Dryland Husbandry in Uganda

Community Participation and Development

Edited by

Elly N. Sabiiti and Tegegne Teka

Organisation for Social Science
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in Eastern and Southern Africa

Makerere University
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Organisation for Social Science Research in Eastern and Southern Africa (OSSREA)
P.O.Box 31971, Addis Ababa, Ethiopia
E-mail: **ossrea@telecom.net.et**
Pub.ossrea@telecom.net.et
http://www.ossrea.net

Makerere University
P. O. Box 7062
Kampala, Uganda

Typesetting: *Selamawit Getachew*
Text layout: *Alemtsehay Zewde*

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Preface

The Dryland Husbandry Project (DHP) in Uganda was a regional undertaking of all the Inter-Governmental Authority for Development (IGAD) Countries. The pastoralists in the IGAD countries inhabit harsh deteriorating rangelands that have for many years supported the large herds of livestock where they derive their livelihoods. These pastoral communities face shrinking grazing resources, chronic water shortages, lack extension services, face livestock diseases, frequent droughts and gender imbalance of access to pastoral resources. It is also a sector that contributes significantly to the national economy, which in the past received limited government support, especially on research and development. In Uganda, over 95% of the livestock is under pastoral production systems and contributes about 17% of GDP and food security (meat and milk) of high nutritional value.

It was on this basis that Uganda received funding from Sida/SAREC through OSSREA to conduct action research in Kazo County, Mbarara District from 1996 to 2003. The funding was made to address the above challenges using professionals from Makerere University, Faculties of Agriculture and Veterinary Medicine, Ministry of Agriculture, Animal Industry and Fisheries, the National Agricultural Research Organisation, NGOs, local Council Leaders and local communities. The project employed a bottom-up approach and identified priorities in the project area along with members of the community. It was participatory and action-oriented and worked with pastoralists and agro-pastoralists at the grassroots level.

This book is the first of its kind in Uganda to contain a compendium of research papers written by professionals who implemented the project that are addressing some of the issues that the pastoral communities face in the arid rangelands popularly known as the Cattle Corridor. The book has 10 chapters tackling different aspects of the rangelands and it concludes by suggesting the necessary interventions that the Government has to put in order to sustain the utilisation and management of dry lands (rangelands) in Uganda.

This book has been written and edited in a style that makes it more readable and understandable by a wide range of audience in the Country and beyond.

Prof. E. N. Sabiiti
National Co-ordinator
DHP, Uganda

Dr. Tegegne Teka
Regional Co-ordinator
DHP, OSSREA, Ethiopia

CHAPTER ONE

OVERVIEW OF THE AGRICULTURAL SECTOR IN UGANDA

E. N. Sabiiti and S. K. Mugasi

1.1 Introduction

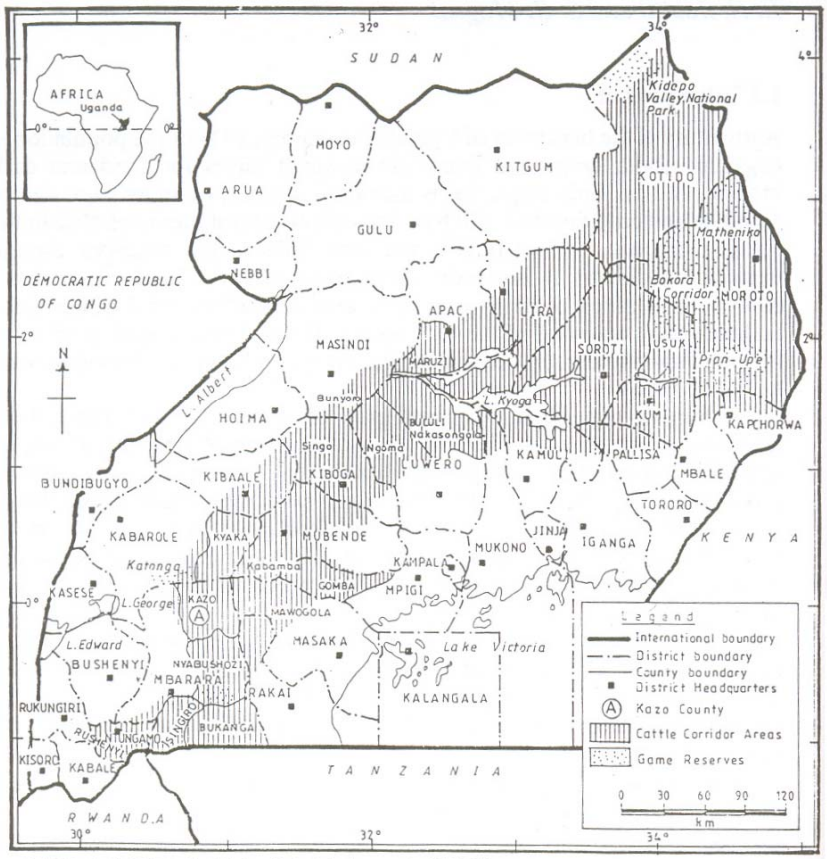
Agriculture is the backbone of Uganda's economy; 95% of the population is engaged (both crops and livestock) in small farms for food and cash income, and on fairly large, farms including ranches, of an average size of 1,200 ha and crop farms (5 - 20 ha). Agriculture contributes over 40% to the Gross Domestic Product (GDP) and over 90% to the country's foreign exchange earnings. It also contributes over 60% of total Government revenue in addition to employing more than 80% of the total labour force and providing over half of the total income for the bottom three-quarters of the population (Ministry of Finance, Planning and Economic Development, MFPED, 1996).

Livestock constitutes a crucial part of Uganda's food production, accounting for about one third of the total revenue of agricultural output. Uganda possesses a comparative economic advantage in livestock production over its neighbours due to its favourable climate and has a potential of being a net exporter to the neighbouring countries. According to the east African livestock survey of 1967, few countries in the world can boast of large areas with higher ecological potential for dairy production than Uganda.

Uganda has a total land area of 241,548 km^2, and is administratively divided into 56 districts. Lakes, swamps and Protected Areas constitute 25%. More than 75% of the country (over 18 million hectares) is available for both cultivation and pasture (Table 1). Pastures and grazing land are estimated at over 16 million hectares, half of which (8.4 million hectares) is extensive grazing. Improved pastures are estimated to comprise only 1.8 million hectares. This land resource, together with the bodies of water, is the base upon which most of the 24 million Ugandans (2002 census estimates) and their livestock depend for their livelihood. The capacity of this land resource to sustain the rapidly increasing populations largely depends on the influence of edaphic (relief and soil fertility), climatic and biotic factors and how well they can be managed to increase and sustain its productivity.

Map 1

Map. 1. LOCATION OF KAZO COUNTY AND CATTLE CORRIDOR IN UGANDA.



Source : Makerere Institute of Social Research (MISR).

Map 1. Map of Uganda showing the cattle corridor

Table 1: Current and Potential Grazing Areas of Uganda

Land Classification	Square Kilometres	%
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: Statistical Abstracts, MFPED, June 1997.

The country can be conveniently divided into seven broad agro-ecological zones which have similar economic and social backgrounds, and in which ecological conditions (soil types, topography, and rainfall), farming systems and practices are fairly homogeneous. These are often further split into sub-zones usually identified by such factors as similar crop combinations, size of holdings, average plot sizes and yields. Based on these divisions, defined mapping units are often worked out, together with outlines of potential for use, as a basis for zoning and stratification for production.

With a potentially available rangeland area of 7.5 million hectares and an average stocking rate of 1.82 hectares/cow, Uganda has a potential of grazing over 4.0 million cows for meat production, a considerable potential for livestock production (Table 2). It is important to note, however, that this great potential has not been fully realised due to a wide range of constraints as discussed later in this chapter.

Table 2: Estimated Productivity and Carrying Capacity of Potential Rangeland Areas in Uganda

Region	Mean Dry Matter Kg/ha/year	50% safe grazing Kg/ha/year	Consumption Kg/LU/year	Ha/LU
Northern Uganda	4500	2250	3194	1.42
North west	4680	2340	3194	1.36
North east	1680	840	3194	3.80
Central	5328	2662	3194	1.20
South east	4250	2125	3194	1.50
South west	3900	1950	3194	1.63
Mean	4056	2023	3194	1.82

SOURCE: Mugerwa, 1992 (Unpublished)

Assumptions: One Livestock Unit (LU) = 350kg; Dry matter (DM) consumption = 2.5 body weight x 365 days. Safe grazing is 50% of total DM production; browse not included in total DM production.

The major livestock species in Uganda include cattle, sheep, goats, pigs, rabbits and poultry. Livestock production is an important sub-sector of agriculture contributing about 7.5% to total GDP or 17% to agricultural GDP. It is estimated that mixed farming small holders and pastoralists own over 90% of the cattle herd and all of the small ruminants and non-ruminant stock; they produce the bulk of domestic milk and slaughter animals. From an economic point of view, cattle are the most important livestock with significant contributions, though to a lesser extent, from goats and sheep.

Official statistics (MFPED, 1996) put the ruminant livestock population at 5.46 million cattle, 5.86 million goats and 980 000 sheep (Table 2). FAO figures (Table 3) are similar. Improved breeds are mostly kept under intensive management on small and medium sized farms under zero grazing. The indigenous breeds, on the other hand, are kept under extensive traditional methods. Livestock production has continued to grow in response to increasing demand for milk as new milk plants open up, and increased demand for meat in the local market. Eighty percent of the national cattle herd is in Southern and Western Uganda where the average number of cattle per household is 2.11 compared to Northern Uganda at 0.67 and the national average of 1.37.

Table 3: Livestock numbers: 1992 - 2001

Year	Cattle´000	Sheep´000	Goats´000	Pigs´000	Poultry´000
1991	5 121	820	4 950	1 210	20 020
1992	5 209	845	5 070	1 228	20 576
1993	5 370	871	5 227	1 266	21 214
1994	5 106	897	5 383	1 304	21 404
1995	5 233	924	5 545	1 343	21 832
1996	5 301	951	5 684	1 383	22 050
1997	5 460	980	5 826	1 425	22 271

SOURCE: Statistical Abstracts; MFPED, June 1997

About 95% of the cattle pastoralists and agro-pastoralists mainly occupy the arid and semi-arid rangelands. They keep population of cattle and own indigenous breeds that produce 85% of the marketed milk, while exotic cattle only contribute 15%. As a result, milk production is very low in Uganda giving an annual per capita consumption of 22 litres of milk as compared to the FAO recommendation of 200 litres per person annually.

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

Item		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Cattle (,000,000)	nos.	5.2	5.4	5.1	5.2	5.3	5.5	5.7	5.8	6.0	5.9
Sheep (,000,000)	nos.	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.1
Goat (,000,000)	nos.	5.1	5.2	5.4	5.6	5.7	5.8	6.0	6.2	6.2	6.2
Beef & prod.(,000 mt.)	veal	86.0	91.5	84.3	86.4	87.5	88.5	93.0	96.0	96.6	96.6
Sheep prod (,000 mt)	meat	4.1	4.2	4.4	4.5	4.6	4.8	5.0	5.1	5.1	5.4
Goat prod. (,000 mt)	meat	19.4	20.0	20.7	21.3	21.6	22.3	23.0	23.8	23.8	23.8
Milk (,000 mt)	prod.	455.7	470.1	447.0	457.8	463.8	468.6	493.5	509.3	511.0	511.0
Cattle imports(nos.)		70	600	478	3	319	n.r.	2	n.r.	n.r.	n.r.
Beef & veal imports (mt)		n.r.	n.r.	1	33	n.r.	n.r.	2	6	6	n.r.

Source: FAO Database 2002; n.r. = no record

1.2 Pastoralism in Uganda

Historically, pastoralism in Uganda has been viewed as a retrogressive and backward practice. Official policy has been discouraging pastoralism in favour of sedentary livestock production. Despite this, the pastoralist sub-sector has continued to contribute significantly to the economy of the country in both direct monetary terms and non-monetized contributions like manure, traction power, livelihood safety nets and ecological conservation. Drylands account for over 90% of the national herd of cattle with 50% of the cattle owned by pastoralists. Despite this strong standing, nowhere else in the country are poverty indicators more glaring? With over 40% of the pastoralists living under the poverty line, Drylands constitute a severe poverty hotspot. This situation gets worse when other aspects of poverty are factored in.

It is notable, however, that pastoral livestock production makes a very significant contribution to both the GDP (7.5%) and the agricultural GDP (AGDP) (17%). The earnings from the exports of hides and skin generated US$19m in 2001/02, fourth after fish (US$88m), coffee (US$85m), and maize (US$20m). A recent study (Oxfam, 2003) in the pastoralist districts of Kotido, Nakasongola and Sembabule indicated that even here, district revenues on account of livestock activities alone amounted to 60%, 65% and 50% of total revenues respectively. Despite this contribution, pastoralists remain a forgotten lot in national development plans. Clearly, there is minimal direct investment into livestock production, both at national or local government level. The potential opportunity cost of the continued exclusion of livestock in general and pastoralists in particular from mainstream economic activities has been estimated at UGX24 billion per annum, excluding middlemen, industries, exporters and non-monetized activities.

Without productivity increases, pastoral communities in the drylands can only develop as fast as the animal population they depend on. However, present livestock populations are in many cases close to or above the maximum a diminishing resource base can support over the longer term, suffice it to note that increased livestock productivity is hardly possible when human and animal populations are pressing constantly against resource base limits.

There is limited crop production in the drylands; moreover this is destined for household use or local trading at relatively low prices. Local and trans-boundary rustling are depleting the cattle in the northeast. All these curtail incentives to invest in land resources conservation.

The current government drive for modernising agriculture has apparently tended to focus more on production of crops while the livestock

sector has continued to receive minimal attention despite its big contribution of about 38% to the agricultural GDP. It is important to note, however, that modernisation of the livestock sector should be dully addressed giving special consideration to the pastoral livestock producers inhabiting the rangelands of Uganda because they occupy approximately 35% of the total area and keep about 95% of the total cattle population of the country. Externally funded projects like Dryland Husbandry Project co-ordinated by Faculty of Agriculture at Makerere University, and Livestock Services Project implemented by the Ministry of Agriculture, Animal Industry and Fisheries are some of few projects that have worked to improve the livelihoods of pastoralists in Uganda.

1.3 Pasture Improvement in Uganda

Pasture improvement in Uganda has been going on for a long time but with limited success. In 1989, the UNDP/FAO Dairy Industry Development Programme imported some seeds and in conjunction with DVS&AI, Makerere University and Namulonge Agricultural Research Institute began pasture seed production. Twenty six hectares of an assortment of pasture crops was established which included grasses namely, *C. gayana* and *P. maximum*; and legumes *M. atropurpureum, C. pubescens, D. intortum, Lablab purpureus, Leucaena leucocephala* and *Cajanus cajan*. Through the work done at Namulonge, the cost of production of seed for each of those varieties was established. The seeds produced under this programme were used in the UNDP/FAO programme area and the rest was given to DVS&AI for bulking. This was done through farmers who were contracted to multiply the pasture seeds. From 1990 - 1992, UNDP/FAO purchased pasture seeds from the contracted farmers in Mpigi, Mukono and Mbarara Districts and sold them to livestock farmers' nation-wide.

The World Bank, through the Livestock Services Project (LSP) in the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), carried on with pasture seed production activities began under UNDP/FAO as well as training both staff and farmers in various technologies of forage production and utilisation. Over the period 1992 - 1997, over 50 farmers had been contracted and produced about 58 000 kg of grass and legume seeds (see Table 5) from an average area of about 0.75 acres each. The main crops produced were *C. gayana* and *P. maximum* (grasses) and *M. atropurpureum, C. pubescens, S. guianensis* and *L. purpureus* (legumes). Under this project, a study for the privatisation of the pasture seed industry was conducted. Unfortunately, before it was concluded, the project came to an end (June 1997). There is now no clear way forward for pasture seed

production in MAAIF. Field extension staff responsible for pasture improvement in the districts has managed to keep a few farmers involved in seed production as they find a market for the seed from amongst livestock owners.

Table 5. Seed production from contract farmers under the Livestock Services Project (kg): 1992 - 1997

Seed Type	1992 (imported)	1993	1994	1995	1996	1997
M. atropurpureum	100	3 132	3 190	5 892	-	1 284
C. pubescens	100	374	2 238	2 243	-	691
L. purpureus	-	11 179	9 252	15 892	-	2 263
S. guianensis	-	2	-	-	-	15.5
Verano Stylo	120	-	-	-	-	-
Seca Stylo	100	-	-	-	-	-
D. intortum	100	-	-	-	-	-
D. uncinatum	100	-	-	-	-	-
C. rotundifolia	120	-	-	-	-	-
L. leucocephala	400	-	-	-	-	-
C. gayana	40	-	-	-	-	656
P. maximum	-	-	-	-	-	209
Total	1 180	14 687	14 680	24 027	--	5,118.5

SOURCE: LSP Internal Completion Report, June 1997.

CHAPTER TWO

DRYLAND HUSBANDRY PROJECT IN UGANDA

E. N. Sabiiti

2.1 Introduction

The Dryland Project (DHP) is a multi-disciplinary and action-oriented research project that brings together a variety of stakeholders in pastoral development to identify and develop strategies for addressing the crisis of African drylands. The project uses a network approach to raise issues of mutual concern to researchers, practitioners and, above all, to pastoralists with particular emphasis on sustainable service provision and pastoral resource management. DHP is one of the few projects that has been directly working with pastoralists with the aim of improving livestock production in Uganda. The DHP activities in Uganda started in 1996 in Kazo County targeting the pastoral herders inhabiting the rangelands of Kazo County in Mbarara District.

The main objective of DHP in Uganda has been to initiate a dialogue among the stakeholders in rangeland utilisation geared towards improving the livelihood of people in the dry areas of the country. Several activities have been carried out in the field ranging from seminars, workshops, training of paravets (Community Animal Health Workers) and with the establishment of range improvement studies.

DHP in Uganda has registered considerable success in the area of pastoral development and has also inevitably encountered several challenges as stated in the evaluation reports. This chapter explains the activities carried out by DHP from 1996 to 2003.

2.2 Objectives of DHP-Uganda

The project had both long term and immediate objectives. The objectives of DHP-Uganda were in line with the regional objectives that acted as a guide for participating countries, i.e. Ethiopia, Kenya and Sudan.

Long-term objectives

i) To improve the standard of living of pastoralists by creating an enabling environment in which they and their herds can better survive the deteriorating range condition.

ii) To develop through action research, range improvement techniques that are economically viable and environmentally sound in the area of bush control and water management, in particular.

iii) To design a national dryland management programme drawn from the research findings of the DHP in Kazo, with the aim of addressing the dryland crisis in Uganda.

Immediate objectives

i) To implement participatory/action research emphasising on-farm trails in the areas of water management, bush control and animal diseases control.

ii) To organise regular training courses for paravets and field extension workers, and grassroots seminars and workshops for pastoralists.

iii) To work with the existing women groups to draw need oriented gender development programmes.

2.3 Justification of the project

Cattle rearing is an important economic activity in Uganda. Livestock constitutes a crucial part of the country's food production, accounting for one third of the total value of food production. According to the Uganda National Census for Agriculture and Livestock (1990-1991), there were about 3.4 million heads of cattle in the 26 districts of Uganda where the census was conducted (MAAIF, 1992). About 95 percent of the cattle population is owned by pastoralists with grazing management systems, which vary from area to area, influenced by increased cropping and subsequent reduction of grazing area. In most of these areas the main management systems remain communal grazing, tethering and pastoral herding (DHP-Uganda Project Document, 1995). Local breeds (*Bos indicus*) are well adapted for survival under the prevailing conditions of low inputs, poor nutrition and high disease incidence.

However, these traditional pastoral practices take place in a rapid changing socio-economic environment that affect nomadism in Uganda which is declining due to sedentarisation prompted by land

pressure and de-stocking. These have a wide range of implications on the rangeland management, standard of living of the pastoralists and manifest a range of management systems among the pastoral communities in order to cope with (DHP publication series No. 5). As observed in the IUCN report, 1992 (cited in DHP-Regional Project Document, 1994), if the current environmental degradation in the Horn of Africa is permitted to continue much longer, it is likely that in a relatively near future human settlement in many parts of the region will become unsustainable.

The Dryland Husbandry Project-Uganda, therefore, attempted to address the salient issues and problems facing the pastoralists in the changing environment. As the pastoralists in this area started to live a settled life due to land pressure in Uganda, they were faced with two main problems: (a) that of an overgrazed land on which they were settling and (b) the deterioration or virtual disappearance of the rangeland pasture needed for animals which was slowly being replaced by the undesirable pasture weeds and bush encroachment (Fig. 1). In addition, the same area is continuously being hit by drought every year, which deprives the pastoralists of the water that is much needed for animals and human consumption during the dry seasons.

Such environmental and animal husbandry situation was sufficient to make Mbarara district an appropriate choice for the DHP-Uganda project area. Kijuma and Burunga project sites were selected after a baseline survey which identified a wide range of issues that concerned land tenure system in the area, land use pattern, land size among the pastoralists, land sufficiency, heads of cattle, pastoral resource management, existence of pasture weeds, water availability (sources) during the dry season, extension workers' services, animal diseases and their control, crop production and household incomes of the pastoralists. These small sites were deemed big enough to provide a sufficient start for the preparatory project activities that could be replicated in other areas in future project activities.

The ultimate outputs were intended to increase understanding amongst practitioners and pastoralists of the sustainable range management, improved rangeland pasture, water management, increase and improve participation of women in pastoral development with the ultimate goal of creating sustainable rangelands for pastoralists.

2.4 Project Management

The Faculty of Agriculture at Makerere University was the national focal and implementing institution of the project. The management structure of the project constituted the following:

National Co-ordinator - The National Coordinator was the most senior officer within the project. He was in charge of the overall supervision of the project.

Steering Committee – A National Steering Committee was formed at the start of the project in 1996 and consisted of representatives from the following institutions:

- Faculty of Agriculture, Makerere University
- Faculty of Veterinary Medicine, Makerere University
- National Agricultural Research Organisation
- Ministry of Agriculture, Animal Industry and Fisheries

The National Steering Committee chairs the National Steering Committee, which is the main decision-making body of the project.

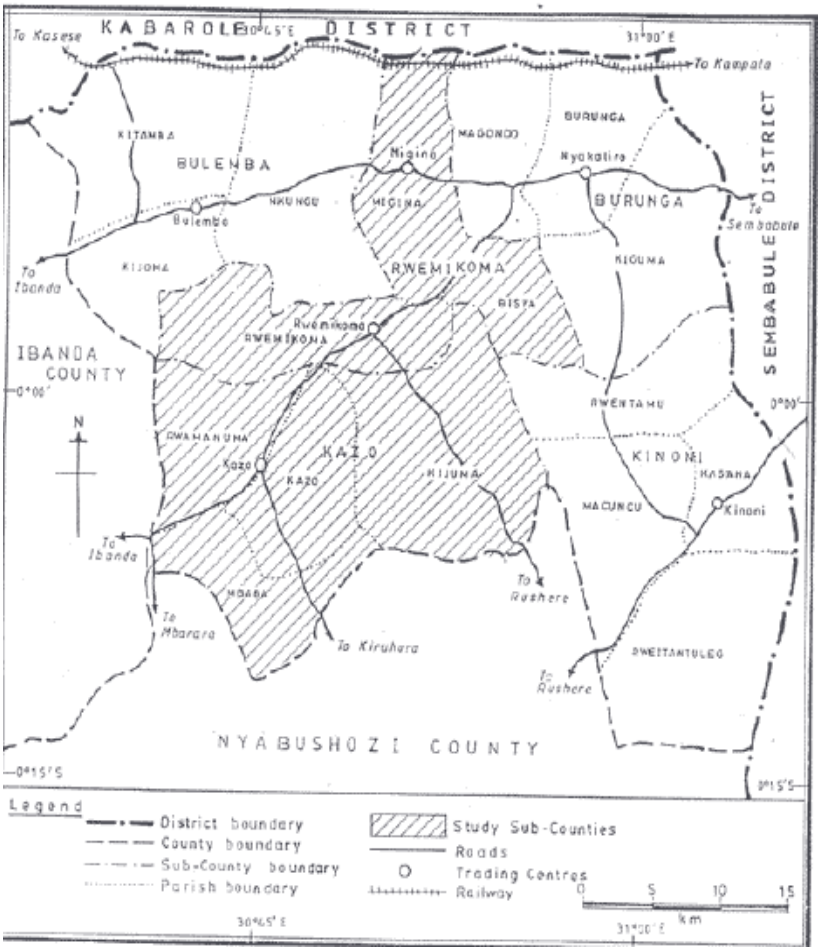
Project Manager – The Project Manager was responsible for co-ordinating field activities, preparation of work plans and writing annual reports.

Research Assistant – An MSc. student was recruited as a Research Assistant for the project and was responsible for co-ordinating research activities. The student conducted a study of the economic implication of bush encroachment on livestock productivity as part of the project output.

Pastoral Development Committees – Pastoral Development Committees were formed in the project to act as a link between the pastoralists and the project. Each of the four project sites has committees of ten people elected by the pastoralists.

2.5 Project Site

The DHP activities are currently being implemented in Kazo county, Mbarara district in the pastoral rangelands of south western Uganda predominantly occupied by the Bahima pastoralists (Map 2). Following the baseline survey conducted in 1996 two project sites were established in Burunga and Kijuma. The two sites are in the same county and about 24 miles apart. The project site is about 260km from Kampala and about 120km from Mbarara the nearest biggest town.



Map 2. Map of Kazo County showing the study area

2.5.1 Climate

Kazo County forms the eastern border of Mbarara District. It is an area medium relief with low hills of over 1,200 meters above sea level and rolling plains. A number of seasonal streams provide natural drainage, some to the north and others to the south. The area has relatively low and unreliable rainfall compared to the rest of the district, receiving annual averages of 700 – 800 mm in 30-60 days. Rainfall is typically bimodal, coming in February – June and October – December, peaking in April/May and October/November respectively. Average temperatures stand at over 27^0C, ranging between 21^0 - 34^0C. Most of the rainfall comes in storms, which in general have tracks of about 3 km width, although four or five storm "cells" will sometimes travel together and so provide a wider storm front. The actual rain in any one Parish is, therefore, made up of a series of storms that criss-cross each other's paths at various times of the year. In effect, two adjacent Parishes or opposite ends of the same Parish may have entirely different rainfalls during the same year or wet season. Relative humidity is moderate (Kamugisha, *et al*., 1993).

The geology of the area comprises of two different Precambrian rocks namely the Toro System and the Karagwe-Ankolean System. The two systems meet around the Mbarara – Masaka road, with a marked scarp at the junction. The Toro System, comprised of the older Basement Complex, occupies about 75% of the county. These rocks are extremely compact and impervious. Groundwater occurrence in them is only restricted to zones of weakness in two hydro-geological regimes namely the regolith aquifer system and bedrock aquifer system. In general, the area is not favourable for groundwater abstraction and most of the water used for livestock and domestic consumption is from surface runoff harvesting. Soils are ferrallitic, consisting mainly of sandy loams. Productivity varies from place to place, depending on rainfall, depth and humic topsoil. Soil depths are very shallow on hilltops and the upper slopes, increasing to lower slopes and valley bottoms. The soil is generally suitable for grass but marginal for crop production, as the latter usually results in rapid exhaustion of the humus content (*ibid*).

2.5.2 Vegetation

Vegetation is a fire climax tree savanna composed of deciduous leguminous trees and perennial grasses. Trees vary throughout the county, depending on rainfall, soil depths and human activity. Commonest trees are *Acacia hockii* on the hillsides, *A. gerrardii* in the valleys and *Albizzia* spp to the north. *Euphorbia candelabrum* and non-fire resistant bushes are common

on anthills throughout the range. As cattle pasture, the grass/herb layer has been deteriorating over the years due over-grazing and seasonal fires. The two pressures have encouraged the spread of the *Cymbopogon afronardus* grass, which is inedible because it is extremely fibrous and bitter. In many parts, *C. afronardus*, and *Loudentia kagerensis* on hillsides, are replacing the original fire climax sward grass based on *Themeda triandra*, *Hyparrhenia filipendula*, *Digitaria maitlandii* and *Brachiaria* spp. Wherever fire and grazing are under control, more palatable species, especially *Panicum maximum*, *Setaria sphacelata* and *Chloris gayana* emerge (*ibid*).

2.5.3 The People

Mainly cattle-keeping semi-nomadic herdsmen, rearing the Nkore longhorn cattle, inhabit the county. These people traditionally transhumed the range in search of water and pasture, wherever their presence was not precluded by presence of tsetse fly and man-eating carnivores. The construction of dams in the late 1940s and the eradication of tsetse fly to establish the 50 ranches of Ankole Ranching Scheme in the late 1950s to early 1960s saw a steady increase of both human and cattle populations in the county, through both immigration and natural multiplication, the latter enhanced by better health and veterinary services. Historically, livestock rearing has been and remains the mainstay and main land use in the area, although lately arable farming of food crops has been on the increase, largely as a supportive activity to livestock rearing (Kamugisha, *et al.*, 1993).

A general improvement in the economic situation in the county is noticeable, a cash economy is gaining ground and local economic dynamics are changing positively. However, some of this is proceeding at a severe environmental and social cost in Nyabushozi County. For instance, local women, who before the advent of milk cooling plants made and sold ghee to generate income for family sundry expenses, are no longer able to do so since as almost all the milk is sold and the money controlled by the men. Conversely, while in the past cash income was based on selling cattle only, the sale of milk and milk products is steadily assuming centre stage as a source of livelihood for many families and there is increasing diversification into other forms of cash generation and multiplication. Thus modernisation is removing some of the traditional livelihood safety nets, hence rendering families vulnerable.

2.5.4 Water availability

Despite the general improvement in the economic situation, perennial drought and water shortages constitute a constraining factor to social

stability. Most of the dams constructed by government in the 1940s are unusable due to mismanagement, which led to silting. The few that are still usable are no longer accessible due to individualisation of land and fencing that have led to closing of access routes. At the height of the dry season, whole families have to move with their small herds from place to place in search of water and pasture, either towards River Katonga in the north or Lake Mburo and River Rwizi in the south. The family order is disrupted, children leave school and social amenities cannot be accessed. They are disdained as a social nuisance or menace by those through whose farms they route, being accused of spreading ticks and disease. To Lake Mburo National Park, they are illegal encroachers bent on destroying the park. It suffices to note that they occupy the park at a time when wildlife cannot find water elsewhere and so converges to areas close to the water bodies in the park.

As families move, they become prone to water-borne diseases since they have to rely on the same contaminated sources for both domestic and livestock use. Infant nutrition suffers as there is little milk and cooked food becomes too expensive for most. Termites raze down the already overgrazed dry pastures and every other dry vegetation, further reducing vegetation cover and exposing ground to denudation. Prolonged dry seasons here have a return period of 6-10 years, when desert-like conditions persist for almost six months. This is time of disruption and desperation characterised by a spiral of environmental degradation and human suffering that does not spare even well off farmers, who have to truck in water for their improved herds. Cost of living leaps while the prices of livestock plummet.

2.5.5 Land

Land ownership for long was not regarded as an important issue by pastoralists as they moved with their herds from place to place in search for pasture and water. With increase in human population (and hence increase of pressure on land) and government restrictions on indiscriminate movement of stock, pastoralists are gradually forced into involuntary sedentarisation. Communal land ownership is as a result giving way to individualisation of land. In Kazo County, communal land is now almost non-existent as most of the land is owned by individuals. According to Mugasi *et al*. (1998), only 2% of the households surveyed grazed on communal land.

Individualisation of land in Kazo has enabled pastoralists to settle and establish permanent homes. They have also been able to fence off their land to improve their pasture. Fencing has helped to control cattle diseases, particularly Foot and Mouth Disease and Contagious

Bovine Pleural Pneumonia, which were rampant in the area. However, about 10% of the pastoralists still have a negative attitude towards individualisation and fencing of land. Their contention is that fencing limits free movement of cattle and also denies access of cattle to communal water reservoirs, which have for long been the sole source of water. This attitude cannot simply be dismissed because privatisation of land greatly reduced grazing area for most pastoralists since land was not equally divided.

This was also reported by Peters (1994) who noted that the *sine qua non* of dryland cattle-keeping in Africa has been mobility. She argues that privatisation reduces land area and eliminates the mobility and flexibility in grazing that is crucial in the management of climatic risk. Restriction of herds to individual land holdings has led to reduced availability of pasture and water resources in the dry season because the practice of freely moving cattle in the rangeland to where these resources are available is no longer permissible. Reduction of herd sizes, through deliberate culling or high mortality resulting from starvation and diseases, has been an inevitable outcome of this situation. This problem is more pronounced on bushy farms where more than 75% of the grazing land is covered by shrubs which limits the grazing capacity of the land. With cleared farms, where more grazing was available, the problem is not felt.

This scenario, which was also reported by Sserunkuuma (1998) in neighbouring Nyabushozi, is likely to have serious implications on low-income pastoral households that are unable to clear their farms to improve on availability of pasture.

2.6 The Target Groups

2.6.1 Pastoralists

Pastoralists herding is practised in the districts of Kotido and Moroto (northeast Uganda) and Masaka, Kabarole, Ntugamo, Mpigi, Nakasongola and Luwero (central and southwest Uganda). According to the national bio-diversity report of 1992, Mbarara district alone supports 30% of the national cattle population. As a matter of priority therefore, DHP targeted the pastoralists in the rangelands of Kazo County in Mbarara district. Pastoralists in this area are confronted with problems of deterioration of herd and rangelands conditions, sub-optimal management of water sources and weak veterinary and extension services.

2.6.2 Practitioners and Policy makers

DHP-Uganda recognised the fact that success of the project required close collaboration and continuous consultations with practitioners and policy

makers. Since Uganda does not have a clear pastoral development policy, it was very important for DHP to work closely with policy makers at all levels, including local and central governments. At central government level, DHP involved the Minister and the Directorate of Animal Production in project activities. At local government level, the District Agricultural Officer, the Directorate of Production, and the extension officers were directly involved in project activities, especially seminars and workshops. In service training programmes of practitioners working in rangelands of Kazo, particularly the paravets and retrenched extension workers were regularly conducted on participatory approaches and extension methods among pastoral communities.

2.6.3 Women

Women play a vital role in all aspects of pastoral production, including herd management, milk processing, marketing and porterage of feed and water. Sufficient information on women in pastoral development in the DHP project area has been gathered. Several women groups have come up particularly in the area of milk processing. DHP closely worked with women as a specific interest group in the overall process of pastoral development.

CHAPTER THREE

SITUATIONAL ANALYSIS IN THE PROJECT AREA

S. K. Mugasi and E. N. Sabiiti

3.1 Introduction

DHP Uganda carried out a baseline survey in October 1996 to identify and establish the status of the resources, level utilisation, and constraints faced, opportunities available and prioritisation of areas for possible intervention by the project. The survey was also intended to assess community problems at grassroots level and identify indigenous technologies used by the pastoralists with specific emphasis on local methods of livestock disease control, range and water management. On the basis of the survey, DHP-Uganda was able to identify the following as its main research priorities in project implementation: range and water management, pasture weeds, livestock diseases, income generating activities for women, and marketing of milk and cattle. The survey findings in terms of pastoral resources such as land, cattle, pasture, water, animal health and extension services are presented as follows.

3.2 Survey Results

3.2.1 Land Ownership

Land availability in Kazo County is not a serious problem as yet. Table 6 gives the number of households by land holding in four sub-counties of Kazo. The table shows that households in Kazo own sufficient land with 62 percent of the households owning between 10 and 100ha, which is well above the district average of 2.2 hectares or national average of 5.3 acres (MAAIF, 1992).

Table 6. Household land-holding by sub-county (in percent)

Land size	Sub-county				
	Kazo	Buremba	Kanoni	Burunga	Total
<10ha	0	3	2	0	5
10-50ha	10	10	7	9	36
50-100ha	9	6	8	3	26
>100ha	21	1	3	8	33
Total No. Households	40	20	20	20	100

SOURCE: DHP-Uganda Final Report on the Baseline Survey in Kazo County, Mbarara District, FAF, Makerere University, Kampala, 1996

Although land is available to all households ii Kazo County, its utilisation is sub-optimal due to perennial drought and the pervasive pasture weeds prevalent in the area. Men traditionally own much of this land, a common characteristic of the pastoral society in the project area, which is patriarchal in nature. Most women do not own land except in rare cases and as widows. However, the new domestic relation bill seeks to give women and men equal rights over land and other property and if enacted into law, the gender injustices will be done away with.

This factor has far reaching implications on the integration of gender aspects in pastoral development since almost only men practically exercise management control and culturally make major decisions over land use. Lack of ownership of land by women in pastoral communities in Kazo exhibit asymmetrical gender sex division of labour that is structured in favour of men. According to the survey findings, males are mainly responsible for looking after cattle, particularly watering, spraying and milking animals, building animal shelter in addition to engaging in income generation, non-farm wage labour activities. While the female folk are responsible for domestic chores most especially cleaning milk pots, milk churning, cleaning of calf pens, and caring for children. This domestication of pastoralist women perpetually keeps women in the periphery of development activities in the pastoralist economy and ultimately undermines the role of women as a driving force and stakeholders in sustainable pastoral development.

3.2.2 Cattle ownership

Over 90% of households in Kazo County own cattle and derive their livelihoods from them. Much as land holding per household is adequate in

Kazo County, the tendency to keep large herds of cattle has lead to over-grazing and range deterioration.

Table 7: Average heads of cattle per household

No. of cows	Sub-county				
	Kazo	Buremba	Kanoni	Burunga	Total
< 50	16	12	15	11	54
50-100	10	04	05	06	25
> 100	14	04	00	03	21
Total No. of respondents	40	20	20	20	100

SOURCE: DHP-Uganda Final Report on the Baseline Survey in Kazo County, Mbarara District, FAF, Makerere University, Kampala, 1996.

A significant number of households owned between 50 and over 100 heads of cattle with a steady reduction in the cattle herd with the shifting of some of the herds from Kazo to ranches in parts of Nyabushozi and Kabula Counties as part of the restructuring exercise in Mbarara and Rakai Districts. The pastoralists also had sold cattle mainly to obtain money to fight the invading weeds that are threatening their pastures. It was also reported that over the years the herd size per household has steadily reduced due increase in land pressure, restriction of indiscriminate movement of cattle and increasing sell of stock and the changing domestic requirements as pastoralists settle and begin to lead modern lives. Some pastoralists still owned over 100 heads of cattle as indicated in Table 7.

3.2.3 Pasture

Analysis of species composition of pastures revealed that the previously grass based grazing resources are gradually transforming into woody shrubs. The dominant valuable forage grasses in the project area were *Brachiaris Spp.*; *Themeda triandra, Panicam maximum*, and *Cynodon dactylon*. On the other hand, *Hyperrhenia rufa* was found only in areas that were not overgrazed.

Valuable browse plants were *Grewia Spp, Cadaba Spp*. and *Acacia Spp*. Some farmers took the initiative to improve on the quality of their pastures by over-sowing with seeds of grasses like *Chloris gayana*, *Panicum maximum*, and legumes like *Siratro*.

The only problem was that this initiative was undermined by acute shortage of pasture seeds since most farmers were amenable to planting improved grass species. It is worth-noting that farmers appreciated the magnitude of the weed problem. Some of them sold part of their herds to raise money to combat it but this could not be sustained since the cleared part could degenerate back into bush in just two years' time.

Figure 1. Severe bush encroachment into rangelands in Kazo County, Mbarara District.

The only option for farmers was to appeal to researchers to explore possible ways *of* economically fighting the weeds since their incomes could not sustain their efforts to control the notorious weeds. Some are using fire to control the bush but with little success because of poor planning of the fire regimes. Fire, as bush control tool requires periodical planning and can only be efficient on large expanses of land with sufficient grass fuel to burn and destroy the bushes. Use of fire under conditions of overgrazing leads to further environmental degradation.

Figure 2. Fire is a useful tool against bush encroachment but must be used properly.

However, some farmers resorted to selling their land so that they could shift to areas deemed not yet invaded by bushes, namely Kabula in Rakai district. Other farmers had transformed into crop production communities. This was evident in some parts of Buremba bordering Kazo, particularly around Kyampangara.

Pasture weeds became a threat to the survival of the pastoralist economy in the project area. The most common pasture weeds identified were *Cymbopogon afronardus*, *Acacia Spp*, *Milleti dura*, *Vernonia amygdalina*, *Diospyros abyssinica*, *Solanum incunum* and *Lantana camara*.

The pastoralists' perceived causes of the high incidence of pasture weeds to be two-fold. Restriction of burning - pastoralists believed that burning is an old practice that helps to improve on the quality of the pastures especially after the rains which are believed to contribute a lot to the suppression of pasture weeds as it is said to destroy weed seeds. However, the pastoralists reported that due to overgrazing the few pastoralists who have persistently burned the bushes have not succeeded because there is always little fuel in form of dry grass to completely burn the bushes.

Pastoralists noted two major disadvantages of using mechanical means especially the hand hoe to uproot the weeds. Firstly, it involves wide opening up of the land thereby creating favourable conditions for germination of seeds of invading weeds. Secondly, removing of stumps leaving roots underground in some weed species leads to sprouting of new shoots from each of the roots meaning that several of them are likely to come up especially after the rains.

3.2.4 Water Availability and Access

Perennial water shortage for both human and livestock use in Kazo County is a major constraint affecting the livelihoods of pastoralists. The water scarcity is most pervasive during dry seasons, which sometimes stretch for about over six months in a year. The sub-counties found to be most hit during the baseline study were Burunga and Buremba where 75 percent and 60 percent of the informants respectively, said that they experienced insufficient water during dry seasons. The least affected sub-county was Kanoni where 65 percent of the respondents said that they had sufficient water during the dry season. In times of severe water scarcity many farmers often resort to communal valley dams or shift to distant areas in search of water. This practice of nomadism in search of water is common in Kazo, Buremba and Burunga areas where the valley dams and tanks eventually dry up during droughts.

Figure 3. A traditional water point in Kazo County, Mbarara District, Uganda.

Table 8: Respondents' sources of water during the dry season in percentage terms

Source	Sub-county			
	Kazo	Buremba	Kanoni	Burunga
Shift to distant areas	22.5	15	0.0	10
Nearby communal dam	35.0	25	30	60
Nearby river-community	0.0	15	05	05
Personal Water enough	42.5	45	65	25

SOURCE: DHP-Uganda Final Report on the Baseline Survey in Kazo County, Mbarara District, FAF, Makerere University, Kampala, 1996

The results in Table 8 show considerable water shortage in Kazo County and illustrate the pastoralists coping mechanism to this phenomenon. They resort to either communal valley dams/tanks of rivers making valley dams the predominant source of water not only in Kazo County but also in Mbarara district while others traverse the drylands to distant areas in search of water. This observation is supported by the Uganda National Census of Agriculture and Livestock (1990-1991), which revealed 10,304 holdings having valley dams as source of water for cattle in Mbarara district. Yet,

valley dams or tanks dry up during severe droughts especially in Kazo, Buremba and Burunga sub-countries.

This persistent water problem has several strategic implications and raises concern among the majority members of the community. Significant proportions of the informants support (in principle) the idea of cost sharing in as far as water resource management is concerned. Table 9 below gives the percentage of the informants who supported cost sharing to make available water sources.

Table 9. Respondents' acceptance of cost sharing of water management in percentage terms

Response	Sub-county			
	Kazo	Buremba	Kanoni	Burunga
Acceptable	75	65	75	55
Not Acceptable	25	35	25	45

SOURCE: DHP-Uganda Final Report on the Baseline Survey in Kazo County, Mbarara District, FAF, Makerere University, Kampala, 1996.

However, in some sections of the community water resource is viewed as a public good whose improvement should be a government responsibility. As such although there was a registered willingness to contribute towards construction and maintenance of water reservoirs and support to the introduction of user charges, there was a shortfall in the lack of support for the idea of cost sharing from Buremba sub-county where 35 percent did not accept cost-sharing. Yet the same sub-county faced the worst water shortage problem. This contradiction within a community facing such an acute problem raises some pertinent issues worth noting in the DHP-Uganda implementation strategy. In the first place there is a question of the effectiveness of collective action in water resource management among pastoralists in Kazo project area. It further raises concerns of handling trade-offs and free rider issues especially in view of the proportion of the people who did not support cost-sharing and a problem of projecting the administrative costs if the policy is introduced.

3.2.4 Livestock Diseases

Typical of rangeland areas, animal diseases pose a significant threat to the pastoralists in the project area. The most prevalent diseases were east cost fever, trypanosomiasis, contagious abortion, three-day sickness, and worm/fluke infections. Two major factors are said to be responsible for

these animal diseases in the area. One is that the grazing system is such that cattle still graze and mix freely in most parts, especially on watering points, creating easy spread of diseases. This was taking place amidst a good number of people who had personal land holdings a factor that would have naturally thwarted this from happening. The other is related to capacity to treat the disease. In this regard, the absence of the necessary field staff to treat the animals with only one veterinary doctor in the whole of Kazo County who also faced a host of logistical constraints including transport, made disease control and animal treatment very ineffective. This is aggravated by the limited supply of drugs coupled with fake and expired drugs on the market rendered poor animal treatment.

However, efforts were being made with the most pervasively used drugs to control ticks in the area using acaricides such as taktic and decatix. In addition, some traditional methods of disease control coupled with other forms of indigenous technology were used by the pastoralists.

3.2.5 Extension Services Provision

Delivery of agricultural extension services has been a subject of contention among the professionals and policy makers. In Kazo County, like in other parts of the country, agricultural extension services had completely collapsed. This problem was largely a result of the public service reform leading to retrenchment of public servants that has been going on in Uganda. In addition, there has been a ban on recruitment of public servants for the last four or five years now. The reported absence of extension services in the project area is presented in Table 10 below.

Table 10. Respondents visited by extension worker in percentage terms

Response	Sub-County			
	Kazo	Buremba	Kanoni	Burunga
Never Visited	95	45	75	85
0 - 2 months	0	50	0	5
2 - 6 months	0	0	5	5
More than 6 months	5	5	20	5

SOURCE: Final Report on the Baseline Survey in Kazo County, Mbarara District, Makerere University, FAF, 1996

Table 10 clearly shows the non-availability of extension services in the area. The relative availability of services in Buremba Sub-county was largely attributed to the existence of only one Agricultural Staff (Assistant Agricultural Officer) in charge of Kazo County who incidentally resided in

Buremba sub-county at the time of the survey. This meant that the officer was "easily" accessible to the farmers in Buremba but less so in other sub-counties mainly due to logistical impediments making the services less and less available to the pastoralists.

Under the PMA framework, the National Agricultural Advisory Services (NAADS) has been instituted to spearhead the development of private sector-led and demand-driven extension services. It is envisaged that farmers will be able to procure extension services from private service providers according to their demands.

The findings of the baseline survey together with information gathered from community participatory rapid appraisals provided a concrete and focused project implementation action plan. In the subsequent chapters, all DHP activities are detailed out.

CHAPTER FOUR

PASTURE AND RANGE IMPROVEMENT

E. N. Sabiiti, D. Mpairwe and S. K. Mugasi

4.1 Introduction

Poor range condition was highlighted as one of the major livestock production constraints in the situational analysis. Range/pasture improvement was, hence, identified as one of the project activities aimed at increasing livestock productivity and household incomes. However, due to resource constraints work was limited to awareness seminars, one demonstration site and four on-farm pasture improvement sites.

4.2 Range management activities

4.2.1 Range and pasture improvement

4.2.2.1 Demonstration Site

A demonstration plot was established at Kazo Senior Secondary School in 1996 comprising of several forage legumes in order to test their adaptability and also to act as a demonstration plot where by all pastoralists were able to see for themselves the value of these legumes especially in the dry seasons when they remained green and productive. The following legumes were adopted to the field conditions at Kazo Secondary School.

	Common name	Scientific name	
1.	Siratro	-	*Macroptilium atropurpureum*
2.	Centro	-	*Centrosema pubescens*
3.	Cassia	-	*Cassia rutondifolia*
4.	Lablab	-	*Lablab purpurens*
5.	Green leaf desmodium	-	*Desmodium intortum*
6.	Stylo	-	*Stylosanthes guianensis*
7.	Silver leaf D	-	*Desmodium uncinatum*
8.	Gliricidia	-	*Gliricidia sepium* (multipurpose tree)

Several pastoralists, students and policy makers visited the site several times and the plot still exists and has made significant impact on the way many

pastoralists have adopted these legumes on their farms. The plot has also been used as a teaching field plot in agriculture lessons at Kazo Senior Secondary School and elsewhere in the County.

4.2.2.2 On-farm range improvement trials

The on-farm pasture improvement trials on selected farms were initiated as a complementary mode of research to bridge the gap between controlled on-station/laboratory work and the successful adoption of true improvements in livestock production.

Figure 4. One of the on-farm pasture improvement trials in Kazo County, Mbarara District.

The ultimate goal was to improve the livelihood of the pastoralists through improved animal production. Improving the productivity of livestock would help increase their incomes and hence their livelihoods. The target of these on-farm pasture improvement trials was to demonstrate to the pastoralists that livestock productivity will be improved by improving the nutritional quality of the natural pastures by planting grass/legume mixtures and introduction of improved fodder species like *lablab* and multipurpose trees like *gliricidia.*

Participating farmers

Following the baseline survey conducted in 1996, two project sites were established in Burunga and Rwemikoma sub-counties. From each site, two farmers were selected based on the availability of essential resources and their willingness to participate in the project action research. The results from the selected farms would then be disseminated to other stakeholders through farm visits and seminars. A deliberate decision was made to involve women in trials. The selected farmers were:-

Burunga sub-county	1. Mr. Benon Kyambu
	2. Ms. Robinah Kamugisha
Rwemikoma sub-county	3. Mr. John Katsigazi (Kijuma)
	4. Ms. Jovia Kamaruka (Rwemikoma)

Farmers' contribution

The participating farmers were required to provide the following:

a) At least 1 acre (0.5ha) of land, however, all the farmers provided more than 2 acres (1 ha) of land on which the trials were established.

b) Labour for all the activities of pasture improvement i.e. fencing, bush clearing, digging and planting the pastures etc.

c) Both the man and wife were involved in the training and conducting the activities of the project

DHP contribution

The project provided the farmers with the following inputs:

a) Fencing materials i.e. poles, barbed wire and nails;

b) Legume pasture seeds for over-sowing into the natural pastures and these included:

- Siratro (*Macroptilium atropupureum*)
- Centro (*Centrosema pubescens*)
- Desmodium (a mixture of green leaf (*Desmodium intortum*) and silver leaf (*D. uncinatum*)
- Stylo (*Stylosanthes guianensis*). This was established on two farms only i.e. Mr. Kyambu and Ms. Jovia Kamaruka because the seed available at that time was not enough to cover all the trial plots and the conditions on these two farms were most suitable for stylo growth.

c) Fodder legume species

- Lablab (*Lablab pupureus*), which was planted in a separate garden to be harvested for supplementation of the animals
- Gliricidia (*Gliricidia sepium*), which was planted as hedgerow around the homesteads and as boundary planting separating the paddocks. Gliricidia is a multipurpose tree, which will be continuously, pruned for fodder production, act as windbreak, improve soil fertility etc.

d) For farmers who were hard up with money to carry out the activities on time, the project would supplement them with some funds. But this was done on only one farm where the lady was a widow and she accidentally broke her leg while working on the farm. Therefore the project had to assist to enable her continue with the project work while recovering from the accident.

e) Training of the farmers in pasture improvement techniques and sensitising them about the importance of having improved pastures on their farms.

f) Training of farmers in seed multiplication and production.

4.2.3 Pasture improvement technology introduced on the farms

The technique of over-sowing by strip planting pasture legumes into the existing natural pastures was adopted. The advantage of over-sowing is that less seed is needed, reduced cost of land preparation, and reduced danger of soil erosion and quick method of establishing pastures. The farmer does not

have to wait for a long time to start grazing the pastures. The following steps were taken:

a) **Fencing:** The area to be over-sown was first fenced to exclude animals and to allow the farmer easy management of the established pastures. The materials used for fencing were dry poles and barbed wire, which were provided by the project.

b) **Bush control:** Dense bushes and unwanted tree/shrub species were cut down and uprooted were possible. This was done physically on each farm and no chemical means were applied. The tall grasses were also first slashed to reduce as much foliage as possible to avoid shading of the growing legumes from light.

c) **Over-sowing:** This was achieved by digging (hand hoe) strips (about 1ft wide) across the paddock (Figure 4). No fertilisers were applied, since they are not available in the project area and also bearing in mind that it would not be sustainable. The pastures/legumes were left to establish under natural conditions. The legumes were then later planted in ridges made in lines in the well-dug strips. The legumes were planted at a seed rate of 3 kg/ha recommended for over-sowing in Uganda.

d) **Management of pastures after sowing:** Two weeks after sowing, the legume seeds had germinated and two weeks later, weeds were removed by hand to allow the legumes grow fast and compete with the already established grasses. After two months, the grasses had grown high and the farmers were advised to slash them down (topping) to reduce on the intra-specific competition with the legumes. Light grazing of the pastures 4 months after sowing was done for 4 times at fortnight intervals.

Figure 5. A pasture agronomist demonstrates oversowing of legumes into natural pastures

4.2.4 Development of the established pastures

a) **Germination and establishment of the legumes:** The germination of the legumes in all the farms was fairly good despite the prolonged dry weather with scanty rainfall that was experienced immediately after planting. On all the farms, Siratro was the best in germination followed by Desmodium and while Centrocema had poor germination and was slow in establishment. On Mr. Kastigazi's farm, Controcema germinated very poorly and the little that managed to germinate failed to establish as the dry conditions continued. The performance of stylo was good on both farms where it was planted (Mr. Kyambu and Ms. Jovia Kamaruka). The reasons for poor establishment of Controcema on all the farms as compared to the other legumes especially on

Mr. Katsigazi's farm are being investigated. It was suspected to be a soil nutrient problem and soil samples have been collected and submitted to Makerere University soil science laboratory for analysis.

All farms were given Lablab seed to plant as a separate plot in pure stand around the homestead but only one farmer (Ms. Jovia Kamaruka) planted the seed and the performance is very good (Figure 5). The farmer has so far collected seed from the original garden and has used the seed to expand her garden. She has started feeding the leaves to young calves and selected few milking animals. On Mr. Kyambu's farm, Lablab was planted but was destroyed by wild birds and chicken. On the other two farms, planting of lablab was postponed to the coming rains.

Figure 6. A well-established plot of lablab in a pure stand

All the farms planted Gliricidia cuttings as boundary hedge rows but the sprouted shoots could not withstand the dry conditions. However, the few trees that survived the drought are performing very well and farmers will be provided with fresh cuttings to replant next season.

b) Persistence and sward characteristics: Field observations of the trial plots have shown that Siratro and Desmodium are the best legumes to be oversown with natural pastures in the study area. For centro, it needs to be fully investigated before its promotion within the pastoral communities of Kazo.

Visual observations indicate that fencing and introducing legumes into the natural pastures in Kazo improved the quantity of forage feed available to the animals. When compared to the control grazing area which is not fenced, the amount of biomass is much more in the trial plots. It is also anticipated that with the legume component in the pastures, their nutritive value should be much better than in the control grazing areas (Table 6). The legumes have started spreading and mixing with the grasses and therefore, the pastures are still being light grazed at biweekly intervals. After full establishment, the pastures were assessed for DM and nutritive value and results are indicated in table 6.

The performance of lablab on Ms.Jovia Kamaruka farm indicates that it's a potential fodder for extension to other farmers both in terms of fodder DM and seed production. Ms J. Kamaruka has been very successful in producing lablab seed and selling the seeds to DHP project and other farmers. The same observations hold true for Gliricidia trees that survived the drought at the establishment phase. This fodder tree could be introduced in the area as a multipurpose tree (MPT) for fodder.

Table 11. Effect of over-sowing on DM yield and CP content on experimental farms in Kazo County, Mbarara District.

Farmer	Plot	Mean DM ($kgha^{-1}$)	Mean % CP	Mean CP yield ($kg\ ha^{-1}$)
Jovia	Improved	4963	7.71	382
	Unimproved	2803	6.97	195
Katsigazi	Improved	4302	8.37	360

	Unimproved	1916	7.63	146
Kyambu	Improved	3202	8.53	273
	Unimproved	1032	8.21	85
Robinah	Improved	3744	9.49	355
	Unimproved	1911	8.59	164

CHAPTER FIVE

THE IMPACT OF BUSH ENCROACHMENT ON LIVESTOCK PRODUCTION

S. K. Mugasi, E. N. Sabiiti and B. Tayebwa

5.1 Introduction

Bush invasion is generally regarded to be part of the process of desertification since the increase in the extent and density of woody vegetation occurs at the expense of other desirable grasses and shrubs resulting in an alarming reduction in productivity. In some areas, emergence of woody vegetation coupled with overgrazing has led to disappearance of undergrowth resulting into severe soil erosion. This problem is not in Uganda only. One exploratory study carried out in Australia placed the potential loss in the wool industry resulting from bush invasion at $ 40 million per annum (Burgess, 1988). In Namibia, it is estimated that an area of between eight and ten million hectares is severely invaded by bush leading to loss of millions of dollars in the livestock sectors per annum (MET, 2002).

In the baseline survey conducted by DHP, bush encroachment was mentioned as the most serious livestock. Although the economic cost of bush encroachment has not been fully estimated in Uganda, it is generally accepted that the decline in the carrying capacity of our rangelands could be more than 50% with a concomitant loss in income of several hundred million shillings per annum. Mugasi (1999), in a study carried out in Kazo County, Mbarara District, found out that bush encroachment led to reduction in reproductive efficiency of cattle, low milk yield, low weigh gain and high calf mortality rate. The effect of bush encroachment on livestock productivity is explained by the low nutritional value of poor pastures. The study also revealed that farmers attempting to control bush encroachment using farm income do not break even due to high labour costs, low prices of livestock products and the quick recurrence of the shrubs. In some cases, livestock productivity does not improve following bush clearing and this is because high stocking rates, low nutritional value of natural pastures and poor breeds.

In attempt to control bushes, farmers have resorted to indiscriminate clearing of trees using fires and mechanical methods. This is further increasing the vulnerability of rangelands to degradation and loss of bio-

diversity. Some farmers have failed to cope with the invading bush and are selling their land with the hope of finding better land in other parts of the country. It is also worth noting that bush invasion drastically reduces the capital value of land hence farmers are selling at give away prices. As a result, farmers fail to replace the land they have sold leading to landlessness.

The fact that bush invasion is putting to risk the livelihoods of millions of pastoralists inhabiting the rangelands and that the problem needs urgent attention. The problem not only threatens the livelihoods of pastoralists and agro-pastoralists, but also the supply of the badly needed protein in beef and milk at national level. Possible measures to reverse or at least check the invasion rate include controlled stocking rates, artificial re-seeding of bare patched with improved pastures, integration of forage legumes into natural pastures, and planting of multipurpose leguminous trees (for nitrogen fixation, fodder for cattle and wood fuel).

The next section explains the methodology and findings of the study carried out in Kazo in 1997/98 on the economic impact of bush encroachment on pastoral rangeland productivity. This study is one of the DHP outputs.

5.2 Research Methodology

5.2.1 Sample Selection

The research involved sixty pastoral households purposively selected from the two sub-counties of Kazo and Rwemikoma. These were divided into two categories of range condition.

i) Thirty households with more than 75% of the grazing land cleared of bush

ii) Thirty households with less than 25% of the grazing land cleared.

5.2.2 Types and Methods of Data Collection

Different types of data were collected from the 60 pastoral households surveyed. Data collected ranged from existing and documented information to data collected from field. Field data collected includes both range and farm productivity. A rapid rural appraisal followed by a comprehensive baseline survey was also conducted in Kazo in 1996 to identify constraints faced by pastoralists in rangeland utilisation. This study was, therefore, a follow up of the baseline survey.

Primary data was collected from the field with the help of questionnaires, field measurements and observations. This included socio-demographic data, farm production, farm income and expenditure, and

herbage quality and quantity. A questionnaire was developed and pre-tested in the area where the research was to be conducted. After pre-testing the questionnaire, unnecessary questions were eliminated and the omitted ones were included. The questionnaire was used to collect socio-demographic and farm production data. The questionnaire was administered by interview method. Interviews were conducted in the selected households in the two sub counties using questionnaires. The interviews were conducted by direct translation of questions into the local language. Most of the responses made by farmers were done by recall method since very few of them keep records.

5.2.3 Measurement of Herbage Yield

Herbage yield was taken to be the main determinant of livestock productivity, while other factor like disease and environmental factors were assumed to be fairly uniform across pastoral households. Five sample areas each $4m^2$, were randomly selected on each farm and the herbage enclosed was harvested to ground level using a slushier. The sample area harvested on each farm was in agreement with Mannetje (1978) who suggested that a sample area of 0.5% or less was adequate for measuring herbage quantity in grasslands. Fresh weight measurements of the cut pasture were taken and recorded in the field using a pocket balance. The samples were then oven dried for 48 hrs at 65^oC to obtain dry matter (DM) weight per hectare and botanical composition.

5.2.4 Chemical Analysis of the Pasture

Chemical analysis was also carried out to determine crude protein (CP) content and neutral detergent fibre (NDF) as measures of pasture quality. Crude Protein was determined using the standard procedure of the micro-Kjeldah* method (AOAC, 1990), NDF was determined using the procedure described by Goering and Van Soest (1970).

5.2.5 Body Condition Scoring

It is useful to quantify the extent to which cattle are affected by nutrition, disease or other environmental factors, especially when large fluctuations in the quantity and quality of available forage occur, as they do in seasonally dry tropical and subtropical areas (Nicholson and Butterworth, 1986). Measuring changes in weight or heart girth usually does such monitoring, but these techniques have a number of disadvantages. First, weighing scales are cumbersome, expensive and difficult to transport. Second, weight *per se*

does not reflect animals' condition and animal with a large frame may have a higher body weight when at low level of body reserves than another animal with a smaller frame but abundant reserves; animals must therefore be individually identified to record seasonal weight change.

For those involved in cattle research in Africa, condition scaring provides a quick, cheap, and easy method of comparing herds of cattle or individual animals under differing management systems, experimental treatments, seasons or environments (Nicholson and Butterworth, 1986). Large number of animals can be scored at a time without need to handle them or use a weigh scale.

The method used in this study was the one recommended for *Bos indicus* cows. It consisted of nine scores with three main conditions - fat (F), medium (M), and lean (L). These three conditions were subdivided into three categories and were abbreviated as; F+, F, F-; M+, M, M-; L+, L, and L-. Each scoring was given a number from 1 (L-) to 9(F+). A 5% sample of the herd was randomly selected from each farm and scored.

5.3 Data Analysis

Statistical analysis was undertaken. The analysis was mainly based on comparison of the two types of range condition using difference of means, percentages, gross margins and financial efficiency.

5.4 Results and Discussion

5.4.1 Land Tenure

Land is increasingly becoming a very important resource among the pastoral communities in Mbarara District. With progressive individualisation of common grazing land rights in Mbarara District as reported by Kisamba-Mugerwa (1995), communal land holding is phasing out in Kazo. Pastoralists have acquired land and settled on their farms as opposed to the traditional nomadism. There were more leaseholds on cleared compared to bushy farms. Twenty three percent of cleared farms had leases compared to only 6.7% of bushy farms. Seventy seven percent of the cleared farms surveyed had freehold tenure compared to 93.4% of the bushy farms (Table 12). This could be attributed to two main reasons. Firstly, owners of cleared farms were relatively more educated and hence more enlightened than those of bushy farms. This enabled them to realise the need to have land titles. Secondly, the cleared farms are more improved and hence have higher capital value. This creates a need for farmers to have land titles to protect their farms.

Table 12. Land Tenure and Ownership in Kazo County in 1998

Tenure	Cleared Farms	Bushy Farms
Freehold (%)	76.7	93.4
Leased (%)	23.3	6.6
Ownership		
Communal (%)	0	1.7
Private (%)	100	98.3

SOURCE: Survey Data

Individualisation of land in Kazo has enabled pastoralists to settle and establish permanent homes. They have also been able to fence off their land to improve their pasture. Fencing has helped to control cattle diseases, particularly Foot and Mouth Disease and Contagious Bovine Pleural Pneumonia, that were rampant in the area. However, about 10% of the pastoralists still had a negative attitude towards individualisation and fencing of land. Their contention was that fencing limits free movement of cattle and also denies access of cattle to communal water reservoirs that have for long been the sole source of water. This attitude cannot simply be dismissed because privatisation of land greatly reduced grazing area for most pastoralists since land was not equally divided.

This was also reported by Peters (1994) who noted that the sine qua non of dryland cattle-keeping in Africa has been mobility. She argues that privatisation reduces land area and eliminates the mobility and flexibility in grazing that is crucial in the management of climatic risk. Restriction of herds to individual land holdings has led to reduced availability of pasture and water resources in the dry season because the practice of freely moving cattle in the rangeland to where these resources are available is no longer permissible. Reduction of herd sizes, through deliberate culling or high mortality resulting from starvation and diseases, has been an inevitable outcome of this situation. This problem was more pronounced on bushy farms where more than 75% of the grazing land is covered by shrubs, limiting the grazing capacity of the land. With cleared farms, where more grazing was available, the problem was not felt. This scenario, which was also reported by Sserunkuuma (1998) in Nyabushozi, is likely to have serious implications on low-income pastoral households that are unable to clear their farms to improve on availability of pasture.

Following privatisation of land holdings, pastoralists' acquired different sizes of land. Land that was originally communally owned and used as common property in Kazo, has been transformed into private property.

Table 13 shows that 40% of the pastoralists had more than 100 ha of land; 26.7% of which were grazing on cleared farms while 13.3% were grazing on bushy farms.

Table 13. Size of Land Holding By Range Condition in Kazo County in 1998

Land size (ha)	Cleared Farms	Bushy Farms	Total (%)
< 10(%)	1.7	0.0	1.7
10-50 (%)	8.3	20.0	28.3
50-100 (%)	13.3	16.7	30.0
> 100 (%)	26.7	13.3	40.0
Total	50	50	100

SOURCE: Survey Data

5.4.2 Herd Size

The herd size in the surveyed area ranged from less than 10 to 400 heads of cattle. The mean herd size was 80 heads of cattle in respect of the entire sample studied. In fact, 48.3% of all the surveyed households had 11-50; 26.7% had 50-100; while only 20% had more than 100 heads of cattle.

There was a relationship between herd size and range condition. Table 14 shows that all the farmers with more than 150 heads of cattle had cleared farms. As herd size increased there was a relatively more tendency to have cleared farms. This was explained by the fact that the larger the herd the higher the income base hence enabling the farmer to improve the farm.

Table 14. Number of Cattle Per Household by Range Condition in Kazo County 1998

No. of Cattle	Cleared Farms	Bushy Farms	Total (%)
< 10 (%)	1.7	3.3	5.0
11-50 (%)	18.3	30.0	48.3
51-100 (%)	13.3	13.3	26.6
101-150 (%)	6.7	3.4	10.0
> 150 (%)	10	0	10.0

SOURCE: Survey Data

An important observation was that farmers sold pregnant cows because they fetch higher prices. Data obtained from the main Kampala abattoir indicated that for the months of September 1997 to March 1998, an average of 41% of the slaughtered cows from Mbarara district, were pregnant. This trend has far reaching implications on the pastoral economy in that it is likely to retard herd replacement.

Overgrazing is not an uncommon observation in the rangelands of Uganda. Conventional wisdom now equates pastoralism with overgrazing, though there are differences in opinion as to its underlying causes (Homewood and Rogers, 1988). Several factors can be used to explain overgrazing in Kazo, but probably the most plausible was the fact that some pastoralists have deliberately refused to adjust their herds to the sizes of the now privately owned land. This is because herd size is an insurance against high mortality rates and low reproductive rates. Furthermore, over dependence on cattle for survival requires that pastoralist keep large herds, which act as a store of wealth. The former practice of communal grazing would allow them to increase their herds without limit because more grazing land was available and cattle mobility was not restricted.

Shrub encroachment has also contributed to overgrazing in Kazo. This is a particularly so on bushy farm where shrubs have covered over 75% of the grazing land and led to reduction of the carrying capacity of land since palatable grass species have been replaced by undesirable shrubs. Given that pastoralists persistently keep large herds despite the poor condition of the pasture, high grazing pressure is exerted on the cleared portions leading to overgrazing and degradation of the rangeland.

5.4.3 Land Utilisation

Land utilisation in Kazo is undergoing a gradual transformation. In the traditional pastoral set up, land was used primarily for cattle keeping and milk and meat constituted the staple food. Food items would only be obtained by exchanging them with livestock products particularly milk and ghee. There has, however, been a gradual transformation of the pastoral economy into an agro-pastoral economy. Land is now used for both livestock rearing and crop production. About 45% of the households were agro-pastoral while 55% were purely pastoral mainly dependant on livestock for survival. Both permanent crops and seasonal crops are grown in Kazo. The major permanent crops grown are banana and coffee while annual crops include beans, maize, cassava and millet.

Table 15 indicates that there was relatively more acreage under both permanent and seasonal crops on cleared farms than on bushy ones. The average acreage under permanent crops on cleared farms was 0.62 hectares compared to 0.49 hectares on bushy farms. On the other hand, acreage under seasonal crops was 0.26 hectares on cleared farms compared to 0.18

hectares on bushy farms. More acreage or cleared farms could be attributed to the fact these farms are improved and commercial oriented. Moreover, they sell some of the crops grown especially bananas and maize, to earn extra income to supplement livestock products.

Table 15. Average Acreage Under Crops in Kazo County in 1998

Land (ha)	Cleared	Bush
Permanent crops (ha)	0.62	0.49
Seasonal crops (ha)	0.26	0.18

SOURCE: Survey Data

Cultivation as a household activity is becoming fully incorporated into the pastoral economy due to a number of reasons. Firstly, the emergence of milk collecting centres in remote areas has brought the market for milk near to the farmers. Five private milk processors have come up in Mbarara town, about 110 km away. With the emerging milk processors, farmers now sell most of the milk, which was traditionally the staple food. The farmers now grow crops to provide an alternative source of food. Secondly, herd size per household is dwindling. Because households hardly survive only on cattle and they have to grow crops to supplement the dwindling livestock products.

5.4.4 Sources of Income

The main sources of income identified were livestock and livestock products, salary, business, crops, and donations, as shown in Table 16. Fifty five percent of the households entirely depended on livestock and livestock products as their main source of income. Milk and beef were the major livestock products sold by farmers. It was observed that 45% the households surveyed did not sale their milk, notably for two reasons. Firstly, some of these households do not have surplus for sale and, secondly, others have alternative sources of income and prefer to leave the milk for calves and for domestic consumption.

Table 16: Main Source of Income By Range Conditions in Kazo County In 1998

Source of income	Cleared farms %	Bushy farms %	Total %
Livestock	15	40	55
Salary	25	3.3	18.3
Business	11.7	5	16.7
Donations	5	1.7	6.7
Crops	3.3	0	3.3
Total	50	50	100

SOURCE: Survey Data

There was also a close relationship between source of income and range condition. Households with sources of income other than livestock had relatively better incomes and were hence able to improve their pastures by clearing bushes. Fifty five percent of the pastoralists depended on livestock as their source of income, 40% of whom were grazing on bushy farms while only 15% grazed on cleared farms. Out of the 30 cleared farms surveyed, 70% were owned by individuals who either engaged in business or salary earners, those receiving donations, and those able to produce crops for sale. On the other hand, individuals depending on livestock as their main source of income owned only 30%. It was also observed that out of the 30 households grazing on bushy farms 80% of them depended on livestock as source of income.

The implication of this finding is that livestock as a source of income may not be sufficient to facilitate improvement of farmers' income in the area. This is mainly because livestock products have low farm gate prices while farm inputs especially cattle drugs and labour are very expensive. The problem was aggravated by the fact that government as a measure to check spread of diseases, especially CBPP, indefinitely closed cattle markets. Farmers have improvised temporary cattle loading sites called *Ebipakiriro* at specific locations where traders buy cattle. The local authorities recognise these sites and only cattle from specific localities are allowed in to control diseases. However, traders were few because of poor roads and this had an effect of keeping cattle prices very low.

Basing on the findings of this study, the socio-demographic set up of the pastoral communities is undergoing a gradual transformation. The major areas affected by this transformation are; attitude towards education, land tenure, land utilisation, herd sizes, and source of income. The effects and implications of each of these aspects greatly vary. Following changes in land tenure, the most challenging transformation in the pastoral economy is perhaps the need to find the means of optimally utilising the available land

so as to sustain their herds and families. Pastoralists have not yet fully adjusted to this requirement as they continue to believe in numbers as an insurance against high mortality rates. This is likely to put the pastoralists in a cycle of high stocking rates, degradation of the range, low animal productivity, low household incomes, and hence inability to improve their pastures.

5.4.5 Herbage Dry Matter Yield

Herbage dry matter yield is an important factor in livestock production and is a reflection of the range condition. On cleared farms, dry matter (DM) yield ranged between 1,850 kg/ha and 2,230 kg/ha, while on bushy farms herbage yield ranged from 622 kg/ha to 1,190 kg/ha (Table 17). The highest dry matter yield of 2,230 kg/ha on cleared farms was lower than that reported by Sserunkuuma (1998), in the pastoral rangelands of Nyabushozi county, also in Mbarara district. This could be attributed to the fact that Nyabushozi is more advanced in pasture management, than Kazo. The highest DM yield in Uganda is about 5,328 kg/ha as reported by Mugerwa (1992) in central Uganda. This is mainly attributed to higher annual rainfall in the central region which goes up to 1800 mm compared to Kazo with 1200 mm, and the difference in vegetation of the two agro-ecological zones. Kazo County consists mainly of *Hyparrhenia* vegetation while the central region consists of *Penniselum purpureum*.

Table 17: Mean Herbage Dry Matter Yield and Chemical Composition of Pasture on Two Types of Range Condition in Kazo in 1998

Yield	Cleared farms	Bushy farms
Dry Matter (kg/ha)	2,040	906
Crude Protein (kg/ha)	182	86
Crude Protein (%)	9.15	8.92
Neutral Detergent Fibre (NDF)	62.50	63.00
Dry Matter (%)	27.49	30.13
Legume Component (%)	7.35	2.27

SOURCE: Survey Data

While the amount of rainfall and grazing pressure in the previous season influence herbage production and availability respectively (Bekure *et.al.*, 1991), shrub encroachment is another important factor that is likely to affect both production and availability of herbage. This is supported by the

findings of Sabiiti and Wein (1991) who observed that shrubs reduce the graze land and suppress palatable grass.

Shrubs in pastures, like other weeds in crops, out-compete the growing palatable pasture and keep its development in check. Shrubs are equally heavy users of water and minerals, both so essential to the proper development of the grass crop. Naturally, cattle tend to exert more grazing pressure on the palatable pasture species while shrubs grow undisturbed. This selective grazing by cattle, coupled with competition for water and minerals by the weeds, suppresses pasture growth and hence leads to reduced herbage dry matter yield.

5.4.6 Chemical Analysis

Chemical analysis was carried out to determine the Crude Protein (CP) level and Natural Detergent Fibre (NDF) of the pasture. The level of crude protein of the pasture in both range conditions was not significantly different and slightly lower than the level required for moderate levels of ruminant production, 11-12% CP (ARC, 1980). But it was higher than the limiting level (6-8%), below which appetite is depressed and pasture intake is less than might be expected (Minson, 1982; Forbes, 1986). On the other hand, average CP yield was 182 kg/ha on cleared farms compared to 86 kg/ha on bushy farms.

The observed difference in CP yield in the two range categories could be attributed to the level of pasture management. CP yield was higher on cleared farms most probably because of two main reasons; firstly, because of the relatively higher herbage DM yield on cleared farms since CP was estimated as factor of DM yield/ha, and, secondly, because of the higher legume component compared to bushy farms. The legume component on cleared farms was 7.35% on average compared to only 2.27% on bushy farms. The dominant legumes on the farms were *Glycine wighttii* and *Desmodium uncinatum*. The low legume component could be attributed to high grazing pressure and severe competition by the encroaching shrubs.

Neutral Detergent Fibre, which refers to the crude fibre content of the pasture, was also determined. Results indicated that though NDF was high in pasture under both types of farms, it was slightly higher on bushy 63% compared to 62% on cleared farms. This high crude fibre level is common in tropical pastures and is attributed to high temperatures, which lead to lignification.

5.5 Cattle Productivity in Relation to Range Condition

The productivity parameters analysed and discussed in this section are, milk yield, body condition, calf weaning age, calf mortality, and age at first calving in heifers grazing under the two types of range condition.

These parameters are economically important because they affect both the reproductive capacity of the herd, and the farm output (milk and meat). Any factor that affects the rate of herd growth and cattle productivity directly affects the income of the pastoralists.

5.5.1 Body Condition

The body condition is a reflection of the nutritional status of the cattle, which in turn reflects the quality and quantity of the pasture. Cattle that grazed on cleared farms had a higher average body score of 5.8 than those grazing on bushy farms with an average body score of 4.2, as indicated by results in Table 17. The difference in body condition was highly significant ($P<0.001$). Reed *et al.* (1974) reported a highly positive correlation between condition and resource availability (finance, management skill and grazing availability), including that condition scoring is useful not only for researchers but also for farmers and development planners.

The major limiting factor of livestock production in the tropics is insufficient availability of herbage. In most rangelands, herbage availability is low and greatly fluctuates with season. The difference in body condition observed could be partly explained by the quantity of herbage available under the two types of range condition. Most studies conducted in this area related body condition or weight gain to DM intake and Dry Matter Digestibility (DMD). Basing on the results of NDF and crude protein analysis of the two types of range conditions given in Table 17, it was fairly assumed that the DMD of the two types of pasture did not differ much. Furthermore, Otim (1973) also noted that pasture abundance or DM yield was one of the factors affecting voluntary intake.

As a conclusion, therefore, the difference in body condition in the two types of range condition was attributed to difference in dry matter availability. Cattle that grazed on cleared farms had a higher average body condition score partly because these farms had higher DM herbage yield than the bushy farms.

Economically, cattle of better body score fetch relatively higher prices than those of poor body condition. On average, a cow of a body condition score of 5.5 and above could go for Shs. 350,000 and one with a score of less 4.0, for Shs. 200,000. Farmers grazing on cleared farms are, therefore, likely to have better income from sale of beef cattle than those grazing on bushy farms. Good body condition is also important for other aspects like reproductive efficiency and milk yield in cattle. These findings suggest that

farmers that grazed on bushy farms, therefore, made economic losses in terms of poor reproductive performance and poor milk yield as a result of poor nutrition.

5.5.2 Milk Yield

Results indicated that milk yield/cow/day was greatly dependent on management status of the pasture. Milk yields were significantly different ($p<0.05$) between cleared and bushy farms. The average milk yield on bushy farms was 2.4 litres/cow/day, compared to 3.8 litres/cow/day on cleared farms, which closely compares with 3.5 litres/cow/day for Ankole cattle in Uganda as reported by Sacker and Trail (1966).

The highest milk yield obtained on cleared farms was 8.3 litres/day/cow, while the lowest was 2.0 litres/day/cow. On the other hand, the highest yield on bushy farms was 4.2 litres/cow/day, while the lowest was 1.00 litre/day/cow. The average milk yield/cow/day on all the farms was generally low compared to the yield potential of the Ankole cow of 8 litres/cow/day. This was attributed to the state of the range, which was generally poor. The crude protein levels of 9.15% and 8.92% in the cleared and bushy farms, respectively, were lower than the level required for moderate levels of ruminant production. This means that though the local Ankole breed is poor in milk yield, its actual potential for milk production is limited by the nature of the pasture. Besides forage availability and the breed factor, climatic stress resulting from high temperatures, humidity and low rainfall also limit milk production in tropical regions as observed by Payne (1970).

5.5.3 Calf Weaning Age

In the pastoral herding system, calf weaning largely depends on calving interval and the length of lactation period. Unlike in modern dairy systems where weaning is a management practice done by the farmer, in the pastoral set up calves suckle until their mothers reject them. Out of the 60 farms surveyed, 83.3% gave an average weaning age of less than 12 months, while 16.7% gave an average weaning age of 15 months.

Apparently, there seemed to be no variation in weaning age in the two range conditions. In both cleared and bushy farms 80% showed a weaning age of less than 12 months, while only 20% showed a weaning age of 15 months. It was also observed that in most of the farms surveyed, calves grazed with their mothers during the day and were separated from the herd at night to allow milking in the morning. Milking was done with calves at foot. It is important to note, however, that suckling plays a major role in governing reproductive cycles in female mammals (Williams, 1990). Prolonged suckling (delayed weaning) leads to delayed ovulation and hence

extend the calving interval in lactating cattle. This is supported by the findings of Moya (1997) who observed that suppression of cyclic ovarian activity during the postpartum period is a characteristic of the suckled *Bos indicus* cow. This suggests that local cows could have shorter calving intervals if pastoralists weaned their calves earlier.

5.5.4 Reproductive Performance

Reproductive performance of cattle was determined using age at first calving in heifers, calving rate and calf mortality. Results in Table 18 indicated that age at first calving varied with range condition. Results indicated that heifers grazing on cleared farms reached puberty earlier and hence calved relatively earlier than heifers grazing on bushy farms. Puberty is the stage of physiological maturation at which natural procreation can first occur. Forty percent of heifers grazing cleared farms calved at less than one old while only 1% of those grazing bushy farms calved at that age. Forty percent of heifers grazing bushy farms calved at more than three years old while none of those grazing cleared farms calved at that age.

Table 18: Age at First Calving in Heifers Grazing on Two Types of Range Conditions in Kazo County in 1998

Age (Months)	Cleared farms	Bushy farms
Less than 2 years (%)	40	1
2-3 years (%)	60	59
More than 3 years (%)	-	40
Total (%)	100	100

SOURCE: Survey Data

Delayed puberty and pregnancy losses, coupled with continuous sale of pregnant cows are two major problems facing pastoralists. The combined effect of these occurrences is the gradual dwindling of herds, a situation that is likely to threaten the survival of pastoralists. Basing on this study, it can be fairly concluded that the nutritional status of the cattle influences their reproductive efficiency. Farmers grazing on bushy farms were most likely making losses in terms of low calving rates and hence inadequate herd replacement.

In the study, calving rate was taken to be the total numbers of calves born as a proportion of the total number of animals in the herd in 12 months. The mean calving rate on cleared farms was 33.6% compared to only 22.6% on bushy farms.

Cattle that grazed on cleared farms had relatively higher mean calving rates compared to those that grazed on bushy farms. The t-test indicated a significant difference ($p<0.05$) in mean calving rates between the two types of range condition. These findings suggest that poor nutritional status of cattle reduce their fertility rates. The implication of this finding is that poor nutritional status of cows can lead to low rates of herd replacement and hence low herd growth rate.

Calf mortality rate, on the other hand, was given as the total number of calves that died as a proportion of the total number of calves born in the herd in 12 months. Calf mortality in pastoral herds is of economic importance because of two main reasons. Firstly, loss of calves means loss of milk because cattle are milked with calves at foot. Secondly, loss of calves means loss of herd replacement heifers, which could lead to herd collapse.

Findings indicated a significant difference between the calf mortality rates in the two range conditions ($p<0.05$). The calf mortality rate on cleared farms was 7.2% compared to 15% on bushy farms. The better quality and more availability of pasture and milk could partly explain the difference in mortality rates to the calves on cleared farms. These calf mortality rates were, however, considerably low compared to 20-25% as recorded by Butterworth (1985) in most tropical herds. The low calf mortality rates observed in the study could, in part, be attributed to form of calf management exercised by the farmers. In most of the farms surveyed, calves were left to graze with their mothers during the day and removed from the herd at night to allow milking in the morning. Farmers have adopted this method of calf management reportedly for two reasons: it allows calves sufficient time for suckling and hence mature faster; it reduces labour requirement for calf rearing.

In conclusion, the findings of this study indicated that shrub encroachment suppressed palatable pasture and therefore reduced dry matter herbage yield on bushy farms. The crude protein yield was also low on bushy farms because the legume component was persistently kept low due to overgrazing. As result, the productivity of cattle in terms of body condition, milk yield, and reproductive performance were lower on bushy farms compared to cleared ones. It is, therefore, very important that farmers clear their farms to improve the quality and quantity of the pasture so as to increase animal performance.

5.6 Analysis of Farm Profitability

Farm profitability was determined using gross margin analysis. Gross margins were worked out for both types of range condition by finding the difference between gross income and the variable costs incurred. The major sources of income as already observed were milk sales, cattle sales and other sources like salaries and business.

5.6.1 Farm Expenditure

Farm expenditure was mainly on cattle drugs, shrub control, veterinary consultancy, labour, (herding, milking and watering), and fencing. The farmers in the two types of range condition spent differently on the five areas mentioned in Table 19.

Table 19: Average Annual Expenditure of Farms Under the Two Types of Range Condition in Kazo in 1988 (Uganda, Shs)

Item	Cleared farms	Bushy farms
Shrub Control	1,215,680	443,360
Cattle Drugs	677,040	477,520
Vet. Services	58,400	28,000
Fencing and Fence Repairs	400,560	341,440
Farm labour	621,120	263,280
Total	2,972,800	1,553,840

SOURCE: Survey Data

5.6.1.1 Bush Control

Bush control was a major challenge facing farmers. On all farms surveyed casual labour was the major form of labour used. The method used in bush control on all farms was manual uprooting using hoes and pangas. Depending on the level of shrub coverage, the cost of clearing 1 hectare ranges from 100,000 to 300,000 shillings (one US Dollar equals one thousand nine hundred Uganda shillings).

On cleared farms bush control was given top priority constituting 40.8% of total farm expenditure while it constituted only 28.5% on bushy farms. The difference in expenditure on bush control between the two range categories can be attributed to variation in farmers' incomes, level of

education and awareness. As pointed out earlier farmers with alternative sources of income were more able to clear their farms.

5.6.1.2 Fencing

Two types of fences were used, namely live *Euphorbia* and barbed wire fences. Fencing as a management practice was done by all farmers and this could be a result of individualisation of land and hence the need to demarcate personal holdings. Most of the farms surveyed had only perimeter fencing while padlocking was uncommon. Average fencing costs were Shs. 400,560 and Shs. 341,440 per annum on cleared and bushy farms, respectively. Fencing constituted 22% on bushy farms compared to 13.5% on cleared farms. These findings can be explained by the fact that most of the bushy farms were just beginning to put up fences, which involved high initial costs. On the other hand, all cleared farms already had fences hence only incurred repair and maintenance costs. Repairing of fences destroyed by bush fires in the dry seasons was a major problem reported by farmers.

5.6.1.3 Drugs and Veterinary Services

Veterinary services in this case refer to payments made to the Veterinary personnel for animal treatment. It does not include costs of drugs. The county has a resident veterinary doctor who is employed by the government as an extension worker. Despite being a government worker, farmers pay a consultancy fee for his services meant to facilitate his movements. On average, farmers spend Shs. 5,000 per visit. There are also paravets trained by the Dryland Husbandry Project to help in animal treatment on a sustainable basis. Veterinary consultancy was very low in both range categories and this was attributed to the fact that most pastoralists prefer treating their animals themselves. Most of the households surveyed had a syringe, a stock of drugs (especially antibiotics), and a spray pump. The veterinary doctor was only called for complicated cases like those requiring surgery. The most prevalent diseases reported were East Coast Fever and worm infections.

Results in Table 19 indicate that there was higher expenditure on drugs on cleared farms compared to bushy farms. Average annual expenditure on drugs on cleared farms was Shs. 677,000 compared to Shs. 477,520 on bushy farms. As a percentage of total expenditure, however, bushy farms spent 30.7% of farm income on drugs, while cleared farms spend only 22% on cattle drugs. This could be due to the fact that bushy farms had higher incidence of tick borne diseases usually associated with bushes. Bushes tend to create favourable conditions for the breeding of ticks.

5.6.1.4 Labour

Traditionally, pastoralists looked after their animals themselves. Children were the main source of labour. However, as already observed, with the advent of schools children are no longer available for labour. About 80% of the farmers relied on hired labour on farms. On average, each household had two labourers on the farm and the average monthly wage was Shs. 20,000 per worker. Labour constituted 21% and 17% farm expenditure on cleared and bushy farms, respectively. The labour referred to here was particularly that for herding, watering, milking, spraying, and transportation of milk. Cleared farms spent more on labour because they had large herd size requiring more manpower for milking, watering, and spraying.

5.7 Gross Margin Analysis

For purposes of comparative analysis, gross margins were calculated on per cow basis. This was done with the aim of standardising the margins given that different farms had different herd and land sizes. Table 20 shows the gross margins of farms under the types of range conditions.

Results in Table 20 indicate that the average gross income per cow per annum for cleared farms was higher compared to that for bushy farms. Results further revealed that the average total costs per cow were also higher on cleared than on bushy farms. The average gross margin per cow per annum on cleared farms was Shs. 7,484, much higher than Shs. 2,805 on bushy farms. This was attributed to the higher income of cleared farms resulting from higher animal production in terms of milk yield, body condition, and reproductive performance as already reported. Gross margins on bushy farms were further reduced by higher calf losses of Shs. 1,250 per cow compared to only Shs. 750 on cleared farms. Other losses that could have been responsible for lower gross margins on bushy farms, but were not included in Table 20, were those resulting from low calving rates, delayed puberty in heifers and longer calving intervals in cows grazing on the farms.

Table 20: Average Annual Gross Margin Per Cow of Farms Under Two Types of Range Condition in Kazo County in 1998 (Ushs)

Item	Cleared Farms	Bushy Farms
Income		
Milk and Cattle sales	45,393	23,351
Total Gross Income	45,393	23,351
Variable Costs		
Shrub Control	15,196	5,545
Cattle Drugs	8,463	5,969
Fencing & Fence Repairs	5,007	4,268
Veterinary Consultancy	729	348
Farm Labour	7,764	3,921
Calf losses*	750	1,125
Total Variable Costs	37,909	20,546
Gross Margins	7,484	2,805
TR/TVC Ratio	1.2	1.1

SOURCE: Mugasi, 1999

* Calf losses were estimated using the mortality rates of 7.2% and 15% for cleared and bushy farms, respectively. Each calf was estimated to cost 30,000 Shs.

However, gross margins per se may not reflect the real economic performance of the farms under the two types of range condition. It was important to consider Total Revenue (TR) in relation to Total Variable Cost (TVC) in order to establish financial efficiency of the farms under the two types of range condition. Financial efficiency was estimated using the TR/TVC ratio. The ratio shows the returns (revenue) per unit variable cost of production. The TR/TVC ratio was 1.2 on cleared farms compared to 1.1 on bushy farms. Though the gross margin per cow on cleared farms was much higher than on bushy farms, the TR/TVC ratio did not differ much. The ratio of 1.1 for bushy farms was fair enough given the low level of farm improvement, while a ratio of 1.2 for cleared farms needs to be improved given the high input in farm improvement. A ratio of about 1.5 would be desirable for cleared farms if the farmers were to improve their farms in a sustainable way.

The closeness of the ratios on the two types of farms could be attributed to several factors no ratio and margin cannot be compared. The cost of labour for clearing the bushes was very high. This was mainly because of

the nature of the vegetation in the area that consists of thick and thorny bushes dominated by *Acacia spp*. Due to the demographic set up of the area, there is severe labour shortage and as a result labourers come from distant areas and are expensive to hire. This, coupled with the fact that the bushes take only 1-2 years to regenerate, makes the cost of shrub control very high. Costs of other farm inputs, especially cattle drugs were also high because there are no competent local drug dealers and drugs have to be bought from Mbarara or Kampala, which are very far (110 km and 270 km, respectively).

Animal productivity was low due to poor condition of the pasture and animal breed. The local breed popularly known as the Long-horn Ankole cow is genetically a low milk producer, but very resilient in difficult range conditions. The improvement done on pasture minimal increase in animal production, particularly in terms of milk yield. The average milk per cow per day on cleared farms of 3.8 vis-à-vis to 2.4 litres on bushy farms was lower than the potential of 8 litres for local cows. *Bos indicus* cows partition most of the nutrients as fats under the hump and in the dewlap while few are left for milk formation (Kisamba-Mugerwa, 1992) as a survival strategy.

Furthermore, mere clearing of shrubs did not considerably improve the quality of the pastures. Even after bush clearing, the dominant pasture species consisted of over 90% of grasses, mainly *Brachaiaria nuzinziensis* and *Hyparrhenia rufa* while the legume component was less than 10%. The low level of CP and high level of NDF of pasture on the two types of farms further evidenced this. Removal of shrubs followed by over sowing with legumes would probably improve the nutritive of the value and hence animal production.

Milk and cattle prices were also very low. More than 80% of the respondents interviewed complained of very poor prices. A litre of milk goes for Shs. 200 while in Kampala it is at Shs. 800 per litre. A cow of approximately 350 kg goes for Shs. 200,000, yet the average price of a kilo of beef in Kampala is around Shs. 2,000 giving about Shs. 700,000 per cow. This sharp difference in farm gate prices and prices on the market are essentially a result of poor marketing systems. Farmers have no ability to market their product themselves, mainly because the nature of the products requires high inputs for the purchase of freezers to transport milk and beef. As a result, farmers rely on traders who act as middlemen between them and the consumers. More of the marketing margins, therefore, go to the traders. Farmers have no control over prices of their products, and this could be because of the products are perishable. Moreover, there are many producers that will increase competition and finally will lead to keeping product prices low. Furthermore, the remoteness of the area and the poor roads make it less accessible to traders, such that the few traders who

appear dictate prices. The situation was made worse by closure of all cattle markets by Government in a bid to control cattle diseases.

In general, it was revealed that cleared farms had higher incomes and gross margins than bushy farms. However, due to higher farm improvement costs the financial efficiency of cleared farms was 1.2 almost equivalent to 1.1 of bushy farms. As Aneja (1993) observed, in many counties farm economics of agricultural enterprise is not consistently applied. More often, output or gross margins are considered as profits without respect to all inputs. This is the reason why farmers remain in business even if they are not making profits. The pastoral economy, which is just undergoing gradual transformation from the traditional barter system into a monetary economy, has had little to do with profit making. Even the farmers currently trying to improve their farms by clearing bushes are not profit driven but rather are output minded. Realisation of profit making and production efficiency as key elements in farm management would go a long way to improve the pastoral economy.

5.8 Conclusion

Basing on the objectives and the findings of the study, several conclusions were drawn. The traditional pastoral economy was gradually transforming to an agro-pastoral one. This transformation was accompanied by increasing education especially among the children, land acquisition, settling into relatively permanent homes, and cultivation of crops. Results also indicated that shrub encroachment on grazing lands led to reduction in the quantity and quality of available pasture, while clearing more than doubled dry matter herbage yield and this affected animal production. Animal production was lowered in terms of milk yield, body condition and reproductive performance.

Analysis of profitability indicated that cleared farms had better gross margins than bushy farms. However, the financial efficiency (measured using TR/TVC ratio) of the cleared farms (1.2) was low and only slightly higher than that of bushy farms (1.1). This was attributed to high variable costs resulting from high costs of shrub control. Shrub encroachment on pastoral rangelands can, therefore, be said to have caused economic loss through reduced levels of animal productivity, increased mortality rates, increased farm variable costs, and reduced gross margins.

5.9 Recommendations

There is need for more research on determining the real magnitude of environmental and economic losses caused by bush encroachment

and the possible implications on the livestock sector and the national economy. The following should be addressed in tackling the bush problem: (i) Identifying shrub control methods that are economically viable and environmentally sound (ii) Increasing the quality and quantity of pasture, (iii) Increasing animal production (iv) Identifying alternative sources of income and (v) Improving the marketing system of farm products.

CHAPTER SIX

SOILS AND WATER RESOURCES MANAGEMENT IN KAZO COUNTY

S. Rwakaikara

6.1 Introduction

Uganda's soils are predominantly Ferrallitic (Ferralsols and Acrisols) of variable morphology with some Gleysols, Regosols, Luvisols, and Vertisols. Characteristically, Ferrallitic soils are old, highly weathered and leached but are deep and well drained. Invariably, they are low in nutrients and often of limited agricultural potential. However, the productivity of such soils is dependent on soil organic matter (SOM), which improves nutrient supply and physical properties (moisture relations, aeration, and root penetration).

Favourable climatic conditions (adequate rainfall and moderate temperatures) stimulate luxuriant vegetation, which often leads to erroneous conclusions that Uganda is endowed with some of the richest soils in Africa. Contrary, surveys in the 1970s indicated that only 26% of the arable land (mostly around Lake Victoria Crescent) was of high to medium potential. Furthermore, for non-volcanic soils nitrogen, phosphorus, bases and base saturations were closely linked to SOM.

Therefore, Ferrallitic soils require careful management, particularly to maintain adequate SOM. However, this is very difficult under small-scale farming where no or little external nutrient replenishment is done. Uganda has the lowest fertiliser use rated at less than 1 kg nutrients per cultivated hectare.

Soil fertility decline, though not exclusively, has been identified as one of major factors limiting agricultural productivity. For example, a survey conducted in 1992 revealed that most farmers were concerned about the deteriorating status of their soils (Table 21) except those in savannah regions where the population densities are still low. In the past, shifting cultivation permitted long fallow periods hence provided for soil fertility rejuvenation. This practice is no longer feasible as the average per capita land acreage had decreased from 0.44 ha in 1983 to 0.33 ha in 1996 (NEMA, 1996). Furthermore, there are reports of negative nutrient balances in some parts of the country particularly of N and P (Wortmann, and Kaizzi, 1998)

Table 21: Farmers' opinions on the productivity trends of their farms

Productivity Trend	Tropical Forest	Highlands	Savannah	Urban
Declining	81.4	73.7	49.0	49.0
Improving	7.8	20.2	46.0	11.0
No change	7.8	6.1	4.0	33.0
Do not know	2.0	0	1.0	7.0

SOURCE: Soil Fertility Initiative, Concept paper, 1999

Basing on the above mentioned soil fertility concerns in Uganda, it was imperative that the soils of Kazo County, Mbarara District, and study site for the Dryland Husbandry Project be investigated.

6.2 Survey results

6.2.1 Farm Management Practices

All of the farmers surveyed practice mixed farming (100%). Some of the farmers had off farm activities like business (27.3%), teaching (198.2%), and magistrate (9.1%) while 45.5% of the farmers had only farm activities. Majority of the farmers (54.5%) practised rotational grazing, stall-feeding (27.3%), rotational and range (9.1%) each in that order (Table 22).

Table 22*:* Farm management practices (n=11)

Item	%
Farm Activities carried out	
Mixed fanning	100
Management practices on farm	
Rotational grazing	54.5
Rotational farming	9.1
Range	9.1
Stall feeding	27.3
Total	100.0

Table 23: Types of pastures grown (n=11)

Pasture	%
Improved	72.7
Improved and natural	27.3
Total	

Majority of the farmers (72.7%) had improved pastures, and 27.3% of the farmers had improved and unimproved (Table 23).

Table 24: Grass and legume species grown by farmers (n=11).

Item	%
Grass species	
Tripsacum laxum (Guatemala grass)	18.2
Brachiaria spp	9.1
Chloris gayana (Rhodes grass) and *Pennisetum clandestinum* (Kikuyu grass)	45.5
Farmers who grow all species	9.1
Digtaria scaralum (Couch grass/Lumbugu)	18.2
Total	100.0

The dominant grass species on the farms surveyed were *Chloris gayana* was the most prevalent grass species occurring in approximately 46% of the farms (Table 24). Others include Guatamala and Lumbugu *(Digitaria sp)* 18.2% each and least *Bracharia* (9.1%).

On the other hand, *Caliandra sp, Desmodium sp* and *Lab lab spp* legume pastures were common in 27.3% of the farms compared to the other legumes.

Table 25: Current status of pasture productivity (n=11)

Item	%
Low	27.3
Moderate	18.2
Adequate	45.5
High	9.1
Total	100.0

Pasture productivity was rated adequate by farmers (45.5%), moderate (18.2%), low (27.3%) and only 9.1% considered it high (Table 25).

Table 26: Current soil productivity and Soil amendment practices (n=11)

Item	%
Current soil productivity	
Low	36.4
Moderate	45.5
Adequate	9.1
High	9.1
Total	100.0
Soil amendment practices	
FYM	36.4
Wash stops	9.1
None	54.5
Total	100.0

Current soil productivity was considered to be moderate by 45.5% and low 36.4% of the farms (26). Most farmers (54.5%) do not apply any soil amendment practices while 36.4% applied farmyard manure in their gardens and not in pastures. Only 9.1% of the farmers used wash stops to control erosion (Table 26).

6.3 Discussion

6.3.1 Socio-economic data

Evidently, nutrients are transferred from the soil through milk and beef that are consumed on or off the farm. Furthermore, transfers occur when farmyard manure is applied to the crop fields instead of the pasturelands. Subsequently, soil productivity is generally low and at best considered moderate.

Low to moderate soil productivity may be aggravated by the nature of soils. These soils are shallow and characterised by granite parent materials that weather slowly. The soils are also sandy and hence cannot hold plant nutrients.

The farmers described pasture productivity as adequate probably because of the low stocking rates. This coupled with rotational grazing practised by most farmers (54.6%) minimises degradation providing adequate pasture for animals. Although farmers were enthusiastic and had adopted use of improved grass and legumes pasture species, the acreage was very small and limited to the periphery of the fields.

6.4 Recommendation

The farmers should be taught pasture management skills and be advised to consider increasing the acreage of the improved pastures.

6.5 Water Management

Water scarcity is a common problem of rangelands and has been the main cause of seasonal migration of pastoralists. Although migration denies pastoralists permanent and stable homes, it is a major survival strategy for maintaining their stock under harsh conditions. In Uganda, distress migration by pastoralists in giving way to sedentary life as modernisation of agriculture takes root. However, in some parts of the country particularly Mbarara district (where DHP was operating), and Karamoja region experience prolonged drought leading to movement of cattle in search for water.

DHP Uganda targeted water management as one of the entry points for ensuring improved livelihoods for pastoralists in Kazo County. Kazo County has over 20 dams constructed by government in the 1950s, but none of them is functional due to poor servicing. Due to budgetary constraints, DHP activities in the area of water management were limited to awareness seminars and educating farmers on the methods of water harvesting and protection of watering points by fencing them off.

Two small dams were rehabilitated and fenced off to demonstrate water resource management. Most of the old dams silted and eventually dried out due indiscriminate watering methods where cattle directly drink from the dams. This was mainly because the dams were communal with nobody directly responsible for their maintenance. DHP encouraged the formation of water user committees to cover the management of communal dams.

Figure (a). A valley tank clogged with water weeds

Figure 6 (b). Valley tank rehabilitated with DHP support

CHAPTER SEVEN

GENDER ISSUES AND POLICY DIALOGUE

R. Kabyesiza

7.1 Gender and Pastoral Development

Uganda has been at the forefront in the fight for gender equality. Gender mainstreaming is currently a major requirement in the implementation of all government programmes. Cultural and traditional beliefs, however, still hamper the realisation of gender equality. Gender imbalance is a common occurrence among pastoral communities. Girls are denied education and usually married off early in exchange for material wealth in form of cattle. Girls in most families do not share on their fathers' wealth because they are seen as " temporary" members of the family. This trend has meant that women will look to men for all their needs. The main source of income to which women has exclusive access is sell of ghee. With the emergence of market for fresh milk, the husbands leaving nothing for processing of ghee sell most of it.

DHP Uganda worked closely with women in the project area to identify alternative income generating activities. Women were encouraged to from groups through which they could be trained and receive support. Regular seminars and training sessions were held in the project with women groups and the following subjects were covered.

7.1.1 *Group formation*

Group formation was encouraged as a way of pooling resources, ideas and soliciting support from government and non-governmental organisations. By the beginning of DHP in 1996, very few women organisations existed in Kazo County.

DHP worked closely with other players to promote group formation and today more than 60 women groups with different income generating activities are operating in Kazo.

7.1.2 *Identification of income generating activities*

Women were able to identify different income generating activities and by the end of the project different women were involved in the following activities;

- Ghee packing
- Zero grazing
- Tree planting
- Crafts
- Education programmes
- Commercial student hostels
- Vegetable growing

7.2 Specific women activities supported by DHP

72.1 *Zero grazing*

Zero grazing is emerging as a dairy production system in Kazo County especially near towns. The project identified ten women involved in zero grazing and helped them in a number of ways.

- Training in pasture management, shed construction and sanitation, record keeping, use of crop residues as feed, disease control and water management.
- Provision of pasture seeds

7.2.2 *Training of women as paravets*

The paravet training programme was one of the most successful activities of DHP in Uganda. A salient innovation of the program was the inclusion of women among the trainees as a one of the ways of increasing women participation in project activities.

7.3 Policy Dialogues

The Faculty of Agriculture, Makerere University in collaboration with the Faculty of Veterinary Medicine, the Ministry of Agriculture, Animal Industry and Fisheries, the National Agricultural Research Organisation and Mbarara District Local Government, led the implementation of DHP Uganda. The involvement of all these institutions in the project helped created an enabling framework for the implementation of activities. Given the multi-disciplinary nature of DHP activities, the input from all these institutions was important for the success of the project.

Uganda government launched the Plan for Modernisation of Agriculture (PMA) as a strategic poverty eradication action plan in 1996. The Ministry of Agriculture, Animal Industry and Fisheries strongly commended the effort of DHP towards the implementation of PMA.

To enhance policy dialogue, Uganda hosted the DHP Regional Workshop in 1996. Participants that attended the workshop were from Kenya, Ethiopia, Eritrea and Sudan and representatives from the Organisation for Social Science Research in Eastern Africa (OSSREA) and the Environmental Policy and Society Network (EPOS). The Ugandan participants included Central and Local Government policy makers, scientists and pastoralists.

DHP Uganda also organised a National Workshop in 1999. The workshop was well attended by Government policy makers, National scientists, Pastoralists, International scientists, and extension staff.

Figure 7. Minister of Agriculture, Animal Industry and Fisheries (centre in short sleeved attire) visits DHP on-farm demonstration sites in Kazo, Mbarara District.

CHAPTER EIGHT

ANIMAL HEALTH IN KAZO COUNTY

E. R Katunguka and S. Biryomumaisho

8.1 Introduction

The majority of the population of Kazo County is pastoralists. In fact, many of them have practised nomadism in the past. With appeal from their leaders, nomadism has been minimised. The predominant domesticated animals in Kazo County are cattle; goats, and sheep are tamed and of recent, there have been attempts to introduce pig farming.

This chapter has been developed basing on our interaction with the farming community in the training workshops. We used the interactive / participatory approach in the training. The pastoralists know many of the diseases discussed in this chapter and we build on their knowledge on several aspects of the diseases. We have also included ethnoveterinary treatment practices where applicable.

8.2 Introduction to common diseases and ethnoveterinary practices in Kazo County

In general sense, disease can be said to a deviation from normal conditions of an animal. Disease can be caused by living organisms (infectious diseases) and all of them can be spread from animal to animal. Insect vectors spread some other diseases while some other conditions are neither caused by living organisms nor spread by insect vectors.

A healthy animal in its general appearance is alert, active, well aware of its surroundings and when walking, walks easily with regular steps. Its ayes are bright with no observable discharges and ears are erect. The tail wags and it continues movements to counter flies. The hair coat is smooth and shiny.

For ease of reading this chapter, we have classified the diseases according to the causative agents (aetiology). Generally, causative agents of diseases fall into one of the following categories:

- Vector-borne diseases
- Parasites
- Microbes
- Lack of appropriate nutrition
- Toxins
- Congenital causes

8.3 Vector-Borne Diseases

8.3.1 Tick-borne diseases

East Coast Fever (*Amashuyo)*

East Coast Fever (ECF) was mentioned as the most important disease of young cattle. Many of them expressed surprise when they were told that the disease can affect adult cattle. When asked about the aetiology of ECF, some said it was caused by ticks while others contended that the disease is caused by a calf suckling too much milk.

Those who thought that the disease was tick-borne knew the tick that is associated with the disease, locally known as *encuju*, which is the Brown ear tick, also known as *Rhipicephalus appendiculatus*.

Interestingly, some argued that adult cattle couldn't suffer from this disease since they do not suckle. We concurred with the 'tick-group' and advised everyone on tick control by spraying the animals with acaricides. About the clinical signs, they mentioned inappetance, dullness, swelling of lymph nodes, diarrhea, 'smoky-eyes' that is corneal opacity in advanced cases.

Some of the participants knew the drugs used in treatment of this disease; they mentioned Clexon (Parvaquone), Butalex (Buparvaquone) and Oxytetracycline. The ethnoveterinary practice in use is a hot iron to cauterise the swollen lymph nodes, mainly the prescapular, precrural and parotid and rub the sap from *Euphoebia candelabrum (bwomi*) roots and sometimes some juice from *Solanum incarnum* fruits. Some other farmers burn snake scales and use the ashes to rub onto the incisions. Other herbal medicines include crushed leaves of *Phytolacca dodecandra* (o*muhoko*).

Anaplasmosis (*Kashanku*)

Although all participants knew about *kashanku*, describing the accompanying clinical signs, not all the participants knew for sure that this disease is tick-borne. All knew that *kashanku* causes high body temperature rise and complete cessation of feeding by the affected animal and constipation is a well-recognised feature. The faeces passed out by an animal affected with *kashanku* are pellet-like and hard in consistency. Some described an important post-mortem sign of dry ingesta in the omasum which is one of the signs seen at post mortem of cattle which have died of anaplasmosis.

We mentioned to them that the cause of the disease is tick-borne and transmitted by a tick, *Boophilus* genus. Some of the ethnovetrinary medicines include drenching animals with crushed leaves of *Senna didymobotrya* (*omugango*), *Phytolacca dodecandra* (*omuhoko*) and sweet potato vines.

Omo soap was reported to have been effective when given to affected animals as an enema. In addition, a mixture of *Solanum incunum* leaves (*entobotobo*), leaves of *Hibiscus fuscus* and leaves of *Indigofera arrecta (omushorooza*).

Babesiosis (*Omusito)*

Though the pastoralists could describe the clinical presentation of this disease, none knew that it was tick-borne. They mentioned that the affected cow is feverish, dull and passes out blood in urine were mentioned as the main features and the animal is also inappetent. They were informed that this is a tick-borne disease and the causative organism are transmitted by the variegated tick *Amblyoma variagatum*, which everyone knew and locally known as *embarabara*.

Some of the local plants used in the treatment include drenching with crushed leaves of *Maerua triphylla* (*omwoyante*) and *Tageres minuta* that are dissolved in water.

Heartwater / Cowdriosis (*Omusimagiro*)

The Runyankole name is derived from the clinical syndrome, which refers to the characteristic movements of the eyelids which occur in animals affected by this disease. The herders knew about the disease and all recognised that it was a rare disease. Additional clinical signs involve walking in circles and head pressing onto objects like trees.

We added to their knowledge about this disease. This included the host range: can be a problem in goats for which some people remembered some of their own goats, which had suffered from the condition.

Different medicinal plants like a mixture of *Cannibalis sativa* and *ebikwatsi* are pounded and added to water to make a drench. The preparations of mixed *P. dodecandrum* and *Sesbania sesban* are administered after boiling.

8.3.2 Tsetse fly transmitted diseases

Trypanosimosis (*Kipumpuru, Mpungira*)

This is transmitted by tsetse flies when they bite. The disease affects man (sleeping sickness) and his animals (*nagana*) but the strains of the parasite that affects these various species are different. Cattle, goats, sheep and pigs can be infected by these parasites. Symptoms of the disease include fever, enlargement of lymph nodes, lethargy, chronic wasting of the disease, a starry hair coat and reduction in milk production.

Control of the disease is by treatment of affected animals and man with drugs and use of acaricides to spray the animals. Acaricides like Decatix® have been shown to reduce on the prevalence of the disease in cattle in areas where it has been used.

8.4 Disease Transmissible Between Animals and Man

Some diseases can be transmitted from animals to man and vice versa. This has a basis; first by the degree of contact between animals and man. Diseases can be transmitted by direct contact or by bites (for instance rabies) or through consumption of meat and milk.

8.4.1 Bacterial diseases

Anthrax *(Kooto*)

Anthrax affects all warm blooded animals and man. It is caused by a bacterium and any infected material that contains spores of the bacterium can act as a source of infection. The bacteria enter the body of an animal through wounds, through the nose when they are inhaled and through the mouth when an animal or human being ingests them.

Symptoms: In cattle the disease takes a per acute form, most affected animals being found dead with no previous signs of illness. There are blood discharges from the nose and anus of the dead animals.

Warning - If an animal dies suddenly without previous signs of disease, anthrax should be suspected. Then such animals are not slaughtered. Burying animals 1.8 meters deep controls spread of this disease, fence off the area. The disease can be controlled by informing the area veterinarian of any sudden death of cattle and then vaccination campaigns can be organised.

Tuberculosis (*Orukororo)*

Tuberculosis is transmitted to man through contaminated milk, which has not been boiled, and from products of that milk for instance ghee. It is also transmitted through the consumption of contaminated meat if not well cooked. The bacteria can even be inhaled when an infected person closely interacts with a healthy person. Skin wounds are also a route through which the disease can reach the body of the host. It can be prevented by carefully boiling milk and no edible carcasses should be consumed unless a trained veterinarian or health inspector has examined them.

Everyone recognised that the major clinical sign of this disease is cough. Some of the herbs used are *Cissus quadrangularis* and *Strychnos* leaves. They are first boiled before they are administered. Some people use a bird known as *ekishamutuutu*, which they capture and kill, boil it and its soup drenched in the morning.

Brucellosis (*Obutorogye*)

This is a chronic disease of animals affecting the reproductive organs and causing abortion in cows especially in the late stages of pregnancy. The disease can affect man, causing undulant fever. When a cow aborts, all infected material like placenta and aborted calf should be buried. No treatment is usually given to animals.

The herders in Kazo recognise that a cow has aborted when they find blood at the vulva, see an aborted foetus, see a hanging piece of placenta or see animals straining in pain with vulval discharge. Though this disease is associated with abortions, the distinction between abortions caused by brucellosis and abortions of other causes was not clear. Animals, which abort, are drenched with boiled leaves of *Dracaena frogans* in the morning. In addition, *V. amygdalina* leaves (*oruhega*), *Cymbopogon afronardus* and salt can be used.

Leptospirosis

Man from water contaminated with urine of infected animals contracts this. The pathogens enter through the skin or mucosa of the mouth and nose. In

man, the disease is characterised by fever, headache, nausea and pain in muscles.

8.4.2 Viral diseases

Rabies (*Eiraro*)

This is a fatal disease, which affects the nervous system of all mammals including man. The virus is transmitted through saliva of the affected dogs and hyenas. This disease brought excitement, as the participants knew that the disease in dogs was related to the disease in cattle though all knew that the syndrome in the dogs is similar to that in the humans. Many could describe the symptoms in the dogs as restlessness, excitement, biting them and other objects like trees, attack people; voice of the animal changes and excessive saliva is produced. They were advised that their dogs should be taken to the veterinarians for vaccination.

Cowpox

This disease affects cattle, sheep, goats and man. In cattle, symptoms consist of pox vesicles, especially the udder. In sheep and goats, the symptoms are purulent inflammation in the mouth and sites without hair such as under the tail and inner side of the thighs. In man the vesicles can be found in the hands.

8.5 Other diseases transmitted between animals and man

Tapeworm infection *(enfaana*)

Tapeworms develop in the small intestine of man. In cattle, the young stages of the worm (larvae) are found in the muscles (meat). Consuming uncooked meat or other infected organs of cattle infects a person. The tapeworm in man may live up to ten years. The life cycle of the tapeworm begins when cattle graze pastures contaminated with human faeces containing the eggs. Larvae of the tapeworm develop in the muscles, tongue, heart, liver and other organs of cattle. Consumption of infected meat, whether raw or undercooked leads to development of adult tapeworm in the small intestine.

In man, the symptoms consist of flatulence, abdominal pain, loss of weight and presence in the faeces of segments of the tapeworm. The control of the disease is affected by treatment of infected persons, prevention of contamination of pasture and cooking meat well before consumption. When

animals are slaughtered, qualified veterinary staff or community health inspectors should first inspect them.

Ringworm

Fungi cause ringworm. It is a disease of animals and man. The disease involves the skin, nails, hair and horns. The fungus is transmitted to man from soil or infected animals. The disease affects cattle also especially calves. Sheep, goats and dogs can be affected. Control of the disease is effected through the treatment of infected animals and man, the washing of the sites of infection with soap and water and the local application of medical applications from health workers.

Education on matters of hygiene is important in all diseases and is especially so for this disease. This is particularly important as when many persons share the same facilities and utensils.

8.6 Diseases of special importance RPT, FMD, Blackquarter BEF LSD, Worms

Rinderpest

This is a viral disease of ruminants, particularly cattle, characterised by febrile course, inflammation and necrosis of the mucous membranes, especially of the digestive tract, and accompanied with profuse diarrhea. The causative virus is very susceptible to external influences and does not survive outside the animal for more than a few hours at normal temperatures. This means that the dead animals do not represent a source of infection.

The virus is excreted during the breathing process and in most body secretions like urine and faeces. Secretions from the nose and mouth can also act as sources of infection. Affected animals usually die; recovered animals acquire life immunity. In Kazo and indeed the Western Region, Rinderpest outbreaks were common in the past. But with the introduction of the Pan African Rinderpest campaign, the disease has been brought under control and no outbreak has occurred in the last 20 years.

Foot and Mouth Disease (FMD)

The disease principally affects cattle and other ruminants. It can also affect man. The virus gives rise to formation of vesicles on the tongue and between the hooves. The animal finds it painful to eat or walk. Transmission is by direct contact between healthy and infected animals, by inhaling air contaminated with the virus and by contact with any contaminated material like animal feeds, meat, milk and milk products. The

disease is important because it spreads quickly, although with very low mortality and because it impairs production of milk.

The disease is controlled by isolation and treatment of sick animals with broad spectrum antibiotics. This treatment takes care of wounds that arise from the vesicles. A quarantine is essential top prevent further spread of the disease. More importantly, all the equipment used in animals handling must be disinfected. In many areas in Western Uganda including Kazo County, annual vaccinations are done by the veterinary staff.

Contagious bovine pleuropneumonia / *Kihaha* (CBPP)

Once there has been an outbreak, this is a very serious disease of cattle. Many of the farmers in Kazo are aware of this disease. It causes a rise in body temperature, accelerated respiration, complete cessation of feeding, cough and often expiration (breathing out) is accompanied by a grunt.

The lung tissue of a dead cow shows oedema and the pleura are thickened. There is change in appearance of the lung to marble / liver-like appearance. The disease can be controlled by vaccination in areas where it is endemic and by restricted movements of the cattle by declaring quarantine.

Black quarter (*Kakooto*)

This is an important disease, which affects cattle, sheep and sometimes goats. The causative bacteria form spores, which are very resistant to environmental conditions such as high temperatures. They remain viable for very long periods of time in soil contaminated with faeces. The disease is characterised by muscle necrosis and oedema and gas formation in particularly in the hind limb. The infection is spread through feeds and wounds.

Symptoms include: rise in body temperature, lameness, hot and painful swellings in the hind limbs. Control is by treatment of sick individual cases with antibiotics, isolation of sick animals, burning of dead animals and annual vaccination.

Bovine ephemeral fever (*Kagarura*)

Bovine ephemeral fever is a very important seasonal disease in cattle in most areas of Uganda. In Kazo, herders recognise that it mainly occurs in the rainy season or shortly after the beginning of the dry season. It is caused by a virus and characterised by raised body temperatures, inappetence and shifting lameness. In severe cases, animals become recumbent. Pregnant

animals may abort. Treatment is by administering broad-spectrum antibiotics. Affected animals may recover by themselves, hence the name Three-day sickness.

8.7 Breeding and Reproductive Disorders

Breeding in simple terms can be defined as the reproduction of species through reproduction. It can be natural or artificial. The very first breeding practices began when man domesticated animals. But serious and modern animal breeding practices has developed in the temperate zone during the last two centuries. These advances, however, have been based on acute observations and limited records and were still very much of trial error until the modern genetic theory came in the 20th century. In addition, there are several reproductive disorders in day-to-day animal husbandry.

8.7.1 Breeding

Through centuries, the majority of farmers have allowed their animals to breed more or less haphazardly and a number of factors have contributed to the evolution of different breeds seen today in the tropical areas. In order to promote a rapid improvement in the productivity of tropical livestock, we must first understand the basic factors of reproduction and inheritance of characteristics, then be able to apply suitable animal breeding practices. But before any sensible breeding is done, development priorities should be established. For instance, if a region still has major epizootic diseases still prevalent, disease control should be given a priority. In Europe, for instance, where major epizootics have been brought under control, improved feeding and management is accorded more priority.

8.7.2 Animal breeding practices

In order to improve the average level of a livestock population for any trait by genetic means, the population must be subjected to selection for the specific trait or a combination of traits required. Remember that some traits are strongly inherited more than others. There are some examples of some inherited traits in cattle. For instance, in dairy cattle, high milk production, reproductive performance and butter-fat content should be the factors determining which animals are chosen for breeding.

For beef cattle, birth weight, weaning weight and daily weight gain. Note that selection acts by allowing selected individuals to contribute more traits to the next generation than other individuals in the same population. Record keeping is very important for any sensible breeding programme.

Some of the common aids to selection to breeding include artificial insemination.

8.7.3 Artificial insemination

This method can be used for every species of livestock, but can only be practised successfully, under quite specific practical conditions. Some of its benefits include maximum exploitation of best bulls, minimises spread of venereal diseases is useful when farmers wish to use different sires simultaneously.

The method again has some disadvantages like involving close handling of animals; so farms, which are far apart, may pause economic problems. The technique requires skilled manpower and equipment like insemination guns and liquid nitrogen.

There are important considerations to take into account when improving your livestock through breeding. These include inbreeding, which is mating of close relatives. However good a bull might be, it should not be allowed to mate its close relatives. The closer the individuals, the more similar the characteristics they will contain. So the system concentrates both bad and good characteristics.

Effects: There is decrease in size and vigour, decline in fertility and increased mortality of offspring. But it is used to fit a specific trait in a particularly group of livestock. This practice has been useful in maize production and poultry; crossbreeding or specific inbred lines have been successful.

Crossbreeding: This refers to the practice when unrelated livestock are mated. First crossbred progeny are usually superior to the parents in production traits. This phenomenon is known as hybrid vigour.

Upgrading - This method is preferred when a livestock owner wishes to change radically the characteristics of his animals. That is to say: the first offspring is 50%, the second generation 75%, the third 85% etc.

In conclusion, efforts should be made to improve the productivity of indigenous breeds by intense selection. But it is vitally important that at least limited numbers of all indigenous breeds should be conserved in their specific environments as a source of genetic variation. Serious errors have already been committed by some countries whereby through crossbreeding, all the indigenous breeds have been eliminated.

Related disorders

Failure to come on heat

Some female animals fail to come on heat. This can be due to hormonal imbalances and poor nutrition. Other animals come on heat but cannot be detected. This happens especially in silent heat.

Sometimes, an animal can have fertilisation failures though inseminated. Some of the reasons for this include poor quality ova or defects of the spermatozoa. In other instances, fertilisation successfully takes place but there are conception failures. Causes are: early embryonic death, too much environmental heat, obesity, infection in the reproductive tract and nutritional related factors.

Abortion is the other reproductive disorder. It can result from infections, hormonal imbalances, and use of some drugs and artificial hormones. Every effort should be made to contact the area veterinarians for assistance.

There are several disorders involving the calving process. These include dystocia and faetal exortion. Proper methods of correcting dystocias can be used when a veterinary officer has been informed. Retained placentas, prolapsed uteri and pyometra are the other disorders that come after the calf is already born.

However, there are some farmers who involve in practices of manipulating the reproductive system without protective clothing. Every effort should be made to come in touch with veterinary personnel for assistance in such circumstances.

8.7.4 Farm Hygiene

Farm hygiene involves hygiene of both people and the farm animals. It should be noted that there are a number of diseases that be prevented from being transmitted between man and his animals. It should be made a point that every farm should contain a pit latrine, a urinal and a waste disposal pit. The waste disposal pit should be of two types: one for biodegradable materials and the other for the non-biodegradable like broken glass, used bottles etc. Biodegradable materials can subsequently be used as manure in gardens or even some pastures especially the improved pastures.

For pastoralist situation in Kazo, a kitchen is very essential. People were also advised to have a clean clay pot for keeping boiled drinking water. Pots can cool the water and therefore preserve it and hence becomes suitable for drinking.

For every kitchen, there should be a clean drying rack. Utensils like milk cans and other containers like those made of calabashes can be dried. It should be noted that the utensils should be dried when their open ends are

facing down and not the other way round. This precaution prevents dust from settling at the bottom of the container. If possible, utensils should be dried when there is sunshine. Sunlight can kill many of the disease causing organisms.

The herders were warned of the dangers of consumption of milk that is not boiled and half-cooked meat. Diseases like brucellosis and tuberculosis can be contracted from milk that is not boiled. On the other hand, tuberculosis, anthrax and tapeworms can be got from half cooked meat. It is important that veterinary personnel inspect meat before it is eaten. In addition, meat should be well cooked.

CHAPTER NINE

INDIGENOUS KNOWLEDGE AND MARKETING ISSUES IN KAZO COUNTY

C. Tizikara

9.1 Introduction

This chapter presents the findings of a case study of indigenous knowledge and information systems (IK-IS) and marketing issues of pastoral communities of Kazo County, Uganda undertaken by the DHP-Uganda country team. The objective of the study was to gain a deeper understanding of the IK-IS related to production and marketing issues in pastoral development, identify good practices and lessons, and assess the potential of different actors as uptake/dissemination pathways for indigenous knowledge, information and technology.

The methodology employed for the study was designed to particularly highlight the use of indigenous knowledge in the following skill areas:

- Pastoral extension and experimentation – problem identification, technology identification, experimentation and adaptation, monitoring and evaluation, technology dissemination;
- Watershed, environment, natural resources and biodiversity management – local species, management practices, utilisation of resources, local rules and organisations; and,
- Animal husbandry – feeding, housing, reproduction, beliefs, tools and equipment, processing of products, marketing, problems and constraints, integration with cropping.

The study approach and methodology used literature reviews and interviews. Literature review was undertaken using published materials, *official statistics and "grey" literature (documents with limited circulation).* Individuals knowledgeable about pastoral issues and willing to share their knowledge were consulted. Notable among the key informants were Veterinary Officers, District Leaders, Executives and staff of projects and associations, NGO's and CBO's involved in pastoral development, the pastoral groups participating in the DHP Project and other stakeholders with

activities that impact on pastoralism. As expected, perceptions and views about particular problems or issues differed among key informants. Consensus of opinions was achieved through focused group discussions. The approach for the review and analysis was designed to enable analysis of the development trends in the use of IK, the underlying influences and the lessons that would have a future bearing on the future development and continued use of IK.

9.2 Resource and Knowledge Base

In the pastoral areas of Kazo, livestock production constitutes the dominant activity supplemented by production of a few food crops, using basic tools and elementary technologies in an environment of poorly developed marketing infrastructure and unfavourable terms of trade. A situation of acute lack of information, knowledge and improved technology for improving production among pastoralists exists, compounded by the failure of development interventions to adequately involve stakeholders in their planning and execution. Many well-intended interventions often insufficiently addressed the needs of the pastoral communities thus remaining inappropriate, irrelevant and unaffordable.

9.2.1 Animal husbandry practices

Domesticated ruminants consist exclusively of cattle. Small flocks of sheep used to be kept with cattle, and goats have of recent become a significant part of pastoral herd due to the high demand for got meat and hence a source of much-needed additional income. These compete on the range with several other forms of wild ruminant animals, although the later have largely been hunted out of the ordinarily available grazing lands and remain in protected areas. The Ankole long horned cattle, the Small East African (SEA) goat with its larger Mubende variant and fat-tailed East African Blackhead sheep are the predominant breeds. The bulk of production is done under semi-pastoral and village level traditional practices of communal herding and free ranging. Although crop production has substantially increased in the recent past, animal management practices are not fully integrated with crop husbandry or planned multi-species grazing.

Research and development reports generally indicate that herd structures do not reflect good breeding and management practices. They are characterised by narrow mating ratios, high pre-weaning mortality, small body sizes, poor growth rates, negative selection practices, indiscriminate mating leading to possible inbreeding and generally heavy losses due to diseases/parasites, predators, climatic stress and under-feeding.

The cow is a prized animal in pastoral culture – it is the reason for the existence of the community. Consequently, the attachment of the

pastoralists to their animals is immense. They sing about them, recite poems about them and the wonders they have done for them. They have a tremendous understanding of the needs and feelings of their animals and base their way of life on accessing the best resources (pastures and water) that their animals can get. Traditionally, animals are selected on account of their parentage – based on the amount and quality of milk that their parents gave, in addition to their body condition, shape and size of horns, colour.

Heifers are closely watched for reproductive ability. Those that fail to conceive within the expected period are given a local treatment to hasten the process. The local practice is that a rope is tied around its neck and the head held up by pushing the chin upwards and the horns downwards, then a second "expert" shoots at the jugular vein with an arrow and about 0.5 litres of blood is drawn. This process known as *"okurasha"* is believed to stimulate the heifer to come on heat – and they insist that it works! The blood so drawn is processed into a meal called *"enjuba"*. The blood is wrapped in leaves (often with herbal spices) and baked in a make shift oven constructed by digging a hole in the ground. The wrapped parcel is then placed inside the hole, covered with soil and a fire lit on top. The parcel is removed after 15-30 minutes and sliced ready for eating. Whoever partakes of the meal is not supposed to touch their nostrils before washing lest they develop an offensive odour condition known as *"omuhembe"* which is supposed to have no cure.

Adult animals are exclusively housed in makeshift open kraals constructed using the thorny acacia bushes. Where pastoralists have acquired ownership rights to land, live fencing materials and barbed wire paddocks are used. Calves are housed in round huts/pens constructed of meshed up wooden twigs and grass thatch. Grass bedding is provided in the calf pens, which are cleaned every day and the wet bedding put out in the sun to dry before being put back. Pastoralists universally know that dirty and wet pens cause respiratory problems and scours in calves.

The roles of men, women and children in the ownership and care for animals in the pastoral communities differ. Some cultural barriers undermine women's interest and ability to perform certain functions. Girls, women and young boys watch over calves and young stock while they graze, as they also perform such tasks as collecting the herbs for use in fumigating milk utensils and churning milk, firewood, etc. The older boys and men are responsible for grazing and watering the main herd. Sick animals are also often left home for the women and children to look after, while the rest of the herd goes out to graze. The women's time is in most cases strained by competing household chores yet, they have to take care of these animals ensuring they are fed, watered, calf pens are clean and they are taken out and brought home at the right time.

It is not a common practice for women and girls to milk cows, their responsibilities being restricted to looking after milk utensils; processing (churning) of milk; securing food, water, fuel and medicines; and providing much of the labour and day-to-day decision-making that goes into running the home. Duties and responsibilities are also often extended to feeding behaviours and routines. Men for example are supposed to take only fresh milk (*amasununu*) and traditional yoghourt (*amakamo*); skimmed milk (*amacunda*) that remains after extraction of butter is supposed to be the diet of women, who are also supposed not to drink milk when they are in their periods – lest the cows' milk will turn bloody. Eating of fish and chicken used to be a taboo to all, claiming that it would result in cows not producing milk.

Milk from specific animals in herd is often designated for churning into ghee, and such animals are often nominally referred to as belonging to the woman. Cows are milked twice in the morning and evening, often after an elaborate skin grooming process that is meant to condition the animal for milk release. Partial milking is practised, and the dangers of allowing too much milk to a calf's health is very well understood and effectively passed over from older to young generations. Milk churning is a responsibility of women. Fresh milk is put in the gourd churns normally in the afternoon and inoculated with a few drops of *"amacunda" a*nd left overnight. The churning is normally done in the morning after the routine chores related to milking are done with. The churning process is done by vigorously shaking the container, a physical and energy-sapping process that takes up to over an hour.

Traditional tools and utensils were largely moulded from wood and clay. Milk churns are exclusively gourds, with smaller containers holding the *amacunda*. Fresh milk is traditionally held in the wooden milk pots. These are normally in two sizes – the bigger ones (*ebyanzi*) that hold about two litres of milk and used by adults and the smaller *"enkongoro"* for children. The making of these milk pots, stools and watering buckets (*amacuba*) is a skill held by a few craftsmen. The making of clay utensils, like the fumigator (*ekicunga*), is a skill held by women.

The advent of commercial milk processing has significantly impacted on the use of these traditional utensils, many of which have now been relegated to becoming decorative items in the homes of affluent Ugandans. Most of the milk now never enters the pastoralist house – milking is done in the kraal in plastic or metallic buckets put in milk cans and rushed to the milk collecting centre. The scent and flavour imparted by smoke from the milk pot fumigating process is not acceptable for commercial processing so this practice is only left for the little milk that is for home use. Modern practice claims the traditional utensils are difficult to clean, and hence

unhygienic, but the elaborate cleaning process and fumigation were the pastoralist way of answering to these concerns.

9.2.3 Pasture resources

Pastures and grazing land are predominantly natural grasslands, under traditional management, with little or no legume component leading to low nutritive values for the greater part of the year. Herbage availability from these natural grasslands is highly seasonal. There are obvious changes in botanical composition in various grazing areas. An obvious widespread and severe problem is pasture weeds and bush encroachment, with the main bushes dominated by *Acacia hockii* and to a lesser extent *Vernonia spp* and by the unpalatable grass *Cymbopogon afronardus*, largely attributed to changes in livestock population, uncontrolled use of fire and heavy grazing pressure. The bush species are, however, a valuable browse resource in goat feeding.

The nutritive values of the pastures differ according to species, stage of growth and the micro-ecological environment in which they grow. Estimates of total digestible nutrients and digestible crude protein indicate deficiencies in these pastoral areas, largely attributable to excessive livestock populations and predominance of grass species that are inherently low in crude protein. Field observations indicate localized foci of rangeland degradation depending on the existence of pre-disposing factors. Land degradation is common on hilltops and grazing lands with less bush thickets leading to considerable erosion and siltation of water sources. There are marked trails related to stock movement to the few communal watering points, especially cattle.

9.2.4 Water Resources

The water requirement for ruminants mainly depends on the nature of feed. Water is present in feeds in widely varying proportions. Green herbage has a very high water content (88-90%) especially when it is young, whereas dry forage and grains contain only small amounts of water (5-15%). The amount of drinking water needed by animals varies according to the concentration of water available in the feed. It is estimated that each TLU requires approximately 35 litres of water per day. The available precipitation would be adequate enough to cater for all the water needs of people and livestock in the area if it were harvested and conserved. However, pastoral culture is based on migration in search of water and pasture and many households' still face water shortages during the dry season.

Indigenous knowledge practices relate to identification of catchment areas for silting watering points and signs indicating onset and severity of

dry seasons. Suitable points for location of water points are identified by the presence of certain plant species, while the onset of rain/dry seasons and/or severity of on-coming dry seasons is also detected by the activities of some bird species and the emergence or condition of some plants.

The traditional water management practice for the pastoralist was to keep shifting and following water wherever it was. Earthen watering troughs would be constructed at the edge of the water source and these progressively moved inwards until that source was exhausted before moving on. More often than not, herds overwhelm the manpower and freely drink from the main source causing contamination and silting.

9.2.5 Animal Diseases

Endoparasites, enteritis/diarrhoea and respiratory disorders and other non-specific infections are important health problems, in addition to tick-borne diseases. Possible control measures of most reported diseases are known but are largely not economically viable. The use of indigenous knowledge in animal disease treatment is common practice. Some of the indigenous practices related to disease management that were captured related to selection for genetic improvement, labour optimisation, use of local herbs for treating some ailments and risk minimisation through either avoidance or modification of the micro climate. Many of these have been captured in a separate study on ethno-veterinary practices supported by DHP Uganda.

9.2.6 Marketing

Pastoral production is currently almost entirely for the domestic market and the marketing of live animals and animal products is largely conducted through informal marketing channels. Most pastoralists do not keep animals for commercial purposes but sell as and when there is need for cash. The situation is further aggravated by the low effective demand for meat, milk and other products and a grossly run down livestock marketing system. Manure is a product deposited on the range or harvested from housing units and used in home gardens and crop fields. Traditional use of hides and skins for clothing and bedding has considerably reduced and there is no reported traditional usage of hair and fur at appreciable scales.

Marketing of animals and produce is done at three levels of distinguishable assembly points: village assembly markets, periodic markets and roadside markets. Pastoralists transport their animals and products mainly on hoof and on bicycle to these assembly points for sale. Village assembly markets are, without exception, open air markets with no infrastructure of any sort and primarily established for trade in crop

produce, animal products (mainly ghee and milk) and general merchandise. Buyers in these markets are mainly consumers, vendors and agents of traders, milk processors and butchers from the urban centres who arrange transport to move the animals/products once the numbers or amounts are sufficient.

The periodic markets operate daily or on a specified day once a week, every two weeks or month. In general, the volume of trade and number of participants in these periodic rural markets increases with the interval. Livestock marketing infrastructure that may be present in these markets include fences, rudimentary buildings and occasionally a water source. Roadside markets are located on the heavily traveled highways. The products mostly sold are fresh and roasted meat, ghee, milk and occasionally live animals.

Livestock marketing is fully liberalised and prices are determined by private agreement. However, due to lack of an organised and systematic market information system, coupled with the absence of grades and standards (especially for meat and slaughter animals), pastoralists are not adequately guided in their management and marketing decisions. They do not produce for the market and sale only when there is need, fixing their prices depending on the immediate cash requirement. Traders have found a consumer clientele willing to pay the high price for the current supply and appear not to bother about the market imperfections. Price fixing, market sharing and tacit arrangements are common practices among traders buying from major livestock markets in producing areas so as to keep producer prices within agreed ranges. Furthermore, the traders' cash in on occasional periods of celebration, when they are able to raise the price of slaughter animals and meat due to excessive demand and yet their costs would not have changed much.

Pastoralists are not as knowledgeable about the market as the traders they are dealing with. Traders are also constrained by inadequate capital, poor infrastructure and an ineffective regulatory framework. These factors greatly impinge on prices at each marketing node, reliability and regularity of supply, marketing costs and returns. Marketing costs vary according to the type of market and the extent of services provided. Because production and marketing are not closely integrated, there is little incentive for most pastoralists to increase their herd sizes or improve the production methods. Similarly, because of lack of effective regulation on movement and handling of slaughter animals and enforcement of sanitary requirements in slaughter places, investors are discouraged from establishing infrastructure that would increase capacity of the marketing system to handle the production system.

Primary or farm gate level buying of slaughter animals and animal products is done through direct negotiations, based on visual appraisal of the size and condition of the animal, with producers either at the farm or known assembly points.

Anecdote by Pastoralist

Our biggest problem now is the market. We now have good animals and are producing a lot of milk but we have no markets. Can the Government assist us to find markets? The prices mentioned on the radios are not the prices we are offered by the traders who come to buy directly from us.

Alternatively, pastoralists go to these places to invite buyers to purchase from their farm holdings. Buyers comprise of consumers, other producers purchasing breeding stock, and traders / butchers or their agents.

Information on markets and prices and on accessibility to improved technologies was commonly explained, as the more urgent information needs. While the availability of information on improved technologies had increased over the past five years, availability of information on market and price remained very constrained. Most pastoralists indicated that this situation had worsened over the past five years. A very limited access to information on potential markets, buyers and prices to charge was reported. Pastoralists indicated that they often accepted the prices offered by the traders who came into the villages to buy produce from them. They express the following as key requirements:

- Training in agri- business issues
- Supporting groups in establishing and strengthening market linkages
- Supporting/linking producers to buyers
- Development of market infrastructure (markets, roads, storage facilities)
- Dissemination of market information (radio, print media)
- Support in staging promotional activities for example agriculture shows, tours/ visits
- Support for value added processes

9.3 Conclusion

Indigenous knowledge systems and the practices based upon them reveal complexity and sophistication in dealing with environmental hazards, experience in manipulating and deriving advantage from local resources and natural processes. They sometimes also reveal the application of several scientific principles without knowing that they exist. Indigenous knowledge and information systems in pastoral communities link people and institutions to promote mutual learning, generate, share and utilise pastoral development related technology, knowledge and information, including coping strategies. The purpose of an IK-IS is to improve access to, and capacity to apply available indigenous information, knowledge and technology in order to increase productivity gains, food security, environmental sustainability, social integrity and cohesiveness, community empowerment and sustainability of development efforts. IK-IS's are dynamic and changing, and because of this current technologies and practices in use in pastoral communities of southwestern Uganda are a blend of local and introduced components. At present, much of the IK is left with the elderly and is fast disappearing from communities.

Pastoral production is currently almost entirely for the domestic market and the marketing of live animals and animal products is largely conducted through informal marketing channels. Information on markets and prices and on accessibility to improved technologies was commonly expressed, as the more urgent information needs. While the availability of information on improved technologies had increased over the past five years, availability of information on market and price remained very constrained.

CHAPTER TEN

CONCLUSIONS AND RECOMMENDATIONS

E. N. Sabiiti and Tegegne Teka

10.1 The Project

The issues that are raised and discussed in this book are an overview of Uganda's agricultural sector with a focus on pastoralism. It discussed dryland husbandry in Uganda mentioning its short-term and long-term objectives along with project management and the target groups. It also mentioned land ownership, cattle, water, livestock diseases and extension service provision in the dryland areas. Range and pasture improvements, gender and pastoral development and policy dialogue were discussed. Animal health at community level and the various animal health diseases were explained. Members of the community were trained as Community Animal Health Workers or paravets. In addition, animal breeding practices and reproductive disorders, artificial insemination and farm hygiene were raised. The use and recording of indigenous knowledge and animal production and marketing are dealt with at length in the book.

10.2 The Project and the Community

The Dryland Husbandry Project in Uganda started in 1996 in Kazo County, Mbarara District. It employed a bottom-up approach and worked with the community up to 2003. Local needs identification, prioritisation and grassroots participation have been leading elements in the implementation of the action-oriented project activities. DHP Uganda was implemented with the support of country and regional structures. At the country level, there was a National Steering Committee composed of experts and specialists in natural and social sciences along with the Project Manager and a Field Management Committee that included selected members of the community. The working relation between the experts and the beneficiaries using these structures has made implementation easy and useful. The National steering committee was responsible to the Regional Advisory Committee composed of the National Co-ordinators in the four countries (Ethiopia, Kenya, Sudan and Uganda) which in turn are all co-ordinated by the Regional Co-ordinator based at OSSREA, Addis Ababa, Ethiopia. These structures at the country and at the regional levels helped to exchange views and opinions and discussed alternatives in the methods of implementing the objectives of the project.

When the project was initiated it was designed to bring about changes in the dryland areas at the community level. As in many other countries, the drylands did not get the proper attention that they deserve. The project approached the community not by distributing material incentives but with ideas of how to work together to surmount the problems they are presently experiencing, i.e. water, pasture, animal disease, etc. Through time, the community saw the achievements of the project. The community benefited from the project. It therefore embraced the project and worked to make the objectives of the project achieve the desired goals. Hence, one can conclude that grassroots-based project operations would achieve results if it puts members of the community as the main actor and performer in dealing with their problems.

10.3 Achievements of the project

DHP enjoyed strong support from national policy makers, such as ministries, university administrators, local politicians, local councils and grassroots leaders. This created an enabling environment for mobilisation of the pastoralists to participate in project activities. The attendance of all pastoralists' seminars and workshops was always way beyond the planned levels.

The Dryland Husbandry Project in Uganda was able to achieve most of its objectives. In the eight years of project implementation action-oriented research was conducted in the areas of pasture improvement, water management, disease control, marketing and policy dialogue. The pasture improvement trials revealed that if guided, farmers have the ability to improve their pastures and increase livestock production.

The paravet training or Community Animal Health Workers programme was another successful project activity. Training members of the community as paravets have solved the weak veterinary service in the rural area. It proved that community animal health workers could provide basic livestock health services in a situation where government institutions are unable to reach and provide. The results of this intervention have been shown in animal production and in the reduction of animal mortality. If there is a good and reliable supply of drugs at the community level, the Community Animal Health Workers will continue to provide services at a cheaper and with easy access to the agro-pastoralists in the dryland areas.

The project encouraged and worked with women to organise themselves. The project offered training to women groups. Some women were involved in income generating activities. Gender issues are discussed and women have groups that make them open for governmental and non-governmental organisations.

There are socio-economic changes that occurred in the project area, if one was to look at the project area before and after the project. There is an attitudinal change of members of the community in raising common

problems and their readiness to solve them in a co-ordinated way. Moreover, there is a change in what they think about training. After eight years of experience with the project, community members prefer training than any other physical support. They say, "training is for life and the project has changed our minds". They have also recognised that training builds independence and self-reliance.

There is also a change in income at the household level. The project has introduced better grass and legume species for animal feed, improved techniques in water harvesting and in range management. Moreover, the project's demonstration in plot division and the use of natural resources and provided useful training programmes. These have resulted in increased output in milk and livestock production.

The sensitisation on pastoral communities has influenced local government institutions including the Ministry of Agriculture. It has made the extension agents to think of agro-pastoralists. It has also helped to bring the case of pastoralists to the formal discussion forum. The work of the Uganda Government in the creation of a National Rangeland Research Centre is a good example. Sensitisation and the need to change the institutionalisation process in the dryland areas have helped the pastoralists to recognise their contributions to the economy and to underline the problems they are facing.

Another strong achievement of the project is the research and documentation and the information gathered during the project period. The reports and surveys reflect what have been put on the ground. These outputs are published and reach various training and academic institutions. They are also used for policy dialogue, for seminars, workshops and for those institutions interested in future pastoral development in the project area or elsewhere. The following are the major outputs of DHP Uganda.

10.4 Publications and documents of DHP Uganda

1. Proceedings of the First National Dryland Husbandry Project Workshop. Sustainable Utilisation of Dryland Ecosystems for Livestock Development. Kazo, Mbarara District, Uganda, 1997. Edited by E.N Sabiiti, C. Tizikara and M.P. Nampala.
2. Sabiiti. E.N and S.K Mugasi, 1997. Control of weeds in Pasture Systems. 16th East African Biennial Weed Science Conference Proceedings, pp. 51-56.
3. Mugasi, S.K. and E. N. Sabiiti, 1997. Shrub encroachment as a constraint in Utilization of range and grassland resources: A case of the pastoral rangelands of Kazo, Mbarara district Proceed.

3rd UPANE workshop 29 - 31 July. 1997, Makerere University Eds: E.N. Sabiiti and F.B. Bareeba.

4. Mugasi. S.K, 1999. Economic analysis of bush encroachment on pastoral production systems: A case for Kazo, Mbarara District. M.Sc. 1999, Makerere, University.
5. Dryland Husbandry in Uganda. Research Report. Dryland Husbandry Project (DHP). DHP Publication Series No. 5, Dec. 1999. Edited by S.K. Mugasi, E.N. Sabiiti, B. Tayebya and T. Teka.
6. Training Course for Community Based Animal Health Workers in Kazo. 2000. Funded by DHP.
7. Mugasi, S.K., E.N. Sabiiti and B. Tayebwa, 2000. The economic implications of bush encroachment on livestock farming in rangelands of Uganda. Agric. J. Range and Forage Sci. 17(1, 2 & 3). 64-69.
8. Training Manual for Community Animal Health Workers/Paravets. DHP Publication Series No. 8, Jan 2004. Edited by D.A.I. Osman, M. Tefera, D.M. Nyariki and S. Biryomumaisho.
9. Indigenous Knowledge in Ethnoveterinary Medicine in Southwestern Uganda. DHP Publication Series No. 9, March 2004. Edited by E.R. Katunguka, S.K. Nalule and E.N. Sabiiti.

The above publications and documents contain original information on the pastoral communities and hence will be useful in informing policy makers and other stakeholders.

10.5 Recommendations

Implementation of DHP in Uganda tackled an area previously not given attention by government, namely pastoral and agro pastoral development. Pastoral development has not received adequate attention at policy level despite the considerable contribution of pastoralists to the livestock sub sector. DHP work in Kazo revealed that if mobilised, pastoralists are able and willing to take up modern farming methods as has been shown by the current transformations from the pastoral system to agro pastoral or commercial ranching systems. Several recommendations are made from the practical experiences of DHP implementation in Uganda and also from lessons learnt from other implementing countries, i.e. Kenya, Ethiopia and Sudan.

- The Government of Uganda should take on the Dryland Husbandry Project as a national programme covering the entire cattle corridor. The project could benefit from the recently secured funding for the Livestock Development Project from African Development Bank and Funds from the National Agricultural Advisory Services (NAADS).
- A Centre for Rangeland Research should be established to co-ordinate research on range management. Currently, there is no specialised institution in Uganda carrying out rangeland research. The Ministry of Agriculture, Animal Industry and Fisheries has proposed the establishment of Rangeland research and Development Centre.
- Rangeland related courses should be incorporated into Education Institutions, especially at Tertiary and University levels. In this regard, Makerere University, Faculty of Agriculture has proposed a master's degree in Rangeland Management and Dryland Farming, which is a welcome development.
- There is need to establish a Dryland Management Programme as a policy framework to govern the management and utilisation of rangelands for sustainable development. Lack of a clear policy on management of drylands is one of the reasons leading to continuous deterioration of this important resource. The Ministry of Agriculture, Animal Industry and Fisheries is developing a policy on Dryland use and management.
- The field Range station at Muko, Mbarara which was used as both a research and training station in the past could be used as a nucleus for the proposed centre or Kazo DHP field office could also be considered
- The bottom-up and participatory approaches of DHP Uganda need to be seriously visited by future projects if they want to develop good relations and be accepted by the community and want to be successful like DHP Uganda.

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