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Measures to prevent overstocking and overgrazing in woodlands

A case study in Babati, northern Tanzania

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Abstract

Title: Measures to Prevent Overstocking and Overgrazing in Woodlands
A case study in Babati, northern Tanzania

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Livestock keeping has been the essential source of livelihood in Babati District for many hundreds of years. The traditional ecological knowledge about this semi-arid environment has influenced the general view on livestock management. This essay discusses the measures that are, or could be taken in Babati District to prevent overstocking and overgrazing in the woodlands. With the continuing population density increase also the livestock population grows. More houses and roads are built and the grazing lands diminish. To avoid overgrazing forest management programmes restrict grazing in forests. This additionally decreases availability of grazing land. My conclusion is that minimizing number of livestock is necessary to not exceed carrying capacity of pasture during drought. Hence this is not free from problems since it is traditionally rooted to have a large number of livestock as a buffer of energy and wealth. One solution for both how to prevent overstocking and how to survive with small number of livestock is to practise zero-grazing. Zero-grazing is to keep a small number of healthy big cattle e.g. exotic cows or crossbreeds in stables or tied up. However, when tying cattle on the spot the fact that cattle have four legs is disregarded.

Key words: *Babati, livestock, overgrazing, zero-grazing, Traditional Ecological Knowledge, carrying capacity*

Abbreviation

CBFM – Community Based Forest Management, villagers both own and manage forest

CC – Carrying Capacity

JFM – Joint Forest Management, The Government owns forest and manage it together with villagers

LAMP – Land Management Programme in Babati District, supported by SIDA

LEK – Local Ecological Knowledge

NARCO – National Ranching Company

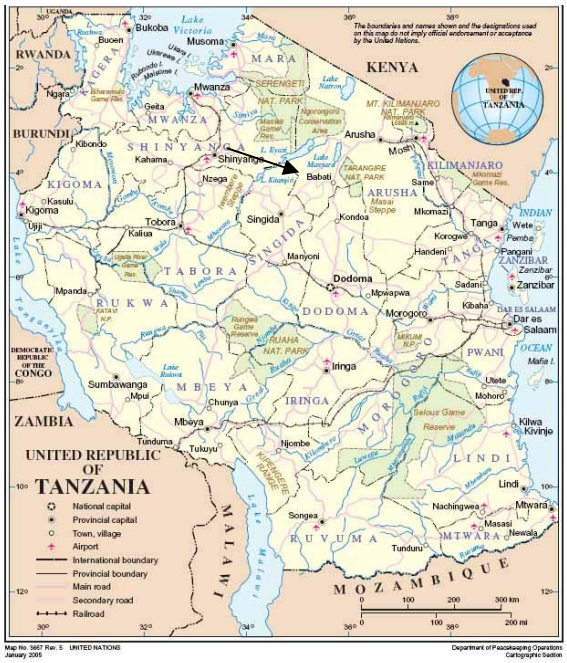
TEK – Traditional Ecological Knowledge

SIDA – Swedish International Development Cooperation Agency

Table of contents

TABLES AND MAPS

Map 1. The case study location in Tanzania



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1. Introduction

1.1 Livestock keeping as old as Methuselah

In the areas surrounding Babati in northern Tanzania livestock keeping has been practiced by nomadic pastoralists for millennia (Oba & Kaitira 2005). These traditional systems of land use were transformed during the last century (ibid.) and grazing land has in many places in Tanzania become a limited resource (Nilsson 2001). The population density has been increasing since the 1960's (Sandström 1995) while forests and pastures suitable for grazing constantly decline (Mr Msangi pers. comm.). Today land is differently and more intensively made use of by agriculture (Nilsson 2001), traditional communal land being changed into private ranches and land use policies formed for wildlife conservation (Oba & Kaitira 2005). Cattle graze on marginal land less easy to cultivate on (Nilsson 2001), in communal forests, pastures, roadsides and backyards. Due to the risk for overuse of natural resources some forests and woodlands are controlled and regulated (Nilsson 2001). In Babati District many different forest management programmes have started throughout recent decades as to safeguard products a forest supplies for e.g. firewood, water reserve and fodder (interview with a villager). The programmes with Community Based Forest Management (CBFM) and Joint Forest Management (JFM) are important tools in the development towards a sustainable forest management in Babati District.

1.1.2 What happens when vegetation diminishes?

Babati District is a mountainous area where lack of vegetation cover on steep slopes can be devastating during rain season. The vegetation cover is destroyed when many cattle pass and eat and trample everything on their way (Yanda & Madulu 2005). The irregular rain patterns of the region contribute to problems occurring when forests have been overgrazed. The pouring rain washes away the soil and the immediate consequences are landslides or gullies making silt deposits in the lower parts for example in Lake Babati (Yanda & Madulu 2005). Temporal soil erosion and variations of land degradation are natural elements in arid and semi-arid environments in sub-Saharan Africa (Kinlund 1996). Thus heavy grazing on vulnerable areas (e.g. hilly woodlands before start of rain season) may lead to more permanent land degradation or even desertification (Rowntree et al 2003). Overstocking, inappropriate farming methods (Kinlund 1996) and deforestation (Sandström 1995) also

contribute to soil erosion. Many people are negatively affected by diminished supplies of land suitable for grazing and agriculture why this is an interesting subject for me to study.

1.1.3 An environmental science approach

Miombo woodlands are a key source of energy, construction products, foods, medicines, leaf litter, grazing and browse (Campbell 1996). My scope is the grazing in the miombo forests surrounding Babati. Livestock keeping is still main source of livelihood of many people (Campbell 1996) and is regarded as a store of wealth (Doran et al 1979). The people in Babati District practice traditional pastoralism, more wide-spread agro-pastoralism, or modern zero-grazing which can be found in the district (Mr Msangi pers. comm.). All these techniques of keeping livestock affect the environment in different ways. The historical way has been to move with the livestock to areas with grazing land. While people became more domiciled some of the traditional knowledge became maladjusted to the new circumstances. Today environmental impact is more concentrated. By including an environmental science perspective on these local practices the term Traditional Ecological Knowledge (TEK) is interesting and can provide us understanding and information (Berkes et al 2000) about livestock keeping in Babati.

1.2 Purpose and questions

First of all I want to know whether overgrazing is a problem in the woodlands in Babati District or not. There is a connection between the increase of both human and animal population density and the decrease in available grazing land (Mr Msangi pers. comm.) per individual. With scarce natural resources a good management is fundamental to provide enough food, fresh water, fire wood, grazing land etc. to everyone. Are CBFM and JFM useful tools for that purpose? The literature I have studied suggests that semi-arid environments with bimodal rainfall have a carrying capacity of grazing land which varies a lot both in time and space. This might contribute to whether overgrazing occurs or not. Following there is a problem, what is done to solve the problem? Are adequate actions taken? If not, is it because of lack of encouragement and interest in environmental issues? In general land degradation processes are very slow (Kinlund 1996). The Traditional Ecological Knowledge (TEK) in the district is much characterised by the nomadic lifestyles of Maasai and Barabaig pastoralists. Traditionally the grazing pressures were more temporal with the possibility for pasture to recover, thanks to herder mobility (Oba et al 2000).

The purpose of my case study has been to examine the complex of problems with overstocking and overgrazing in forests. I try to answer the following questions at issue:

- Is the livestock keeping in Babati District characterized by Traditional Ecological Knowledge or something else?
- Is overgrazing a widespread problem in the woodlands in Babati District and does it contribute to soil erosion?
- If overgrazing is a problem, what measures are taken to prevent it and is it enough?
- CBFM and JFM are tools to use in sustainable development; what are their benefits for prevention of overgrazing?
- Are there any problems connected with prevention of overgrazing and in that case, what are the problems?

2 Theory and background

2.1 Background facts about Babati District

Babati District is situated in Manyara Region in north-central Tanzania in East Africa (see Map 1). The district is divided into four divisions; Babati, Bashnet, Gorowa and Mbugwe, the Babati Division consisting 21 wards and 82 villages (C. Kavishe, pers. comm.). Babati Town is the centre of Babati District. The district covers an area of 6069 square kilometres (Kavishe, unpublished a). The population in the district was in 2002 estimated to be about 300'000 people. Kiswahili is the official language bringing together all people of the United Republic of Tanzania which consists of a great variation of ethnicities. In Babati District all four major African language groups are represented i.e. Cushitic speakers (Iraqw, Gorowa), Nilotic speakers (Barabaig, Maasai), Bantu speakers (Mbugwe, Chagga) and Khoisan speakers (Sandawe) (Lindberg 1996). Most of the people are agro-pastoralists, i.e. they both cultivate land and keep livestock. Two other ways of keeping livestock is to practice zero-grazing or to be pure pastoralist (Msangi, pers. comm.).

2.1.1 Climate and vegetation

Babati is situated within the tropical savannah climate zone (Rowntree et al 2003). The climate is semi-arid or arid with small seasonal variations in temperature (Oba & Kaitira 2005, Sandström 1995). On the other hand the precipitation rate changes considerably from month to month. The bimodal rain season reaches from November to April. During the dry period there is very little or no rain at all. There are four main types of vegetation in Babati district, open grasslands, miombo woodlands, acacia woodlands and mountainous rain forests (Sandström 1995). The open grasslands consist of a "mixture of grazing land, actively cultivated land and land in fallow (being grazed) and with few attempts at soil conservation" (Sandström 1995:22). Babati District is located in The Rift Valley Highlands and most of the soils are of fertile volcanic origin and vary from sand loam to clay alluvial soils. (Kavishe, unpublished a). The altitude within Babati District varies between 950 and 2450 meters above sea level. The climate and natural vegetation fluctuate greatly with the altitude.

2.1.2 History

The pastoral history of the area surrounding Babati is very long (Sandström 1995, Oba & Kaitira 2005). Ever since hundreds of years Maasai livestock have grazed the northern

Tanzanian woodlands. Early during last century there were mainly Maasai and Barabaig pastoral people living in the study area. The great rinderpest epidemic and the colonial rule changed the life of the pastoralists and they lost cattle, power and influence (Campbell 1996, Sandström 1995). The depopulation of people and livestock eased the grazing pressure of the rangelands and farms leading to a regeneration of woodland (Campbell 1996). This woody vegetation became an excellent habitat for the tsetse fly, *Glossina morsitans*, which now spread the disastrous human and animal sleeping sickness over the region. To get rid of the tsetse fly the Government cleared large forested areas in the 1940's (Sandström 1995). After the clearings the open grasslands, fertile soil and generous rainfall encouraged agro-pastoralists to settle the area. The population growth in Babati District has consequently been very high ever since then. Big political programmes as *Ujamaa* (1963) and the Villagisation programme (1974-76) changed the structure of villages from scattered to nucleated (people were forced to move away from their farms) and the new settlements and farmlands needed an extensive clearance of woodlands (Campbell 1996). The lack of management systems for woodlands in villages gained the exploitation rate (ibid.) and production techniques of some farmers were misplaced in their new environments which led to a decline in agricultural output (Lindberg 1996).

2.2 Livestock keeping

Even though the tsetse infestation is still a problem throughout the district (Lindberg 1996) keeping livestock represents people's major source of livelihood (Campbell 1996). Main livestock animals kept in the study area are indigenous cattle, goats, sheep, pigs, donkeys and chickens. Livestock is important for people in various ways. People keep livestock to produce meat, milk, eggs, hides, skins and manure (Li Pun et al 2004). 40 % of the livestock sub-sector (to Tanzanian Agricultural GDP) originates from beef production, 30 % from milk production and the rest from poultry and small stock production (Internet 1). According to Lindberg (1996) livestock is first and foremost an essential resource for working the land. Besides consumption and ploughing cattle work as a safety buffer for droughts, accumulation of capital, inflation-free source of value and as a representative for social prestige etc. (Internet 1, Lindberg 1996). More reasons to keep livestock, especially goats and sheep, are for ceremonies, work parties and for solving acute economic problems. Many households practicing livestock keeping do not necessarily own the cattle they keep and it is common to "borrow" livestock from others (Loiske 1995). In unpredictable, low-rainfall environments

indigenous cattle have a function as “relatively drought-resistant packages of concentrated energy to buffer against variability” (Berkes et al 2000:1256). The different systems of livestock keeping are to (a) be a pastoralist, have a large number of livestock and move with the cattle to available grazing land (Mr Msangi pers. comm.). Today a more common way is to (b) be agro-pastoralist, have a medium size of livestock and also practise crop cultivation for survival. The modern ways is to (c) practice zero-grazing and keep the livestock in stables or tied up. The farmer keeps a small number of exotic cattle or cross-breeds and uses more time cultivating food, cash crops and fodder. Further there is commercial ranching but it only covers for two percent of the national cattle herd and is mainly practised by the National Ranching Company (NARCO) (Internet 1). Zero-grazing resembles private commercial ranching.

2.2.1 Carrying capacity

One important factor in livestock keeping is the importance of not exceeding carrying capacity of pasture. There must be a balance between the number of cattle and the size of land in possession. In many studies overgrazing is seen as the result of overstocking which in turn implies that the carrying capacity of the land has been surpassed (Kinlund 1996). The carrying capacity of a grazing land is defined as the maximum number of livestock grazing on a sustainable basis (De Leeuw & Tothill 1990). The carrying capacity is adjusted by the grazing efficiency of livestock, forage loss due to fouling, trampling, decomposition etc. and the maximum proportion of forage that can be grazed without causing land degradation (De Leeuw & Tothill 1990). Many attempts to make a rule of thumbs for the number of animal units a pasture can carry have mismatched the reality. For example the range management theory from the 1940’s where carrying capacity was used as an instrument to count how many animals a grazing land could support (Kinlund 1996) is not applicable on environments with great climatic fluctuations. Carrying capacity is not static and should be seen as varying in both space and over time (De Leeuw & Tothill 1990). The spatial variations are for example soil type, grazing pressure or incidence of fire. In semi-arid environments with a bimodal rain period the inter-annual variations in rainfall are great. The amount of rainfall affects the amount of vegetation available for cattle to graze. Forests have for example perennial grasses and the degree of plant cover is an important source of variation in carrying capacity of the forest.

2.2.2 Soil erosion

Soil erosion can occur as surface crusting, exposed roots, small gullies and rills, sand deposits in depressions, and downslide accumulation of silt (Sandström 1995). The main cause of soil erosion in semi-arid environments is the natural biophysical factors (Kinlund 1996). Beside the natural explanation to soil erosion human overexploitation of vulnerable environments (i.e. at drought) can lead to permanent desertification. Four main causes of desertification are over-cultivation, overgrazing, deforestation and poor irrigation. The blame has traditionally been directed at the farmers for mismanaging their land (ibid.). Mismanaging grazing land by overstocking can lead to soil erosion, bush encroachment, drying up of springs and low animal productivity (Doran et al 1979). Environmental effects of overgrazing are contribution to contamination of ground water, eutrophication and compaction of soil (Li Pun et al 2004). Overgrazing is not alone a contributing factor to soil erosion. The most important human causes are inappropriate land use policies, population pressure, rural poverty, insufficient ecological knowledge in tropical areas and inappropriate technology (ibid.). Farmland left in fallow for a long time and stocked with cattle and goats results in soil with a very low infiltration capacity of rainwater (Sandström 1995). The temporal and spatial fluctuations in rainfall are high in the study area. Intensive grazing diminishes the protective vegetation cover during periods of drought. Therefore, as the rain season starts high momentum raindrops hit the bare soil surface and cause water erosion (Loiske 1995).

2.3 Traditional Ecological Knowledge

Traditional Ecological Knowledge (TEK) is a theory the researcher Dr. Fikret Berkes has been making several studies of the recent decades. When the theory of ecological knowledge is adapted to a certain group of people or a specific place the conception can be called Local Ecological Knowledge (LEK) (Söderqvist et al 2004). TEK and LEK can be used as complements in the basic data for decision-making for sustainable use of natural resources. TEK is a cumulative body of knowledge, praxis and conceptions about the relationship between different living beings (including humans) which are transferred from generation to generation throughout cultural tradition. Berkes et al (2000) declare that case studies have revealed that there exists a diversity of local or traditional practises for ecosystem management. Indigenous knowledge can contribute to the conservation of biodiversity, rare species, protected areas, ecological processes and to sustainable resource use in general. The attitude of TEK may be holistic and the behaviour adaptive. Hence traditional practice is not

automatically synonymous with ecologically suitable systems and resilience building of ecosystems. TEK is tested by trial-and-error and accumulates incrementally. Indigenous notions of conservation are fundamentally different from those of Western conservationism. This is why many (but not all) societies characterized by TEK are indigenous or tribal, non-industrial or less technologically advanced (ibid.).

Since the landscape and climate is so varying and unpredictable in East Africa it has been important for pastoralists to adapt to the conditions by making small-scale movements. In semi-arid environments with bimodal rainfall the plant productivity oscillates seasonally and follows the rains. Traditionally cattle herders have adopted this pattern by migrating seasonally enabling the recovery of heavily grazed pastures (ibid.). In many traditional systems it is common with integrated farming and cultivation systems, a so called multiple species management (ibid.).

2.4 Sustainable Development

Sustainable development is a concept advocated globally today. The expression was published by the Brundtland Commission in 1987 and it is defined as: “humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland 1987:24). To reach Sustainable Development three dimensions, the ecological, the economical and the social, must be integrated (Söderqvist et al 2004). Sustainability is achieved where the three dimensions meet in consensus. In reality the work in putting Sustainable Development into effect has been very different according to the methods used and the basic conditions of the actor.

If an activity is “sustainable” it can be continued and repeated for the foreseeable future (Townsend et al 2003). If people want to continue using the natural resources the forest supplies for the harvesting rate cannot be faster than the reforestation rate. The same basic rule is relevant for grazing. A pasture in a forest or open grassland must have a possibility to recover (let grass grow) after disturbance (cattle grazing) to be maintained as a grazing land. If overstocking and overgrazing today lead to soil erosion there will be fewer natural resources to use in the future. Therefore the time perspective (both history, present and future) must be taken into account.

3. Methods

3.1 Choice of methods

In my case study I try to interpret the specific data I have collected about the small area studied and connect it to Fikret Berkes theories about TEK in a broader context. I incorporate a local perspective to the problems with overstocking and overgrazing. In my field work I have used a variety of sources and methods; semi-structured interviews, observations, studies from secondary data and informal talks.

3.2 The case study

My field work was concentrated and carried out during eight days within a three week long excursion to Babati town in March 2006. The excursion was integrated in the course "Sambandet miljö och utveckling i Syd" within the Environment and Development Educational Programme at Södertörn University College in Stockholm. The aim of the field work was to attain knowledge and to understand the complex of problems with overstocking and overgrazing in a rural area. The case study is based on semi-structured interviews with about 20 people either working as foresters or voluntarily engaged in forest management. The information I received from the villagers was given by people in duty or was personal reflections told by livestock keepers living in Babati district.

3.3 Delimitations

My case study is limited geographically to villages in Babati District in Northern Tanzania. Since the fieldwork part of the case study is much limited in size I have based a large part of the essay on secondary data, for example other studies of overgrazing, semi-arid environments and zero-grazing. A majority of the interviews were done in Kiswahili with a translator. There was no requirement that the translator should have any knowledge about my studied subject which sometimes caused misapprehensions, both between me and the translator and between the translator and the responder. To minimize misunderstandings I used cross-checking and triangulation, i.e. I asked several persons the same questions at different interviews to see if I got the same answer. All of the interviews were group-interviews (with between three to seven students) and the misinterpretations between me and the translator were reduced, since I triangulated the replies with my classmates. I also combined the data I collected with observations and literature reviews.

4. Results of the field work and the interviews

4.1 Overgrazing in Babati District

4.1.1 Overgrazing

There is not enough grazing land for maintaining current livestock density in Babati District (C. Kavishe pers. comm.). The lack of grazing land is a problem in Babati (Mr Msangi pers. comm.). The density of people increases all the time which leads to establishing of more houses, community institutions, garden plots and roads. The problems with overgrazing occur on common plots, on public land. When no one "cries for" the pasture there is a risk for overexploitation (ibid.) according to the theory about the "Tragedy of the Commons" (Hardin 1968). Individual livestock keepers gain from having one more cattle on the grazing land while the whole community shares the cost (Sandling 2005). In Babati District forest management programmes as CBFM have turned this tragedy of the commons into a "success of the commons" (ibid.). Overgrazing is not the major problem in woodlands, neither the major cause of soil erosion (interview with villager). Also logging and fires contribute to land degradation in the woodlands in Babati.

4.1.2 Soil erosion

The forests I visited in Babati District were under control of either CBFM or JFM. I was told that soil erosion is caused by the absence of trees and vegetation cover (interview with villager) i.e. deforestation or overgrazing. Other studies of soil erosion and land degradation in semi-arid environments have shown that deforestation (Sandström 1995), over-cultivation (Lindberg 1996), overgrazing and poor irrigation (Kinlund 1996) are contributing human factors to land degradation applied to the biophysical natural features as irregular low rainfall (De Leeuw & Tothill 1990, Kinlund 1996).

C. B. Kavishe works as a technical advisor for LAMP in Babati. He says that erosion is a great problem in Babati District (C. Kavishe pers. comm.) Wind erosion occurs at times of drought. Water erosion occurs when raining heavily. One contributing factor to erosion is overgrazing (ibid.). Some people keep a number of 20-50 livestock and they graze along the roads, on commons i.e. anywhere where they can find pastures.

4.2 Measures to prevent overgrazing in Babati District

4.2.1 Minimize number of livestock

Minimizing the number of livestock is necessary to not exceed carrying capacity of local grazing land (Campbell 1996) at drought. In whole Tanzania large tracts of land are said to be overstocked and overgrazed (ibid.). One advice some villagers I interviewed in Babati District gave to prevent overgrazing is to reduce the number of cattle. The problems with too many cattle appear when it is difficult to find grass to feed them with (e.g. at the end of dry season). Many cows in a small area also transmit diseases to each other (interview with villager). But only destocking does not solve the problem with overgrazing. Mr Msangi is a veterinary surgeon and works as a livestock officer for LAMP in Babati. He says that "we should not reduce the number of livestock; instead increase quality of animals and it will balance itself" (Mr Msangi pers. comm.). It is not the big number of livestock that causes overgrazing; it is bad management (ibid.).

4.2.2 Spatial and time limitations for grazing on common pastures

There are seldom enough cattle to cause overgrazing during wet season when grass amount is unlimited (Kinlund 1996). The carrying capacity of grazing land is varying from month to month and from year to year due to the irregular pattern of rainfall (ibid.). Therefore the limitations for grazing must be variable according to risk for fire, condition of soil, if it is rain or dry season etc. (interview with villager). In forests it is of particular importance to protect steep slopes, tree plants and fresh water resources from cattle grazing (ibid.). C. B. Kavishe thinks it would be better to encourage people to "cut and carry" grass from the forest instead of letting the cows go inside. Then there would still be a protection from fires but without the problem with the soil erosion caused by cattle. The grass could be fed to cows or sold as fodder.

4.2.3 Putting a price on grazing on controlled areas

In villages with forest management programmes (CBFM or JFM) farmers must pay an entrance fee per head of cattle to enter the forest for grazing (interview with villager). The grazing is limited to certain areas, zones (Kavishe, unpublished b). After the rain season there is a lot of grass and it is a good time to graze (interview with villager). The forest committee in a village with CBFM allows controlled grazing between February and May. During dry

season it is also good to graze a bit to minimize the risk of fire in the forest. Too high grass also disturbs the growth capacity of trees in forest.

4.2.4 Feeding crop residues

Every crop farm has a strip of grass, a pasture along the contour of the farm (Mr Msangi pers. comm.). The pasture acts as a protector of the soil and also as a supplement to what is missing in grazing land. An alternative to depending on access to grazing land is to feed dried and stored crop residues (from e.g. maize, beans and pigeon peas) to the livestock. Crop residues can compensate the shortage of fodder because of overgrazing.

4.2.5 Cooperation

A villager I spoke to advocate the expression “grazing under responsibility”. It is important for livestock keepers to make and follow common rules and limitations for where to graze and when. There should also be cooperation between villages sharing grazing areas (interview with villager).

4.2.6 Land use planning

During an interview with C. B. Kavishe he established the fact that “land use planning should be on position” (C. Kavishe pers. comm.). The community should decide which areas will be used as farmland, grazing land or forest. “Livestock keepers should be encouraged to reduce the number of livestock which should be enough for the area of land they possess” (C. Kavishe pers. comm.). People could change their livestock into money and invest in cultivation or a shop.

4.2.7 Zero-grazing

C. B. Kavishe is of the opinion that “zero grazing should be encouraged” (C. Kavishe pers. comm.). The farmers can cultivate fodder grass around farmland. If they reduce the number of livestock they can grow enough fodder to feed a few cows on their farmland. Instead of keeping a large number of underfed indigenous zebu cows people could reduce the number and have a few healthy exotic cows or crossbreeds (see table 1). In table 1 I present some differences between the traditional indigenous zebu cow and the exotic breeds (Ayrshire, Jersey and Friesian) based on my interview with Mr Msangi (2006) at the LAMP office. It is also possible to cross between different species of cows. A mixed breed between the zebu and an exotic breed gives more milk and meat while it still is more durable against local diseases

and drought. The cross breeds usually varies from 50 to 100% of exotic origin to the East African Zebu and are managed under zero grazing or grazing and concentrate feeding (Bee et al 2006).

Table 1. The benefits and disadvantages with different cows (according to interview with Mr Msangi 2006).

Indigenous (Zebu)	**Cross breed** (Bee et al (2006) advice 60-75% exotic)	**Exotic** (Ayrshire, Jersey, Friesian)
+ Resistant to diseases	+ Resistant to diseases	- Dies easily, not resistant to local diseases.
+ Has hap. Can survive drought and times with no food	+ Has hap. Can survive drought and times with less food	- Doesn't have hap. Can't survive drought
- Small body weight (up to 300 kg). Grows slowly	+ Big in size [X = (indigenous + exotic) / 2]	+ Maximum body weight (up to 1000 kg). Grows fast
- Produce little milk and manure	+ Produce more milk and manure	+ Produce a lot of milk and manure
- Improper to keep indoor, causes gullies damage tree plants and shrubs	+ Good to keep indoor, no soil erosion	+ Should be kept indoor, no soil erosion
- Must keep many if you want to make money	+ Rather keep a few healthier specimen	+ Keep a few healthy cows, possible to earn more money
+ Local knowledge, long history	- Modern and costly. In small villages only a few veterinary surgeons or none	- Modern and costly. In small villages only a few veterinary surgeons or none
+ Easy to maintain breed quality	- Difficult to find inseminators and to keep breed quality.	- Difficult to find inseminators and to keep breed quality.
+ "Real" taste of milk and meat	- New taste of milk and meat	- Less tasty milk and meat

A villager I spoke to in Babati District prefer the exotic cows since they give more profit. They cost more to keep because they eat for example expensive elephant grass and need more veterinary services (see table 1) but produce more milk per day (compare about 15 litres from exotic cow with 3-5 litres from an indigenous cow) and more meat when finally slaughtered (Mr Msangi pers. comm.). Exotic cows and crossbreeds are good due to greater meat, milk and calf production. But a villager told me exotic cows are more easily infected by local diseases than the indigenous cows (interview with villager). That problem can be coped with by consulting the local veterinary surgeon. When a farmer suspects one of the cows is sick, the farmer consults a doctor (cheap measure) and gives medicine (expensive measure) to all of the cows to make sure the disease will not spread. In general this farmer thinks that exotic

cows cope with the climate very well. This farmer can get technical advice and knowledge about how to keep exotic cows. The opinion of this farmer is that if one knows how to keep them there are only benefits from keeping exotic cows instead of indigenous cows.

4.3 Forest management programmes in Babati District

Table 2. Benefits of CBFM and JFM (according to interviews with villagers 2006)

Soil in forest increase in quality when land is covered by vegetation.
The coverage of trees prevents soil erosion. A gully appeared many years ago in a village in Duru-Haitemba because of lack of forest. Today the aim is to prevent it from happening again.
There are sources of fresh water on the hills since the water infiltration has increased, the rainwater evaporation and run-off has decreased.
There is more grass in the forest since the cattle is only allowed to graze for a short period of time each year (February – May).
It is possible to practice beekeeping in the forest thanks to increase in amount of wild flowers.
There is collaboration between the villages in Duru-Haitemba

4.3.1 Community Based Forest Management in Duru-Haitemba

Duru-Haitemba is a "success story" of Community Based Forest Management (CBFM) in Tanzania. The program started in 1993-94 between eight villages in Babati District, within the Duru-Haitemba area (Sandling 2005). Before CBFM the forests were overexploited without control; there was too much grazing, harvesting, timber collecting, fires etc. (interview with villager). Today the forests are managed by the villages instead of the District or the Government. An important factor for the success of CBFM was to make the villagers feel responsibility through feeling that the forest "belonged to them". During an interview I was told that in the start of CBFM some villagers in Duru-Haitemba did not like the measures but today they experience a good climate. As an example of benefits from CBFM some villagers told me that the forest is better for practicing beekeeping now because more wild flowers growing there attract bees (see table 2).

In one of the villages I visited I was told that overgrazing is not a problem. The village is sparsely populated, with three acres of land provided from the Government to each farmer to build a house on and cultivate. People are advised to practice zero grazing. An opinion from a villager I met is that it is better to keep the cows in stables. To walk with the cattle is a waste of time; walking behind the cow waiting for it to grow big. Instead you can keep the cow inside, feed it and you have time to do other things as well. In villages in Duru-Haitemba

there are areas either protected from grazing or where grazing is allowed. “The grazing zones are not enough for the number of cattle in the village” is the view of C. B. Kavishe.

In this village the manner when having a great number of livestock and suffering a lack of pasture i.e. at times for cultivation or drought, is to take cattle to bigger communal grazing lands (interview with villager). When I visited one of those rangelands I had the possibility to ask some pastoralists about their point of view. When there is a shortage of fodder in the villages with forest management there is no extra grass on the rangelands either. The major problems during drought are lack of fresh water and fodder for cattle (interview with pastoralist).

4.3.2 Joint Forest Management in a village in Babati District

Another village I visited belonged to Joint Forest Management programme (JFM). The Government owns the forest and manages it together with the villagers. In this particular village the forests are of two types: In one of them, no action as grazing cattle is permitted. If you get caught with grazing, the village government will fine you. In the second type of forest some actions are permitted i.e. grazing during dry season, firewood picking by hand, collecting berries, mushroom and medicinal plants. During rain season no grazing is allowed. The reason is that the grass should be let to grow high. At the end of the rain season cows are allowed to graze in the forest. In this village most households own between two and six cows. They keep indigenous species, crossbreeds and exotic cows.

5. Discussion

5.1 Summary of the field work

During my three weeks long stay in Babati District I visited several villages around Babati town. I met farmers and foresters and looked at rangelands and forests where cattle are taken to graze. From the interviews I gathered information about what measures are taken to prevent overgrazing in the forests. My experience from what I observed is that a management programme can be a successful tool in minimizing overuse of the natural resources a forest supplies for e.g. fodder, firewood, timber (see Table 2).

I believe there is Traditional Ecological Knowledge (TEK) in the behaviour among many villagers I interviewed. People had similar views on during what periods it was good or not good to let cattle graze in the forest according to the accumulation of grass and fire prevention. The tradition is also to keep indigenous cattle that can survive times of drought and local diseases. I was told by some villagers that overgrazing and overstocking in a forest is a contributing factor to soil erosion among other factors e.g. burning and logging. While the population is expanding and building more houses, roads and services, the pastures and forests suitable for grazing are diminishing (Mr Msangi pers. comm.). To avoid permanent land degradation overgrazing should be prevented. The TEK about the need for large rangelands where areas can be left to recover for some time is an unsustainable practice to the increasing livestock density. In villages with CBFM or JFM activities the forests are regulated by official bylaws (Sandling 2005). CBFM and JFM promote small livestock number and encourages zero-grazing (interview with villager). It would be good if more households in the district minimized their livestock number (Mr Msangi pers. comm.) and eased the grazing pressure. From Mr Msangi I heard that a new policy is under development in Babati Town Council which proposes all households to keep a minimal number of livestock because of the lack of grazing land inside and around Babati town. I did not read the policy since it is not finished yet but it will be interesting to see what impacts such a policy has on the livestock density in Babati.

Following an improvement of the forest management and restrictions for grazing there will be less land available for cattle to graze. Zero-grazing is promoted as a solution to prevent overstocking. The cattle is kept in stables or tied up instead of wandering around freely in the

fields (Löfstrand 2005) or the forest. Many of the villagers I spoke to were very much in favour of zero-grazing. Instead of keeping many indigenous cows that need a lot of space and time spent walking with them, some villagers told me they preferred to keep a few number of cross-breed or exotic cows in stables. In some villages where zero-grazing is practiced all villagers cooperate since keeping exotic cows requires a lot of preparatory work i.e. training on appropriate zero-grazing techniques (Katila et al 2003) obtaining veterinary services (Mr Msangi pers. comm.) and providing for inseminators.

5.2 Conclusions

5.2.1 Traditional Ecological Knowledge affects management

Rotational grazing and managing multiple livestock species are traditional methods (Oba et al 2000) that can be recognized as TEK. The traditional livestock management involves indigenous zebu cows that resist drought, starvation and local diseases. It is said not to like standing on one spot which contributes to the need of large grazing areas (Mr Msangi pers. comm.). The outcome of this knowledge collides with the increasing human and livestock population. Keeping exotic breeds and practicing zero grazing is a more recent occurrence in Babati and is not characterized by TEK (since its aim is to have a minimal size of grazing land and use land for other things). It is traditionally known that a certain level of grazing pressure is needed in a miombo forest to not impede the regeneration of trees and to decrease the risk for fire by minimizing the amount of grass for fuel (interview with villager). The measure to both decrease the quantity of grass and to avoid trampling and soil compaction caused by cattle is to let people “cut-and-carry” grass from forest (C. Kavishe pers. comm.).

5.2.2 Overgrazing contributes to soil erosion

Overgrazing is a contributing factor to soil erosion among others e.g. poor irrigation (Kinlund 1996), deforestation (Sandström 1995) and over-cultivation (Lindberg 1996). In forests with forest management programmes such as CBFM and JFM grazing is regulated and overgrazing is not a problem (Interview with villager). The grazing pressure and land degradation might be moved to surrounding areas instead (Katila et al 2003, interview with pastoralist).

5.2.3 Measures to prevent overgrazing

To prevent overgrazing in Babati District minimizing the number of livestock is promoted (C. Kavishe pers. comm., Mr Msangi pers. comm.). In overgrazed areas the general controlling

measures involves “destocking to bring the number down to the carrying capacity of the area” (Doran et al 1979:46). Zero grazing is encouraged. Other measures are to forbid entrance into forests by rules in bylaws and patrolling volunteering villagers when risk for overgrazing is high (Sandling 2005). Some controlled woodlands have entrance fees for cattle to regulate the stocking rate. This measure is unfair towards poor people which are excluded because of lack of capital. To ease the grazing pressure in forests people can also feed dried and stored crop residues to livestock when suffering from lack of fresh grass (interview with villager). Mr Msangi has the idea to restrict the size of the grazing areas given and instead increase the grazing quality of it by removing bushes and planting grasses (Mr Msangi pers. comm.). This measure is sometimes illegally taken by villagers who put the bushes and shrubs on fire just before rain-season to make room for more grass to grow (interview with villager).

5.2.4 Are the measures sufficient?

The measures are sufficient to prevent land degradation specifically in the forest the regulation is intended for. However, without cooperation between the villages in the district the prevention from overgrazing in one village might lead to a greater grazing pressure in the adjacent village. The timescale must be taken into account – many adequate actions, such as promoting “cut-and-carry” of grass from forests and grazing exclusion from pasture at extra vulnerable times, takes time to be accepted by all people. The measures Mr Msangi and C. B. Kavishe promote are good but time is needed for implementation and evaluation.

5.2.5 Benefits from CBFM and JFM

Forest management programmes i.e. CBFM and JFM are useful tools in bringing together power to act for a sustainable development. Cooperation between villagers and the feeling of responsibility towards the forest are the greatest benefits in prevention of overgrazing. Other examples of benefits from CBFM and JFM can be seen in table 2. Villagers patrol the forests voluntarily (Sandling 2005) and if they catch someone illegally taking their livestock into the forest the responsible must pay a fine or he (or she) goes to jail.

5.2.6 The measures are not free from problems

The major problem with prevention of overstocking is to force people to decrease the number of livestock. Livestock is the most important source of income to most of the people (Campbell 1996) and a large number of livestock represents both store of wealth (Doran et al 1979) and prestige (interview with villager). To keep a large number of livestock has through

historical time been regarded as ecological knowledge due to the current circumstances. The cattle work as a buffer of concentrated energy which is necessary in unpredictable semi-arid environments (Berkes et al 2000). But if sources of wealth and survival are spread over many other factors, for example agro-forestry and education, there are arguments saying big livestock number is not "ecological knowledge" anymore (Mr. Msangi pers. comm.).

5.3 Reducing livestock number

A big number of livestock has trough all times been a storage of wealth (Doran et al 1979). At hard times the family sells or slaughters an animal. A great number of livestock is also a prestige which makes it more difficult for the farmer to decrease the number by his (or her) own will (interview with villager). To change to new systems from something characterized by TEK, like the indigenous zebu, is not easy with uncertain quality-breeds with different taste of milk, meat and changed methods of keeping.

To change from indigenous cows to exotic or crossbreeds is easier if villagers cooperate. It is a great risk factor in keeping exotic breeds if there are no veterinary surgeons nearby or if you have no education in how to keep them. If many villagers cooperate there is a bigger chance for sustainable livestock management (interview with villager). Mr Msangi is of the opinion that those with a large number of livestock should sell their cattle, "put your money in the bank" and let children go to school (Mr Msangi pers. comm.). But it is not only reducing number that solves the problem with overgrazing. It is not overstocking itself that causes overgrazing; it is bad management of the grazing lands (Mr Msangi pers. comm.)

5.3.1 Zero grazing

On communal plots there is a risk for overexploitation (Sandling 2005). With forest management programmes such as CBFM and JFM the grazing is regulated and overstocking eliminated. Then there instead is a lack of grazing land. One side effect from good management and closing from cattle in one area is that it can result in increased land degradation problems in the surrounding areas (Katila et al 2003). The great measure to solve this problem is to keep cattle in stables or tied up (Löfstrand 2005). Then the farmer is free to also do other things than walk behind the cattle spending time waiting for it to grow big (interview with villager). This development is in a way similar to the Western farming methods where almost all cattle are kept in stables and fed with concentrates. By zero-grazing

people ignore the fact that a cow has four legs. Lidfors and Loberg (2001) are two researchers who have come to the conclusion that cows have an intrinsic urge for movement which is not only connected to seek for food. Cattle are creatures curious about the surroundings and show stimulation if they can change environments. Cows, calves and bulls are social animals that need motion, company and teamwork from the herd (L. Björklund pers. comm.). They also have a big need of grazing. L. Björklund who works for Animal Rights Sweden claims that it is important that cattle has big space for movement, grazing and to have a possibility to move out of the herd for some quiet time. One question is whether livestock keepers take into account the opinion of the cattle (which might be difficult to interpret since they do not speak Kiswahili) when they count the benefits from keeping cattle in stables instead of out in the nature? I wish they will.

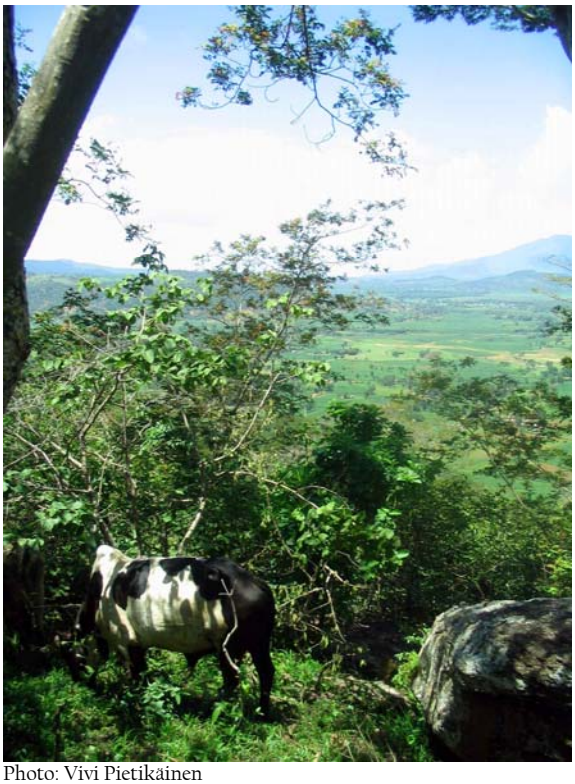

Photo: Vivi Pietikäinen

Photo: Vivi Pietikäinen

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Tables and maps

Table 1; according to Msangi, Mr. (2006-03-11) interview
Table 2; (2006), according to interview with villagers in Babati District
Map 1; (2005), Map No. 3667 Rev. 5 United Nations
Available PDF: < http://www.un.org/Depts/Cartographic/map/profile/tanzania.pdf > (2006-05-19)