectively. Only 33% of food crop output is marketed compared with 66% of livestock products. 56% of agricultural GDP consists of subsistence production for own consumption and is non-monetised. About 50% of the construction and 30% of the manufacturing sectors are directly dependant on natural resources such that in 1995, the nature based GDP was about 56%, (NEMA, 1996).

1.2 Natural Resources

Climate and Vegetation

In most parts of the country the seasons are fairly well marked as rainy and dry seasons. Mean temperatures over the whole country show great variation, depending on elevation and landscape. NEMA (1996) identifies five climatic zones within the country, using rainfall received in a given area as the dependant variable, although these zones do not have sharply defined boundaries. These are:

a) Zone I – the Lake Victoria Zone.

This zone which extends 48-64 kms from the lake-shore experiences two relatively dry seasons, one between December and March and another in June and July. Both periods are however interrupted by thunderstorms hence rainfall is fairly well distributed throughout the year. The peak rainfall periods are March to May and October to November. Rainfall varies from 1250 mm per annum south of the equator to over 1500 mm per annum north of the equator. Annual rainfall is heaviest over the open lake with a marked gradient of about 30 mm per kilometre inland. Rainfall maxima are associated with the onset of the southeast and northeast Monsoons.

The Mukono district study area lies within this zone.

b) Zone II – the Karamoja region.

This zone is characterised by an intense hot and dry season lasting from November to March. There is a single rainy season beginning in April and ending around August, with a marked

minimum in June and peaks in May and July. December and January are the driest months. Average annual rainfall is in the range of 100 to 625 mm.

c) Zone III – Western Uganda.

This is a relatively narrow zone along the Western boundary of Uganda. It embraces the high ground of West Nile, the escarpment on the eastern side of Lake Albert, Kabarole, Bundibugyo, Kasese, the high ground of the southwest and the rift valley lakes. The rift valley part of this zone is hot and dry, with mean annual rainfall of around 875-1000 mm falling in 80 to 100 days. Mean annual rainfall on the higher plateau of the zone rises to over 1250 mm and occurs in 100 to 150 days. In the higher altitude extreme southern parts of the zone (districts of Bushenyi, Rukungiri and Kabale), mean annual rainfall exceeds 1875 mm while barely 10 to 30 kms away in the rift valley, the corresponding rainfall is less than 875 mm. On the slopes of the Rwenzoris, the mean annual rainfall reaches up to 2000 mm at an altitude of about 4600m a.s.l.

d) Zone IV – the Acholi-Kyoga region.

This zone embraces a large part of northern and eastern Uganda. Rainfall averages about 1250 mm and occurs in 140 to 170 days of the year. The wet season extends from April to October, with peaks in April, May and August. A drier period occurs in June and July.

e) Zone V – the Ankole-Southern zone.

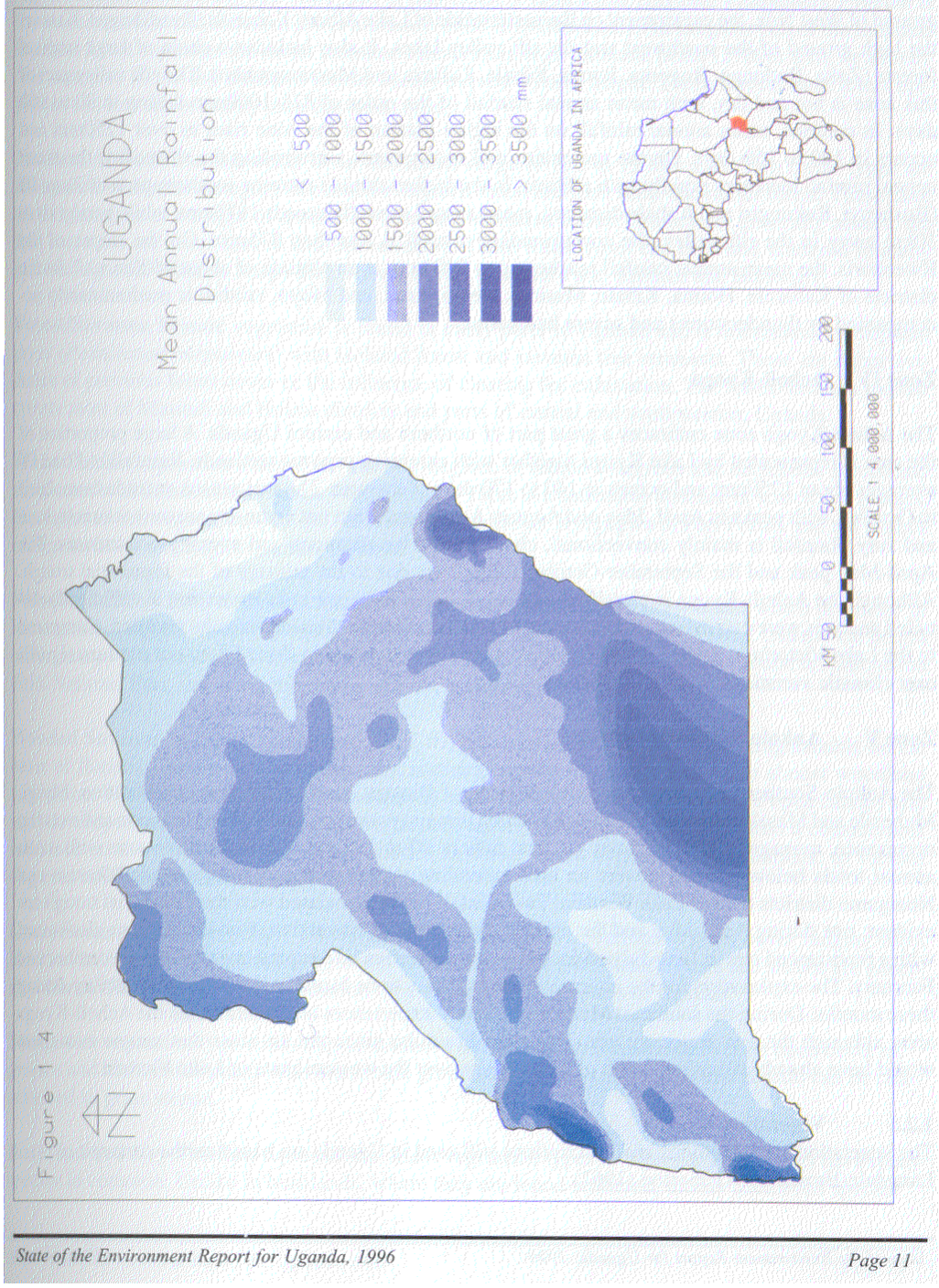
This zone encompasses parts of Busoga, most of the east and Mukono, Mpigi, Mubende and Masaka districts. Rainfall averages about 1125 mm per annum and falls in 90 to 130 days. A drier zone with mean annual rainfall below 875 mm covers an area extending to the northeast from eastern Mbarara and Ntungamo districts to near lake Wamala. Rainfall peaks are evident in April to May and September to November. Dry seasons occur in June-July and a less severe one between December and February. The Mbarara district study area falls within this zone.

Descriptions of climatic zones and the map of rainfall patterns in Uganda were taken from NEMA (1996) report.

There are eleven main categories of vegetation types, namely High Montane Moorland and Heath; Medium Altitude Forests; Forest/Savanna Mosaic; Moist Thicket; Woodland; Wooded Savanna; Grass Savanna; Steppe; Bushland and Dry Thicket; Swamp (Wetlands); and Cultivation Communities (NEMA, 1996). These classifications are based on the concepts of Langdale-Brown and Osmaston (1964).

Ugandan Rainfall Patterns

Figure 1.4: Mean Annual Rainfall of Uganda



Soils

In Uganda soils are classified according to the FAO system. Ferrisols and eutrophic soils are the most productive and are found all over the country. Ferruginous soils are scattered throughout the country but are concentrated in Tororo and Gulu districts. Studies suggest that ferruginous soils are less productive and require careful usage to preserve their poorly developed top soils, whereas lighter soils unlike heavy soils are more susceptible to leaching.

The most dominant soil type in Uganda is ferralitic soil which accounts for about two thirds of the soils found in the country (NEMA, 1996). Soil type and topography are key determinants of land use and soils are classified in seven groups (World Bank, 1993).

These are:

a) Buganda surfaces (42, 200 sq. km) which cover much of the region south of Lake Kyoga including districts north and north west of Lake Victoria and embrace five types of deep sandy clay loams with medium to high productivity. These are the soils typical of the Mukono district study area.

b) Tanganyika surfaces (78, 200 sq. km) cover much of the area north of Lake Kyoga, West Nile and parts of the southwest. They consist of sandy clay loam soils with low to medium productivity.

c) Karamoja surfaces (16, 400 sq. km) in the North east comprise sandy clay loams and black clays of low productivity.

d) Rift valley soils (12, 500 sq. km) in the west and north are sandy clay loams with alluvial parent rock of high productivity.

e) Volcanic soils (5,000 sq. km) of high productivity are found on Mt. Elgon and in the extreme southwest. In northern Karamoja these soils have low productivity.

f) Alluvial soils (27, 400 sq. km) found in central and northern Uganda (Lango and Acholi as well as west of Lake Victoria) are sandy and of low productivity.

g) Other soil types in the north (15,000 sq. km) are of low productivity.

The Mbarara district study area contains soils classified under the Tanganyika surfaces and Rift Valley soils.

The descriptions of Uganda's soils originated in Jameson (1970). Further work on land productivity and use is contained in Langlands (1974).

Water Resources

Lakes in Uganda cover one fifth of the total area of the country. Water resources comprise open water bodies, ground water and rain harvest. NEMA (1996) indicates that on a regional basis, 39.1% of water bodies are found in central, 30.3% in eastern, 3% in northern and 8% in western regions. The whole of Uganda lies in the upper Nile catchment consisting of numerous rivers and streams flowing into principal lakes such as Victoria, Kyoga, Edward and Albert and eventually into the River Nile.

There is a paucity of data on the quality of the country's surface and ground water. The Water Action Plan 1995 and Water Statute 1995 are the cornerstones of water resources management. The major areas of concern are poor watershed management, inadequate water accessibility and quantity, poor water quality, inadequate institutional capacity and international water rights. Issues pertaining to the fisheries subsector are sustainability of the fisheries resources, the impact of the introduction of alien species, high post harvest losses, pollution of the fisheries, impact of the activities of the fisher-folk communities on fisheries resources and inadequate institutional and administrative structures (NEMA, 1996).

Wetland Resources

According to NEMA (1996) wetlands can be characterised as papyrus swamps, swamp forests, riverine wetlands, lake edges, flood plains, dambos and artificial wetlands. Wetlands possess distinct trees, shrubs and grasses and their soils are quite unique. They are found throughout Uganda but varied and conflicting definitions have led to inconsistent data/information on their size. Further, the most recent comprehensive data from the National Biomass Study reveals that wetlands occupy an area of about 30,100 sq. km. There are two broad distributions of wetland ecosystems, a) natural lake and lacustrine swamp/wetlands and, b) riverine and flood plain swamp/wetlands. NEMA (1996) suggests that Wetlands in Uganda serve four major physical functions, i) regulation and conservation of water; ii) sediment and nutrient trapping; iii) climate modification; and iv) provision of habitat for flora and fauna. They also provide products and services including plant products, grazing, water supply and nutrient and toxic chemicals retention.

1.3 Land Use and Management Systems

Agro-ecological Zones and Farming Systems

Excluding lakes, swamps and forest reserves, more than 75% of the country (18 million hectares) is available for cultivation, pasture or both. NEMA (1996) reveals that the rural population density on cultivable land has increased from 53 people per sq. km in 1969 to 88 in 1991. In eastern, southern and western Uganda more than half of the districts have a rural population density of 180 persons per sq. km of cultivable land. While an estimated 4.6 million hectares was under cultivation in 1990, large areas of land are potentially productive and under-utilised.

Agricultural production is carried out on the basis of farming systems based on agro ecological zones, soil types and cropping systems (MAAIF, 1996). The five identified farming systems are based almost entirely on the seven agro-ecological zones and constitute an aggregation of some of the characteristics of the agro-ecological zones. Most publications tend to use the terms farming systems and agro-ecological zones interchangeably. It is argued that these classifications were not determined purely by agronomic considerations, but by colonial arrangements of supply zones for the various cash crops. Table 1 defines the seven agro-ecological zones and their corresponding farming systems. The definitions of agro-ecological zones are taken from World Bank (1993), while those for farming systems are taken from NEMA (1996). The map of farming systems in Uganda is taken from NEMA (1996).

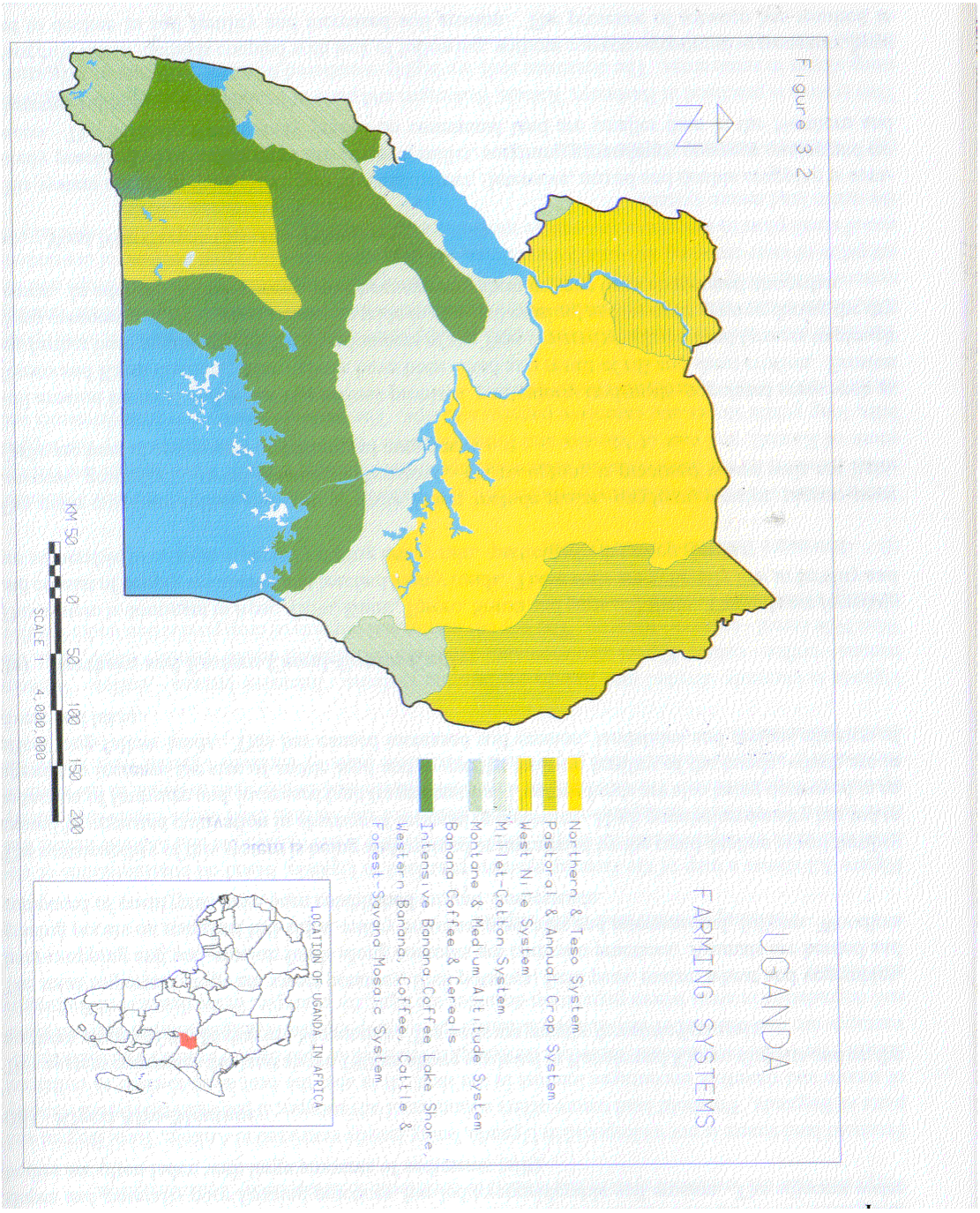
Table 1: Agro-ecological Zones and Farming Systems in Uganda

Agro-ecological Zones	Characteristics	Farming Systems	Characteristics
Banana-Robusta Coffee System	Equable climate and evenly distributed rainfall on medium to high productivity soils. Vegetation is mainly forest/savanna mosaic with pastures suitable for intensive livestock management. Banana and coffee are the main crops with root crops on the increase. Livestock is generally not integrated into the system but it can be an important source of income.	Intensive Banana Coffee System	Constituting the high rainfall areas around Lake Victoria producing bananas, robusta coffee and food crops grown in mixed farming systems where fallowing is minimal. Animal production forms part of this farming system comprising poultry, dairy cattle and pigs. The relief is characterised by flat-topped hills, long gentle slopes and extensive papyrus swamps, with mostly ferralitic/ferrasols soils and some fertile friable clays.
Teso System	Characterised by bi-modal rain falling on sandy-loam medium to low fertility soils. Main staples are cassava, millet and maize. There is short grassland ideal for grazing. Use of crop residues is very common.	Northern and Eastern Cereal-Cotton-Cattle	Otherwise known as the Teso system dominant in Apac, Gulu, Kumi, Tororo, Soroti and parts of Mbale, which is characterised by annual crops grown in two distinct rainy seasons. The rains are separated by a four month dry period and finger millet has been replaced by cassava as the main food crop, while cotton was the main cash crop. The soils are generally low in fertility and are vulnerable to erosion especially during heavy rain, particularly on the steep slopes. Prior to the mid 1980s, there were large numbers of cattle, use of draft oxpower was widespread and intercropping, rotations and fallow periods were common to maintain fertility and reduce soil loss. Cattle are herded and grazed on communal rangelands. This system is also prevalent in Karamoja, Kitgum, Pallisa and Lira.
Northern System	Mono-modal annual rainfall (1000-2000 mm) adequate for most crops but the intensity of the dry season requires that drought tolerant annuals are cultivated (finger millet, sesame, cassava and sorghum). Tobacco and cotton are major cash crops. There is short grassland where communal grazing abounds.		
Pastoral System	This is divided into Karamoja in the northeast (Kotido and Moroto districts) and parts of Mbarara, Masaka, Rakai, Nakasongola and Mpigi districts. The pastoral system is characterised by short grassland where nomadic extensive grazing is practised. Multi species grazing is common but appropriate cattle/small ruminant ratios for optimum utilisation of the grassland have not yet been achieved.		
Banana-Millet-Cotton System	There is greater reliance on annual food crops (millet, sorghum and maize) since rainfall is less stable than under the Banana-Coffee System. In the drier areas livestock is a main activity.	Western Banana-Coffee-Cattle System	Practised in Bushenyi, Kabale, Rukungiri and parts of Mbarara. The relief is hilly, with steep slopes in some areas and the dominant soils are highly-weathered ferralitic soils and mostly sandy loams with some sandy clay loams.
Montane System	Higher elevation with cool weather, high effective rainfall and cloud cover. High population density with smaller sized holdings. Bananas are a major staple as well as sweet potatoes, cassava and Irish potatoes. Arabica coffee is prevalent above 1600 metres. This zone is found in the east (Mbale, Kapchorwa) and the south west (Kabale, Kisoro, Rukungiri) and the Rwenzori mountain range.	Kigezi Afro-Montane	In the west comprising land above 1800m above sea level in Kabale and Kisoro districts and on the northern slopes of the Muhavura Mountains. Soils are mainly ferralitic/ferrasols. Higher altitudes permit cultivation of temperate fruits, vegetables and irish potatoes as well as some of the traditional food crops. Inter cropping and anti erosion funds along contours are common practices. Animals are herded and grazing occurs on marginal hill-sides, valley bottoms, and roadsides.

West Nile System	Rainfall patterns are similar to the northern system with greater rain at higher elevation. Intercropping is common with a wide variety of crops. The system is in the sub-humid zone and livestock activities are limited by the presence of tsetse fly.	West Nile Cereal-Cassava-Tobacco	Also known as the Northern systems and descriptive of the northwest in which rainfall patterns restrict cultivation to one season. Rainfall declines from south to north and in the central northern zone, communal cultivation is customary. Annuals such as cotton, maize and finger millet are common. Further south ground-nut and sweet potato are more common with sunflower and tobacco the main cash crops. The herd sizes commonly grazed on communal land are smaller than in the Northern and Eastern-Cotton-Cattle system. Common to Arua and parts of Nebbi.

Source: World Bank (1993) - Agro-ecological zones and NEMA (1996) - Farming Systems.

Farming systems



Of the total area under cultivation in 1990, 36% was under perennial crops. Of 1.7 million hectares under perennials about 1.4 million hectares was under bananas and 0.25 million hectares under coffee. Sugar is grown on about 20,000 ha and tea covers about 20,000 ha. Except for 70,000 ha of cotton and 4,000 ha of tobacco, annual crops are all food crops. Of the 2.9 million ha in annual food crops, 1 million ha are in cereals, 0.8 million in root crops, 0.7 million in pulses and 0.4 million in oilseeds (World Bank, 1993).

Information on key relevant meteorological stations, soil studies and agronomic research for each agro-ecological zone or farming system is not readily available, however the most often cited reference in the literature on agriculture in Uganda is Langlands (1974), which continues to be a key reference.

The climatic zones do not correspond directly with individual agro-ecological zones and a climatic zone may encompass several agro-ecological zones. An attempt has been made in Table 2 to match climatic zones, range-lands, forest reserves and wildlife conservation areas with the different agro-ecological zones.

Table 2: Agro-ecological Zones and Land Use Types

Agro-ecological Zone	Climatic Zone	Range-lands	Forest Reserves	Wildlife Conservation Areas
Banana-Robusta Coffee System	Lake Victoria Zone	Range lands	Natural Closed Forest/Tropical High Forest(THF)	
Teso system	Acholi-Kyoga Region	Range lands	Savannah	
Northern System		Range lands		Wildlife Conservation Areas
Pastoral System	Karamoja Region	Range Lands		
Montane System	Western Uganda		Natural Closed Forest/THF/Montane Heath and Grassland	Wildlife Conservation Areas
West Nile				
Banana-Millet-Cotton System	Ankole Southern Zone	Range lands		

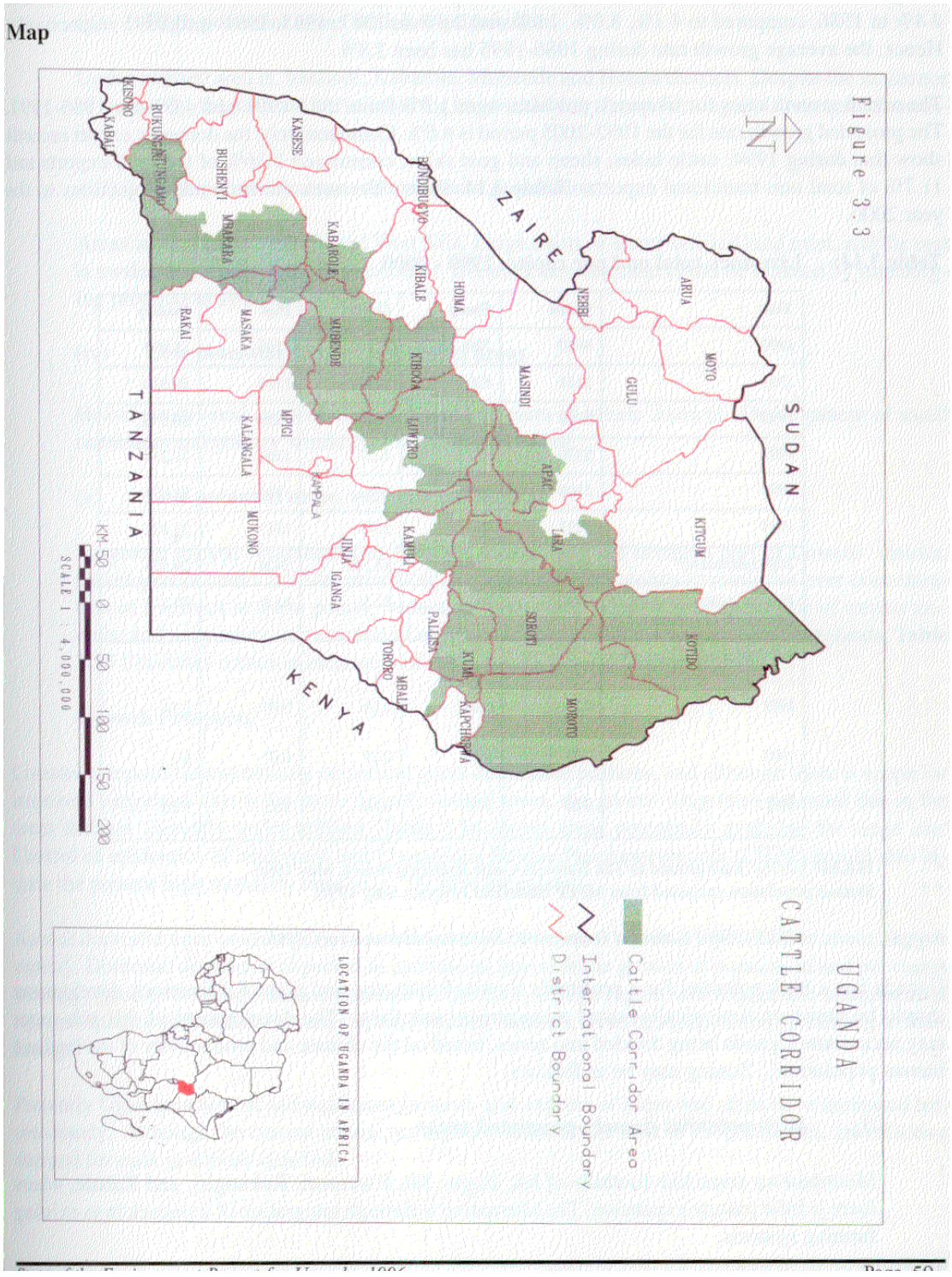
Range Lands

NEMA (1996) identifies two types of fragile ecosystems, namely the highlands in the southwestern, eastern, western and northeastern parts of the country and the rangelands, or cattle-corridor. The highlands are unique ecosystems, well endowed with productive soils and favourable climate hence they are densely populated and intensively used. Livestock production is the dominant activity in the drylands and is associated with emergence of desert like conditions as a result of improper land use practices.

NEMA (1996) indicates that range lands occupy about 43% (84,000 sq. km) of the total area of the country. These form what is known as the cattle corridor stretching diagonally from northeast to southwestern parts of the country. As such the cattle corridor cuts across several agro-ecological zones, namely, the pastoral system, part of the Northern and Teso systems, part of the banana-millet-cotton system and parts of the intensive banana coffee system.

The Cattle Corridor

Map



Overall conditions of these pastures is not known, however these areas experience erratic and low rainfall and severe drought either annually or every few years. As a result, there is a characteristic seasonal movement of people and livestock between wet and dry season grazing areas. NEMA (1996) indicates that grasses are the most important forage plants. In addition the variation in grass composition is great although the area of open grassland is limited.

Increasing individualisation of communal grazing land rights is however causing range land resource use conflicts and displacing indigenous pastoralists.

The livestock sector contributes about 9% of total GDP and at least 90% of the livestock is in the hands of traditional herders and the remainder under commercial enterprises. Considerable growth has been witnessed in this sub-sector which is expected to maintain an upward trend up to 2005, indicating that Uganda has a great potential for a profitable livestock industry.

Key references on livestock and range lands in Uganda are Kisamba-Mugerwa (1995) and Mugerwa (1992).

Forest Reserves

Forests in Uganda occur as gazetted areas (forest reserves), protected areas (national parks) and on private and ungazetted public land.

Forest reserves constitute around 7% of the area of the country with 700,000 hectares in tropical high forests, 632,000 hectares in savanna forests and 24,300 ha in plantation forest. Tropical high forests are found in western Uganda around Lake Victoria and on Mt. Elgon in the east. They include rare plants and animals and unique ecological systems. Over the years, these forests have been cleared, and from a coverage of 12.7% of the country's land area at the start of the century, tropical high forests now account for only 3% of Uganda's land area.

Plantations make up 2.2% of gazetted forests and were established to meet the demand for industrial wood. They consist of conifer (pine) and hardwood (mainly eucalyptus) plantations and are located in almost every agro-ecological zone, but particularly in the southwestern part of the country and along the northwestern areas of Lake Victoria.

Table 2 depicts the main types of forest reserves falling within the differing agro-ecological zones and climatic zones. The key reference work on forest reserves is UNEP (1988).

Wildlife Resources

The country is rich in wildlife resources, which occur in both protected and private or public ungazetted public land. According to NEMA (1996) there are four types of wildlife protected areas, namely national parks, wildlife reserves, wildlife sanctuaries and community wildlife areas. National parks cover 4.6% (11,150 sq. km) of the total area of the country, wildlife reserves cover 3.6% (8760 sq. km), wildlife sanctuaries, 0.35% (850 sq. km) and community wildlife areas 11.4% (27,600 sq. km). These are found pre dominantly in the northern, northeastern and western areas of the country.

There are four types of wildlife protected areas, classified according to the degree of protection given. Uganda has ten national parks, ten wildlife reserves, seven wildlife sanctuaries and 13 community wildlife areas. Protected wildlife areas occupy about 20% of

the area of Uganda, the main economic benefit being tourism earnings, which are only now recovering. Up to 1970, tourism was the third largest foreign exchange earner after coffee and cotton (NEMA, 1996).

The key reference work for wildlife resources is MTWA (1994).

1.4 Land Tenure and Land Use Rights

Land tenure systems differ across Uganda and tenure practices are a mixture of traditional practice, colonial regulations and post-colonial legislation. Land tenure refers to the way land is owned, occupied, used and disposed of within a community. A properly defined and managed land tenure system is essential to ensure balance and sustainable development.

Until 1975 there were four types of land tenure systems in Uganda, customary, mailo, freehold and leasehold, (NEMA, 1996). Tenure systems are not confined to particular farming systems and may encompass several farming systems. Customary tenure is found all over the country, but predominates in the northern and eastern cereal-cotton-cattle farming system, as well as the West Nile Cereal-cassava-tobacco system. Mailo tenure, dominant in the Buganda region, constitutes the Intensive banana coffee system, but customary, freehold and leasehold tenure are also found in this farming system. Customary, freehold and leasehold tenure is also prevalent in the Western banana-coffee-cattle system and the Kigezi Afro Montane system.

Customary Tenure

Customary land tenure is the most dominant in Uganda, whereby land is owned and disposed of in accordance with customary regulations. Specific rules vary according to ethnic groups and regions. This tenure system also exists on its own as communal land ownership. Customary land tenure was the only land tenure system in operation before colonial rule in the late 19th century. Up to the time of the Land Reform Decree in 1975, land held under customary tenure constituted about 75% of all the land in Uganda (EPRC, 1997). Principal categories of customary tenure are:

a) Communal/tribal tenure where ownership of land occupied by the community or tribe is vested in the paramount tribal leader as owner, who holds it in trust for the entire group.
b) Clan/family tenure where land is vested in the head of the group as owner or trustee for the entire group.

Customary tenure does not recognise individual ownership of land. It only recognises the rights of the individual to possess and use land subject to superintendancy by his family, clan or community. The disadvantage is that it does not encourage record keeping, often making it difficult to resolve land use disputes. Environmentally the main disadvantage is that it generates little personal interest in the status of land resources (tragedy of the commons) leading to mismanagement and degradation (NEMA, 1996).

Mailo Tenure

Mailo tenure was introduced as a result of the 1900 Buganda Agreement. Under this agreement, 9000 sq. miles of land were divided between the Kabaka, other notables and the Protectorate government. This area represented half the estimated area of Buganda. The basic unit of sub division was a square mile, hence the name mailo. Initially there were two categories, private mailo and official mailo. In the case of official mailo, grants of land were

attached to specific offices in the Buganda government. They could not be subdivided or sold but passed intact from original office holder to his successor. In private mailo, the owner held rights in the land akin to those of freehold and could dispose of land as he wished. Official mailo land was transformed into public land in 1967, with the abolition of kingdoms. Under this system land is held in perpetuity and a certificate of title is issued (EPRC, 1997).

The allocation of original mailo holdings took no account of the rights of peasant cultivators whose tenancy rights were recognised under the customary land tenure that had existed before. The 1972 Busuulu (ground rent) and Envujjo (tribute) Law was an attempt to rectify this oversight by providing tenant cultivators with security of their plots of land and setting fees which they were required to pay the mailo holder. Under this law, peasants could not be forced off their holdings without a court hearing. Tenancy could be passed on to the next generation but could not be subdivided or sold (EPRC, 1997).

The principal advantage of this system is that it provides security of tenure thus allowing long term developments including those related to conservation. Absentee landlordism and lack of access by regulatory agencies are disadvantages that limit sound environmental management. Absentee landlordism encourages squatters on mailo land who have no incentives to ensure sustainable management of land they do not own. To the extent that mailo land is private, resource management regulatory agencies have limited authority over what happens on it. As such, most of the deforestation occurring in the districts of Buganda is on mailo land. There are no clear mechanisms which allow the Uganda Forest Department to regulate private forests on these lands (NEMA, 1996).

Freehold Tenure

In freehold tenure, ownership is also in perpetuity and a certificate of title is issued. The system was originally established to address limited and specific requirements or requests such as by religious organisations. Freehold tenure was also granted by the Toro Agreement of 1900, Ankole agreement of 1901 and Bunyoro Agreement of 1903. The Crown Lands Ordinance of 1903 gave the British colonial administration power to alienate land in freehold. This system is found mainly in parts of eastern and western Uganda. NEMA (1996) argues that while land held under freehold tenure is not of the same magnitude as that under mailo tenure, it has a lot of similarities with mailo tenure and shares the same environmental management problems. Also due to population pressures in parts of Uganda where freehold tenure exists, land fragmentation is a common occurrence. Land fragmentation is believed to have contributed to significant environmental degradation although concrete evidence is lacking (NEMA, 1996).

Leasehold Tenure

Leasehold is where land is held based on agreement between lessor and lessee. There are two types of leasehold tenure agreements, private leases given to individual landlords and official or statutory leases given to individuals and or corporate groups under public act terms. The advantage of the leasehold system is that the lessor can attach conditions to leases and has the right to revoke ownership in case of abuse. The main disadvantage is that leases are costly and cumbersome to obtain and so far leases awarded have not addressed environmental concerns (NEMA, 1996).

The different land tenure systems affect land use and land management in a variety of ways and have environmental implications that are discussed in section 3 on sustainability of land use and management.

1.5 Changing Market Influences on Land Use and Management

Structural Reforms

Uganda undertook a structural adjustment programme in 1987 which led to the liberalisation of prices and markets. This shift from the existing market structure included increased private sector participation and a change in the role of marketing parastatals and cooperations. It was aimed at increasing the economic efficiency of marketing and price structures. Mungyereza (1998) suggests that market liberalisation policies were stimulated by the recognition that the existing marketing practices could have constrained agricultural production, producer incomes and consumer welfare.

The government removed all price and market controls and the policy of setting pre announced prices was replaced by announcing floor prices below which buyers were not allowed to go. This led to increases in producer prices from below 30% of world prices to above 50% in the early 1990s. The monopoly enjoyed by the marketing boards from marketing coffee and cotton were eliminated and private sector participants were licensed to market and export these commodities with parastatals competing equally in the market. Private traders were licensed to deal in produce and compete with the produce marketing board (PMB), a one time monopsony for purchasing all produce in the country. The consequent competition was supposed to reduce inefficiencies existing in parastatals. Institutions like PMB and the coffee marketing board (CMB) failed to cope with the competition and therefore their share of the market almost declined to zero (Mungyereza, 1998), and private traders now dominate agricultural produce markets.

Food Crops

Liberalisation of domestic and export marketing of food crops under the Economic Recovery Programme (ERP) initiated in the period 1987/88 and the improved supply of basic agricultural inputs have resulted in increased food production and consequently improved food security in rural areas. Policy measures also resulted in the entry of private traders in rural markets and provided export outlets for maize, beans, simsim and oil seeds which at present constitute almost 50% of total non traditional agricultural export (NTAE) earnings.

Food crop production dominates the agricultural sector accounting for 71% of agricultural GDP and 92% of total cropped area. Bananas account for 54% of total tonnage of food produced followed by root crops, 29%, cereals, 12% and pulses, 3%. Food crops were projected to account for 4,968 thousand hectares in 1996 up from 3,805 thousand hectares in 1980 (GOU, 1998).

During the 1960s food production grew at an average rate of 10% per annum but during the 1970s the annual growth rate in food production was only 1%. The strong recovery in food production during the late 1980s is mainly attributed to acreage expansion. This increased production was largely due to increased production of bananas, maize and root crops. Other cereals, oil seeds and pulses registered moderate recovery in the 1980s but remained below the peak levels of production of the 1960s.

The composition of Uganda's total food supplies has changed. While cereals and high energy protein foods (millet, sorghum and maize) constituted 44% of the total food supplies in the 1960s, this share dropped to 27% by 1990. In contrast, the share of starchy foods went up from 56% to 73% over the same period (plantains 30-35%, cassava 18-26% and sweet potatoes 8-12%) NEMA, 1996.

Exports

Liberalisation of trade led to non traditional agricultural exports (NTAEs) including food crops being promoted as major exports having observed the declining trend in prices of traditional cash crops like coffee, cotton and tea.

Being a landlocked country Uganda does not have comparative advantage in the export of food crops in the world market. GOU (1998) suggests that the recent insecurity in neighbouring countries and more volatile and variable climates, together with higher population growth and densities, means that Uganda is well placed to respond and exploit the regional market for export of food crops. Regional market prospects depend mainly on climatic variations, food short falls in neighbouring countries and regional market integration.

Future growth in traditional export crops will be limited mainly by growth in global demand and quality improvements. Further expansion in exports has to focus largely on new high value products for which Uganda has comparative advantage in order to generate growth. Development of the NTAE market will be contingent upon such factors as traditional airline freight capacity, improved airport infrastructure and increased foreign investment.

Non Traditional Agricultural Exports

Trade liberalisation and the removal of market distortions have provided a competitive and conducive environment and incentives to exporters to promote NTAEs. With exception of cut flowers, most other NTAEs are mainly produced by small holder farmers in remote rural areas (GOU, 1998).

NTAE crops popular with farmers include maize, beans, bananas, ground nuts and simsim. Newer crops include soya beans, pepper, vanilla, fruits and cut flowers. The most prominent maize growing districts are Kapchorwa, Iganga and Kamuli while bean production is concentrated mainly in Kabale and Mukono districts. Studies have indicated that poor extension services have been manifested in very low yields and that unless cultivation methods are improved increases in maize production are not likely to be sustainable. Under pressure to generate income, farmers may resort to expanding the area under maize at the expense of other crops or environmentally sensitive areas (NEMA, 1996).

In the case of chilies, vanilla and pyrethrum, extension advice is provided by the processors/exporters. Chilies are widely grown in Mukono and Mpigi districts and pesticides and fertilizers are rarely used. Vanilla production is also concentrated in Mukono district, often intercropped with banana and coffee plantations. Pyrethrum is grown in Kabale district using subsistence farmers as outgrowers. It is grown on hill tops and hill sides above 2000 metres above sea level in areas prone to soil erosion (NEMA, 1996).

Cut flower production on a commercial basis is new to Uganda's farming systems and started in 1992. Mukono and Mpigi districts are the key areas where the crop is grown and

production has replaced low value crops or is occurring on land reclaimed from fallow. Cut flower production makes intensive use of agro chemicals leading to increased chemical loading of the environment especially in soils and water (NEMA, 1996).

Physical Infrastructure

An important determinant of market led growth is the cost of transport to markets and ease of access to price and volume information for both product and inputs. Inadequacy of physical infrastructure such as feeder roads, communication facilities, power supply, education and health facilities, water supply, market and infrastructure continues to constrain marketing of agricultural produce and investments in rural enterprises and are responsible for high and prohibitive market transaction costs (GOU, 1998).

2. DYNAMICS AND CONSTRAINTS IN LAND USE AND MANAGEMENT

2.1 Historical Changes in Land Use and Management

Key factors determining land use have been the location of wars and civil disorders, the breakdown of government control and the abandonment of economic policies that used to support cash crop production (World Bank, 1993). Natural resource management programs and policies that broke down during the civil disorder are still in the process of being re-established.

The study areas for this project will be Mukono District in central Uganda and Mbarara district in western Uganda. Detailed information on specific project sites is not readily available hence district wide statistics will be used, to ascertain the nature of land use and management in the study areas.

2.2 Mukono District

Mukono district lies within two agro-ecological zones, the intensive banana-coffee system and the banana-millet-cotton system in the northern part of the district. Project sites in this study area cover the sub-counties of Nazigo in Ntenjeru County, Bbaale in Bbaale County and Ntenjeru in Mukono County. The map of Mukono District indicates that Ntenjeru County is located in the central part of the district, Bbaale County in the northern part, and Mukono County in the southern part.

Natural Resources

Mukono district covers an area of 14,241 km^2 of which 9,648 km^2 is open water and swamps. The climate is influenced by Mabira Forest Reserve and Lakes Kyoga and Victoria and the district experiences two rainy seasons (March-May and September to December), with a mean annual rainfall of 1400-1600 mm but as high as 1600-2000 mm in areas close to the lakes and forest reserve (NEMA, 1997). Mukono district falls within the Lake Victoria climatic zone. Climatic conditions for the district are depicted in Table 3.

Table 3: Climatic Conditions in Mukono District

Month	J	F	M	A	M	J	J	A	S	O	N	D
Rainfall mm	68	108	175	203	165	83	62	81	130	160	243	132
Temp												
Max.	27.5	27.2	26.8	26.1	25.8	25.6	25.1	25.7	26.4	26.8	26.7	26.5
Min.	14.5	15.1	15.8	16.0	15.9	14.9	14.3	14.2	14.7	15.5	15.2	14.7
Evaporation mm	138	122	147	122	120	110	100	105	124	134	122	128
RH %	88	92	89	89	89	88	91	90	86	86	86	88

Source: NEMA, District State of Environment Report, 1997

The topography is varied consisting of flat land in the northern part of the district, and sloping, undulating land in the southern part. Soils are mainly ferralitic, constituting sandy clay-loams (Table 4). Vegetation consists of forest/savannah mosaic characterised by patches of dense

forest in the south and scattered trees in shrubs and grassland in the north. NEMA (1997) indicates that natural forests on private land and government controlled forests are a characteristic of this region. Wetlands cover an area of 392km^2, and consist of natural lake lacustrine swamp wetlands and riverine swamps and flood plain wetlands.

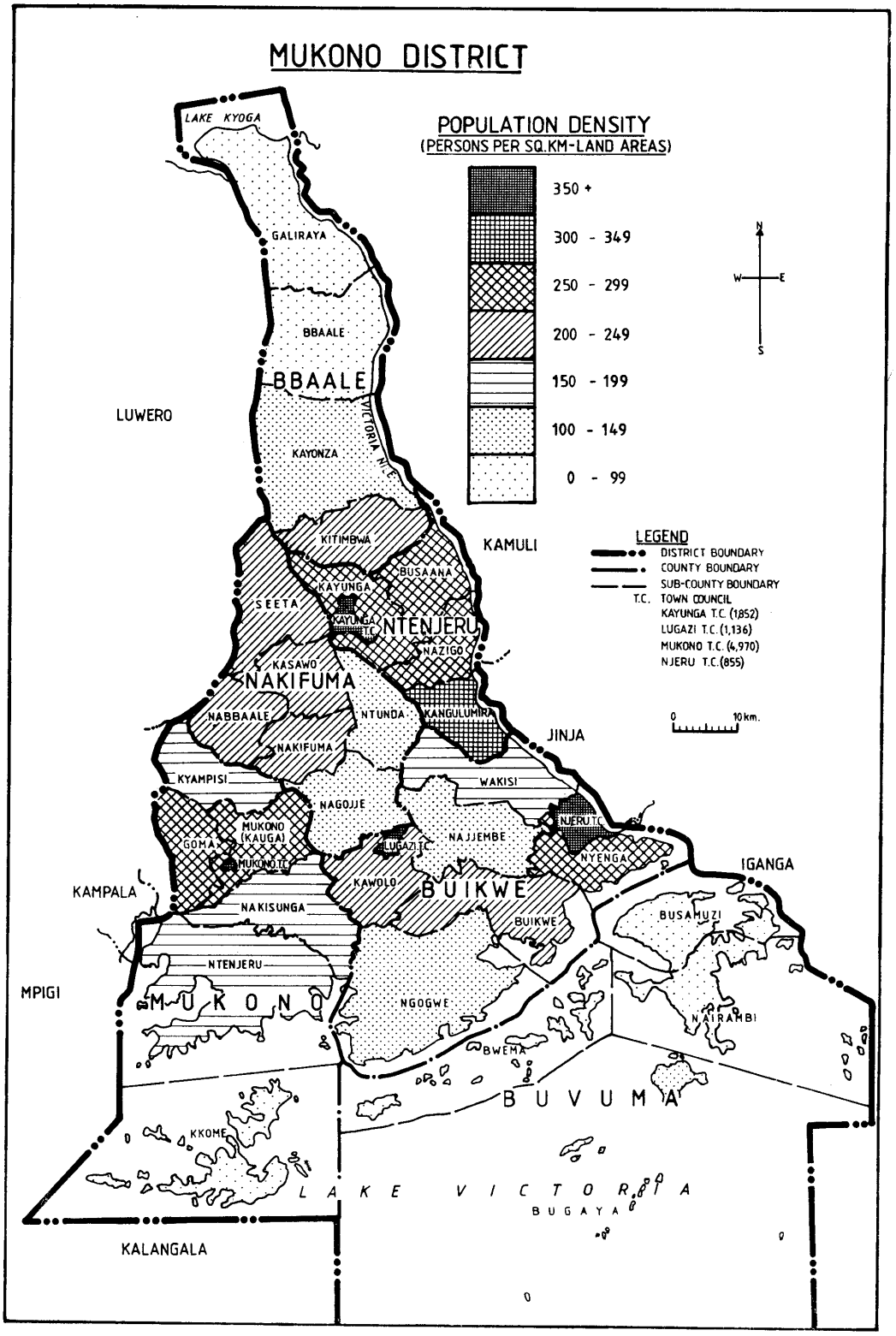
Table 4: Soil Productivity Rating and Crop Suitability – Mukono District

Soil Unit	Soil Type	Productivity	Crop Suitability
Lwampanga Series	Grey/yellow sandy loams	Medium	Cassava/Cotton
Buruli Catena	Red sandy loams	Fair	Cassava/Cotton
Buyaga Catena	Red Clay	Fair	Cotton/Cassava
Buyaga Semusene Complex	Red Clay	Fair	Cotton/Cassava
Nakabango	Dark Red Clay	High	Sugar/Cotton
Mabira/Nakabango Complex	Red Clay	High	Sugar/Coffee
Buganda Catena	Red Clay Loams	High	Coffee-Banana
Kyobe Catena	Red Loams + Murram	Medium	Tea, Coffee, Cotton

Source: NEMA, District State of the Environment Report, 1997

Mukono district has a total of 61 gazetted forest reserves, covering 60,000 hectares, 50% of which is accounted for by Mabira Forest. There are no national parks or game reserves in the district. Activities in private forests are not monitored, however there are 51 licensed pit sawyers in the district operating mainly in privately owned forests. In 1996 the volume of trees cut and timber produced from gazetted forests was 430m^3 and 357.5m^3 respectively (NEMA, 1997).

Mukono District



Land Tenure

The land tenure systems operating in Mukono district include:
- registered freehold 16,295 ha
- leasehold 16,549 ha
- Kibanja (customary) 161,984 ha

An absence of land titles for most farmers in the district, and the consequent lack of security of tenure, makes the transference of environmentally sustainable practices more difficult (NEMA, 1997).

Economic Activity

Agriculture is the dominant activity in the district and much of the district's income is derived from large sugar estates at Lugazi, tea at Kasaku and vanilla plantations (NEMA, 1997). Crops that also contribute significantly to the district's income include coffee, horticulture and food crops. Fishing is also a major economic activity in the district, which accounts for 15% of the national fish catch, attributed mainly to Lakes Victoria and Kyoga (NEMA, 1997).

Industrial activity is also present in the district, and includes breweries, a sugar plant, mattress manufacturer, matchbox factory, a firm making electric cables and a plant producing fabricated spare parts. Agro-processing exists in the form of coffee factories (NEMA, 1997).

Agricultural Production

NEMA (1997) identifies three farming systems in Mukono district, namely banana-coffee in the south, vanilla-coffee in the central part and cassava-millet in the north of the district. Farming is predominantly carried out on a small scale using traditional hand tools. Population pressure has led to land fragmentation and poor farming methods and an absence of soil conservation practices has resulted in low yields. Table 5 depicts the acreage of crops grown in the district as well as their yields and output.

NEMA (1997) indicates that subsistence crops occupy the biggest acreage, while sugar cane, cocoa and coffee, the traditional cash crops, cover over 30,000 hectares of land each. Although there are some coffee estates in the district, comprising over 30 acres, these are relatively new and are held by less than 15% of coffee farmers. The largest coffee estate, which is 300 acres, grows clonal coffee and is considered to be a model farm. Cassava, grown in the northern parts of the district occupies more than 10,000 hectares of land.

While most households depend mainly on family labour, hired labour tends to be used during peak periods of farming activity such as planting and harvesting. The large tea, coffee and sugar estates use hired labour, agro-chemicals and mechanised ploughs.

Table 5: Crop Production and Yields – Mukono District 1995

Crop	Area (Ha)	Yield(Metric Tonnes/Ha)	Output (Metric Tonnes)
Maize	7277	2.01	14626.77
Finger Millet	1240.7	0.25	310.175
Sorghum	1133.43	1.86	2108.18
Rice	126	0.6	75.6
Sweet Potatoes	7271.1	11.45	83254.1
Irish Potatoes	148.5	0.26	38.6
Cassava	12406.67	10.96	135977.1
Yams	340.02	3.76	1278.48
Banana	14630.60	1.64	23994.33
Beans	4175.38	0.38	1586.64
Ground Nuts	2264.92	1.59	3601.2
Pineapples	1049.12	15	15736.8
Coffee (Clonal and Robusta	35493.04	1.6	56788.9
Tea	1980.8	-	-
Sugar Cane	38246.5	-	-
Cocoa	38246.5	-	-
Vanilla	60.97	0.5	-
Passion Fruit	88.18	10	181.8
Cabbage	629.01	6	3774.06
Onion	198.2	-	-
Sim Sim	218.7	0.5	109.35
Tomato	741.68	10	7416.8
Cowpeas	68.44	0.38	26.0
Field Peas	56.48	0.38	21.46
Soya Bean	319.01	0.38	121.22

Source: NEMA District State of Environment Report, 1997

Most farmers cultivate crops such as bananas (matooke), maize and beans for home consumption. Household income thus depends on the surplus of food crops and livestock products, which can be sold and the production of cash crops. In general a farmer cultivates between five to ten crops (JALDA, 1993). Table 6 shows the acreages, yields and production of crops by County in Mukono district. For some crops such as bananas/plantain and cassava, the acreages and production figures differ greatly from the NEMA (1996) data. Although the data refers to different years, the data may also have been collected using different measuring techniques and in the case of bananas, the NEMA data may refer to matooke, while the JALDA data may refer to all types of bananas.

In the coffee-banana farming system, production costs are low and wages and expenses for agricultural chemicals and machinery and equipment also tend to be low. JALDA (1993) suggests that this indicates that crops are suited to natural conditions, such as weather and soil. According to JALDA (1993), the socioeconomic conditions such as distribution conditions are established and farming methods are not easily changeable. They therefore contend that consequently there is almost no improvement in cultivation technology, hence an absence of soil conservation and the introduction of new breeds, which has led to a decline in both land and labour productivity. The study however does not provide empirical evidence of declining trends in land and labour productivity.

As regards new crops such as vanilla, market price fluctuations are high and both the cultivation technology and farming methods are still being established. There is therefore a large difference in the output of successful and non-successful farmers (JALDA, 1993).

In the areas nearest the cities there has been a shift towards the production of horticultural products. This type of farming has involved greater capital investment in seeds and fertilizers. These products are also affected by price fluctuations, which may negatively impact further productive investments.

Table 6: Agricultural Production Volume in Mukono District by County

Item	Yield/ha	Bbaale		Buikwe		Buvuma		Mukono		Nakifuma		Ntenjeru		Total	
	Ton	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
Cash Crops		Ha	Ton	Ha	Ton	Ha	Ton	Ha	Ton	Ha	Ton	Ha	Ton	Ha	Ton
Coffee (Robusta)	1.60	4,401	7,042	11,567	18,507	0	0	13,962	22,339	7,998	12,797	17,648	28,237	55,576	88,922
Sugar Cane	60.00	0	0	34,119	2,047,140	0	0	1,868	112,080	1,807	108,420	354	21,240	38,148	2,288,880
Tea	0.50	0	0	691	346	0	0	607	304	1,253	627	0	0	2,551	1,277
Cocoa	0.25	68	17	1,448	362	483	121	290	73	2,703	676	579	145	5,571	1,394
Cotton	0.45	93	42	0	0	0	0	0	0	21	9	76	34	190	85
Vanilla	5.00	0	0	2	10	0	0	17	85	1	5	2	10	22	110

Food Crops		4,024	21,867	14,314	94,442	3,474	22,599	17,235	96,024	13,602	64,092	17,082	82,543	69,731	381,567
Plantains/Tubers	6.90	987	6,810	11,790	81,351	3,141	21,673	10,379	71,615	4,834	33,355	6,507	44,898	37,638	259,702
Plantains		3,037	15,057	2,524	13,091	333	926	6,856	24,409	8,768	30,737	10,575	37,645	32,093	121,865
Tubers	27.30	1,088	2,970	738	2,015	329	898	5,210	14,223	6,802	18,569	8,047	21,968	22,214	60,643
Cassava	6.20	1,945	12,059	1,782	11,048	0	0	1,632	10,118	1,951	12,096	2,524	15,649	9,834	60,970
Sweet Potatoes	4.00	0	0	0	0	0	0	10	40	11	44	0	0	21	84
Irish Potatoes	7.00	4	28	4	28	4	28	4	28	4	28	4	28	24	168
Yams		1,516	1,221	911	977	0	0	872	979	1,254	1,420	2,830	2,784	7,383	7,381
Cereals	1.00	723	723	685	685	0	0	686	686	1,001	1,001	2,247	2,247	5,342	5,342
Maize	0.60	774	464	96	58	0	0	35	21	31	19	427	256	1,363	818
Finger Millet	1.80	19	34	130	234	0	0	151	272	222	400	156	281	678	1,221
Sorghum	1.40	0	0	0	0	0	0	0	0	0	0	2	3	2	3
Rice		1,495	2,235	1,272	1,894	2,109	3,164	1,237	1,844	2,008	3,002	2,313	3,461	10,434	15,600
Pulses	1.50	1,488	2,232	1,258	1,887	2,109	3,164	1,225	1,838	1,998	2,997	2,302	3,453	10,380	15,571
Beans	0.40	7	3	7	3	0	0	7	3	7	3	4	2	32	14
Field Peas	0.60	0	0	7	4	0	0	5	3	3	2	2	1	17	10
Cow Peas	1.20	0	0	0	0	0	0	0	0	0	0	4	5	4	5
Pigeon Peas		0	0	0	0	0	0	0	0	0	0	1	0	1	0
Grams		345	1,574	298	1,513	83	1,245	365	1,597	373	1,612	701	2,028	2,165	9,569
Oilseeds	1.20	131	157	197	236	0	0	259	311	246	295	476	571	1,309	1,570
Ground Nuts	0.70	58	41	0	0	0	0	0	0	6	4	40	28	104	73
SimSim	1.80	73	131	18	32	0	0	23	41	38	68	102	184	254	456
Soya Beans	15.00	83	1,245	83	1,245	83	1,245	83	1,245	83	1,245	83	1,245	498	7,470
Sunflowers		11	64	169	1,266	0	0	262	2,024	234	1,830	192	1,446	868	6,630
Vegetables	8.50	1	9	100	850	0	0	178	1,513	163	1,386	122	1,037	564	4,795
Tomatoes	10.00	1	10	2	20	0	0	7	70	6	60	4	40	20	200
Onions	6.00	6	36	65	390	0	0	70	420	63	378	57	342	261	1,566
Cabbages		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greens	3.00	3	9	2	6	0	0	7	21	2	6	9	27	23	69
Chillies		0	0	114	3,180	0	0	255	6,830	75	2,050	441	12,770	885	24,830
Fruits	30.00	0	0	102	3,060	0	0	214	6,420	65	1,950	418	12,540	799	23,970
Pineapples	10.00	0	0	12	120	0	0	41	410	10	100	23	230	86	860
Passionfruits	10.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avocado															
J.Fruit/Pawpaw/	10.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mango	6.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Fruits															

Source: JALDA, 1993

LivestockLivestock in Mukono district comprise cattle, goats, sheep, pigs and poultry. Although the livestock sector is important, over-grazing and poor stocking methods as well as inadequate disease control have had a detrimental effect on livestock numbers. Findings from livestock census in 1994 and 1996 indicate that livestock numbers have declined (Table 7), except for goats.

Table 7: Livestock Population – Mukono District

Livestock Type	1994	1996
Cattle	132,980	131,706
Goats	61,168	62,214
Sheep	16,632	16,549
Pigs	29,285	28,840
Poultry	31,126	-

Source: NEMA District State of Environment Report 1997

The distribution of the differing types of cattle breeds within the district is given in Table 8, for 1996. The main types of cattle bred in the district are exotic, crossbreed and indigenous.

Table 8: Distribution of Cattle Breeds – Mukono District 1996

County	Exotic	Cross	Indigenous	Total
Mukono	991	1396	21,325	23,712
Buikwe	722	1187	38,342	40,251
Nakifuma	346	732	11,689	12,767
Ntenjeru	340	934	19,540	20,814
Bbale	195	958	29,007	30,160
Buvuma	-	52	3,950	4,002
Total	2594	5259	123,853	131,706

Source: NEMA District State of Environment Report 1997

NEMA (1997) identifies several major husbandry practices under which cattle are grazed, namely:

- intensive zero grazing, mainly concentrated in the southern and central parts of the district, comprising the counties of Mukono, Buikwe, Nakifuma and Ntenjeru, and constituting 5% of the cattle stock in the district.
- Small dairy farms, housing a cattle population of around 5 – 20, consisting mainly of crossbreeds that require intensive care, although indigenous breeds are also common. These farms account for 30% of the cattle in the district.
- Large dairy farms, found mainly in the central and southern parts of the district, accommodating on average 40-400 heads of cross breed cattle.
- Ranches, found in the northern counties of Bbale, Nakifuma and Ntenjeru house mainly the indigenous breeds and some cross breeds and some ranches measure up to 10 square miles.

Facilities constructed by the government, such as cattle dips, valley dams, and valley tanks are communally shared by the cattle grazers, but as a consequence of mismanagement, most of them are non functional. There has also been evidence of soil erosion in areas that are

overstocked. The population and distribution of other livestock types for 1996 is given in Table 9.

Table 9: Distribution of other Livestock by County, 1996

County	Goats	Sheep	Pigs
Mukono	7,687	2,593	6,195
Bbale	9,552	1,556	1,618
Nakifuma	10,554	4,049	5,214
Ntengeru	10,833	2,772	5,380
Buikwe	22,315	5,475	9,414
Buvuma	1,273	122	519
Total	**62,214**	**16,549**	**28,840**

Source: NEMA District State of Environment Report 1997

Of the 15,000 litres of milk produced daily by Mukono district, a large proportion is sold outside the district, hence the district is not self sufficient in dairy products. Milk cooling facilities are located in Mukono, Buikwe and Ntenjeru counties. The district has a cattle abattoir at Kyetume livestock market as well as slaughter centres in trading centres throughout the district. Hides and skins are also sold (NEMA, 1997).

Demographic Change

According to the 1991 Population and Housing Census, Mukono's population measured 824,604 people, 413,580 females and 411,024 males. Much of the population is concentrated in urban centres and in the southern part of the district and 57% of the population is below 18 years (NEMA, 1997). Table 10 depicts the population characteristics for the district. Relative to other regions of the country, human living conditions in Mukono district are relatively higher, with the population having a 30% illiteracy rate.

Table 10: Population Characteristics – Mukono District

Population Size	824,604
Growth Rate	2.4%
Percent urban (1991)	11.9%
Percent rural (1991)	88.1%
Life Expectancy	Males 45 years Females 49 years Both 47 years
Literacy Rate (male)	65%
Literacy Rate (female)	56%
Literacy Rate (average)	60%

Source: NEMA District State of Environment Report, 1997

Of the district workforce, 80% are engaged in agriculture, while others are engaged in fishing and wood fuel harvesting. Brick making forms an important income generating activity yet has serious implications for conservation.

2.3 Mbarara District

The district lies within two agro-ecological zones, the Pastoral system and the Montane system. Mbarara district lies in western Uganda and is divided into 7 counties, comprising 43 sub-counties and covering an area of 10,020.8 sq. km, 1108.5 sq.km of which comprises wetlands. Through consultations with district agricultural officials, three farming systems in the district have been identified. These comprise the livestock farming system, annual crops farming system and the banana farming system. Project sites have tentatively been chosen as Nyakayojo sub county in Rwampara County for the banana farming system, Nyamalebe sub county in Ibanda County for the annual crop farming system and Bubale sub county in Kashari County for the livestock farming system. The map of Mbarara district indicates that Ibanda County is in the northern part of the district, while the Counties of Kashari and Rwampara are in the western part of the district. All three project sites lie in the wet zone of the district which comprises the western half of the district from North to South, while the eastern part of the district is known as the dry zone.

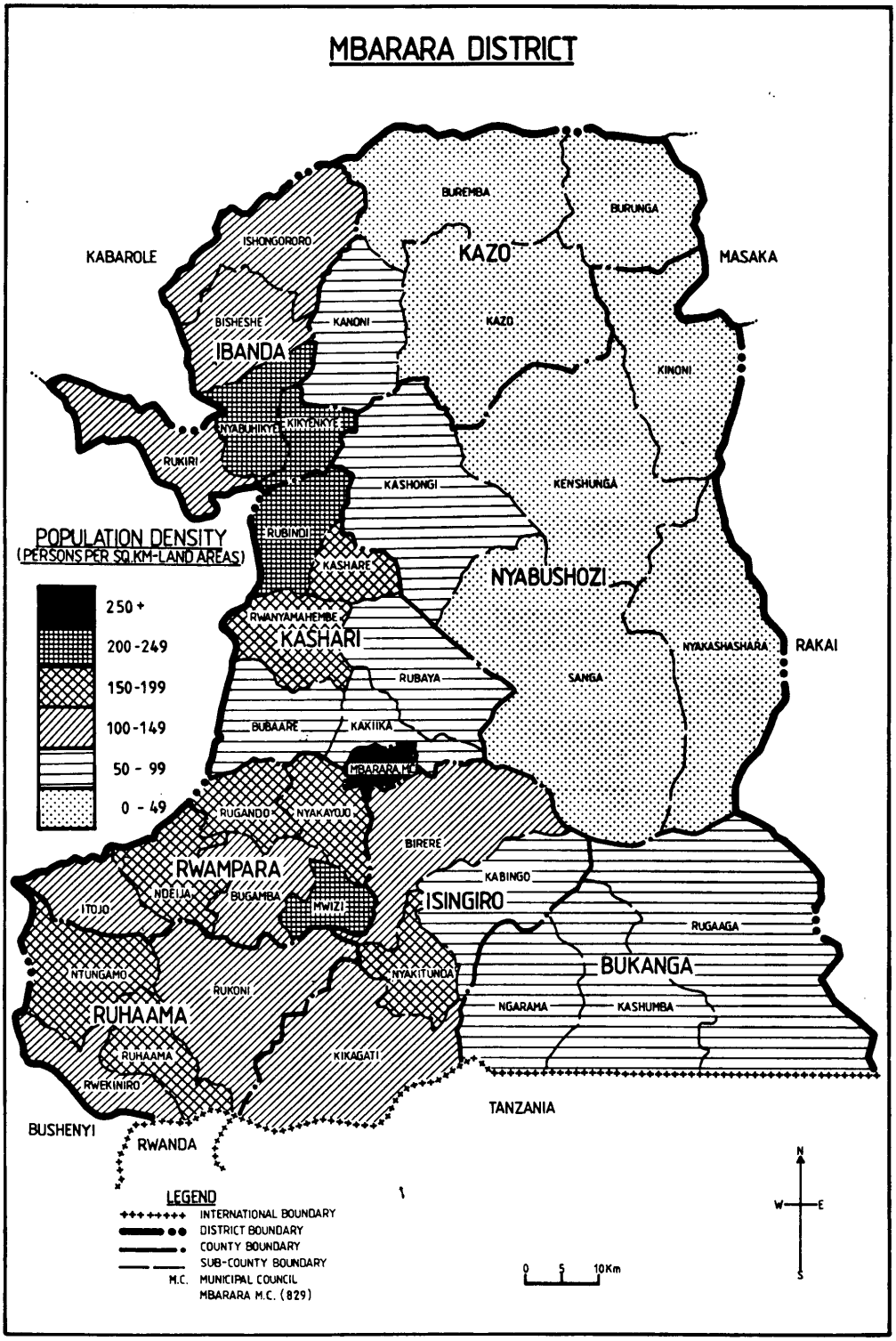
Natural Resources

There are two rainy seasons and average rainfall is estimated at 1000mm per annum. The first rainy season is from mid February to end May, while the second rains are from mid August to end December. Two dry spells separate the rainy seasons. The long dry season is from June to mid August and between January and February there is a short dry spell. Temperature in the district ranges from 15°C -25°C most of the year (NEMA, 1997). The district thus falls within the Ankole-Southern climatic zone.

The soil is mainly comprised of sandy loams or clay loams and consists of ten varieties, the Mbarara Catena, Bukora Series, Rugaga Series, Koki Catena, Bugamba Catena, Kazo Series, Magunga Catena, Mawogola Catena, Isingiro Catena, and the Nyabushozi Catena (NEMA, 1997).
Soils on hill tops are generally shallow and those in the valleys are relatively deeper. These reddish brown silty clay loams and yellowish red silt clay loams have medium to low productivity. Shallowness of the soil has led to land degradation.

Vegetation in the district can be classified into grass savannas, moist acacia savannas, dry acacia savannas and permanent swamps. There are eleven forest reserves in the district consisting of natural high forest, cyprus plantations and eucalyptus plantations. District forest reserves have been decimated by a variety of factors and there is active deforestation particularly in Rwoho and Kyahi forest reserves. The causes of deforestation have been cited as cultivation, demand for fuelwood and building poles, ineffective management, increase in charcoal burning, and the need for grazing land (NEMA, 1997).

Mbarara district



Land Tenure

The district has three main land tenure systems, customary, freehold/mailo and leasehold. Customary tenure is the most common in the district. Land ownership in the district mainly comprises private ownership, with the majority of people owning small pieces of land (2.5 acres), while a few own excessively large tracts. Some areas have mailo land belonging to the former King of Ankole. Youth and women are not generally accorded possession rights over the land they cultivate. Renting out land is common and payment is done in cash or kind following harvesting or selling of produce (NEMA, 1997).

Agricultural Production

Agriculture constitutes the main land use in the district, comprising a system of mixed agriculture with perennial and annual crops, as well as grazing throughout most of the district. A large fraction of the land area is under banana plantations, which comprise a major staple food for the district. Bananas are grown in pure stands, but are occasionally interplanted with beans and fruit trees like avocados, pawpaw and mangoes. Annual crops are also grown on the mid parts of the hills and include sorghum, millet, beans, maize, sweet potatoes and peas. Animals are communally grazed in the hills in communal grazing lands, and in crop fields after harvests although these grazing lands are privately owned (NEMA, 1997).

Ninety percent of the total land area is arable land, and comprises land under cultivation, ranches and areas potentially available for pasture and cultivation. 90% of rural livelihoods are agriculture dependent. Banana and coffee are the most important cash crops. An estimated 220,000 hectares are under banana plantations producing 500,000 metric tonnes of bananas per annum, 35% of which is sold for cash and the rest for home consumption. 80% of the population is engaged in banana production and 70% of bananas sold in Kampala come from Mbarara district (NEMA, 1997).

Table 11 gives the crop production for a season in Mbarara district. The Table indicates that 80% of farm families grow bananas, and 60% grow maize and beans. Bananas are thus the most predominant crop in the district and are mostly grown in Bukanga, Isingiro and Rwampara counties. Coffee, wheat and sorghum are the main cash crops, but cash crops also include ground nuts and Irish potatoes. Coffee is grown mainly in Rwampara, Ibanda, Kashari and Isingiro counties. Rwampara, Isingiro and Kashari counties have the biggest acreage of cultivated land, while Ibanda, Kazo, Nyabushozi and Bukanga counties have a very low acreage of cultivated land. Table 12 gives the crop production by County for Mbarara district as well as the population distribution for each County. Despite high levels of food production, NEMA (1997) argues that there is evidence to suggest that 51.5% of all children below five years are stunted. Food security is constrained by lack of agricultural diversification, high incidence of post harvest losses, poor farming methods that result in soil exhaustion, and vermin that destroy crops.

Table 11: Crop Production, Marketing and Storage for a Season – Mbarara District

Crop	% of FFs growing the crop	% of FFs holding 5 ha under the crop	Total no. of FFs	Estimated area under the crop	Ave. Prodn Tons/ha	Total prodn (tons)	Qty consumed (tons)	Qty sold (tons)	Qty wasted (tons)	Storage before sale	Qty stored
Bananas	80	40	133,000	220,000	25	5,500,000	3,200,000	2,200,000	100,000	Sold fresh	
Coffee	16	10	"	10,640	10	127,680		125,126	2,554	Gunny bags	125,126
Maize	60	5	"	19,950	2.5	49,879	12,469	34,912	2,494	Cribs/bags	34,912
Beans	60	8	"	31,920	0.8	25,536	12,768	12,257	511	Gunny bags	12,768
G/Nuts	40	25	"	6,650	1	6,650	2,660	3,990	-	"	3,990
I/potato	10	5	"	1,663	12	19,950	5,586	13,956	399	sold fresh	-
S/potato	7.5	2.5	"	12,469	15	180,035	168,332	11,703	-	"	-
Cassava	50	2.5	"	8,313	17	141,313	127,181	14,132	-	"	-
Sorghum	5	1.5	"	499	3	1,496	224	1,197	75	gunny bags	1,197
F/millet	20	1.5	"	1,995	1	1,995	1,596	299	100	"	299
Wheat	5	3	"	83	2	166	8	150	8	"	150
F/peas	5	1.5	"	499	0.8	399	311	80	8	"	80
Tomato	2.5	0.5	"	83	20	1,663	333	1,330	-	"	-
Cabbage	10	2.5	"	83	25	2,075	415	1,660	-	sold fresh	-
Pineapple	3	0.1	"	22	22	484	144	340	-	"	-
Onions	3	1.5	"	30	20	600	120	480	-	"	-
F/fruit	2	0.01	"	13	20	260	156	104	-	"	-
Others	5	5	"	1,663							
Total				316,575							

Source: NEMA District State of Environment Report, 1997
FF refers to farm households

Table 12: Food Production per County per Season

Crop	Kashari	Rwampara	Isingiro	Ibanda	Kazo	Nyabushozi	Bukanga	Municipality
	Popn: 122,084	Popn: 120,319	Popn: 147,220	Popn: 148,029	Popn: 64,646	Popn: 76,318	Popn: 79,145	Popn: 41,031
	FF 17,441	FF 17,188	FF 21,032	FF 21,147	FF 9,233	FF 10,903	FF 11,307	FF 5,862
	% Prodn	% Prodn	% Prodn	% Prodn	% Prodn	% Prodn	% Prodn	% Prodn
Bananas	10	30	40	10	2.5	2.4	50	0.1
Maize	5	5	30	35	10	10	5	-
Beans	5	14.8	30	30	5	5	5	0.2
G/nuts	25	5	20	30	5	5	10	-
I/potato	15	55	30	-	-	-	10	-
Cassava	10	5	15	15	20	25	-	-
S/potato	15	25	15	10	10	10	5	5
Coffee	10	50	10	30	-	-	10	5
Wheat	-	70	-	30	-	-	-	-
Sorghum	5	35	30	30	-	-	-	-
P/fruit	35	35	10	10	2.5	-	2.5	2.5
Pineapple	5	45	40	10	-	2.5	-	-
F/peas	-	55	45	-	-	-	-	-
Onions	15	-	85	-	-	-	-	-
Cabbages	5	15	70	-	-	-	-	10
F/millet	30	-	20	30	-	-	20	-
Others								
Total								

Source: NEMA District State of Environment Report, 1997
FF refers to farm households
% prodn. refers to the percentage of the population in each County producing the crop.

Land holdings are small, there is over-dependence on production and consumption of bananas and there is a lack of famine reserve foods in the district (NEMA, 1997).

Livestock

Mbarara district is highly regarded for its stocks of cattle and the district is often referred to as "the land where milk and honey flows on the paths". It is estimated that the district cattle stock numbers 889,500 animals.

Almost every household keeps cattle, which are kept either in the free range herding system or, in fenced farms. Free range herding is commonly practiced where 2-4 farmers pool together to graze their animals in a big herd. This type of herding is also associated with the burning of range-lands during dry seasons in order to allow young pastures to regenerate (NEMA, 1997). This however has environmental effects.

Goats and sheep are kept in smaller numbers, and sheep may be herded with cattle, otherwise they are usually managed by tethering. Goats and sheep are mainly reared in Rwampara county due to cultural practices. NEMA (1997) argues that goats and sheep require careful management and tend to be a problem to cultivated crops and agents of environmental degradation. The number of pigs is low due to cultural and religious beliefs and also because knowledge about pig rearing is sparse. Local and exotic breeds of chicken are reared, both in the free-range system and deep litter system. The latter is mainly used by those with exotic breeds.

About 1,700,000 litres of milk are produced by the district every month. Other dairy products include milk, ghee, cheese, butter and yoghurt. 300 heads of cattle are slaughtered in Mbarara municipality abattoir every month, and twice that number slaughtered in the villages (NEMA, 1997). There are around 26,000 layers and 22,000 broilers in the district, while the exact number of local birds is unknown.

Demographic Change

The 1991 population and housing census estimated that Mbarara district had a population of 930,772 people, 473,515 of whom were females. Population density has increased in the district from 42.5 in 1969, to 65.0 in 1980 and 87.9 in 1991 and this trend is expected to continue. The average annual population growth rate was estimated at 2.75% in 1991, a decline from rates of 4.07% in 1969 (NEMA, 1997). This has been caused by migration in search of employment, high rate of infant mortality and wars.

Population densities vary throughout the district. Areas with the highest population densities are Mbarara municipality, Rubindi, Nyabuhikye, Kikyenkye, Kashere, Mwizi, and Nyakitunda sub-counties. Population densities are greatest in the eastern part of the district due to wildlife conservation areas, uneven distribution of activities like livestock keeping and farming and the availability of social services and infrastructure (NEMA, 1997). The district has a variety of government aided educational institutions, and private institutions also exist. Table 13 gives the numbers and types of institutions in Mbarara district.

Table 13: Educational Institutions in Mbarara District

Pre-primary	45
Primary Schools	
Private	146
Government	477
Secondary	
Private	13
Government	39
Technical schools	
Private	06
Government	04
Training Colleges	03

Source: District State of Environment Report, 1997

The district can be readily accessed by road, and telecommunication facilities are adequate. Postal services are available and the district can access the national television channel.

2.4 Productivity in Current Land Use and Management

Production Technology

Uganda has one of the lowest crop yields in the world and for most crops, yields have remained stagnant during the last four decades and in some cases declined (GOU, 1998).

Agriculture in Uganda has been plagued by weak research, extension and farmer linkages resulting in low input-low output technology. Unless farmers are availed high yielding technological packages at farm level, adoption rates will remain low. Selected and improved varieties that come out of the research system cannot reach the farmer because of the absence of on farm trials, demonstration plots and the lack of a viable seed industry. The private sector has not engaged in the multiplication and distribution system for farm inputs mainly because of a breakdown of the private sector trade network in rural areas. While private traders have engaged actively in the marketing of farm produce, and have benefited from the removal of marketing boards and a more liberalised market, private provision of inputs is not as widespread in rural areas and the high price of inputs results in limited use by farmers. Consequently, there is at present no effective and efficient delivery system for inputs easily available to farmers.

Ugandan farmers do not depend much on purchased inputs whether locally manufactured or imported. It is estimated that less than 10% of all farmers use pesticides and hardly 6,000 tons of fertilisers are used country-wide. Most farming is subsistence in nature and basic input requirements are hand hoes, axes and pangas (Tumusiime, 1998). There is a need for a refocus of the government policy on inputs. The Plan for the Modernisation of Agriculture (PMA) acknowledges that increased agricultural output can come from increases in areas under cultivation and intensification of management on existing farms through the application of agro-chemicals, plant breeding, improved extension services, post harvest loss reduction and adaptable soil conservation techniques (NEMA, 1996).

Scant adoption of modern varieties in Uganda has been attributed to the fact that these varieties require other complementary inputs such as fertilizers and pesticides without which they are out competed by traditional varieties. Another causal factor is the virtual absence of an efficient distribution system that would ensure timely availability of seed at a reasonable cost. Labour saving cultivation techniques such as animal or mechanical traction are little in evidence.

This situation is typical throughout the country and is also evident in the study areas. Farmers in both Mukono and Mbarara districts use traditional farming practices, with the majority making use of hand tools such as hoes, pangas, slashers and axes to prepare their land. Family labour provides the greatest source of labour although hired labour, in particular prison labour (where available) is employed at peak times such as planting and harvesting. Small-scale farmers mainly apply organic fertilisers such as urea and cow manure, while only a small proportion of large and medium scale farmers use inorganic fertilisers and these are applied mostly to horticultural crops.
Many farmers practice extensive farming, and do not use fertilizers, agricultural chemicals and farm machinery. As a result, farm land productivity is poor, few households produce surpluses and there is little re-investment in farm production.

Some farmers do practice soil conservation techniques but these are in a minority. The larger coffee, sugar and tea estates use mechanised ploughs and apply agro chemicals to their crops.

For NTAE crops significant improvements are expected largely through widespread use of improved seed varieties and adoption of proper agronomic practices. High yielding varieties (HYVs) are already available in research stations and what remains is the design of proper systems for their large sale multiplication and distribution to ultimate producers (GOU, 1998).

2.5 Key Resources and Constraints for Current Systems of Land Use and Management

Crop Sub Sector

Major issues pertaining to the crop subsector include i) soil degradation; ii) inadequate land tenure arrangements and their impact on agricultural productivity; iii) impact of farming systems on the environment; iv) food security and; v) inadequate agricultural (crop) production technology in terms of access to improved technology and affordability (NEMA, 1996).

Constraints observed in the agricultural sector are numerous, namely:

a) Very low investment compounded by a lack of access to credit which minimises the ability to utilise recommended technologies, hence the low levels of productivity observed.
b) The excessive dependence on rainfed agriculture, whereby shortfalls adversely affect output.
c) The keeping of large herds of cattle by farmers which are predominantly of low genetic potential.
d) Poor and unreliable marketing systems for both agricultural inputs and outputs, hence unfair prices to farmers. Marketing systems for export crops do not face the same problems, hence farmers do not face unfair prices for traditional cash crops such as coffee and for non traditional export crops such as maize and beans.
e) Poor handling and processing practices for crops, livestock and fish leading to high post harvest losses.

Marketing of Produce

Constraints faced in marketing of agricultural products may be classified in two categories:
a) Constraints of a general nature which affect most of the agricultural products, and
b) Sub sector specific constraints.

Transport Infrastructure

The rural feeder road network in Uganda consists of about 22,300 km mainly of gravel and earth roads. It is estimated that about 25% of feeder roads are impassable during the rainy season, 54% require full rehabilitation and 20% need culvert and drainage repairs. About 10% of the total network would require improvements every year. Railway links to up country towns are in poor condition. In some cases, they have been discontinued.

Rural Markets

Rural markets are operational on a weekly or bi-weekly basis. Such markets do not have minimum facilities such as roofed structures to guard against rain and other weather conditions, lockable secure storage for temporary handling before transfer of goods or for unsold goods, and other services such as water and toilets.

Most of the agricultural produce from Mukono is sold in the urban centres of Kampala, Kayunga and Jinja. Large sugar and tea factories also have outgrowers schemes for buying crops from small scale farmers. Produce is also sold in road side markets scattered along the

Kampala-Jinja and Mukono-Kayunga roads. The most common form of sale is at the farm gate where traders come to buy farmers produce since farmers cannot afford the high transport costs of transferring produce to the market. Some products are destined for export markets such as fish, sugar and coffee.

Information

Price information in both rural areas where production takes place and markets where goods are consumed is important to facilitate marketing decisions by both sellers and buyers. Statistics on production and sales are similarly vital. While prices need to flow on a more regular basis, production, local sales and exports information needs to be disseminated to sellers and buyers on weekly, monthly or quarterly basis for planning purposes. There is very little information in this field other than for coffee and cotton where UCDA and Cotton Development Organisation (CDO) are currently playing this role. ADC/IDEA is also issuing regular reports on NTAEs. The Export Promotion Board (EPB) can help mobilise information on foreign markets.

It is important that production and marketing target specific markets. Addressing quality requirements will therefore require dissemination of information coupled with quality control and certification services starting from rural markets. With liberalisation most of the agro-processing and marketing operations are now in the hands of efficient participants. This has helped bring down the unit cost of marketing especially the financial costs. However other than road and rail infrastructures, public service utilities still affect the marketing process in many areas of the country. Services such as electricity are not widespread and some areas have to rely on expensive sources of power.

GOU (1998) argues that lack of a commodity exchange has affected the marketing process in two ways: firstly if in place the exchange would enhance competition among sellers and buyers by providing necessary information on market statistics and prices. Secondly, sellers would sell goods in advance to be delivered at some future period thus serving the credit function referred to earlier.

Post Harvest Handling

Post harvest handling is poor. This results in product losses and loss in quality thus reducing viability of crops, both at farm level as well as during marketing. There is a lack of appropriate methods for harvesting, drying, cooling, pest control and other operations, as well as lack of appropriate storage facilities, and improper packaging.

Extension services in the country have generally been neglected and it is now the responsibility of individual districts to provide extension services under the decentralisation programme. Mukono district has a Unified Extension Service (UES), which encompasses the agricultural, fisheries, veterinary and forest departments. It is the responsibility of UES to extend technical advice to rural farmers on agricultural innovations that enhance sustainable agricultural development. The UES has registered some successes and Mukono district is now regarded as a model district in improved farming practices. Each extension worker provides extension services to 4,000 farmers instead of 1,000 originally planned for (NEMA, 1997). Some extension workers have organised farmers into groups for income generating activities in various fields such as bee keeping.

Problems constraining the district agricultural extension programme have been cited as,

poor participation by civic leaders, unclear decentralisation policy, inadequate staff facilitation in terms of transport and remuneration, and the slow pace at which farmers adopt new agricultural interventions. Awareness courses on post harvest crop handling have been carried out by the district, however adoption rates are still very low and the majority of farmers store their agricultural produce in their main houses because of the high incidence of crop thefts. In Bbale and Busana, millet is stored in granaries. Poor drying of crops may result in fungal destruction, while cereals and legumes may be destroyed by rodents and weevils during storage due to poor storage facilities (NEMA, 1997).

Crops in Mukono district are also affected by pests and diseases which reduce yields significantly, such as banana weevil, coffee berry borer, sugar cane stem borer and cassava mosaic. Control of these pests and diseases is through the application of agro-chemicals which tend to be unaffordable by most farmers. In addition chemicals may have adverse effects on the environment and evidence has been found of chickens dying after feeding in banana plantations following the application of Furadan.

In Mbarara district, the extension services provided to the farmers are inadequate. This has been attributed to poor motivation of extension officers, lack of logistics and inaccessibility to rural areas (NEMA, 1997).

Land Tenure

Uganda's land management is dominated by customary and mailo land tenure systems, which do not confer freehold rights and engender fragmentation of holdings as a result of inheritance. These systems of land tenure tend to discourage investment in the land and soils are being degraded due to population pressure and yields are generally low. NEMA (1996) analyses the advantages and disadvantages of the tenure systems prevailing in Uganda.

The customary system has two main types of property holdings, specific single permanent holdings and communal with non permanent individual holdings. Specific permanent holdings are predominant in southern, eastern and east central Uganda. The head of each household (usually a man) decides on the use and transferability of the land, which tends to lead to fragmentation. The communal type of customary land tenure is found in northern and eastern Uganda, southern rangelands of the districts of Mbarara, Mubende, Kiboga, Luwero, Mukono, Kamuli and the Lake Albert flats of Semliki and Bugungu.

Traditional pastoralism is mostly restricted to communally held land. Where arable agriculture dominates over animal grazing as in northern Uganda, specific parcels of land are set aside for communal grazing and other parcels are alloted to families for homesteads and crop farming.

The advantage of customary tenure is that it is well established and understood by the majority of the population and those affected are not generally subjected to annual payments of ground rent. The disadvantage is that land cannot be used as collateral security for credit facilities thus constraining technical and economic improvements. Lack of adequate security of tenure discourages investment and commitment to care for land resulting in overexploitation, land degradation and eventual abandonment.

Mailo tenure is confined to Buganda and parts of Bunyoro. It offers advantages of a land title system which minimises land conflicts and encourages investment in the land. In practice it has encouraged the proliferation of absentee landlords whose interest is focussed on rental

income to the detriment of appropriate land management. Much of the mailo land in Mubende, Kibale and Kiboga is idle or under utilised. Since holdings are fixed transfers through inheritance have led to land fragmentation in areas of high population density such as Mpigi, Masaka and Mukono.

Leasehold offers the advantage of enabling the government to specify how a given landholding could be developed and to attach specific user or environmental conditions to the lease. However environmental conditions are rarely attached to leases.

Freehold land tenure is not widespread in Uganda and is mostly restricted to Ankole, Toro, Bugisu and parts of Buganda. It offers numerous advantages, provides maximum security of tenure, therefore encourages interest in the land. It is also the best asset to offer as collateral security for credit facilities and therefore facilitates investment in land improvement. However the transfer of sub divided land holdings has led to excessive fragmentation and extensive soil degradation in areas of high population density such as Rukungiri and Kabale.

3. PERSPECTIVES ON THE SUSTAINABILITY OF LAND USE AND MANAGEMENT

3.1 Evidence for Environmental Degradation Under Current Land Use and Management

NEMA (1996) reveals that according to the National Environment Action Plan (NEAP) 1995, at present Uganda does not have a comprehensive national land use policy. As such, inappropriate land use activities are contributing to serious environmental degradation. The NEAP suggests the development of a comprehensive national land use policy and enhanced land use planning system based on appropriate technology such as a Geographic Information Systems (GIS).

NEMA (1996) argues that inappropriate and uncontrolled land uses are a major cause of degradation and depletion of land resources. The most fragile ecosystems are the highlands and drylands. The highlands occupy about 7% of the country's total land area and are divided into southwestern, eastern, western and northeastern highlands. Due to good climate, adequate rainfall and relatively high productivity, these highlands are relatively heavily populated except for the northeastern area. Population in the highland areas consists mainly of peasants dependant on indigenous agriculture. There is a severe degradation of the highlands due to population pressure. People have been forced to reclaim steeper slopes with the resultant negative consequences of soil erosion, mass wastage and land fragmentation although there is little quantitative information on their extent and degree of severity (NEMA, 1996).

In Mbarara district, clay loams of the valleys especially near swamps are used for brickmaking and many of these clay mines are left open, posing a serious environmental hazard. This activity is mainly found in Ruhanga parish, Buteraniro and Nyeihanga trading centre. It has resulted in deforestation due to the fuelwood requirements for brickmaking. In addition, wetlands resources which have been cleared for brick making are at risk of depletion as are swamp forests (NEMA, 1997).

5.37 sq.km of the district's wetlands have been converted and this has been attributed to agricultural conversion, drainage activities, brick making, over harvesting of natural products and urban pollution. Wetlands are taken to be communally owned resources and are accessible to everyone, and this has contributed to their massive reclamation and eventual destruction (NEMA, 1997).

Agriculture

Agricultural activities unless carefully planned and controlled have negative environmental impacts. The main cause of soil degradation and declining productivity includes increasing population, inappropriate farming practices and changing land use resulting in over cultivation and absence of fallow periods. There is evidence of declining productivity especially in fragile ecosystems as well as the limited use of improved farming techniques and inputs to ensure soil conservation. This is particularly obvious in intensive banana, coffee and annual food crop montane farming systems in the south and southwest of Uganda and the medium altitude coffee growing areas of Mt. Elgon. Land fragmentation and a multiplicity of land ownership arrangement further hinder adoption of improved soil conservation techniques which minimise soil degradation and possibly even restore soil productivity (NEMA, 1996).

Major causes of land degradation in Mbarara district, include socio-economic and socio-cultural factors, lack of institutional support and political will. High population, shortage of land and insecurity of land tenure have contributed to land degradation. Poor farming practices without the application of conservation measures and soil mining have further exacerbated the problem (NEMA, 1997).

NEMA (1997) reveals that poor soil management, and heavy rainfall has led to rapid deterioration of the soils in Mukono district, caused mainly by water run-off which has been worsened by deforestation in an attempt to increase agricultural land, particularly in the southern parts of the district. There is however no empirical evidence of the extent of land degradation and soil deterioration in Mukono and Mbarara districts.

The shift to NTAEs such as spices and essential oil crops will increase diversity within the agroecological systems in Uganda and will therefore impact on biodiversity. There is likely to be an increase in demand for farmland which will lead to increased clearing of forested and other virgin lands hence aggravating soil degradation problems (NEMA, 1996).

Forest Reserves

In the mid 1970s, management broke down and indiscriminate logging degraded the forest environment, damaging wildlife habitats. Timber resources have been depleted and both reserves and savanna forests have been subjected to uncontrolled and damaging harvests (World Bank, 1993). NEMA (1996) reveals that records indicate that around 1890, forest and woodlands covered about 10,800,000 hectares, 45% of Uganda's land area. Since then the area has shrunk to 20.3% according to 1996 estimates. This reduction in area under forest has been attributed to a number of factors including population pressure, and the breakdown of law and order during periods of civil unrest.

At the turn of the century tropical high forest covered 3,090,000 ha or 12.7% of the country but it has been subjected to clearing and now covers only 730,000 ha, 3% of Uganda's land area.

Although Mukono district has a rich diversity of forest reserves, over exploitation and encroachment are threatening their existence. Natural high forests are being threatened with over exploitation and encroachment to meet the demands of agriculture and grazing land, fuel wood and timber. Mabira, Kifu and Zirimiti forests have been degraded although they are being replanted. The current high demand for forest products in Mukono district is attributed to the increase in population. Charcoal and firewood are on high demand in towns and urban centres as far as Jinja and Kampala where the average income earner cannot afford the high cost of electricity. The growth in construction has also resulted in a high demand for poles and timber.

There is clear evidence of deforestation in Mukono district and Mabira forest reserve lost about 10,000 ha during the 1980s due to pressure for agricultural land, and high demand for forestry products such as fuel-wood, charcoal, timber and poles. Deforestation has further been exacerbated by the rise in firewood brick making. Firewood is also on high demand from schools and the fish smoking industry. Although the rate of deforestation is high, it cannot be easily quantified since most of the forest are either publicly or privately owned (NEMA, 1997).

In Mbarara district, most of the population depends on firewood for its energy needs. This has placed considerable pressure on woodlands, forest and agricultural lands of the district for the exploitation of woodfuels. Accelerated harvesting of trees has led to de-vegetation, soil erosion and other forms of land degradation (NEMA, 1997). Use of fuelwood is also common to all districts in Uganda.

Drylands

In 16 out of 39 districts of Uganda, large areas are categorised as dryland ecosystems. The pre dominant occupation in dryland areas is livestock production. Although human population is sparse in these areas the cultural attitudes of the people coupled with survival coping considerations have resulted in overstocking. Thus drylands carrying capacities are frequently exceeded leading to over grazing and erosion. Desertification in some dryland areas is already pronounced including Karamoja, Buruli county in Luwero district and Kakuto county in Rakai district.

NEMA (1996) indicates that there is evidence of continuous and insidious deterioration of the rangeland especially along the cattle trails and around water points. In addition, the main rangelands within the cattle corridor areas are experiencing increasing individualisation of communal grazing land rights. In other words, there are untitled parcels of land on customary tenure whose rights to use have been individualised. This is leading to a high incidence of rangeland resource use conflicts, displacement of indigenous pastoralists and crises in rangeland management. Discussions with Mbarara district agricultural officials has revealed that individualisation of communal grazing land rights is carried out by the customary tenants of those lands who agree among themselves to share out a tract of land such as a hill side.

3.2 Success and Sustainability of Land Use

The World Bank (1993) argues that there has been a clear environmental cost of civil disorder. Wildlife, forests, fish, grazing lands and other natural resources are in danger of being overused, polluted and driven to extinction. Soil erosion is a problem in high population density, high rainfall areas. Agricultural output is generated by 2.5 million smallholders, 80% of whom have less than 2 hectares each. Only tea and sugar are grown on large estates which total 40,000 hectares.

Agriculture

The major constraints to sustainable agriculture in Mukono district have been cited as, lack of accessibility to credit, difficulty for women in controlling the use of land thus impairing farming practices that promote agricultural development, scarcity and high cost of agricultural inputs such as seeds, implements and agro-chemicals as well as lack of an organised delivery system which hinders agricultural development (NEMA, 1997). There is no proper marketing system in the district for agricultural produce apart from tea, coffee, cocoa and sugar cane. The result is that during the harvesting season, prices of food crops fall and farmers sell their crops at giveaway prices because they may urgently need cash and also to avoid post harvest losses. Poor funding for extension work as well as delays in funding are factors that hinder agricultural sustainability. Research activities carried out in the district may also not answer the needs of farmers.

Agricultural sustainability in Mbarara district is hampered by pests and diseases, both in the field and in storage. Crop loss in the field is estimated at about 15%, while that in storage is

estimated at 15-25%. Extension services in the district are inadequate due to the poor motivation of extension officers, lack of logistics, and inaccessibility to rural areas, and farmers rarely get information about the best crops to grow in particular areas (NEMA, 1997).

Forest Reserves

Demographic pressures are exacerbating the stress on Uganda's environment. Tropical high forest has declined from 1.2 million hectares in 1958 to 0.7 million ha in 1987. Pressure on forests also comes from the growing demand for charcoal and building poles resulting from growth in population estimated at 3.1% per annum and incomes.

Agro forestry is being touted as a way to address problems associated with high population pressures and shortage of land in some parts of Uganda. Plantations cover only 2.2% of the area under gazetted forests. Apart from providing wood products, forests also provide services/functions and an opportunity for developing eco tourism. Issues pertaining to the forestry subsector are i) deforestation; ii) pest and disease control; iii) harvesting and processing practices (NEMA 1996).

Livestock

The Cattle Grazing Act of 1964 attempts to control soil erosion by regulating the number of animals which can be grazed on a given area. However the act is not adequately enforced as evidenced by the increasing degradation of drylands. Drylands also support some crop production partly because of government policy promoting NTAEs. Large areas have been opened up in the drylands for growing simsim, maize and sorghum far in excess of normal consumption requirements. The fragility of drylands ecosystems calls into question the sustainability of agronomic practices without significant inputs of agrochemicals.

NEMA (1996) reveals that there are plans for livestock development based on ecologically sound management practices. Five zones based on climate, productivity of the land and human population have been identified in the country and each will require specific prescriptions under this plan. Issues regarding the livestock sub sector are a) shrinking of grazing land; b) inadequate water supply and water resources; c) lack of effort to determine the viability of wildlife ranching; and d) insufficient market facilities, (NEMA, 1996).

Wetlands

Wetlands in Mukono district comprise swamp forests with papyrus at the fringes, palm dominated swamp forests, papyrus swamps and swamps dominated by the herbs and grasses. The wetlands are currently being used in a variety of ways such as brick making, timber from swamp forests, fuel wood, floats for fish nets, fencing, handicrafts and building materials, and as a source of thatch. Swamp destruction through brick making has been estimated at 0.085 km^2 per year. Wetlands are facing encroachment from agricultural land use especially for horticultural purposes. Factors affecting Mukono district wetlands include rapid population growth, the need for more agricultural land, rapid urbanisation, industrialisation and the expansion of the construction industry (NEMA, 1997).

4.0 THE POLICY AND INSTITUTIONAL FRAMEWORK FOR LAND USE AND MANAGEMENT: GOALS AND PERFORMANCE.

4.1 The Institutional Framework

Land Tenure

The Land Reform Decree 1975 substantially changed the legal basis of land tenure in Uganda. All land was declared public land to be administered by the Uganda Land Commission. Freehold and private mailo land was transformed into leases of 99 and 199 years for individuals, public/religious and other bodies respectively. The system of occupying land by customary tenure was allowed to continue but the previous provision in the Public Land Act 1969 which sanctioned occupation of public land by customary tenure without express permission of the prescribed authority was removed. Under the decree, one cannot occupy public land by customary tenure except with the written permission of the prescribed authority (EPRC, 1997).

The commission can freely alienate such land in leasehold without the consent of the customary tenant. Under the decree the customary tenant is declared a tenant at sufferance, that is, one who occupies land without the consent of the landlord and whose tenancy can be terminated without notice. The customary tenant has no interest in land to transfer, his interest is only in the improvements on the land which he can transfer after giving not less than three months notice to the prescribed authority.

Bibanja holders (tenants) of former mailo and native freeholds in Ankole and Toro became customary tenants under the decree liable to eviction at any time after a notice of six months and compensation for improvements on the land (EPRC, 1997).

The 1975 Land Reform Decree was an attempt to improve tenurial arrangements for land. The decree substantially changed the legal basis of land tenure in Uganda by declaring all land as public land administered by Uganda Land Commission. However the provisions of the Land Reform Decree were not fully implemented due to lack of budgetary provisions and personnel and resistance by land owners under the previous system. Therefore both land owners and administrators continued to behave as though they were in the pre Decree period (NEMA, 1996).

Except for abolition of payment of Busuulu and Envujjo, original tenure systems continued as if the Decree had not been promulgated. Freehold and mailo titles have not been converted into leases as provided for under the decree. This could be because the existence of mailo land was never repealed so it can be argued that the Decree was in conflict with the Constitution. The Decree was also promulgated without adequate consultation or debate and yet it concerns and touches the most sensitive asset, land (GOU, 1998).

As a result, there was lack of a clear land policy and national physical development plan. There was also land fragmentation and exclusion of women from land inheritance; open access to resources under communal land use; land degradation due to unsustainable methods of resource use; and demographic pressure leading to encroachment in gazetted areas (NEMA, 1996).

In the late 1980s the government commissioned a number of extensive and comprehensive studies on land tenure and policy reforms. These studies formed the basis for articles

contained in the 1995 Constitution which provide for the gradual transformation to a uniform freehold system throughout the country (GOU, 1998).

The 1995 Constitution thus sought to introduce a better land tenure system for Uganda. The Constituent assembly resolved that the four tenure systems existing before the Land Reform Decree 1975, be recognised. The 1995 Constitution recommended that all Ugandan citizens owning land under customary tenure be converted into freehold ownership by registration, any lease granted to a Ugandan citizen out of public land be converted into freehold in accordance with the law made by parliament, and that lawful or bonafide occupants of mailo land, freehold or leasehold enjoy security of occupancy of the land. The Land Bill was intended to streamline the tenure system in accordance with the provisions of Chapter 15 of the 1995 Constitution (NEMA, 1996).

In the 1970s there was a persistent decline in agricultural production, increasing deforestation, encroachment on natural resources and environmental degradation which led the government to establish the Agricultural Policy Committee (APC) supported by the agricultural secretariat to formulate, coordinate, direct and review policies and programmes in the agricultural sector in 1983. The World Bank and government set up 11 working groups made up of local experts and external consultants to carry out studies and prepare actionable programmes in major policy areas including a study on land tenure and soil conservation. In 1988 the APC commissioned the Makerere Institute of Social research (MISR) in collaboration with the Land Tenure Centre (LTC) University of Winconsin-Madison to undertake two studies, one on Land Tenure and Agricultural Development (LTAD) and another on Settlements in Forest Reserves, Game Reserves and National Parks in Uganda (SFRGNP). The LTAD study was to analyse land tenure systems operating in Uganda and make recommendations on changes in land tenure policy. The study was to assess the implications of land tenure on agricultural development in Uganda. The study found that the security of tenure of farmers is not positively associated with a higher level of investment on land. The Land Reform Decree was hardly enforced and hence has not resulted in mass eviction of mailo or other tenants. The low rate of eviction was partly attributed to cultural values, family history and tradition.

The goals of the Decree were to facilitate the use of land for social and economic development and to introduce land use planning, including land use zoning. Development conditions were to be imposed and leases terminated if the conditions were not met. On the face of it the decree appears to have reduced security for tenants especially kibanja. It appears to have been a mixed blessing for lessees (former freeholders) who though their terms of holding were curtailed to leases of 99 years for individuals and 199 years for “legal persons” such as churches or corporations were now entitled to evict tenants and regain possession of lands (World Bank, 1993).

Land reform is a major social policy which (with safety of tenure) has tremendous implications for increasing the effective utilisation of land together with land conservation. Land reform will stimulate development of rural land markets which foster efficiency of land use.

The Land Act 1998, which entrenches the rights of Ugandans over land is intended to deal with the problems of land access by the majority of the rural poor. It is expected to facilitate more optimal utilisation of land by allowing for major improvements in farm sizes and greater efficiency and productivity.

4.2 Policies on Land Use and Management

The government has committed itself to enforcing appropriate rules and regulations on the use of natural resources and environmental management. Public sensitisation on environment conservation issues like proper land use and management, rational use of fertilisers and pesticide, appropriate fishing methods, proper waste disposal and management, optimum stocking rates, pollution etc is already underway through environmental awareness campaigns by both NGOs and respective public institutions.

The main objectives of the agricultural sector policy in Uganda are to increase agricultural productivity so as to ensure food security and self sufficiency in raw materials for agro processing industries. It is also expected to generate a surplus for exports, increase incomes and reduce poverty through increased sales of agricultural surplus and to diversify the country's exports through the promotion of NTAE crops (NEMA, 1996).

Decentralisation

The PMA has been set within the context of decentralisation, which involves the transfer of political, financial and planning authority from the Central government to Local government councils.

Non Traditional Agricultural Exports

Establishment of the Export Policy Analysis and Development Unit (EPADU), the Export Refinance and Export Credit Guarantee Scheme to provide financial assistance to exporters through commercial banks by the Bank of Uganda and the USAID funded Export Diversification Program through IDEA project has boosted the growth of NTAEs.

Food Crops

The Plan for the Modernisation of Agriculture (PMA) plans to achieve rapid uptake of technologies in food production and progress on lowering costs. The first priority is to lower per unit costs of food in production and the second is to lower costs in the trading and processing chain.

During the past ten years agriculture in Uganda has grown at a rate of 4-4.5% per annum in real terms. Government's goal is to speed it up to about 6% pa over the medium term and to achieve this on a sustainable basis. The government's goal is to change how agricultural growth is achieved. Previously growth stemmed from increasing cultivated area and labour helped by substantial improvements in incentives to farmers as a result of freeing markets and stabilising the macroeconomy. With very limited application of modern inputs this growth was achieved with scarcely any improvements in average yields.

Modernisation of agriculture will be based on the adoption of appropriate and improved land and water management practices adapted to the various agro ecological zones. There must be a substantial increase in the use of yield enhancing inputs including acceptable levels of appropriate fertilisers. However mineral fertilisers should be promoted as a complement to appropriate land and crop husbandry practices such as water and soil conservation, organic fertiliser, proper tillage, and crop rotation (GOU, 1998a).

Uganda has near self sufficiency in production. The food crop subsector is the main engine of rapid growth, but accelerating the growth rate beyond 3-4% will necessitate emphasis on the industrial exploitation of agricultural products and export markets. This coincides with the imperative need to promote agro-processing industries and increase exports through non traditional sources.

Coffee

Government policy envisages the improvement of productivity through the replacement of old coffee with high yielding clonal varieties; improvement in agronomic practices to increase productivity of existing Robusta; expansion of acreage under Arabica; and the improvement of coffee quality at farmer level to generate a higher unit value (GOU, 1998).

Wetlands

Since 1994 there have been significant policy developments in wetland management. The most significant are contained in the National Environment Statute and the National Wetlands Policy. Issues concerning Uganda's wetlands are a) draining of wetlands, b) over harvesting of wetlands products and c) increasing levels of pollutants in some wetland ecosystems (NEMA, 1996).

Livestock

The government has implemented the Livestock Services Project (LSP) to improve provision of veterinary and animal health services to small livestock farmers in the country. Cattle numbers have increased at an annual growth rate of 2.8% from 4.5 million in 1989/90 to 5.23 million in 1995/96. Daily milk collection and processing has increased from 50,000 litres in 1990 to 1.2 million litres in 1995. There have also been significant increases in the population of other ruminants and poultry (NEMA, 1996).

Research and Extension

The government is to take steps to privatise selected parts of the agricultural research and extension efforts namely in tea, sugar, tobacco and cotton. The activities of MAAIF will be limited to planning and policy formulation, setting regulations, design of extension methods, setting extension standards, training, monitoring and evaluation of progress on the modernisation of the sector. Public activities in terms of investment of public funds will be agricultural research and technology dissemination through NARO and the coordination of agricultural extension whose implementation will be the responsibility of district governments through the zonal agricultural research and outreach centres (ZAROCs) (GOU, 1998a).

Production, processing and trading parastatals will be privatised. National agricultural extension effort will be implemented by Local governments. Primary focus will be on productivity and intensification to boost output. There will be much closer research extension farmer linkages through ZAROCs and adaptive research and demonstration in farmers fields will be a primary method of developing, testing and spreading technical knowledge. In addition focus will be placed on improved farm management to raise incomes, sustainability of resource management, gender, AIDs and other farm family issues to improve farm family welfare and participation by extension staff in programmes of rural mobilisation and empowerment (GOU, 1998a).

4.3 Policy Performance and Impact

There are several major policy reforms in Uganda that have had a direct impact on the operations of MAAIF. These are:

a) The economic liberalisation and privatisation programme
b) The civil service reform and restructuring programme
c) Decentralisation
d) Plan for modernisation of agriculture
e) Land Reform

The ERP was intended to restore price stability and control inflation; reform agricultural pricing policies and liberalise marketing to restore incentives; rehabilitate the infrastructure; improve public sector resource mobilisation; and increase efficiency in the public sector while encouraging growth of the private sector. As a result, producer prices have increased for most crops, and marketing efficiency has improved.

Market liberalisation has had a profoundly positive impact on producer prices for traditional cash crops. Prices paid to the farmer have increased substantially and the abolition of the monopoly marketing boards has encouraged the entrance of many buyers into the market, hence assuring farmers a favourable price for their produce. In addition, farmers are paid immediately and are not issued with promissory notes as was the situation in the past. As a result agricultural markets are free, and prices are determined by demand and supply. This has also affected foreign trade, and agricultural products that were previously grown as food crops are now forming a central tenet of non-traditional agricultural exports, namely maize and beans, commercial sales of which have increased in response to regional demand.

The market liberalisation policy has been accompanied by the withdrawal of the government from the supply of agricultural inputs or their subsidisation. Input provision has been privatised, consequently prices of inputs are now unaffordable by a large section of the population, hence the low levels of commercial fertiliser use recorded.

Civil service reform has been spear headed by massive retrenchment of staff in most government institutions including MAAIF as a result of which, agricultural programmes such as extension services have been affected. Extension services are now the responsibility of individual districts under the decentralisation programme. It is however evident that most districts have extension services that are under funded particularly in terms of logistics, hence extension staff are rarely able to meet the needs of the communities they serve.

GOU (1998a) indicates that decentralisation is intended to take decision making closer to those concerned. Government functions have been allocated between the centre and local administrations. Responsibilities for finance, personnel and planning are gradually being decentralised. It is now the responsibility of the districts to allocate their budgets according to their own priorities. The government does not specify how much districts should spend on specific sectors. This may have a detrimental effect on the agriculture modernisation plan if districts do not view it as a priority in terms of expenditure. A major objective of the agriculture modernisation plan is to increase productivity on small-scale farms and to create a conducive environment for the evolution of large-scale farms. While the central government will be responsible for formulating policy, all programmes will be implemented at district level. It will therefore be necessary to sensitise the district administration on the importance of making agriculture modernisation an expenditure priority.

The Land Act 1996 entrenched the rights of Ugandans over land, and it is hoped that this will encourage more optimal utilisation of land for developmental purposes. Implementation of the Act has however been stalled by the excessively large monetary requirements involved, and contradictions in the Act, which require streamlining. As a result, the Act is now under review.

5. METHODS AND CONCLUSIONS

All data was obtained through desk research using publications produced by various government organisations, namely the National Environment Management Authority (NEMA) and the Ministry of Agriculture Animal Industry and Fisheries (MAAIF).

The government of Uganda is in the process of finalising the Plan for Modernisation of Agriculture which is intended to transform agriculture and raise rural incomes through sustainable and environmentally friendly agricultural practices. These proposed interventions, especially with public funds, are intended for subsistence farmers, and these form the majority of farms in all the study sites in Mukono and Mbarara. If successful, the PMA will lead to improvements in the livelihoods of subsistence farmers and also sustainable use and management of natural resources.

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