Makerere University

GRASSLANDS:
A Resource for Humanity

Inaugural Lecture

BY

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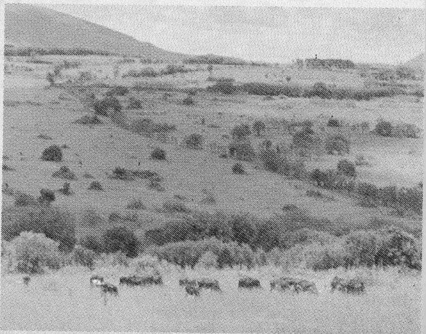

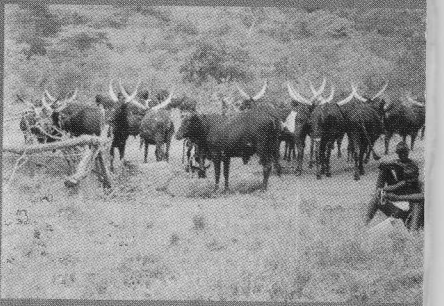

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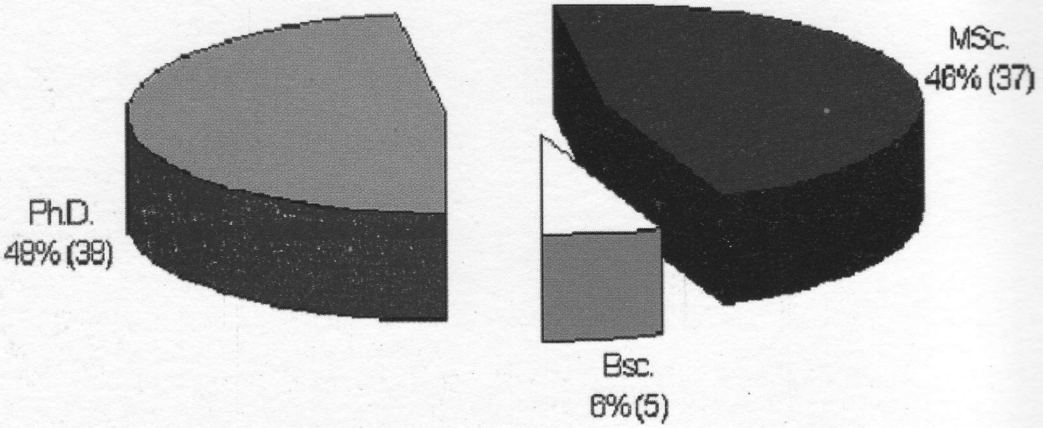

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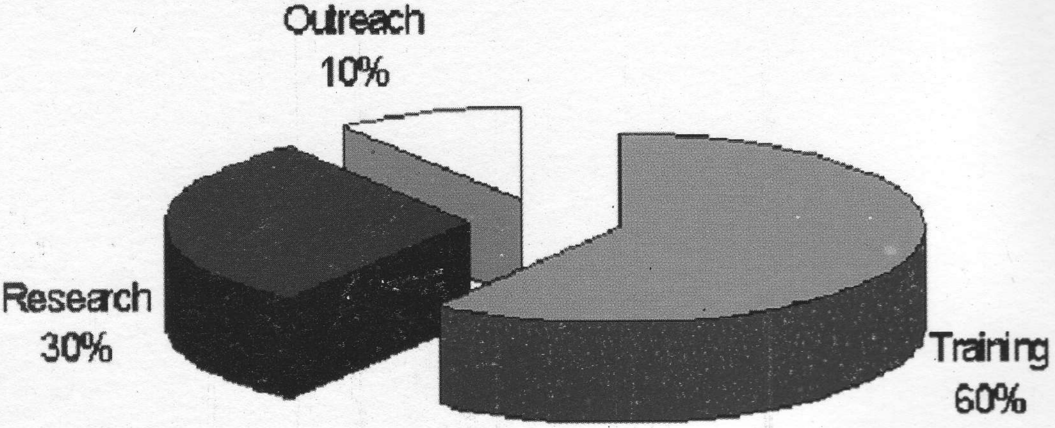

GRASSLANDS: A RESOURCE FOR HUMANITY

Inaugural Lecture

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ABSTRACT

This paper is a compilation of an inaugural lecture which is a Makerere University requirement following promotion to a full Professor in ones area of specialisation. I was promoted to full Professor in December 1998 having risen through all the ranks and files since 1985. My research has focused on grassland and range sciences since 1976 and I have a record of more than 100 scientific publications, the majority falling in these areas. I have attended several conferences, symposia and workshops the World over and accumulated massive knowledge and information about the vital role of grasslands in supporting the wellbeing/ livelihoods of humanity. I developed the interest in grasslands during my child hood when I used to graze our livestock and was always amazed about the way cows and goats selected green grasses and were able to produce milk, which is white. There are now several institutions, grassland societies, universities all over the World engaged in grassland science because of its importance to humanity. This paper describes18 vital roles of grasslands in supporting the livelihoods of humanity which are provision of food, household incomes, medicines, recreation, shelter, natural assets, biodiversity, conservation of soil and water, linking humanity to the sun and eventually to God, production of oxygen, removal of Carbon dioxide from the environment thus reducing global warming, stabilises soil structure for growth of crops/grasses, etc. The most important role is that the grasses act as biological factories that incorporate all nutrients from the soil and with gases from the air to manufacture food for humans and feed for animals. Nearly all the 6 billion of people on this planet depend on cereals maize (*Zea mays*), wheat (*Triticum aesitivum*), rice (*Oryzae sativa*), sorghum (*Sorghum bicolar*), sugar cane (*Saccharum offinarum*), teff (*Eragrostis tef*) which are grasses and also eat grass **indirectly** through eating animal products produced by the grazing animals. The paper also discusses several approaches to sustainably utilise grasslands for animal and crop production. There is a lot that has not been researched on grasslands especially, in East Africa, because people engaged in grassland science are few due to the fact that the field does not attract young scientists. We have taken grasslands for granted because what we consume is indirect so I hope from today's lecture you will reconsider your thinking. Remember that **our flesh is grass** and without grassland cover our soils would be no more and hence humanity! We must consider these grasslands as vital assets/resources for humanity that require scientific management and good grassland policies.

Key words: Animal, biological factories, grassland

INTRODUCTION

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I developed the interest in grasslands during my childhood when I used to graze our livestock and was always amazed about the way cows and goats selected green grasses and were able to produce milk, which is white. There are now several institutions, grassland societies, universities all over the World engaged in grassland science because of its importance to humanity. This lecture is therefore intended to discuss some of the vital roles grasslands have played as a resource for humanity and approaches that grassland scientists have used to sustain this resource.

DEFINITIONS

Grassland

"Grassland" refers to natural or planted vegetation in which the dominant species are grasses, with a few or without woody plants and are for purposes of grazing animals among other uses (Fig. 1). Grassland is one of a number of several phases of vegetational succession. The grassland structure is dynamic rather than static. It is constantly changing as a result of changing climate, natural plant migration and evolution, and natural fires and influence of human activities.

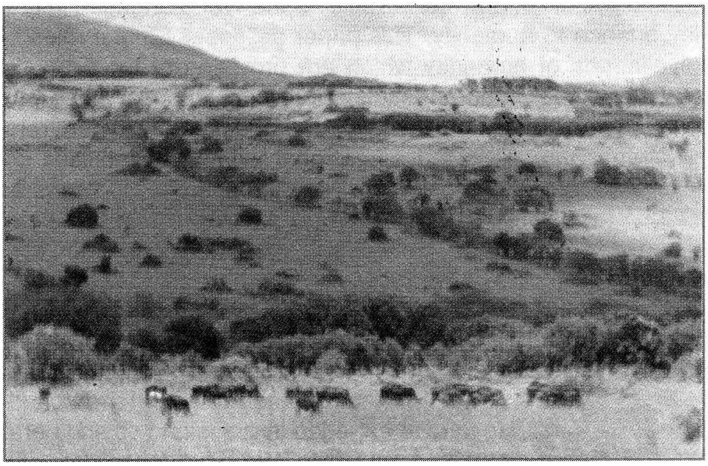


Figure 1: Grasslands with grazing cattle

Grass

A monocotyledonous plant with narrow and slender leaves which belongs to the family of grammineae. The grasses are the major source of energy food (maize, millet(*Eulensine indica*), rice, sorghum, wheat, barley (Hordeum vulgare), oats (*Avena sativa*), teff) for humans as well as feed for livestock and wild life.

Pasture

An area dominated by grasses and managed for grazing animals. The pasture may be natural or planted.

Hay

This is dry grass preserved for feeding to livestock during pasture shortages. The grass may be cut during the time of plenty and dried in the sun for use later.

Humanity

In simple terms it refers to human race or people (over six billion) who inhabit the Earth and derive their livelihoods from it. These people depend on the natural resources found on this planet and in this lecture; the focus will be on grasslands, which are a vital resource for humanity.

ORIGIN OF GRASSLANDS AND ECOLOGICAL SUCCESS OF GRASES

The origin of grasslands can be traced from several documentation including biblical revelations (Box 1). In the Miocene and Pliocene Epochs, which spanned a period of about 25 million years, mountains rose in western North America and created a continental climate favourable to grasslands. Ancient forests on this planet declined and grasslands became widespread. Following the Pleistocene Ice Ages, grasslands expanded in range as hotter and drier climates prevailed worldwide(World Resource Institute 1989).

Grassland is one of the major types of biomes of the world, and others are the aquatic, deserts, forests and the tundra. Biomes are defined as "the world's major communities, classified according to the predominant vegetation and characterized by adaptations of organisms to that particular environment" (Campbell, 1996). Grassland biomes have changed and moved many times during the history of life on Earth. More recently, increasing human activity has rapidly altered, destroyed or polluted many ecological grassland habitats throughout the world. Therefore, it is important to preserve all these grassland types as each type houses many unique forms of life.

BOX 1:

Biblical revelations with regard to origin, preservation and importance of grasslands

The Holy Bible recognises the creation, preservation and the value of grasses as depicted by the following verses.

Genesis 1 – 12:	“And the earth brought forth GRASS whose seed was in itself, after its kind: and God saw that it was good”.
Genesis 47 – 4:	“They said moreover unto Pharaoh, for to sojourn in the land are we come; for thy servants have no PASTURE for their flocks; for the famine is sore in the land of Canaan . . .”
Deuteronomy 11 – 15:	“And I will seed GRASS in thy fields for the cattle, that thou mayest eat and be full”.
1 Kings 1 – 23:	“Ten fat oxen and twenty oxen out of the PASTURE, and a hundred sheep, beside harts, and roebucks, and fallow deer, and fatted fowl . . .”
1 Kings 18 – 5:	“And Ahab said to Obadiah. Go into the land, unto all fountains of water, and unto brooks; per adventure we may find GRASS to save the horses and the mules alive, that we lose not all the beasts”.
Psalms 65 – 13:	“The PASTURES are clothed with flocks; the valleys also are covered over with corn; they shout for joy, they also sing”.
Psalms 104 – 14:	“He causes the GRASS to grow for the cattle, and herb for the service of man; that he may bring forth food out of the earth”.
Proverbs 19 – 12:	“The king’s wrath is as the roaring of a lion; but his favour is as dew upon the GRASS”.
Isaiah 15 – 6:	“For the waters of Nimrim shall be desolate; for the HAY is withered away, the GRASS faileth, there is no green thing”.
Isaiah 40 – 8:	“The GRASS withers, the flower fades; but the word of the Lord shall stand forever”
Joel 1 – 18:	“How do the beasts groan, the herds of cattle are perplexed, because they have no PASTURE; yea the flocks of sheep are made desolate”.
Matthew 14 – 19:	“And he commanded the multitude to sit down on the GRASS, and he took the five loaves
Revelation 9 – 4:	“And it was commanded that they should not hurt the GRASS of the earth, neither any green thing . . . .”

All these verses emphasise the importance of grass in supporting the survival of humankind. About 3000 years ago the Hebrew prophet Isaiah wrote, “ALL FLESH IS GRASS” This idea fascinated philosophers, poets and theologians at that time. In this technological era, we understand that the meat we eat is a by product of grasslands and that the wheat, maize, rice, sorghum, millets and other cereal grains are primary staple foods for mankind since long before recorded history-are all grasses. Other grasses include sugar cane, bamboo and rye grass all eaten by humans".

Ecological success of grasses

Grass species are ecologically adapted to a wide range of environmental conditions due to several reasons outlined below;

- They produce very many viable seeds
- Seeds of grasses are light, thus can be easily dispersed (especially by wind) and others have hooks which attach them to animals and humans.
- Grasses are highly adapted to defoliation and regenerate quickly
- They demand less nutrients thus they can survive on poor/infertile soils, even rocks.
- They have short life cycles. They germinate, flower and set seed in one season.
- Some have underground stems, rhizomes and extensive root systems that are able to sprout after the vegetative part has been destroyed.
- They have high silica content to create resistance to grazing
- Their extensive rooting system enables them to reach nutrients and moisture in the deeper soil horizon (Fig. 2).

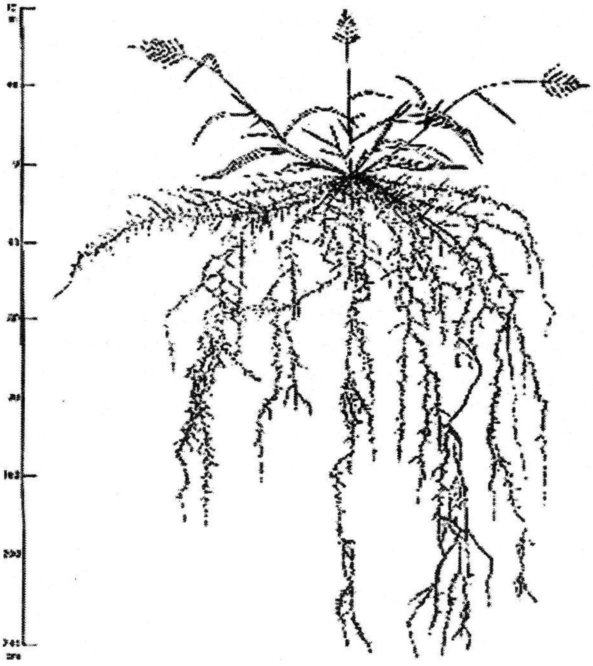


Figure 2: Root system of grasses (Panicum maximum)

2.2 Distribution of world grasslands

Nearly two-thirds of the world's surface area is covered by grass biome (Fig. 3). There are two main grassland biomes, namely the tropical grasslands (savannas), and temperate grasslands.

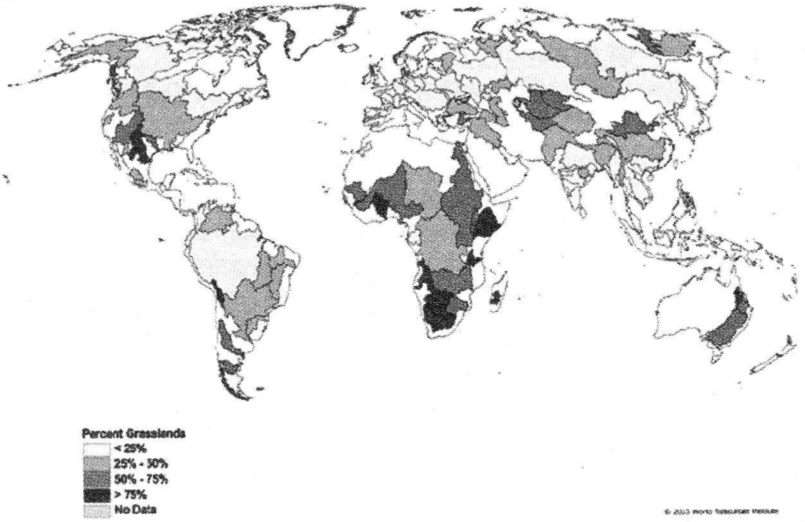


Figure 3: Map showing world grassland distribution

Savannas

Savannas cover almost two-thirds of the total land area of Africa (World Resource Institute, 1989) and large areas of Australia, South America, and India.Savannas are found in warm or hot climates where the annual rainfall is about 500 to 1270 mm per year. Some savannas receive as little as 150 mm or as much as 2500 mm of rain a year.Different savannas support different grasses due to disparities in rainfall and soil conditions. Because the savannah supports such a large number of species competing for living space, usually only one or a few kinds of grass are more successful than the others in a particular area. For example, throughout the East African savannas, star grasses are dominant; the lemon grasses are common in many parts of western Uganda savannas (Sabiiti, 2000).

Seasonal fires play a vital role in the savannas biodiversity. Pastoralists and poachers mainly set these fires (Sabiiti and Wein, 1987;1989). The intention by pastoralists is to clear away dry unpalatable grasses so that fresh ones can grow and provide feed to livestock; while the poachers want to clear away the hide outs of their prey. Although the dry stems and leaves of grasses are consumed by fire, the grasses' deep roots remain unharmed. These roots, with all their starch reserves, are able to regenerate when the soil is moistened by forth coming rain.

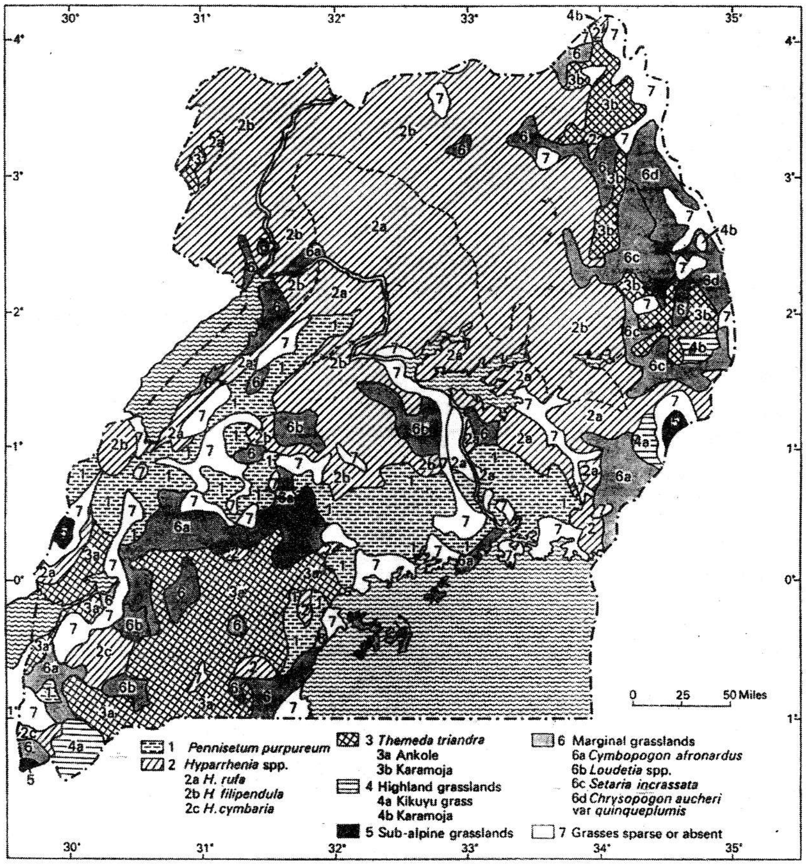
Temperate grassland

Temperate grasslands are characterized as having grasses as the dominant vegetation, and they lack trees and large shrubs. Temperatures vary more from summer to winter, and they receive less rainfall than the savannas. They experience hot summers and cold winters. The major manifestations are the veldts of South Africa, the pampas of Argentina and Uruguay, the steppes of the former Soviet Union, the puszta of Hungary, and the plains and prairies of central North America.

As in the savannas, seasonal drought and occasional fires are very important to biodiversity. The seasonal drought, occasional fires, and grazing by large mammals all prevent woody shrubs and trees from invading and becoming established. Precipitation usually occurs in the late spring and early summer. The annual average is about 500 to 900 mm. The annual temperature range is very large. Summer temperatures can be as high as 38°C, while winter temperatures can be as low as -40°C.

Grass Distribution in Uganda

Uganda appears to be a home of important genera of grasses as in (Fig. 4 and Table 1) all of which are important for grazing by livestock and wildlife. Also in these grasslands there is a mixture of legumes that improve the quantity and quality of the pastures.
Source: Horrell and Tiley 1970



Source: Clayton 1983

Figure 4: Map showing natural grassland distribution

Table 1. Major grass genera and species found in Uganda

Genera	No. of Species
Andropogon	10
Aristida	7
Axonopus	1
Bothriochloa	4
Brachiaria	21
Cenchrus	1
Chloris	7
Cynodon	3
Dichanthium	2
Digitaria	18
Echinochloa	7
Eleusine	3
Enteropogon	2
Eragrotis	38
Eriochloa	3
Heteropogon	1
Hyparrhenia	24
Melinis	4
Paspalum	6
Panicum	29
Pennisetum	17
Rottboellia	1
Rhynchelytrum	2
Setaria	21
Sorghum	8
Urochloa	2
Themeda	1

Within the dominant genera there are important grasses that are found here as shown in Table 2. There is limited research data on the majority of these natural grasses.

Table 2. Important forage grasses in Uganda

ANDROPOGONEAE

Andropogon gayanus
Dichanthium annulatum
Hemarthria altissima
Hyparrhenia rufa
Lasiurus hirsutus
Sorghum almum
Sorghum bicolor
Sorghum halepense
Sorghumn drummondii (S. Sudanese)
Tripsacum andersonii (T. laxum)
Zea mays
Zea mexicana

PANICEAE

Axonopus compressus
Brachiaria arrecta
Brachiaria brizantha
Brachiaria decumbense
Brachiaria mutica
Brachiaria ruziziensis
Cenchrus ciliaris
Cenchrus setigerus
Digitaria decumbens
Digitaria pentzii
Echinochloa polystachya
Melinis minutiflora
Digitaria milanjiana
Panicum antidotale
Panicum coloratum
Panicum maximum
Paspalum dilatatum
Paspalum plicatulum
Pennisetum clandestinum
Pennisetum pedicellatum
Pennisetum polystachion
Pennisetum purpureum
Urochloa musambicensis
Setaria sphacelata

CHLORIDOIDEAE

Chloris gayana
Cynodon aethiopicus
Cynodon dactylon
Cynodon nlemfuensis
Eragrostis curvula
Eragrostis tef

Source: Clayton 1983.

TYPES OF NATURAL GRASSLANDS IN UGANDA

Uganda's grasslands are found largely in the corridor extending from Moroto and Kotido districts in the north-east through Lake Kyoga's flat lands to Masaka, Rakai and Mbarara districts in the south-west, with smaller parts scattered throughout the country. This area is often referred to as the "cattle corridor", for most cattle are found in this zone. Keeping cattle is the main source of livelihood of the people staying in this area(Mugasi *et al* 2000, Sabiiti and Teka 2004).There are six major types of natural grasslands in Uganda. They are distinguished basing on the dominant grass species, the grazing importance, the rainfall and soil fertility status.

Pennisetum purpureum grassland

This grassland is mostly found around the shores of Lake Victoria, extending to about 25 miles from the lake. Elephant grass (*Pennisetum purpureum*) is the dominant grass species (Horrell and Tiley 1970). This area receives over 1000 mm of rainfall a year, and is well distributed over the year with no marked dry season. The soils are fertile and the land is intensively cultivated with both annual and perennial crops. The area is regularly burnt and cattle are grazed on both cultivated and uncultivated land. Stocking rate is one animal per hectare

Hyparrhenia grassland

This occupies most of the savanna areas in northern and eastern Uganda, with exception of Karamoja. Dominant grasses are *H. rufa* and *H. filipendula*. The rainfall range is between 800 and 1000 mm a year. There is a long dry season that poses problems of feed availability. Burning is a common practice. Soil fertility is medium and land is intensively cultivated with annual crops, like maize (*Zea mays*) and beans(*Phaseolus vulgaris*). Cattle are grazed on uncultivated land and swamp margins in the dry season. Estimated carrying capacity is up to 2 ha per animal in the rainy season and 2.5-20 ha per animal in the dry season.

Themeda triandra grassland

Themeda triandra is dominant and found in the dry savanna areas of Ankole (Mbarara district) and Karamoja. Rainfall is about 800 mm/year with a long dry season and soils are of medium fertility. Burning is frequent, grazing is extensive and there is little cropping. Carrying capacities vary from 3-6 ha per animal during the wet season, decreasing to 4-10 ha per animal during dry season. Overgrazing is common and productivity is low.

Highland grasslands

These are found in the highlands of Kigezi and Bugisu.. Dominant grasses are Kikuyu grass (*Pennisetum clandestinum*), which prefers cool climate and fertile soils and giant setaria (*Setaria sphacelata*). In these areas cultivation is intensive.There is limited grazing due to hilly terrain. In Kigezi, farmers have reclaimed swamps and planted Kikuyu grass. Carrying capacity is 0.4-0.8 ha per animal.

Sub-alpine grasslands

These occur in areas above 3000 m on high mountains of Rwenzori and Elgon. The species found there are of temperate origin, for example, Trifolium clover. The area is subject to burning but is not grazed.

Marginal grasslands

Grass species found here are coarse and unpalatable, and their distribution is related to localized soil and biotic effects than to rainfall and altitude. Common species include spear grass (*Imperata cylindrica*) and citronella grass (*Cymbopogon afronardus*).

THE ROLE OF GRASSLANDS

Natural grasslands cover 67% of Africa's total land surface area (World Resource Institute, 1989) and about 21% of Uganda's total land surface area (Govt. of Uganda 1998, Table 3). These grasslands are basically for grazing but otherwise you see grasses everywhere. The grasslands constitute important natural systems that help provide services that support life. The services and products derived from grasslands are diverse and they benefit people at the local, national and global levels.

Biological conversion of sunlight energy

The green grasses indirectly link humanity with the sun and it is not surprising that our forefathers worshiped the sun, especially at the time of planting their crops. These grasses are in fact a biological factory, through photosynthetic pathways, that produce carbohydrates (food, fibre, and feed) for humans and animals as in equation 1 and Figure 5. Oxygen released as a by-product supports respiration in all living things including humans.

Table 3. Current and potential grazing areas of Uganda

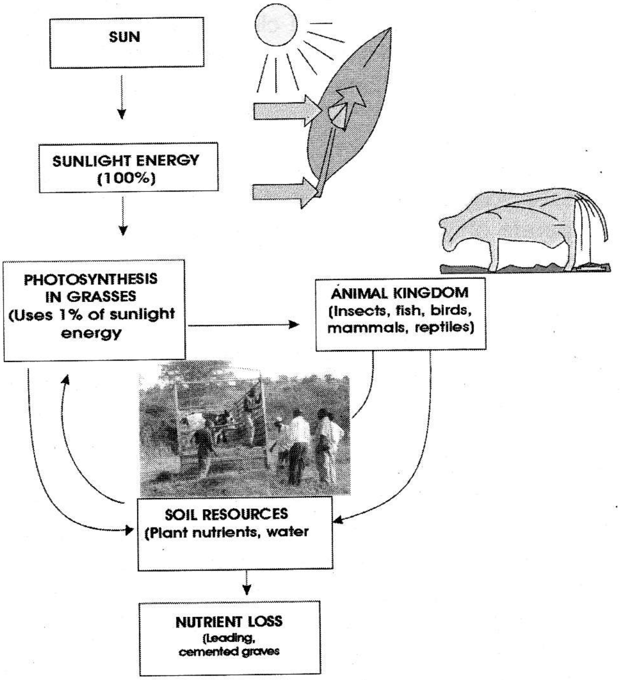
Land Classification	Land area (KM^2)	% Land area
Grassland	51 118.6.	21.16
Farmland	83 931.0	34.75
Woodland	40 277.7	16.67
Bush	14 198.6	5.88
Total potential grazing land	189 525.9	78.46
TOTAL LAND AREA	241 548.0	100

Source: Govt. of Uganda (1998).

Equation 1. Photosynthetic pathway leading to production of carbohydrates

$$6CO_2 + 6H_2O \xrightarrow[\text{Sunlight energy absorbed by chlorophyll (Grass)}]{} \underset{\text{Carbohydrate}}{C_6H_{12}O_6 + 6O_2}$$

Figure 5: Diagramatic representation of linkage between the sun, grasses and humanity



Thus, grasslands are a source of food for humans and feed for their animals - a means of maintaining essential life support functions (Fig. 5). Pastoralists rely on the use of grasslands as the sole source of forage for livestock production, which in turn provide them with food (milk, meat and blood). Other livestock farmers graze their animals on planted grasslands (ley pastures) and obtain meat, milk, hides and skins from this resource. Table 4 summarises the value Uganda derived from grasslands in the years 19992-2001.

Table 4. Uganda statistics for ruminant numbers, meat and milk production for the period 1992-2001

Item	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Cattle nos. (millions)	5.2	5.4	5.1	5.2	5.3	5.5	5.7	5.8	6.0	5.9
Sheep nos. (millions)	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.1
Goat nos. (millions)	5.1	5.2	5.4	5.6	5.7	5.8	6.0	6.2	6.2	6.2
Beef & veal prod (000 mt)	86.0	91.5	84.3	86.4	87.5	88.5	93.0	96.0	96.6	96.6
Mutton prod (000 mt)	4.1	4.2	4.4	4.5	4.6	4.8	5.0	5.1	5.1	5.4
Goat meat prod (000 mt)	19.4	20.0	20.7	21.3	21.6	22.3	23.0	23.8	23.8	23.8
Milk prod. (000 mt)	455.7	470.1	447.0	457.8	463.8	468.6	493.5	509.3	511.0	511.0

Source: FAO (2002)

Source of materials for putting up shelter

The pastoral communities rely on grasslands for materials for shelter construction, especially grass for thatching. In Northern Uganda, the majority of their houses are grass thatched. The culture of using grass for thatching roofs isadvantageous because the grasses reduce heat absorption and so these houses are cool during the long hot seasons experienced in Northern Uganda. Grasses are further used for beddings and decorating floors of houses.

Broom and Seed Production

A lot of grass species produce plenty of seed and panicles, which have economic value as can bee seen from Table 5.

Table 5. Returns (Ug. Shs) from the sale of seed and brooms by contract broom makers around Gayaza, Uganda

Name of broom maker	Number of brooms	Amount of seed (kg)	Returns from seed (shs)	Returns from brooms(shs)
Amunda J.	80	3.1	7,285	20,000
Zanvayo M.	50	2.4	1,920	12,500
Drazia T.	140	15.8	30,44	35,000
Kana J.	100	5.4	9,666	25,000
Nema J	50	7.4	9,398	25,000
Kana L.	300	8.4	25,840	75,000
Total	**720**	**62.5**	**84,603**	**192,500**

Source: Lusembo *et al.* (1999).

Hunting

The early man used these grasslands as hunting grounds for wild game and also for gathering edible foods. Even up today, some sections of Ugandans still hunt from these grasslands.

Soil and Water Conservation

Grasses provide a cover to the soil, hence protecting it from the sun's heat and erosion by water and wind. Grasses like *Cynodon dactylon* (star grass) and *Pennisetum clandestinum* can be useful in controlling soil erosion. Roots of grasses improve the soil structure by binding soil particles together. As they decompose, roots and leaves increase the nutrients and organic matter content of the soils

Habitats for Wild Game

Grasslands play an important role in economic development by serving as habitats for wild life (Fig. 6). In Uganda, for example, the major national parks (Lake Mburo, Kidepo, Kabalega and Queen Elizabeth) are located in grasslands. The country earns foreign currency from tourists who visit these parks and wild meat is eaten by many Ugandans.

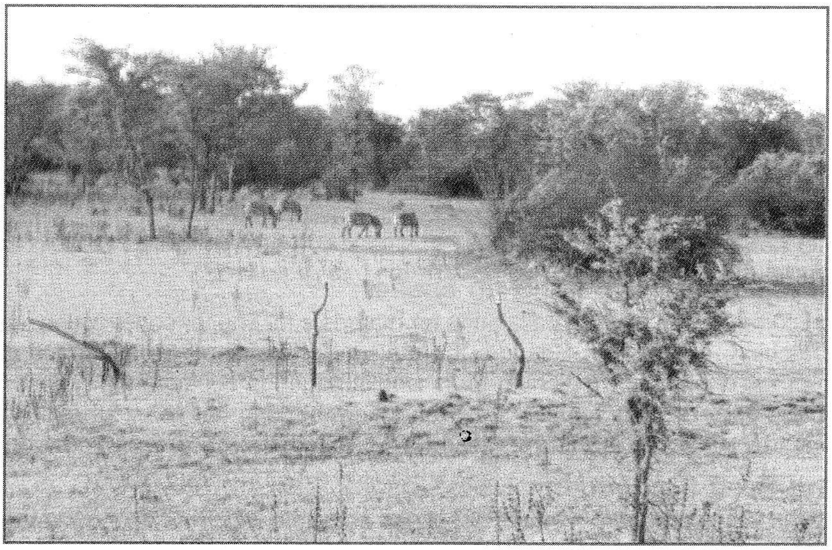


Figure 6: Wild life habitats for Zebra in Lake Mburo National Park

Bio-diversity protection

Tables 1 and 2 above show the large biodiversity of grasses in Uganda some of which are used for grazing and others ensure stability of the ecosystems. The dominant genera are *Setaria, Hyparrhenia, Panicum, Eragrotis and Digitaria.* In these grasslands there are medicinal plants (Katunguka-Rwakishaya *et al.*, 2004), forage legumes and browse plants (Sabiiti *et al.*, 2004) all of which contribute to the survival of livestock and people living in the grassland ecosystems.

Provision of fuel wood

Grassland communities contain woody species such as Acacias and Combretum, which provide fuel wood and charcoal (Fig. 5) used for cooking, lighting and warming up homes. Also the tobacco farmers use the grass for flue-curing. The charcoal sold in sacks along roads costs up to ten thousand shillings (approximately US $6) a bag, and this is income for the households.

Figure 5: Sacks of Charcoal each at Ug. Shs. 10000/= (approximately = US$ 6)

Recreation

Football fields, golf courses, picnic sites, resort sites are maintaned. with a biomass cover of grasses such as *Cynodon* and *Paspalum* species as ground cover where people play games, hold parties and relax (Fig.6).

Figure 6: Recreational grounds with grasses

Scientific fora

There are so many International fora where grassland scientists meet to discuss the importance of grasslands and so far there have been 19 International grassland congresses held and the 20th Congress will be held next year 2005 in Dublin, Ireland. Over three hundred scientific papers will be presented including mine.

Employment

I was recruited as Pasture Agronomist in Makerere University and I earn my living through teaching and conducting research in grassland science. I have supervised about 24 graduate students and most of these are employed. There are thousands of grassland and livestock scientists all over the World that earn their living from this resource. The University of Free State in South Africa has a Department of Grassland Sciences and also the Country has a whole Institute called Range and Forage Institute just to give an example. Universities in Africa have a Department of Animal Science or Animal Production or Crop Science where grassland science is taught.

At the faculty of Agriculture, Makerere university, Kampala, we have proposed a degree program on Dryland Husbandry and Farming .

Mushrooms

A lot of mushrooms are harvested from grassland habitats. The termites harvest grasses and convert them into products that are used as substrates for mushroom growth.

Inflorescences for mattresses

The inflorescences of some grasses like *Imperata cylindrica* were used for making soft mattresses and young children including myself would harvest them after flowering following burning the grassland and would sell them to people thus raising some income from these grasses. This was my first agribusiness activity as a young man during early sixties.

Production of essential oils and tooth paste

Some of the grasses are being researched on for production of Citronella oil from *Cymbopogon nardus* (Kyamuhangire 2004 Personal Commun) while *Cymbopogon citrus* is used for flavouring tea and *C. afronardus* has been used for cleaning teeth. His Excellency the President of Uganda and Retired General of the Uganda Peoples Defence Forces (UPDF) Y.K.Museveni has been promoting production of toothpaste from *C. afronardus*.

Biological control of pests

Some livestock farmers trap ticks in the pasture paddocks using *Melinus minitflora* grass. These grasses are planted around the paddocks so that any ticks coming from outside are trapped on the grass leaves, which have oils on the surface. This reduces the costs of Acaricides. There is need to carry out research on this grass so that it could be used by many farmers in the Country.

Banana Juice Production

Many crop farmers use grasses like *Imperata cylindrica* with ripe bananas to produce juice (Fig. 7).

Figure 7: Banana juice production using grass

Sale of Grasses for Zero Grazing Systems

Farmers in peri-urban areas are buying fodder grasses at about 2000/= per bundle from people within the city who cut grass and sale it (Fig. 8). This practice is generating income for some of these people.

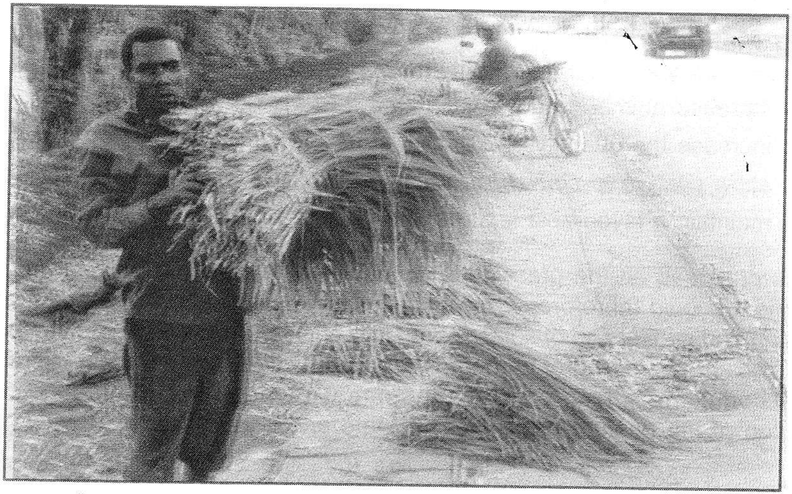


Figure. 8: A man prepares grass within Kampala for sale

Removal of Carbon dioxide from the Environment

Green grasses remove carbon dioxide from the air through photosynthesis thus, reducing on greenhouse warming effects.

Grasses as Mulch

Farmers use a lot of grasses (Elephant grass) for mulching their banana or coffee gardens to reduce moisture loss and suppress weeds thus increasing crop productivity and hence income, The list of roles is long but the above examples show the vital role grasslands play in contributing to the social and economic wellbeing of people.

CURRENT STATUS OF GRASSLANDS IN UGANDA

Although the grasslands continue to serve as a vital resource for the 26 million people of Uganda, there is serious degradation of these grasslands due to overgrazing, bush burning, cultivation, weed invasion and recurrent droughts. Studies by Sabiiti and Wein (1989), Mugasi *et al.* (2000) have reported increased bush encroachment into grasslands and subsequent decline in herbage and animal productivity. This has serious implications on the food security and incomes of the pastoral communities and Uganda at large. According to the State of Environment Report (Government of Uganda, 1998), the annual loss of grasslands is estimated to be 9%. There is limited research in grasslands and livestock science to guide the users of grasslands and this partly explains this degradation of grasslands. The products from grasslands are indirect and so people and policy makers do not pay much attention unlike in cereal crops where production is largely research driven, i.e., agronomic packages, better/improved seed varieties, etc.

MANAGEMENT OF GRASSLANDS FOR SUSTAINABLE PRODUCTION

Objectives of Managing Grassland

We have noted that the major output from grasslands is livestock or animals including insects, it is important to manage the grasslands based on scientific knowledge of the growth and development of grasses and how they respond to grazing and other forms of utilisation. The objective is to balance both grass and livestock production to achieve economic gains without degrading the grasslands.

Grazing Management

The following are the objectives of grazing management

- To increase animal productivity
- To increase the quantity and quality of forage
- To allow pasture to persist for a long time
- To maintain a favourable legume and grass balance

All forage produced on the grasslands should be converted into animal products. Grazing management should therefore, wisely and skillfully manipulate the pasture sward (i.e., the interception and conversion of solar energy into primary production) and the grazing animals (i.e., for efficient harvesting of primary production by livestock). Certain important principles must be considered in grazing management namely, the phenology and chemical composition of the pasture plant, stocking rate and grazing systems,

Phenology

Phenology refers to the growth and development of the pasture plants i.e., from germination to maturity (Fig. 9). Three important stages/phases should be known, namely the leaf initiation phase, the food manufacturing phase and the seed setting phase. Grazing of the pasture should be done during the feed manufacturing phase. That's when the growth of plants will not be affected and the animals will get adequate nutrients. If the pasture plant is annual, it has one cycle but if it is perennial, it will regenerate after defoliation by the animals. Failure to graze in good time means that animals will be grazed on aging leaves. When seed setting phase begins, nutrients are removed from the leaves to the seeds, which are rarely eaten by the animals.Grazing should therefore, be at the correct time when carbohydrate reserves are high. If grazing is done too early, carbohydrate reserves will be still low and if grazing is done late, the herbage will be too old and most of the carbohydrates will have been lost through senescence and leaf fall.

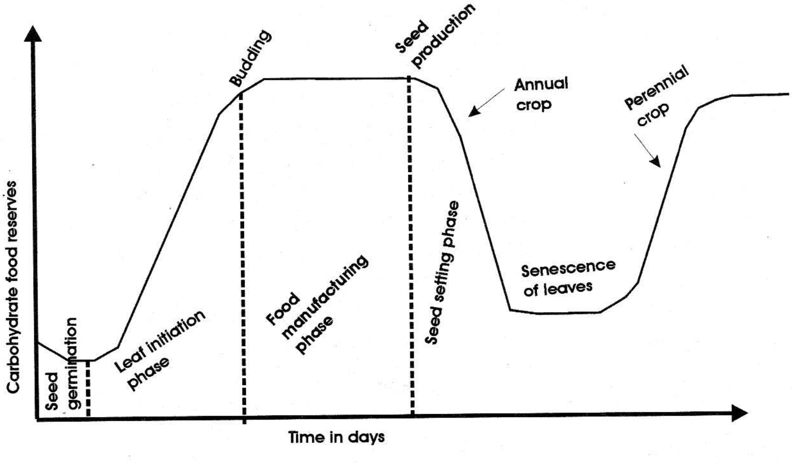


Figure 9: The phonological development of grass plants

Chemical Composition

The grasses absorb nutrients (macro and micro) from the soils and during photosynthesis and these are consumed by the grazing animal that then converts them into animal products, which are in turn eaten by humans.Research by Ndyanabo (1992) has indicated the levels of these nutrients in grasses usually grazed by livestock in Uganda (Table 6). It's clear that the grasses contain adequate nutrients that will result into sustainable animal products if properly managed. Any deficiency can be supplemented artificially, or by incorporating forage legumes which are highly nutritious.

Table 6: Average mineral content of pasture herbage in four areas of Uganda together with recommended nutrient levels for livestock

Element	Composition of species sampled % Content on dry matter basis				Recommended % level for animals
	Western Area[1]	Lakeshore Area[2]	Eastern Area[3]	Northern Area[3]	
	Mean	Mean	Mean	Mean	
Potassium	1.06	2.41	1.68	2.11	0.80
Magnesium	0.15	0.22	0.20	0.17	0.18-0.20
Calcium	0.36	0.39	0.68	0.4	0.39-0.48
Phosphorus	0.21	0.43	0.27	0.26	0.30-0.35
Nitrogen	0.99	2.51	2.59	2.10	2.24
Sulphur	----	0.16	0.19	0.17	0.10-0.20

1. 22 common grasses analysed
2. All grasses collected
3. Grasses and legumes

Source: Adapted from Ndyanabo, (1992).

Stocking Rate

This is a management factor, which determines output of animal products from available pasture, stability and persistence of the pasture components and financial returns to the farmer. Therefore, manipulating the stocking rate is one of the most effective means of improving grassland productivity in terms of live-weight gain (LWG) and milk production. When there is plentiful herbage, stocking rate is increased and with reduced herbage, the stocking rate should be reduced (Figures 10 and 11).

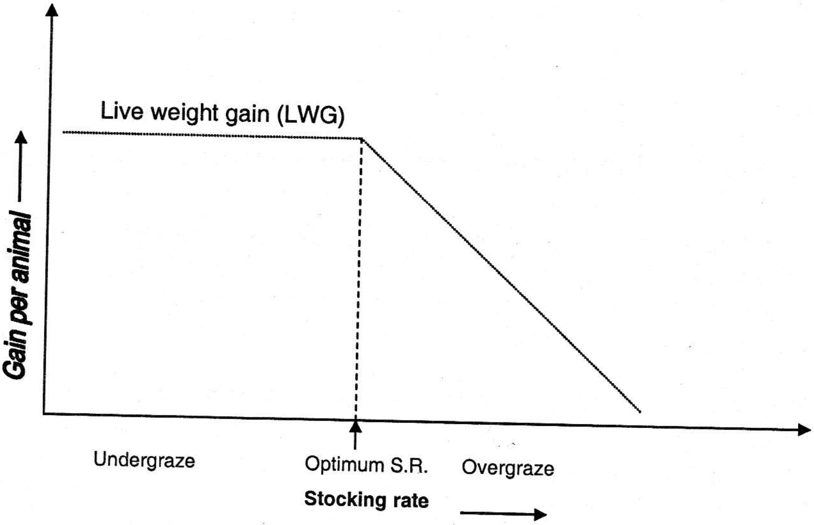


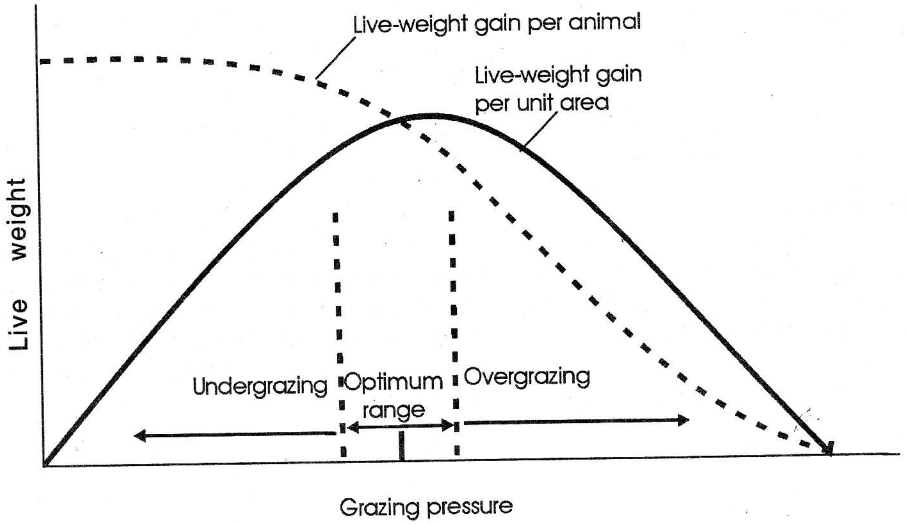
Figure 10: Stocking rate model

Source:Walshe 1975

The live weight gain per animal decreases as the stocking rate increases, but gain per unit area increases up to an optimum level and then decreases. At low stocking rate, LWG per animal is not affected, but at higher stocking rates greater than the optimum, LWG declines with increasing stocking rate due to reduced available herbage (nutrients).

Optimum stocking rate is influenced by the following.

i) Rate of forage re-growth
ii) Ease with which animals can reach the forage
iii) Nutritive value of the pasture
iv) Botanical changes in the pasture with time
v) Seasonal variations in the feed supply
vi) Type of animal product expected.



Source: Matches and Mott (1975)

Figure 11: Relationship of grazing pressure to gain per animal and gain per unit area

Tropical pasture plants mature very fast. Grasses become lignified, which reduces digestibility hence reducing animal production. Incorporation of forage legumes improves digestibility of the grasses. In farming systems where nitrogen fertilisers are not used, forage legumes should be adopted to increase animal production.

Comparison of various stocking rates on different pastures

Tropical pasture grasses mature very fast in the wet season and become lignified, which reduces their digestibility and nutritive value, hence reducing animal production. Incorporation of forage legumes or application of fertilisers will improve quality and quantity of the grasses. In farming systems where nitrogen fertilisers are not used, forage legumes should be adopted to increase animal production (Fig. 12).

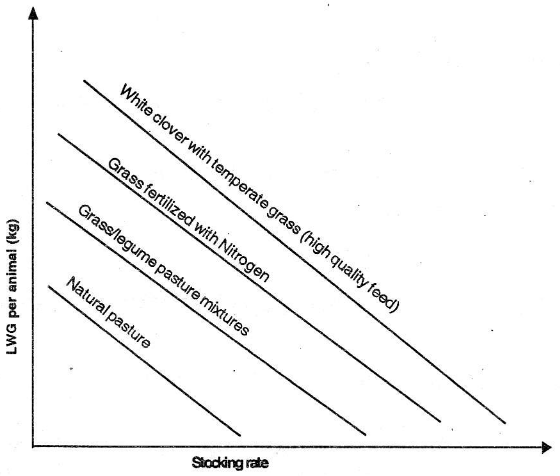


Figure 12: Beef production from different grasslands

Grazing systems

There are four grazing systems, namely, continuous grazing, rotational grazing, deferred grazing and stall/zero grazing.

Continuous grazing

This is an extensive grazing system in which livestock remain on the same pasture area for prolonged periods. Commonly practiced in the tropics and is satisfactory for low yielding pastures. This method allows animals to have free access to any part of the pasture. But it permits selective grazing leading to wastage of herbage and a patchy pasture. Also, it encourages the build up of ticks and internal parasites of cattle.

Stall/zero grazing

Is a method of forage utilization where fresh forages (grasses and legumes) are cut on a daily basis and fed to the animals confined in stalls. It is also commonly called zero grazing, stall-feeding, cut and carry, green chop and soiling. Fodder grasses (e.g, Elephant grass, Guatemala grass, Giant setaria) and legumes (e.g, Lablab, Calliandra, Leucaena, Glilicidia) are specifically grown for cutting and carried to the animals in stalls. Other feed materials used include crop residues (i.e., maize stover, sweet potato vines, banana peels and pseudostems), agro-industiral by products (i.e., cereal brans, seed cakes, brewery waste) and commercial concentrates (e.g., dairy meal). This method is mainly practiced in highly populated areas where there is scarcity of land and the demand for livestock products, particularly milk is high.

Advantages

- Since animals are housed, effects of selective grazing and trampling of forage are non-existent
- Animals are protected from adverse climatic conditions
- Animals conserve energy which is reflected in higher production and
- Manure can be collected and returned to the gardens or used as fuel.
- Animals are protected from pests and diseases that are spread by other animals.

Disadvantages

- This method is capital and labour intensive
- It may lead to soil fertility depletion if manure and animal excreta are not returned to the fodder gardens
- The method is only feasible where the market for milk is readily available.
- The system requires high level of managerial skills
- Animals lack exercise

STRATEGIES FOR IMPROVING GRASSLAND UTILISATION / SUSTAINABILITY OF THE GRASSLAND

- Settling the pastoralists (in ranches) and encouraging them to fence their land – paddocking and rotational grazing.
- Government should allocate (invest) more funds in the rehabilitation of grasslands, e.g., constructing valley dams to supply water to pastoral families and their livestock, clearing weeds shrubs and thickets, controlling the tsetse fly and vaccinating livestock against dangerous diseases.
- Improving natural grasslands through over-sowing with improved forage grasses and legume species (Otim, 1973, Sabiiti *et al.*, 2004). The following are the recommended species for over sowing in the various grasslands of Uganda (Tables 7 and 8).
- Incorporate legumes into natural pastures to increase milk production (Table 9)
- Educating / sensitizing the pastoralists about the stocking strategies that can prevent overstocking, which is the cause of overgrazing. Avoiding overstocking would prevent overgrazing. "Grassland management through administrative measures to enforce carrying capacities can be tried. The following are approaches (strategies) to the matching (balancing) of forage supply and livestock forage requirements as described / discussed by Behnke (1992) Fig. 13 and Bryan & Evans, (1967) Fig. 14.

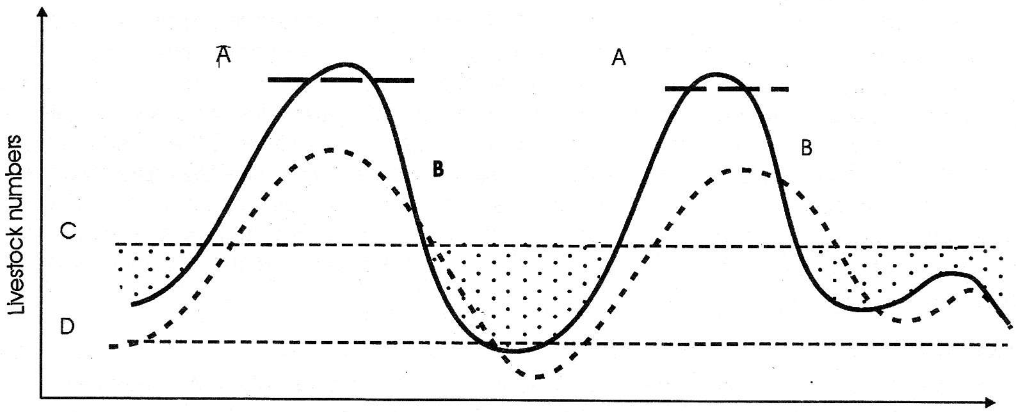


Figure 13: Stocking strategies for coping with irregular seasonal forage supply

KEY: Dotted areas = periods of supplementary feeding;
Solid line = ecological carrying capacity;
Dashed line = livestock numbers under stocking strategies A to D

ii) Tracking strategy

Represents a possible moderate stocking rate policy in which managers attempt to compersate for fluctuations in feed supply by quick and deliberate adjusting of livestock numbers. Animals leave the local grass, primarily through disposal (death) rather that relocation. Development options include:

a) Retention of indigenous stock breeds which can withstand in feed availability
b) Stock mobility
c) Development of livestock marketing systems that can absorb large shifts in levels of throughput
d) Producer credit or insurance schemes, or post-drought restocking programs

Risks of this strategy are associated with the simultaneous collapse of livestock prices, markets and grassland carrying capacity

iii) Agro-pastoral or mixed crop-livestock strategy

Represents another moderate stocking rate policy where livestock numbers are held constant and shortfalls in grassland forage are offset by the purchase or cultivation of forage. Pastoralism and cultivation are closely integrated either through market exchanges or mixed agro-pastoral systems. Development options are:

a) Increase cultivated fodder production and of crop residues and improve crop storage techniques (Table 7).
b) Increase the availability of feed supplements, either manufactured or hay;
c) Develop agro-forestry for the provision of feed resources which are less susceptible to climatic change than natural grazing lands; and Maintain grazing reserves for use in periods of exceptional stress.

The system permits the maintenance of high stock numbers and may therefore have long-tern deleterious effects on the natural grassland. In addition, this may be compounded by the conversion of the best grazing land to cropping.

Table 7.Recommended high quality species for different grasslands of Uganda

Pennisetum purpureum zone	
Grasses	**Legumes**
Guinea grass (*Panicum maximum*)	Green leaf desmodium (*D. intortum*)
Rhodes grass (*Chloris gayana*)	Silver leaf desmodium (*D. uncinatum*)
Congo signal grass (*Brachiaria* spp)	Glycine (*Neonotonia wightii*)
Nandi setaria (*Setaria anceps*)	Stylo (*Stylosanthes guianensis*)
Giant setaria (*Setaria cephacelata*)	Siratro (*Macroptilium atropurpureum*)
Hyparrhenia spp. Zone	
Grasses	**Legumes**
Thatching grass (*Hyparrhenia rufa*)	Siratro
(*H. filipendula*)	Desmodium spp.
Rhodes grass (*Chloris gayana*)	Glycine
Guinea grass	Stylosanthes spp.
Congo signal grass	
Elephant grass	
Buffel grass (*Cenchrus ciliaris*)	
Themeda triandra zone	
Grasses	**Legumes**
Rhodes grass	Stylosanthes spp.
Star grass (*Cynodon dactylon*)	Glycine
Nandi setaria	Centro (*Centrosema pubescens*)
Elephant grass	
Highland areas	
Grasses	**Legumes**
Rhodes grass	Alfalfa/Lucerne (Medicago sativa)
Kikuyu grass (*Pennisetum clandestinum*)	Trifolium clover
Elephant grass	

Table 8: Mean dry matter yield and botanical composition of the natural grass pastures oversown with *Desmodium uncinatum* at Makerere University Farm, Kabanyolo, Uganda (1987 – 1989)

Number of cuts	Pasture component	Grass pasture + legume		Grass pasture without legumes	
		DM (kg/ha)	BC (%)	DM (kg/ha)	BC (%)
1st	Legume	6,350	50.6	-----	-----
	Grases	5,350	42.6	2,462	46.4
	Weeds	846	7.8	2,845	53.6
	Mean total	12,546	100.0	5,307	100.0
2nd	Legume	7,642	52.5	---	---
	Grases	6,544	45.0	3,114	50.5
	Weeds	362	2.5	3,048	49.5
	Mean total	16,385	100.0	13,555	100.0
3rd	Legume	7,150	43.6	1,200**	8.9
	Grases	8,235	50.0	4,680	34.5
	Weeds	1,000	6.4	7,675	56.6
	Mean total	16,385	100.0	13,555	100.0
4th	Legume	9,965	50.6	1,543**	9.3
	Grases	8,974	45.6	6,022	36.4
	Weeds	760	3.8	8,971	54.3
	Mean total	19,699	100.0	16,536	100.0
5th	Legume	9,540	49.1	1,360**	9.4
	Grases	9,242	47.6	4,883	33.8
	Weeds	650	3.3	8,211	56.8
	Mean total	19,432	100.0	14,454	100.0

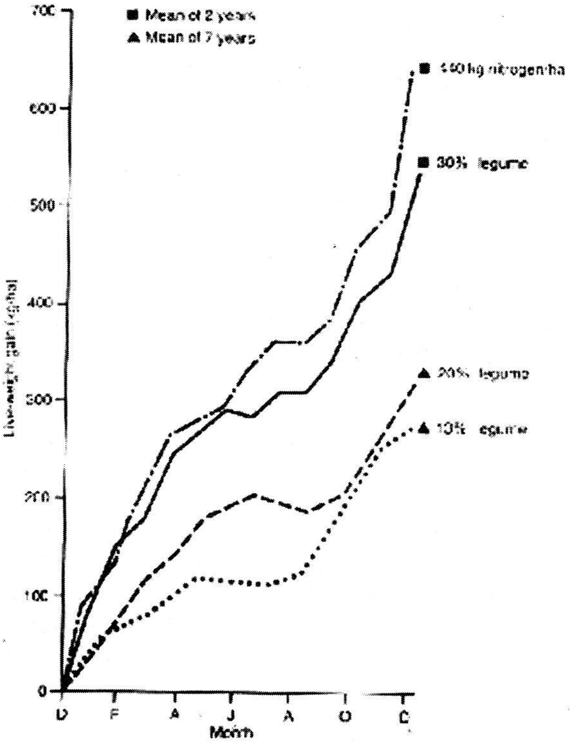
Source: Sabiiti et al. (1989)

** With volunteer legume components; BC = botanical composition

Table 9: Milk production per cow on tropical grass and legume pastures

Species	Mean yield (kg/cow/day)	Breed	Management
Pennisetum clandestinum *Neonotonia wightii*	12.2	Guernsey & Jersey	Continuously grazed for 10 months
Pennisetum clandestinum	9.8	Guernsey & Jersey	Continuously grazed N-fertilised pasture
Pennisetum clandestinum *Neonotonia wightii*	8.2	Grade Jersey	Indoor feeding for 9 weeks
Pennisetum clandestinum	16.5	Friesian	Short-term trial grazing 3-4 weeks regrowths fertilised with N.
Pennisetum clandestinum *Subterranean clover*	7.8*	Guernsey	Full lactation for 2 years – some conservation 3 and 5 weeks. Regrowths for periods of 8 weeks *ad lib* grazing.
Setaria sphacelata & Chloris gayana	7.0	Jersey	
Dolichos purpureus	10.5	Jersey	*Ad lib* grazing
Panicum maximum/ Neonotonia wightii	10.3-14.0	Friesian	Mean yield for 300 day lactation of 15 cows. Some conservation.
Setaria sphacelata/ Desmodium sp.	9.0	Jersey	Full lactation – some concentrates
Phaseolus atropurpureus & Desmodium intortum	7.7	Jersey	Sort-term trial under lenient grazing. Cows in various stages of lactation.
Digitaria decumbens	9.0	Jersey	

Source: Stobbs, 1971.



Source: Bryan and Evans (1976)

Figure 14: Cumulative live-weight changes in grazing pastures with varying percentages of legumes and a pure grass sward fertilised with nitrogen

- Enabling the pastoralist to access loans so that they can invest in structures like fencing, constructing dipping tanks, etc. This would require to be given land titles, which they can use as security. Clarifying and certifying the ownership of grassland, and handing out certificates for the use and ownership of grassland is necessary.

- Improving the well being of the pastoral communities by providing basic services such as education of children, medical, etc. to the pastoral communities. The combined impacts of environmental degradation, (toxic weed invasions, soil loss,) poverty and the absence of basic human services threatens the very survival of the nomadic way of life. The pastoralists may soon be forced - by escalating health costs and school charges, and by absolute poverty - to become beggars in towns and cities.

- Empowering the pastoral communities. Pastoral-friendly policies are urgently needed to facilitate slow, sustainable progress so that pastoralists have the choice and freedom to decide their way of life in future. Since animal husbandry is subsistence-based - and the environment pastoralists operate and depend on is marginal, with limited potential for intensification - it is essential that State policies do not impose interventions that by-pass local conditions and the traditional wisdom of nomads.

- Promoting and developing community-based management of resources through collaborative management of pasture, with local communities in partnership with government extension, research and administration entities. By building on the strengths of the pastoral communities, Uganda can achieve the goal of improving the livelihoods of pastoralists and restoring the quality of their grasslands. This calls for a new way of thinking, a new approach that respects and utilises the diversity of expert knowledge - from pastoralists to scientists and policy-makers.

- Promoting economic diversification and improving social development programs and off-farm employment opportunities that take natural and comparative advantage of pastoral so that the pastoralists remaining on the grassland can develop a viable livelihood.

Integration of crops and livestock into grasslands

In smallholder farming systems, crop residues are a major source of animal feed especially during the dry season, and livestock derive most of their energy needs from this and/or natural grasslands (Kossila, 1984). The availability of crop residues is closely related to the farming system, the crop produced and the intensity of cultivation (Kossila, 1985). Cereal crops that provide the main bulk of residues for feeding livestock are maize, millet and sorghum. The potential availability of crop residues in Eastern Africa (Table 10) could, if used strategically, save up to 378.8 million heads of ruminant livestock during the dry season when the region experiences acute shortage of feed (FAO, 1981). The utilisation of crop residues is gaining more importance as crop production increases with increasing acreages and yield; and as acreages of grazing land get reduced due to the increase in human and animal populations. Fig. 15 summarises the pathways of integrating crops and livestock in grassland ecosystems. Table 11 further shows animal production in terms of milk from integrating forage legumes and crops.

Table 10. Availability of major crop residues in East Africa

	Maize	Millet	Sorghum	Wheat	Rice
Region			1,000 tonnes		
Africa	52576	46269	41343	8584	8562
Ethiopia	1760	855	2541	491	---
Kenya	3600	585	814	212	40
Malawi	2560	---	518	1	40
Mozambique	320	630	481	3	62
Tanzania	1200	5400	814	70	200
Uganda	547	2461	1850	8	14
Zambia	1600	7200	148	12	6
TOTAL	**11587**	**17131**	**7166**	**797**	**362**

Source: FAO (1981)

Table 11. Mean daily milk production characteristics of crossbred cows fed *ad libitum* maize-lablab (ML) Stover or oats-vetch (OV) hey basal diets supplemented with graded levels of lablab hay

Basal diets	Treatments							
	Maize – lablab (ML)				oats-vetch (OV)			
Lablab level (%BW)	0	0.4	0.8	1.2	0	0.4	0.8	1.2
Milk production								
Milk yield (kg / day)	8.25	9.50	7.70	7.43	6.82	8.54	8.69	9.73
Fat yield (g / day)	379	139	366	361	308	388	399	452
Protein yield (g / day)	239	268	227	228	208	248	262	299
Total solids (g / day)	1069	1192	1001	947	875	1078	1082	1246
Milk composition								
Fat	46.3	46.8	47.5	48.7	46.6	45.6	46.2	46.2
Protein	29.0	28.6	29.5	30.8	31.2	29.2	30.2	30.8
Total solids	130.1	126.5	130.0	127.7	130.2	126.6	125.1	127.9

Mpairwe *et al.*,(2002).

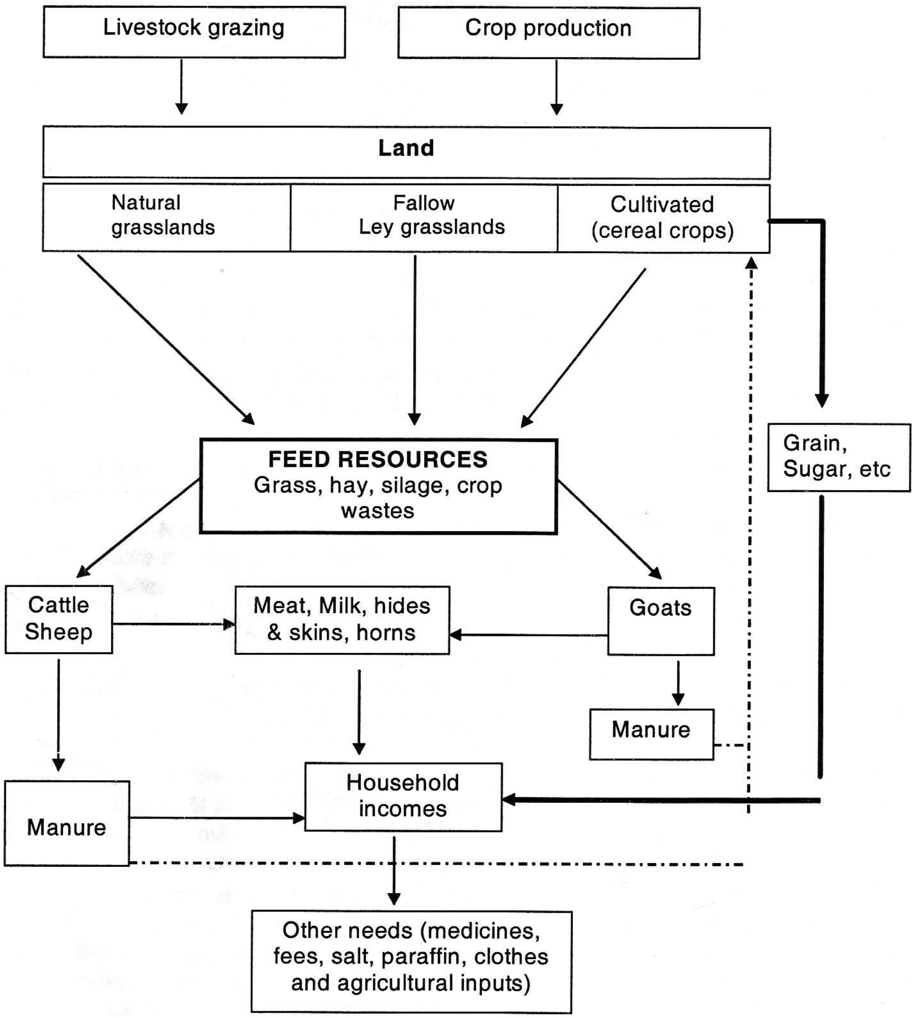


Figure 15: This conceptual model shows various pathways that result from integration of crop and livestock production systems. In general, there is better utilisation of feed resources and nutrient recycling, which in turn results in higher household incomes.

Summary, Conclusions and recommendations

This lecture has described 18 vital roles of grasslands in supporting the livelihoods of humanity which are provision of food, household incomes, medicines, recreation, shelter, natural assets, biodiversity, conservation of soil and water, linking humanity to the Sun and eventually to God, production of oxygen, remove Carbon dioxide from the environment thus reducing global warming, stabilises soil structure for growth of crops/grasses etc. The most important role is that the grasses act as biological factories that incorporate all nutrients from the soil and with gases from the air to manufacture food for humans and feed for animals. Nearly all the 6 billion of people on this planet depend on cereals(maize, wheat, rice, sorghums) which are grasses and also eat grass indirectly through eating animal products produced by the grazing animals. The lecture also discussed several approaches to sustainably utilise grasslands for animal and crop production. There is a lot that has not been researched on grasslands because people engaged in grassland science are few since young scientists are not attracted to specialise in this field. We have taken grasslands for granted because what we consume is indirect so I hope from today's lecture you will reconsider your thinking. Remember that **our flesh is grass** and without grassland cover our soils would be no more and hence humanity! We must consider these grasslands

Acknowledgements

There are many people and Institutions to acknowledge that have contributed to my professional development and to them all I say."Please accept my humble appreciation for your role in making me to the level of a full Professor of Makerere University in 1998". I have cherished this status because it was my long-term vision since Senior Four in 1970. I specifically acknowledge my parents-Mr Eliab Nyambobo and Faith Turyakira Nyambobo for becoming enlightened and educated me and paid school fees most of it from grasses(sale of millet,sorghum,maize and livestock). Dr. E. Tiharuhondi and late Prof. J. S. Mugerwa as my supervisors at master's level and Prof. R. Wein at Ph D level in Canada are greatly acknowledged. Dr.E. Edroma then Chief Research officer, Uganda Institute of Ecology obtained CIDA funds for me to complete my Ph D in Canada. Prof. F. I. Kayanja has been my mentor since 1980 and greatly inspired me. Profesors W. Senteza Kajuba and P.J. M. Ssebuwufu, former Vice Chancellors were very instrumental in my career development because Prof Kajuba extended my study leave with ILCA to complete my postdoctoral research while Prof. Ssebuwufu solved promotional roadblocks in Makerere University. My wife Joy Sabiiti got involved with my academics long time ago and became my great pillar. The faculty of Agriculture is acknowledged for providing an enabling academic environment for me to advance my career. The acting accademic registrar, Mr. Ngobi and Director of graduate school, Prof. D. Bakibinga provided funds to the production of the lecture. Finally I thank the Government of Uganda which sponsored me for my undergraduate studies, Makerere University Council for supporting my masters programme together with the National Research Council and CIDA of Canada with the National Research Council of Uganda for my Ph D programme.

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Departments

7 Departments

- Crop Science
- Soil Science
- Animal Science
- Agricultural Engineering
- Agricultural Economics & Agribusiness
- Agricultural Extension Education
- Food Science & Technology

Training Programs

Undergraduate programs

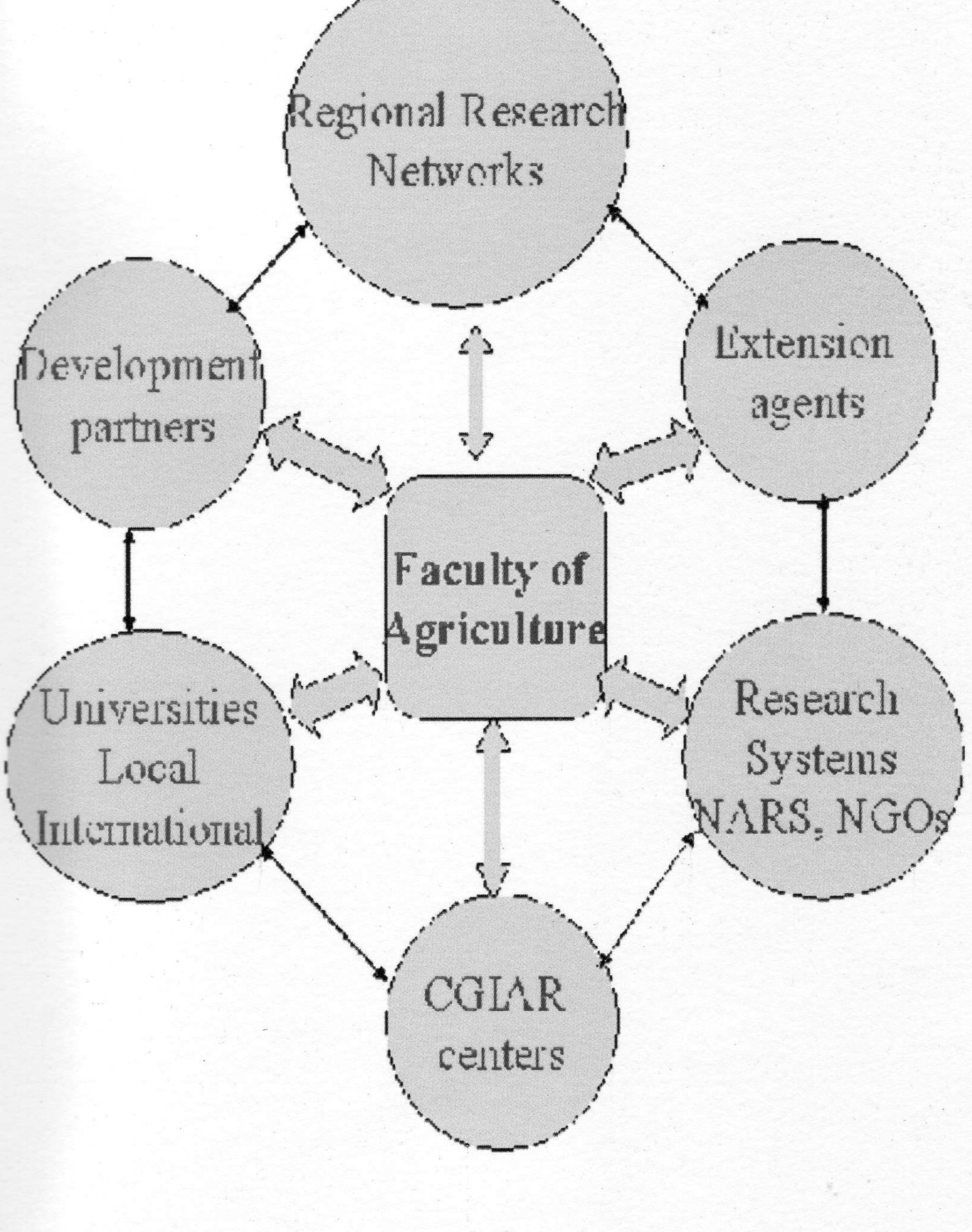
- BSc Agriculture
- BSc Food science & Technology
- Bsc. Horticulture
- Bsc. Agribusiness
- BSc. Agricultural Land use & Management
- B. Extension/Education

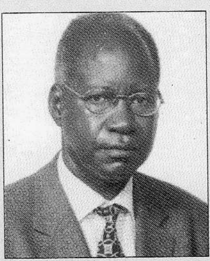
Postgraduate programs

- MSc. Crop Science
- Msc. Soil Science
- Msc. Agricultural Extension Education
- Msc. Agricultural Engineering
- Msc. Agricultural Economics
- M. Agribusiness Management
- Msc. Food Science & Technology
- Msc. Applied Human Nutrition
- Msc. Animal Science
- Ph.D (various disciplines)

Upcoming programs

- MSc. Breeding & Biotechnology
- MSc. Natural Resources Management


Regional Research Networks
Development partners
Extension agents
Faculty of Agriculture
Universities Local International
Research Systems NARS, NGOs
CGIAR centers



ABOUT THE AUTHOR

Prof Sabiiti was born on 12th November 1951 in Rwampara, Mbarara , Ankole District. He begun his education career by attending a Church School and thereafter joined Bujaga Primary School in 1959, completed and joined Kinoni Secondary School in 1964 and from there to Mbarara High School and then to Ntare School in1970, all in Ankole District then. He completed his undergraduate and postgraduate degrees at Makerere University between 1973 and 1979. He worked with Uganda Institute of Ecology while pursuing his Ph D, which he completed at the University of New Brunswick, Canada in 1985 and returned to Makerere University as a Lecturer in 1985 where he advanced through all the ranks to the level of full Professor, Crop Sciences in 1998.

Professor Sabiiti has published extensively in agricultural sciences with major focus on grassland and range sciences. He is a FELLOW of the Third World Academy and Uganda National Academy of Sciences, respectively. He also won the Full bright Fellowship for African senior scholars in 1994. Over 25 graduate students have been supervised by him and still continue to supervise more. One of his former graduate Ph D students is now a Lecturer in the faculty of Agriculture who is currently an Acting Deputy Dean; Training an achievement Prof Sabiiti is proud of. Prof Sabiiti sits on several National Boards/Committees as well as International ones. He was a Member on the InterAcademy Council Panel that produced an excellent report on harnessing science and technology to improve agricultural productivity and food security in Africa; a study commissioned by the Secretary General of the United Nations in 2002. He is a founder member of I@mak.com that oversees the Makerere University Capacity Building for Decentralized Districts funded by the Rockefeller Foundation, World Bank and Uganda Government and also a founder member and first President of the Association of Uganda Professional Agriculturalists (ASUPA). He was a commissioner appointed by Government that planned and founded the establishment of Gulu University and also chairman of the Task Force that vetted the establishment of Busoga University. He is well travelled world over.

He is Chairman of Council for Bishop Stuart University, Mbarara. Prof Sabiiti has taught several undergraduate and postgraduate courses and also introduced new courses in the faculty. He has been external examiner for many graduate students in Universities in Africa. He is a former Head of Department of Crop Science and Former Dean, faculty of Agriculture with a total of 10 years of successful administrative career. During his Deanship, the Faculty of Agriculture and Forestry grew tremendously by attracting a lot of Donors and transformed the Faculty into two faculties, Agriculture and then Forestry and Nature Conservation.

Currently Prof Sabiiti is the Coordinator of Sida/SAREC faculty programme, which he initiated in 2000; a senate member representing his Faculty in Senate, he is on the Senate Academic and Library Board and Graduate School Research Board. He is also a Director of National Agricultural Advisory Services (NAADS) Board, Uganda National Examination Board (UNEB), Uganda Independence Scholarship Trustee Fund, Deputy Vice Chairperson, Makerere College Governing Council and Chairman, PTA, Buganda Road Primary School among others. He is Vice President of the Uganda National Academy of Sciences (UNAS). Prof Sabiiti celebrated his Silver Jubilee wedding Anniversary recently and has six children.

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