SLUSE
Sustainable Land Use and Natural Resource Management
Joint Basic Course 2001 6 Field Course in South Africa

Patterns of Livestock Production in Pepela, South Africa

Field Course Report by

Sesselja Bjarnadóttir, Land Use in Developing Countries, KVL
Zoran Brkic, Land Use in Developing Countries, KVL

Marcelino Gauguin, Horticultural Sciences, KVL
Kim Raben, Geography and International Development Studies, RUC

Supervisors: Thorsten Treue (KVL) and Anita Veihe (RUC)

TABLE OF CONTENTS

Abstract

The factors that determine livestock production in the study area, Pepela, South Africa, is investigated using socio-economic and natural scientific approaches.

The importance of livestock, determining factors such as diseases and cattle theft are identified as well as an identification of the role of the livestock's place in peoples' livelihoods.

Preface

The aim of the ILUMNR SLUSE course is to:

"*Demonstrate the need for and potentials of an interdisciplinary approach* (…) [and] *analyse, discuss and apply a wide spectrum of methodologies, both on bio-physical, socio-economic, political and cultural aspects*" (SLUSE Homepage).

From the beginning our research team had various scientific backgrounds and through all of our work including the final analysis and report writing, a process of reflection, discussion and dispute has taken place reflecting our different scientific backgrounds. Mikkelsen (1995) points out the importance of working inter-disciplinary ('*in concert*') contrary to a multi-disciplinary way of working separately in a team ('*in parallel*'). "*The purpose of attacking development problems in their complexity and addressing the different layers of causal relationships has determined the need for holistic or interdisciplinary perspectives in research and development work"*(Mikkelsen 1995, p. 216) At the same time we find it as important to remember that "*the special strengths and contents of single disciplines should not be jeopardized by turning everyone into generalist*" (Mikkelsen 1995 p. 217-18).

Introduction

In South Africa there is a very high income inequality, widespread poverty, and high levels of unemployment. The poverty rate (percentage of individuals classified as poor) in rural areas is about 71%, compared with 29% in urban areas. The HDI (Human Development Index) by province and race reveals great disparities in the level of human development in different parts of the country. The lives of many rural people are characterized by unequal and distorted access to markets, services and opportunities. (May, 1999)

Most of South Africa's land area (86%) is not suitable for arable production and is used extensively livestock production (Dept. of Env. Affairs and Tourism, 1999; Scoles, 1994 in Cousin, 1995, p.3). Livestock production on communal rangeland is likely to be central feature of Southern African black farmers livelihood strategies, and is continuing to make economic sense for rural households (Cousin, 1995). Animal diseases are a factor that threatens the economy of livestock production and their control is needed in order to safeguard people's dependence on their products and services.

Objectives

Our main research question is:

What are the factors that determine livestock production in the study area, Pepela?

To answer this, the following objectives are pursued:

- To identify the use of livestock and their importance in peoples' livelihood
- To investigate the influence of animal diseases on the livestock production and the measures taken against these
- To identify the interaction between the management and use of rangeland and livestock

Study Area

The area appointed for this study was a group of three villages, Mabula, Makomereng and Pepela, situated in around 1600 meters altitude above sea level, at the foothills of the Drakensberg mountains, by the border to Lesotho. Makomereng and Pepela are part of a catchment area called Madlangala, which also encompasses the village of Goxe. The villages are situated in the Maluti district of the Transkei region, which again is situated in the western-most part of the province of Kwazulu Natal. The total population is increasing in the region (from 1970 to 1991). The population growth in this part of Kwazulu-Natal is measured to be 2-4 % (1980-1991 figures). Just under half of the population is living below the poverty line (Dept. of Env. Affairs and Tourism, 1999).

The main annual temperature in the study area is 14-15$^{\#}$C (Compared to e.g. 18-19$^{\#}$C in Durban) (Dept. of Env. Affairs and Tourism, 1999). The average annual rainfall is between 700 and 1300 mm, which is above the national average semi-arid conditions of 500 mm pr. year. The region is well favoured in terms of water availability, and the average potential of primary production in the study area is thus moderately good (Dept. of Env. Affairs and Tourism, 1999), but soils are poor in fertility and very erodible (Fox and Rowntree, 2000). The region receives most of its rain during the summer, while winter (from June to October) is the dry season (Dept. of Env. Affairs and Tourism, 1999). Cultivation starts in November-December and the growing season is 7-8 months.

The study area is situated right in the middle of the so-called grassland biome (see Figure 1). The vegetation is used for grazing and is thus a basic resource that sustains many livestock species. The most common types of livestock in the study area are poultry, goats, sheep and cattle, but also pigs, horses and ducks are found in the area. Overgrazing is the main cause of degradation in the natural

rangelands of South Africa (Dept. of Env. Affairs and Tourism, 1999, Fox and Rowntree, 2000). Overgrazing leads eventually to degradation of rangelands and to soil erosion (Fox and Rowntree, 2000).

Figure 1. Distribution of the Grassland Biome in South Africa (shaded area).

The livestock group chose to work in the village of Pepela. Pepela consists of 105 households and has a population of 498 people. All these villages have access to safe water.

Background

In order to get as clear a picture of the livestock situation in Pepela as possible, and to profit by our different disciplinary backgrounds, we wanted to look at it from several different aspects. The broad lines of these aspects are drawn below.

Livelihood Strategies

Investigating the importance of livestock in Southern African rural settings will not make much sense if it is not placed in a wider context - understanding how poor households engage in a wide range of activities in order to generate their livelihood[1]. It is widely recognised that the (multiple) activities of people living in poor households can be understood as a way of spreading out the risk that shocks can oppose on their livelihood. Droughts, floods, degradation of natural resources,

[1] A variety of definitions for Alivelihood@ have been made ranging from the use of a few parameters of production, employment and income to the term Asustainable livelihood@ which brings in aspects of reduced vulnerability and environmental sustainability, food security, health, social networks etc. (Shackleton et al.; DFID 1999). As the main focus of this report mainly is on methodology aspects we will use the more Asimple@ definition of livelihood using the parameters production, employment and income.

economic changes, theft or animal diseases are examples of such shocks creating insecurity (CARE Bolivia, 1999; May et al. 1999).

Multi-purpose use of livestock in communal systems

Communal livestock systems are often viewed as unproductive and with little off take of animals. Direct comparison of the productivity of communal systems and commercial systems e.g. in terms of calving rate or animal growth rates, usually find that production is lower in communal systems (Tapson 1991 in Shackleton et al. 2001). However, comparisons ignore the range of goods and services obtained by owners and non-owners in communal systems. Livestock herds in rural areas are of multi-purpose use in character, for instance cattle are used for draught and their manure is distributed among households. When all their functions are valued, their economic value per hectare is often much higher than that from commercial ranches for beef production. The higher values are not only a result of multiple goods and services from livestock, but also lower input costs under communal system (Barret 1992; Behnke 1985 in Cousin 1995).

Rangeland as a Natural Resource Base

Among other features the grassland biome is characterized by having an extremely high biodiversity (Low and Robelo, 1996). The grasslands provide the essential needs for domestic animals and by this way maintain livestock production. Thus it is the basis for livestock production especially cattle, and that is why it is important and relevant to look into the environmental state of the grassland to get a full picture of all the factors, which influence the livestock production. Generally, a lot of importance is placed in problems regarding degradation of the grasslands (mostly due to overgrazing and erosion) (Dept. of Env. Affairs and Tourism, 1999; Barnard and Newby, 2001). Thus we did not want to look at livestock production without investigating the grassland factor, which could threaten the whole basis of cattle/livestock production and on the people who rely on it in the near future.

Mostly the low seasonal rainfall but also because of low soil fertility limits the productivity of the grassland. Soil is, together with water availability, a key factor in supporting plant growth and therefore in food and livestock production (Fox and Rowntree, 2000). Fodder supply and quality are important for the livestock's nutritional and health state, are indirectly related to the soil properties that limit pasture production (Ahn, 1993).

Rangeland Management Patterns along time

In South Africa, rangeland is a communal resource to which every community member has the right of use, but not ownership. During the 1900's, population growth resulted in greater pressure on the natural resource base and degradation of the rangelands. Increased stock theft has constrained some stockowners to keep their animals close to their homesteads for long periods, further increasing the pressure and overgrazing of the rangeland (Maloti-Drakensberg Transfrontier Project, 1999).

Furthermore, many of the communal areas were affected by the “betterment” planning by the government in the 1950's. The areas were divided in three zones (grazing camps, villages and croplands), which were fenced to control livestock movement. During summer (the growing season), livestock were kept in grazing camps in the mountains when the grazing value of natural rangelands is high, and livestock damage to crops in the village was thus minimized. In winter (the dry season), the grasses in the summer grazing areas in the high mountains are dormant and have low nutritive value so that it is necessary for the livestock to feed on crop residues and the grasslands close to the village.

The management of grasslands includes controlled burning and rotational use of grazing sites (Ahn, 1993). Careful management is required to maintain the abundance of palatable grasses and to prevent the establishment of trees (Low and Robelo, 1996).

Degradation of Rangelands

Soil degradation encompasses physical degradation (E.g. erosion or decline in structural qualities), chemical degradation (E.g. depletion of nutrients) and biological degradation (E.g. decline in soil organic matter, loss of biodiversity) (Totolo, 1998). All these can severely impact the productivity of the rangelands. The movement and grazing by livestock can induce erosion, because the soil is left bare and unprotected from heavy rains. 5% of the soils in South Africa are affected by water erosion in greater or lesser extent. The average soil loss is 2.5 tonnes per hectare per year[2] (Dept. of Env. Affairs and Tourism, 1999). Uncontrolled erosion can develop into greater areas (dongas) that can destroy vast areas leaving them unsuitable for any kind of production (Fox and Rowntree, 2000).

An indicator of the environmental state of the grazing land is the species diversity. A vegetational parameter used to asses degradation is the proportion of palatable species (suitable as fodder)

[2] The quantity is not much. It corresponds to a 0.2 mm thin layer of the topsoil. Nevertheless it is above the soil formation rates and locally, it can have great impacts as, for instance, in formation of dongas. In other areas, the soil loss can be can be much higher than the 2.5 tonnes per hectare per year. (Dept. of Env. Affairs and Tourism, 1999)].

compared with unpalatable (Dept. of Env. Affairs and Tourism, 1999). The availability of palatable grasses indicates the condition of the rangeland in regard to animal nutrition, and overgrazed grasslands tend to be dominated by unpalatable grass species (Totolo, 1998). The arise of weeds and small bushes are a sign of rangeland deterioration (Totolo, 1998). Finally, an indicator of rangeland degradation is the percentage of bare ground (Maloti-Drakensberg Transfrontier Project, 1999).

Animal diseases

The disease can be caused by microorganisms or protozoan parasites (Hall, 1985) or by mechanical injures, thermal injures, and nutritional deficiency. Many diseases are the result of complex interrelationship of the animal with its environment and very often two or more factors contribute towards a disease, thus there is more than one way in which to try to prevent or cure disease (Cullen, 1991). In Africa, ticks and tick borne diseases are the most serious constraints to increased cattle production (Pegram *et al.*, 2001). Therefore, the control of these vectors has been a major preoccupation of tropical and subtropical veterinary services for decades and considerable resources have been utilized in the building, supervision and maintenance of dipping facilities (Payne, 1990). The benefits of the control of animal diseases within the *herds of small holders in the tropics and subtropics are ability for to increase livestock production and by this contribute to the whole social and economic stability.*

Nutritional Status

The major cause of poor livestock productivity is inadequate nutrition. Many nutritional problems of grazing animals result from ineffective management practices that limit the quantity or quality of forage. Grazing management can enhance or reduce the quality of the diet and by this limited they digestibility (Kothmann and Hinnant, 1998). Diseases can also affect the nutritional status of grazing animals. Some diseases reduce feed intake as well as the absorption of specific nutrients thus further depressing nutritional status in the animals (Belzinger, 1999).

Breeds

Under reasonable environmental conditions there are genetic differences in all livestock in a number of traits of economic importance. Traits that demonstrate large genetic differences in cattle are age at first calving, calving percentage, milk yield, length of lactation period, length of dry period, birth

weight, rate of daily liveweight gain and mature body weight (Payne, 1990). One of the most important limiting factors for distribution and rational utilization of the cattle breeds under tropic and sub-tropic climate is acclimatization (Payne, 1990). Other processes of adaptation of new breeds are adaptation to the health conditions (adaptation to the new diseases) and adaptation to local, mostly traditional husbandry methods.

Methods

As presented in ‘Objectives’, our formulation of the main research question made room for all kind of aspects from the different disciplines to be researched upon if necessary. Naturally, our different scientific backgrounds reflected our ways of choosing and combining methods and our divergent perspectives on how to approach the topic of livestock. Data triangulation defined as crosschecking your data from different sources e.g. different (types of) informants and literature for undertaking validation also took place (Mikkelsen 1995). The following paragraphs will present the chosen methods, which show our ideas of approaching and answering our main research question and of course also reflect the omission of other methods.

Monitoring the Nutritional Status of Animals

Monitoring the nutritional status of animals is method used for describing the relation between animals´ condition and effectiveness of nutritional strategies in an area. Monitoring the nutritional status of animals contains three different components: animal condition, milk yield and record keeping investigation (Chesworth, 1992). This is mostly a quantitative method that is based on measurements, grading and comparison between individual proportions of animals as representatives of breeds and their standard values. By comparison is possible to calculate standard deviation, positive or negative, and then attribute quality of investigated animals. This method in general demands high ability and skills in the term of well perception and sensitive palpation during the grading of animal condition. Estimated animals must be randomly sampled and body mass and grading of animal condition must be measured at the same time.

The most important indicator of the nutritional status of animals in investigated area was animal condition, rather than milk yield analysing and record keeping investigation that are more convenient for investigation of intensive farming production, rather than for extensive grazing in rural areas. We expected by this method to detect differences between individual characteristics of the animals in the investigated area and standard characteristics for given breeds.

Animal condition measurement as a component of overall investigation related to the nutritional status of animals contains two related operations; weighing animals and grading of animal conditions. A simple way to estimate body mass of animals is to use a tape measure to gauge the girth of the animal around the chest approximately near the hearth and then compare the results with a scale which giving a final value (Chesworth, 1992). Grading of animal conditions is based on the observer’s feeling of the fleshiness of the tail and on the back, and then using grading schemes for giving accordingly a number or score to body condition .We used the ILCA nine point system, used

for zebu type animals, which is widely used in Africa. During and after our measurements of the cattle on the investigated area, we faced few significant problems that impeded us to complete and finish investigation. Firstly, we were not allowed to choose random samples of investigated cattle. Instead of it, we could measure only almost the biggest animals selected by the veterinarian assistant, probably due to his misunderstanding of meaning of the measurements. The measurements thus do not represent average proportions and characteristics of the cattle in investigated area. Under these circumstances we decided to finish measurement without reaching the expected number of samples, considering the meaningless of further measurement. In this connection it is very important to emphasize the importance of better explanation of main tasks and meanings of an investigation to the local community in order that they entirely understand it.

Another problem was scientifically based and is related to the lack of scales. It was impossible to find a scale for local breed, which is crossbreed and newer was under scientific estimation. It is also important to mention that other two breeds, Afrikaner and Drakensberger as pure breeds, in interaction with local conditions, have lost their main breed characteristics and further estimation could be inaccurate.

Soil Sampling and Testing and Vegetation Analysis

Three different grazing areas were selected for these analysis: 1. In the top of the mountains, 2. in the slope of the mountain, 3. in the grassland surrounding Pepela village. By selecting these different sites we wanted to compare the best grasslands with the poorest. The “good” and “bad” grasslands were selected with participation of the local people, users of the grasslands; their criteria were thus used to choose the good from the bad grasslands. On each of these sites three sampling places were selected randomly thus having a total of 9 samples. Overall observations were made e.g. signs of erosion and topography. A photograph was taken of the vegetation cover.

For the vegetation analysis a circle of 1 m^2 was drawn on the ground and the vegetation was counted. The following observations were noted: Number of grasses and other species, total numbers of species and ground coverage. Grass-species were identified or collected for later identification and ground coverage (density) of grasses and other species was assessed by eye-estimation and recorded as percentage of the ground covered/uncovered.

Soil samples were taken within the same 1m^2-circle with a soil auger down to 12 cm (because the soil was rather shallow at the first sampling sites). Topsoil was sampled from the centre of the outlined circle and for at least two more augerings at the border of the circle. The soil from the augerings (sub samples) was thoroughly mixed in a bucket and a cupful of soil representing the 1 m^2

(1 composite sample) sampling site was taken out for soil tests. The soil was tested for plant available macronutrients (N, P and K), and pH was measured using a soil testing kit. Soil texture was determined by the feel-method. Soil organic matter content (SOM) was tested for in the laboratory at KVL, Institute of Chemistry by means of dry combustion at approx. 1300^{o}C using a Eltra CS500 detector to measure the evolved CO_2 from the organic matter.

We found that it was rather time-consuming to auger into the soil to get the soil samples and due to that, we chose to take only three sub samples to make up each composite sample (instead of the planned 5), but this was also acceptable, as the soil in the augerings in every case was rather homogeneous. In the SOM analysis we did not make any correction for CO_2 evolved from carbonates due to time constraints. This means that the SOM content is overestimated.

When we planned this part of the study, we were counting on having some grassland specialists from the African universities with us. But this expectation was not fulfilled. We tried to conduct these studies the best we could because we felt it was important to get some knowledge about the state of the grasslands as a source of nourishment to livestock. This was regarded to be important because it is related to the nutritional status of livestock an thus to their productivity, health and susceptibility to diseases. But we faced several difficulties during the process. For instance, we had quite a lot of trouble identifying the grass species. In order to be able to draw something out of the species composition of grasses it was very important to know which types were palatable and conversely which were unpalatable (as an indicator of grassland degradation). Our lack of insight in this field also put some major constraints here in that we were not able to relate all the species to one of the two categories. The vegetation analysis also suffered from the *'seasonal bias'* of our field study. We had difficulties in identifying the grasses because most of them were at a very early stage of development. Nutritional aspects of the grasses, e.g. digestibility, content and bioavailability of the nutrients on species level were also data that we were unable to get.

Participatory Rural Appraisal

The Participatory Rural Appraisals (PRA) have been developed over the last 20 years of development working history as a response to the researcher's needs of cost effective methods to learn about rural conditions and people. PRAs have evolved from the RRAs (Rapid Rural Appraisals). The two have in common that they are rapid ways of gathering, relevant information from rural communities, but the RRAs were not, in contrast to PRAs, participatory. The growing recognition that rural people have much knowledge on many subjects affecting their lives led thus to the development of methods to extract local knowledge from the people themselves, with their participation (Chambers, 1992).

The PRAs allow for direct contact between investigators and local people in the field. The researcher using PRA methods plays a role as a learner and facilitator of discussions and information-sharing in a way that all 'parts get something out of it'. Ideally the local people should come out of a PRA exercise with a better understanding of their own context, and thus "*empowered*" (Mikkelsen, 1995) to take an active part in a development process. By involving the people in this way "*commitment is promoted and sustainability of the project is enhanced*" (Chambers, 1992).

In a PRA, knowledge can be generated in several ways, in which interviewing (although we will treat interviews separately), transects, mapping and diagramming, presentation and analysis are carried out more on the premises of the rural people themselves, - they are the ones who identify the priorities.

Some of the methods often used in a PRA are:

- Direct conversation, observations, taking part in activities, village walks
- Diagramming, ranking and scoring exercises
- Investigating key indicators
- Secondary data review

The success of the participatory methods depend much on the attitude of the researchers and their ability to facilitate the participation of the villagers. The researcher must participate and identify him with the problems, be humble, show respect for the villager, be patient, not rush with people, and not interrupt. He must be a professional who uses the proper materials and methods that "*empower the villagers to express and analyse their knowledge*" (Chambers, 1992). Sometimes what seems to the local people's ignorance (because they cannot express their knowledge) is in fact the researcher who is incapable to extract their knowledge.

In much PRA it is common to record information visually while carrying out an exercise, e.g. in matrixes, maps or diagrams which are drawn in such a way that the people can understand them and keep the overview. Instead of questionnaires, where the information is transferred in words and kept and owned by the researcher, "the visual sharing is visible and public and "*owned by the participants. The participants are able to verify the information, discuss it and alter it. Triangulation and cross checking takes place and the learning is progressive.*" (Chambers, 1992). Paper can be used for diagrams but the ground or other materials have the advantage of being the people's own media, which they can control and alter with confidence. Prior to our field trip we reviewed the literature on PRA methods and we found some very useful guidelines which applied directly to the

study of livestock (Kirsopp-Reed 1994) and which we also used as an inspiration for the planning of our investigations.

Investigating Indigenous Knowledge

Indigenous knowledge is a “hot” issue in development studies and is most often termed by Indigenous Knowledge (IK) (Scoones and Thompson, 1994). The acknowledgement and use of indigenous knowledge in project design and planning is a result of an understanding that rural people are not ignorant, but have a lot of knowledge which is useful in identifying key issues. Scientific and indigenous knowledge do not necessarily contrast each other, but can complement each other (Scoones and Thompson, 1994). Experience shows that there is a need to rely on local people’s knowledge and perceptions, and to recognize that this knowledge is situated in a political and social context. This implies that the local people must be involved when planning resource use (Matose and Mukamuri, 1994).

Knowledge about particular resources is common to people who are engaged with a certain activity in society related to these resources. For instance, farmers have their own criteria to characterize local soils based on properties of the topsoil using parameters as colour, texture, organic matter content, and by observation of crop performance. Farmers describe the different types of soils with attributes related to their cultivability, e.g. hardness, weak/unfertile, thirsty (needs a lot of water) and properties under wet and moist conditions (e.g. the forming of crusts) (Sikana, 1994).

Problem and Solution Diagram

This is a participatory method, which is a combination of discussion and drawing /diagramming on certain subject, focusing on the relation between problems and its solutions. As a participatory method, the process of the drawing of diagram by participators together with discussion on same subject must involve different groups of the rural community to get real picture of the situation, a better understanding of the problem and consider different solutions, depending on the informants’ opinion and points of view. By using this method, at an early point of our investigation, we expected to identify main problems related to the livestock production and compare different standpoints on them, made by different groups (age, gender, social).

Our problem and solution diagram was held in local pre-school during a local community meeting. We tried to gathered relevant information on problematic topics and discussed them with two gender-segregated groups. During the discussion we attempted to comprise the participators in the drawing of the diagrams on the chart-papers, but we did not succeed to do it completely participatory

because villagers could not draw diagram mostly as a consequence of lack of understanding of this method and inexperience. Our individual failures were related to relative lack of experience in engaging the local people to do it themselves. We did not have time to go into solutions and from other point of the view it was difficult to discuss the solutions without ”taking” over the discussion. We were able to identify the main problems related to the few different topics although we could not go to the details of these problems, but we could not compare different standpoints within these two groups because participants were mostly older cattle owners and older women cattle owners. The main problems mentioned when conducting the method were the cattle theft and diseases. These results encouraged us to investigate more in these directions. It is also important to mention that was very difficult for participators to discuss and find adequate solutions on given problems mostly because of the large number of participators in the group and different approaches to the problems. Unfortunately, we did not have opportunity to create groups of participators.

Direct Observation and Village Walk

Direct observation in combination with village walk usually with key informants, is qualitative method, used for collection of qualitative information. Direct observation can range from formal to causal data collection activities. We used direct observation and village walk as an easy, informal and little time-consuming method of learning about the local livestock management and production system. *´´By the direct observation combined with informal questioning during the village walk it is possible to collect information, which can give an indication of a number of important aspects of the local farming system including the health and nutritional status of the livestock''*, grazing/feeding strategy and breeding structure of the herds (Kirsopp-Reed, 1994). From another point of view, direct observation and village walk used in rural communal areas must be combined with other methods because in itself it cannot provide enough relevant information about the investigated area. A limitation for direct observation and village walk as a method is related to the informants and they understanding and interpretation of the main problems in the community related to the livestock production.

By using direct observation and village walk we expected to get as much as possible relevant information related to the main research topics during the relatively short period of research. After the fieldwork it is possible to conclude that direct observation and village walk as a first-hand observation method was helpful and could realise our requirements related to the collection of qualitative information. One of arguments for it was solid ability for getting an overall impression about investigated area and recognizing of key indicators of the most investigated topics and from the other hand, a high quantity of totally collected information.

Preference Ranking Matrix

A matrix enables a range of different items to be assessed against a selected criterion where the preference of the items can be given a score or ranked. A preference ranking matrix should, on the one hand, be seen as a useful tool for initiating a discussion with informants and on the other hand give the researcher some reliable data indicating the respondents preferences for a given resource or item affecting their life e.g. preference for different livestock species (Oksen 1997, Mikkelsen 1995, Kirsopp-Reed 1994).

The main reason for choosing this method for our research was to find the preferences for different animal species for different criteria e.g. compare their importance for income in the households[3]. Furthermore, the method was used to initiate discussions, which were continued in the subsequent interview. The following criteria were chosen without participation of the respondents: income, food, cultivation, symbol of status, reproduction and expenditure. The exercise was done on an already drawn sheet using locally available materials (seeds and stones) in order to emphasise the informal character of the exercise. A certain number of seeds were given to the respondent, who was then asked to divide them among the items according to preferences in relation to specific criteria. Items are listed in the columns and criteria are listed in the rows. Applying the method in the field, we found the visual way of expressing the preferences an advantage, which gave us the possibility to raise questions taking point of departure in the different scores given. Executing the exercise raised several discussions, for instance ownership of the animal species and differences of preference within the household as well as a broader discussion on the importance of livestock in the village. On the other hand several problems appeared applying the method in the field. We experienced that the chosen criteria could be understood in several ways, e.g. 'expenditure' could include a number of issues but it was impossible to check whether the respondents had the same understanding of 'expenditure' as the interviewer or if she/he included less, more or just other aspects. Status was also a very difficult issue to explain and some (richer) people refused to talk about it.

The results showed considerable differences in the informants' preferences – which required follow-up interviews to further unpack the data, e.g. if different income groups mentioned different preferences. If we had done the exercise in different groups (divided by age, gender etc.) a clearer picture of preferences might have been revealed. Working with groups of informants would of course also make it possible to use the method as a tool for initiating discussions between informants. We used local language to write the names of the species and criteria, but it would have been better to make drawings, which would have eased the orientation in the matrix, and of course would have made it possible for illiterate respondents to 'navigate' by themselves. Even though the distribution

[3] The matrix was applied during 7 interviews with women and men from poor and richer households.

of the seeds should be a visual aid for the respondents, not all did succeed in seeing the matrix as an overall picture of their preferences. It must therefore be stated that to use this method with success it is of utmost importance to make the respondents understand the principle of distributing the seeds according to preference.

We often found the results unclear and we had to interfere by asking "*Why did you give more seeds to A when you just said that B was better?*" Or following up with questions like "*Is it correct that B is not as good as A?*" The result would often be that the informant changed his/her scoring to please the researcher, thereby (maybe) making the data even more unreliable! We also experienced difficulties in comparing the results, because the informants had different numbers of items but the same number of seeds to distribute in a row. Finally, it should be mentioned that many of the problems and critics mentioned could have been solved if we had made a proper test before applying it in the field. The method did reveal important data on variations in preferences among different livestock species and even more important it did raise discussions and further subjects for investigation. The use of the ranking results from the matrix will be discussed further in the presentation of the data.

Seasonal Calendar

Seasonal Calendar is a means of diagramming to show the distribution of activities or features such as rain, food, expenditure or workload. It is a good way of highlighting local histories or trends. It can show information, which varies with time in a repetitive (often, but not necessarily) seasonal way. This information is represented as a simple list (like a time line) or a grid. Seasonal calendars indicate types of activity, when these activities occur and the relative significance of simultaneous events. They can also be represented as bar charts. Participatory applied the method should facilitate discussion (David Young and Rachel Hinton 1997).

We chose to make a seasonal calendar in order to help us to identify the seasonal changes in cattle disease outbreaks. As mentioned earlier diseases can constraints livestock production. In order to answer our research question and to get a comprehensive understanding of the problem of diseases in the area we applied this method. Seasonal changes in disease outbreaks can affect people's livelihood, in terms of increased veterinarian cost and death of animals from diseases. We prepared a time line calendar on a paper, which we draw, a 12-month calendar at the horizontal line. Our calendar started in January and ended in December. The information given was listed as a time line on the calendar. We applied this method participatory with the veterinarian assistant and the chairman of Pepela. In interviews with the farmers the information we got from the veterinarian assistant was confirmed. By using the seasonal calendar we got important information about how

many cattle diseases are strongly related to the local seasonal changes (see appendix 1).The fodder and grazing calendar summarize the fodder and grazing pattern that were identified in the area. The seasonal calendar that shows changes in fodder and grazing patterns was based on information conducted by interviews with key-informants and farmers (See appendix 6).

When we applied this method participatory we felt it was inconvenient for the participators. We felt that they were intimidated and not eager to participate. We did not apply the method later in the field. The reason for the difficulties applying the method is most likely, how we prepared the calendar. We wrote the month's names in English. This should preferable be written in the local language and perhaps also visually show the rainy and dry months and by the participants themselves. Seasons, written or drown on the axe should reflect the indigenous seasonal categories. Meaning not starting with January but with initial months of the wet or the dry season. By proper preparation it would have made it easier to apply and easier for the farmers to participate and facilitate discussions.

Social and Livestock Mapping

Social and livestock mapping is a participatory method to visualise e.g. households in a village and particular attributes connected to the different households (e.g. wealth, numbers of household members, access to services) (Mikkelsen 1995) The main purpose for carrying out this method was to map the numbers of livestock distributed in the households of Pepela. The method is often elaborated participatory (done by local inhabitants), but due to our lack of experience and our difficulties in finding the right persons for this exercise, we ended up making the mapping ourselves by collecting the information at household level. The way we chose to collect this data was very time consuming. On the other hand we felt that we got a reliable estimation of the numbers of livestock in Pepela and their distribution in households.

An inquiry was carried out in 54 households (corresponding to 51 % of the total households in Pepela) to determine how many of each type of livestock was owned by each household. We defined a household as one clearly distinct group of houses sharing the same fence. In case of doubt we would ask if the particular house was part of the homestead. The respondent was also asked to determine whether it was a female- or male-headed household.

The social and livestock mapping was very time consuming and resulted in a great amount of data that we were not able to analyse fully. Nevertheless we felt it was very valuable to get the number of livestock estimated this way as a means to triangulate the information we got from the cattle records from the veterinarian assistant and our general observations. The problems associated with assessing this data were, for instance, problems understanding/agreeing with the respondent which houses were

included in the household. There could be problems in defining ownership of the livestock residing in the particular households (e.g. if the livestock was mixed with livestock from relatives residing in another household). Some of these problems might have been a consequence of not operating with a local definition of household-units rather than our own. We also tried to ask if there were any animals that were lent out, but we didn't identify this in any case, although it doesn't mean that it wasn't happening.

After doing this part of the study, we regretted that we had not, in our inquiry, differentiated oxen from cows because that would have given us an impression of how many oxen there were available for traction and their distribution in households. We also acknowledge that the wealth parameter would have been useful information in order to related it to types of livestock (e.g. poultry in the poorest households) and this parameter would probably have been easier to assess if we had done the mapping by participatory means.

Interviews

Interviewing is one of the most important methods of gathering information and it is one of the main techniques used in development studies. (Mikkelsen). There are various forms of qualitative interviews.

We chose to use interviews as one of our main tool along with exploratory and participatory methods to achieve an in-depth understanding of the perceptions and attitudes of the people in Pepela to a broad range of issues related to livestock and in order to find the factors that determine livestock production. We interviewed both key-informants and individuals using the semi-structured, open-ended form as well as the informal type of interview.

Semi-structured Interviews with Key Informants

A Semi structured, open-ended interviews is the most structural form of qualitative interview. An open-ended questionnaire is used, which lists the specific questions to be asked. The informants are encouraged to express themselves fully rather than respond to a predetermined list of options. The sequence of the questions is not predetermined; the interviewer is still allowed to exercise discretion in controlling the course of the interview. Additional questions can be asked in order to pursue interesting leads. (Casley/Kumar 1989). The advantage of using semi structured, open-ended interview is that it increases the comprehensiveness of the date and makes data collection somewhat systematic for each informant. "*Logical gaps in data can be anticipated and closed while the interviews remain fairly conversational and situational*" (Mikkelsen 1995).

Key informant interviews aim to obtain knowledge by key informants chosen because of their special knowledge on a given topic. They are not necessarily the "leaders" (Mikkelsen 1995). We chose our key-informants in order to get information about animal health related issues, grazing patterns and management and the cattle theft in Pepela. The Chairman in Pepela we considered to be a knowledgeable source because of his position in the community. We interviewed him on our first day and he helped us as well as the Problem and solution diagram to get an overview of the situation of livestock in Pepela. The Traditional healer was suggested by a member of the community as a good source of information about traditional ways to heal livestock. He provided us with information about the traditional ways to cure diseases with local herbs and roots. A Herdsman was interviewed in order to get information about the grazing patterns and seasonal fodder management. The information we got from him was later covered more in-depth in other individual interviews. The Veterinarian assistant and her husband which is the Chairman of Makomereng and also her assistant, were chosen because of their knowledge on the livestock healthcare system and diseases in the study area. The head of the agricultural and land affairs office in Maluti became a key-informant when we went to Maluti to try to find the Veterinarian. He informed us about some of the constraints in controlling diseases in the area as well as the main diseases the farmers are dealing with in the region.

We conducted the interviews with our key-informants (veterinarian assistant, chairman, the head of the agricultural and land affair office) with an interview guide prepared in the preparation phase of the study and during our stay in Pepela (Traditional healer). The interview guide regarding health issues was also used in the interviews with individuals either as a part of a bigger guide or solely, depending on our informants (see appendix no.2)

Semi-structured Interviews with Individuals

We interviewed twenty-one individuals in Pepela. In the preparation phase of the study it was agreed to secure a social stratification of informants for the semi-structured interviews with individuals thereby getting a representative picture of the inhabitants (livestock owners/non livestock owners, rich/poor, young/old, women/men). The selection of informants for the semi-structured interviews was done by asking people and by observation in the village e.g. looking after indicators for richer or poorer households. In order to answer our research question we covered wide range of topics in our interviews. From the beginning it was decided to use an interview guide to secure that a number of topics were covered, among other the following: land tenure, cattle theft, importance of different livestock species, the reasons for the cattle owners to keep cattle, herd sizes, livelihood strategies, animal health and access to veterinarian service, access to market, (see appendix 2). The topics were further elaborated during the field study when issues appeared to be more or less important than

expected from the initial review of literature. Further more, several topics were included later on, due to the importance of the topic or simply because of themes disregarded in our preparation phase.

The interviews were conducted with a high degree of flexibility due to the different informants, e.g. livestock assets possessed by each informant and the importance of other activities in their livelihood (e.g. interesting responds to shocks imposed on their livelihoods).

Informal Interviews with Individuals

One form of an interview is the informal one. “In these interviews the interviewer enjoys complete freedom and flexibility to explore a broad subject with the informants, who are encouraged to share their views, experiences, values and information” (Casley/Kumar 1989). The advantage of this type of interviews is that a wide range of issues may emerge, some of which may have been unforeseen (Casley/Kumar1989). However the information gathered from respondents in these interviews may be difficult to compare, the conversations can become unfocused and it can be a very time consuming method (Casley/Kumar 1989). We often started general conversations with local people and later we talked about our special interest; livestock, grazing areas, management, “good and bad” grasses etc. In these interviews we did not take notes while the discussion took place, but recorded the information afterwards. By using this method we got opportunities to explore broad fields of interest. The information we got from these casual conversations often gave us ideas about topics to be covered more in-depth later in interviews. Our respondents for these interviews were chosen casually among the people we met on our way in Pepela. The informal interviews were applied together with our direct observation and the village walk.

However data collected by applying this method is prone to be biased and limited in various ways. The following facts might have influenced or limited our data collected during the study.

- Key-informants should preferable be suggested by the community (Mikkelsen 1995). Only one of the key-informants was suggested by a community member. We are aware of our limited number of key informants and how they were chosen can make our data susceptible to bias.
- We used key informants interviews as a source for various issues. The fact that the Veterinarian assistant and the Chairman works for the government can bias their view. We felt that the picture they gave us about the control of diseases was better than from the farmer’s point of view.

- Diplomatic biased. We did not want to offend our respondents and thereby did not gather as much data as needed about sensitive issues like status, income and HIV/AIDS.

The method gave us a good opportunity to discuss and to collect in-depth information about various issues related to livestock and livestock production in the study area. By using this method we got an insight to the perception and attitude of the people in Pepela, which is not possible to achieve by using other types of methods.

Interviewing is not an art and can be learnt through practice. Only one of our six-members team had previous experience in interviewing. During the fieldwork a lot of experience was gained on “do’s ” and “don’ts”, to secure a flow in the interview, get your information, not make the informant feel uncomfortable, ethical consideration etc. To mention just a few important things, it was found that interviewers should remember to:

- Explain the reasons for doing the interview
- Make simple questions
- Look at the person and not the interpreter
- Give the informant time to answer a question, but pass to other questions if people get embarrassed if they cannot answer the question
- Go outside the house to investigate further in topics while you are by the crawl or in the home garden.
- Ask the informants if they have any questions (which they always have) and thank them for the interview.

Overall Limitations

When conducting research, objectivity and validity are goals that must be strived towards. However there are numerous biases that can influence and distort the information and the data gathered (Mikkelsen 1995). We tried to use our best judgement at all times, however, some aspects which in different ways have affected the gathering of data should be mentioned before we turn to our findings. Biases, which to some extent affected our data, will be described. Subsequent, our reflection on our various participatory methods and the problems confronted will be treated. Afterwards, comments will be made on our experience working with interpreters. Finally, the aspect of triangulation will be treated.

Biases affecting the data

Lack of confidence in our purpose of the study may have caused some distortions in the information given. In our first meeting with the community in Pepela, during a communal meeting, some of the community members said that we were just foreigners trying to draw out something from them, and they would not have any benefit so no information should be given. After a very long conversation they finally decided to give us the permission to do our study in Pepela. Informants can have hidden agendas which make the validity of data low, e.g. the numbers of cattle stolen can be exaggerated which make the effects look worse that they actually are. The fact that our group members had different backgrounds and agendas did result in different wording of the question thereby reducing the comparability of the responses. We tried to choose our informants as representative as possible, trying to reflect the setting in the village. However this was not always possible, not many of the young people were present, a lot of men were not at home during the day, as a result more women and elderly people were interviewed.

The fact that our study was conducted in the end of the dry season most likely influenced and distorts our data. The aspect of poverty such as cutting off roads during the rainy season or other problems were possible "overlooked". It also influenced our direct observations on the vegetal cover and the plant community analyses. Animal diseases are at minimum in the dry season, it was therefore difficult to make observations on the animals and our data gathering thus relied on statements in interviews making a triangulation difficult.

We will now take a look on the participatory methods and how they contributed to our study as well as some limitations in this approach.

Rapid, Relaxed and Participatory?

One of our intentions of the study was to use a lot of PRA methods in order to try out the principles and experience the weaknesses and strengths of that approach while investigating our main topic. Through our application of the methods in the field we have gained important experience in what it requires to use these methods as well as a number of problems in the using of PRA.

A general lesson from our use of the different participatory methods was that it requires good skills as facilitator to explain the aim of, as well as 'how to do', the method to the participants. The same could be said about keeping the exercise in process without taking over the control. One way of securing that the participants take over the process is to set up meetings where a number of people do the exercise together, which (maybe) also give us, as researchers, a better possibility to see where differences actually appear between villagers. Looking back we must admit that applying the

methods in groups could have established a better base for discussion, but unfortunately one week was not enough time to set up appointments.

Analysing our data we can see that in some situations (e.g. during the preference matrix ranking) we have put too much focus on the visual aspects of putting piles of seeds into boxes and thereby forgetting the discussions appearing from the exercise. As also applies to our interviews, we can state that it is of utmost importance to have clear definitions of your concepts and to get hold of the informants' understanding of these (e.g. how to understand the concept expenditure). Related to this issue it should also be mentioned that it should be clarified on whose behalf the respondent speaks. It did not always appear obvious whether the informant answered as a representative of a household or as a single person.

Using PRA was mainly done to research on the socio-economic aspects which we afterwards regretted due to the lost possibility of comparing hard natural scientific data and PRA findings for instance in the aspects of soil fertility. Partly, the explanation was that it was sometimes regarded as easier to pose a few central questions compared to a larger session with visual techniques. Using the PRA-methods it appeared that these will not produce *the* final answer, but is part of a process that contributes to a better understanding of the situation. Or said in another way, we find that the PRA-methods applied should be seen more as an indicator of certain trends and should be complemented with other kinds of methods, for instance interviews.

As mentioned earlier some of the characteristics of PRA are the empowerment of people, that it is mainly a learning process for participants and that they should be in control (Laier 1999, Mikkelsen 1995). An ethical problem could also be raised, namely whether or not you can make participatory work if you do not share your findings with the informants. Taking into consideration the above mentioned arguments we have come up with the conclusion that rather than doing a PRA we did RRA, defined as "*information is more elicited and extracted by the outsider*" (Chambers 1992 in Mikkelsen 1995 p. 197). No empowerment took place, the participants did only partly take over the control, the study was mainly concerned with extracting data and a 'follow up' is definitely not going to take place, as our reports will not reach the inhabitants of Pepela or their leaders! Furthermore, it must also be questioned whether the participatory methods rose "*people's awareness of things often not thought of*" (Mikkelsen 1995 p.119).

Finally, some comments should be made on the assumptions that PRA build on, and how they were not always were as easy to apply as it looks on paper! Facilitating the process without taking over control is a difficult task. As mentioned, our intention from the start was to secure a stratification of the villagers and secure that different groups of people were reached. As facilitator you should reach

‘the voiceless’, but as our work with the ‘Problem and Solution Diagram’ showed it is not an easy task without taking the control. Of course, choosing the theme (livestock) also places limitations on handing over the control if another aspect (e.g. violence against women) is a more central problem. Also ethical considerations must be taken into account e.g. who would like to be displayed in the group of poorest? (Laier 1999).

The methods are thought to be carried out relaxed which assumes that people want to participate and do have plenty of time, which is not always the case (Laier 1999). Furthermore, it could be added that even though the methods are said to be rapid compared to more ‘traditional’ methods, it still consumed a lot of time. A fact that should be considered if it is applied together with other methods e.g. interviews. PRA emphasize the use of visual techniques. Making games or putting seeds in a matrix can be viewed as crazy but funny, which makes the situation less formal and more relaxed or it can make people feel embarrassed especially if they have problems understanding ‘*what to do’*. The assumption that people enjoy visual methods could be a problematic aspect of PRA.

Interpreters

A disadvantage of qualitative methods is the high dependency on the integrity, honesty and discipline of a translator (Oksen 2001). We experienced some difficulties because only one of us spoke the Xhosa language and the rest of us had to rely completely on interpreters. Translating back and forth can easily create misunderstandings, especially when the translators speak a very broken English. For instance when we conducted our Problem and Solution Diagram, the session was prolonged because of our problems working together with the translator and this tired the informants.

Triangulation

The data triangulation should preferable be a crosschecking of your data using different informants and methods to see if data from the different methods were contradictory or pointing in the same direction.

An example of data triangulation on the socio-economic aspects is the cross checking of data on the preference for livestock species. This was done through the use of the preference ranking matrix, the mapping of actual numbers and in-depth interviews with informants. Investigating the number of cattle stolen was done by triangulation of the data by interviewing individual informants, key informants and checking the records during the last 15 years. However, we found out that all our sources of information on this aspect were to some extent biased or incomplete, and in the end we had to make our conclusions from an unclear picture. Some of our methods gave interesting aspects

for other topics of our investigation. For instance applying the preference ranking matrix for revealing socio-economic aspects also gave us indications on veterinarian aspects of animal diseases that should be investigated more from a veterinarian point. In our investigation of the rangeland condition we focused mostly on soil samples and vegetation analysis. Looking into the local knowledge, which we actually had planned before the field trip, but did not conduct it, could have done a more in depth triangulation. We must conclude that the data triangulation that took place was limited and our findings should be seen in this light.

The different aspects in the previous paragraphs have highlighted a number of aspects that have biased our data, made the collection difficult and limited the possibility of crosschecking. We therefore more see our data as indications of certain trends rather than data for making conclusions. We will further comment on gaps in our data findings during the presentation of these. The chosen methods sometimes were not the best to answer our main research question, an aspect we will come back to after our data presentation.

Findings and Results

Theft

Virtually all our respondents regarded the cattle theft as the main problem regarding cattle management in Pepela. The cattle theft has influenced the whole society in various ways and has according to our respondents caused great decline in the cattle number and changed the pattern of cattle management. The effects of the lack of cattle is further dealt with in other paragraps. Key-informants told us that Pepela used to be a center for cattle production and the farmers used to have camps in the mountains were they stayed with the animals for one to six months. The cattle thieves come from Lesotho and are by some of our respondents believed to be working in collaboration with the local residents in the villages. “Or how would they know were to find the cattle in the middle of the night” as one of our respondents stated.

From official records, it is obvious that there is a huge decline in the total cattle number for the area of Makomereng, Pepela and Goxe (See appendix 3). From the records the decline is about 70% since 1985 in total number of cattle. According to our key informants the decline is because of cattle theft. Our respondents told us that they used to have herds of 80-200 each. These numbers however are probably overestimated, when compared to the official records, so high numbers do not parallel with the official records. From records for the last 18 months the cattle number shows a total of 40 % decline. According to our key-informants this is due to cattle theft. However, cattle theft does not explain all this decline, as also can be seen from the records that a part is due to cattle death and also a part of this cattle have been moved from the area, either sold or to be kept in other places.

How much of this decline is actually caused by the theft is difficult to estimate. Surely is have reduced the cattle number a lot a caused a great economical loss to poor people in Pepela. The government of South Africa recently sent soldiers for protection of the cattle. However, cattle still get stolen and the help came too late, as already most of the cattle have been stolen according to our respondents.

Preferences for Livestock Species

Through the use of a matrix of livestock, interviews and the mapping of livestock in households we gathered interesting data on the different species. Despite of the problems using the matrix and not least the fact that our mapping only covered the part of the village where most of the livestock was concentrated, we still believe we can mention some tendencies.

As seen in the appendix 4 the diagram illustrates most of the households keep poultry to some extent and also goats are quite represented in the households although 41% do not keep them. On the other hand more than 50% do not own cattle and 84% do not have sheep. Behind these numbers a range of criteria are hidden which can explain why the distribution looks as it does. We will now look at some of these explanations[4].

Without doubt, poultry and eggs were the most important livestock income source among the informants and were perceived as "fast" profit due to its quick reproduction cycle. Furthermore a lot of income came from goats, which were "traditionally" not a typical livestock income source. A few households also had the cattle as their main livestock species for income. The "well-off" kept sheep as a very important income (mohair wool) which, due to great expenditure on medicine, the poorest could not afford to invest in. For home consumption the poultry was also the most important in the households, and "scored" as much as the rest of the livestock species together in the matrix. As the figure shows only 20 % did not own poultry. In households that kept cows, especially the milk provided an important nutritional source but nowadays cows were seldom slaughtered, due to the rebuilding of herds that was identified taking place in the cattle-owning households[5]. Some households also used goats and sheep regularly for food but this was normally related to feast and religious purposes. The number of pigs in the area was very limited, most of the households kept one (eating kitchen waste), which was used as supplementary food.

Expenditures on medicine had actually a bigger importance for the preference of livestock than we expected. Due to a lot of poultry diseases some used medicine, and also injections for the cattle were a large expenditure. Especially the sheep had a great need for medicine. This aspect along with the faster reproduction of goats, were mentioned as the most important reasons why the poorest turned to goats after the cattle stealing and not to sheep and their valuable wool. Our mapping of livestock found that 84% did not have sheep compared to 59% that did keep goats, although most informants stated that they would like to go into the "wool-business".

Status, although a very difficult and sensitive issue to discuss with informants, was raised during the application of the matrix. Status was found more related to profit than expected. Even though, cattle

[4] It shall of course also be considered that some people prefer not to keep livestock because they are engaged in other (income generating) activities, a topic that will be further elaborated in the subsequent paragraph.

[5] Even though the overall picture in the village indicate that people often changed their preferences from cattle to other livestock species some still found access to the goods and services of cattle so important that they insistently tried to rebuild their herd of cattle.

”traditionally” are high-status livestock, also goats and sheep could be a status symbol if the herd was big enough. Identity also plays a role in the preference for livestock species. As one woman told she had sold 13 cows during the last year because of the death of her husband. She has now turned to sheep and goats but even though it is unprofitable she keeps two cattle and pays a herdsman R150 monthly to look after them.

Finally it should be mentioned that the cattle theft has influence on the preferences that people has and that cattle were ‘traditionally’ of more importance in the study area. We will look further into the effects of the lack of cattle and the multipurpose use of cattle in subsequent paragraphs.

The Role of Livestock in Livelihood Strategies

As previously mentioned poor people engage in a wide range of activities in order to sustain their livelihood. Questions were asked about the importance of different livelihood activities to understand the importance of livestock and agriculture. The following types of activities were identified as taking place in the village: Agriculture, livestock, beer brewing, selling of firewood, having shops, washing clothes, claiming of remittances from migrant workers, government projects in the area (Working for Water), employees on local farms and social pension from the state.

Although, general conclusions should not be drawn from our relative small number of informants some tendencies can be mentioned[6]. A majority of the informants in the study area rely heavily on pensions and stated it as the most important income generating activity. A great number of our informants stated that working in urban areas or the mines or getting remittances from relatives outside the household was a very important source of income (together with or without pensions). An illustration of the multiple activities that people engage in was demonstrated in an interview in a household composed of 7 persons which had the income of 2 pensions (2 x R570 per month), one person was employed in the ‘Working for Water’ project (R660 per month), they had income from selling vegetables and furthermore exchanged livestock with other households in the village. Another household had three sons working as migrants.

Of our 21 individual interviews only two well-off households considered the selling of livestock products as their most important income source. However, this does not mean that livestock was not important in the majority of the households although it was not their most important activity. As our

[6] Given the time constraints, we did not set specific criteria on how to distinguish between the poorest, average and well-off households, however the impressions from observations and informal conversation gave us some indications from which we can draw our conclusions on different tendencies between “poor” and “rich” households.

interviews and the mapping of livestock show only very few households did not keep some kind of livestock and the majority of inhabitants uses the goods and services that livestock provides to some extent.

The picture of the importance of agriculture was quite blurred. Everybody did engage to some extent in agriculture at least in a home garden. The richer households (which were heavily engaged in livestock production) did also perform quite a lot of agricultural activities although this was not their main income source. In some cases agriculture was stated as the most important livelihood and / or income generating activity, but this was mainly identified in the poorest households who did not have any income from pension or migrant work but relied almost 100% on agriculture (supplied with some work of beer brewing and clothes washing). For both agricultural and livestock activities it can be said that it seems to play a dual role as a safety net and as an important way of deriving income especially for the more 'well-off' in the village.

Shocks to the Livelihood

As mentioned, poverty should not be seen as static because shocks, for instance "*the death of a main income earner, or the loss of cattle through theft or disease*" (Rakodi 1995 in May et al. 1999, 28), can put a risk on people's livelihood. During our field investigation we identified the cattle theft as the main shock that the households in the study area are facing presently. With no exception, all informants stated it as the most serious problem. Animal diseases were also a central problem in the village; the topic is treated in the paragraph 'Control of Diseases'. Also HIV/AIDS played a crucial role and a non-identified, but increasing, number of (young) people die in the study area. As some informants exemplified, HIV/AIDS has multiple impacts on households, in terms of the lack of labour for agricultural and livestock activities and the important remittances from family members and relatives in urban areas stop coming as well as the disgrace that the disease puts on the families in the local society[7]. We will subsequently analyse the effects of the stealing as well as the different responses made by the households.

As mentioned the lack of cattle has crucial effects on the agricultural activities because of the lack of cow dung used as fertilizer and because of the insufficient draught power for preparation of the fields. According to some of our informants the amount of inorganic fertilizer (bought in the city) had to be doubled for the same field size in order the get the same fertility as before where sufficient manure could be applied.

[7] The topic of HIV/AIDS will not be treated further in the report.

A majority of our informants preferred to get their fields ploughed by oxen rather than a tractor because of the cheaper prices. However, we could not identify anybody in the village who were willing to lend or rent out their oxen, simply because they had been stolen or were rebuilding the herd at the moment and therefore would not lend out their young oxen. This left the household with two possibilities; either to pay a tractor to plough or abandon (some of) their fields. We identified all kinds of responses to this. As an example, one peasant mentioned, "*people without money can only grow the home-garden*". Several conclusions can be drawn from these findings. For some people, who have other possible income generating activities, the importance of agriculture will drop. The poorest households, who lack access to complementary assets and services, are unable to plough and buy fertilizer, and will have to abandon their fields and concentrate on their garden plots and small jobs in the village. Several households in the study area were forced to follow this strategy.

One type of response to the thefts was identified in one rich household who had 30 cattle, 30 goats, four horses, 80 sheep, pigs, donkeys, poultry and pigs. As a reaction the farmer had simply removed all of his animals (except the pigs) and his tractor to another village away from the Lesotho border. Another response to the stealing is changes in preference for species of livestock. Preference for goats and sheep were stated because they do not get stolen that often and because small ruminants have a faster reproduction. It seemed from our investigation that the people who continued to rebuild their herds, despite of continuing thefts, did it entirely by reproduction and not by purchase.

Other important effects of the cattle theft are the lack of cattle auction in the area and the changing patterns of management of livestock had changed; the cattle were now kept closer to the village, which meant a higher rate of diseases. These aspects will be dealt with further in the subsequent paragraphs.

Summing up, we can state that those households with access to formal wage employment, migrant remittances and welfare claims are generally better off and have the ability to use their cash income in times of crises as capital injection for hiring a tractor or buying more fertilizer. Or we could say that a correlation was identified between access to pension and / or remittances and the possibility to pay someone to plough the fields, to buy fertilizer and cattle to rebuild your herd. However, we must conclude that cattle theft is a big threat to livelihood security to both poor and richer households in the study area. We also expect that the non-livestock owners are the first to get hit in times of crises e.g. by lack of manure for building houses and fertilizing their fields.

Animal Diseases

From the beginning of our study it was clear that animal dieses was regarded as a serious problem by the local people in Pepela. The presence and frequency of animal diseases in the investigated area is influenced by environment and seasonal changes. According to this, one of the main characteristics of animal diseases in the investigated area is a significant seasonal variation. During the summer, the population of the main transmitting vectors, ticks, rapidly increase and as a result there is an outbreak of the major diseases in the summertime. This can been seen on our seasonal calendar of diseases (appendix 1) By the interviewing key informants, livestock owners and herdsmen we were able to identify the most common animal diseases of the grazing animals.

The most important diseases of the cattle in the investigated area:

Babesiasis (Redwater) is a protozoan disease, transmitted by ticks. The disease is followed by fever, anorexia, weakness and very high mortality (Hall, 1985). Heartwater is a rickettsial disease transmitted by ticks. The disease is followed by rapid rise in temperature, anorexia, muscular tremors and nervous signs indicated by continual movements of the limbs, head, and tongue. This terminates in convulsions and death (Hall, 1985). Parasites, are endoparasites (tapeworms, roundworms), ectoparasites (mites, ticks), the vectors of the most frequent cattle diseases and insects, mostly flies and mosquitoes. The rate of infestation of the parasites is correlated with management practices and the quality of the grassland. The measures such as grass burning and cultivation of land are common practices and can reduce density of the parasites on the pastures.

The most important animal diseases of small ruminants are very similar to the most important animal diseases of the cattle because they grazing on the same common pasture and are exposed to the identical environmental conditions. However, sheep and goat have scab disease, infectious skin disease caused by microorganisms and bluetongue caused by viruses, either transmitted by ticks.

In general, the presence of the ticks and another parasites on the pastures affecting the animal condition trough the direct consequence of their infestation or disease transmitted by them. Consequently, poor animal condition affecting the productivity.

Veterinarian Service

Good veterinarian service is vital for handling and controlling diseases in order to minimize the death rate of cattle from diseases. The veterinarian service seems to be poor in the area. This can be explained by the fact that the veterinarian’s office is situated in Maluti, approximately 40 km from Pepela and partly connected by dirt roads. The veterinarian’s service area is huge. The veterinarian service in Pepela is performed by the veterinarian assistant who is based in Makomereng and is responsible for the functioning of the dipping tank, which is based in Makomereng as well as other veterinarian service in the villages of Pepela, Goxe and Makomereng. From Pepela to Makomereng

there is a distance of 5 km and the majority of the people do not have telephone connection. Farmers told us that when animals get sick in Pepela its takes a long time for the veterinarian assistant to come so often they do not try to get help and normally the cattle will die. This is especially the case when the cattle get redwater disease. According to the Head of the office of agriculture and land affairs in Maluti the main constraints in controlling diseases in the area are: Few staff members in the veterinarian office in Maluti; no research station in Maluti; Insufficiently trained veterinarian assistants and the need for training facilities.

There are communicational problems between veterinarian assistant and livestock owners in Pepela. We were in Pepela the day before the dipping day, and our respondents did not know about the coming dipping day. Farmers told us that sometimes they do not get the message sent by the veterinarian assistant in time, and then they would have to take there cattle to another village for dipping. To ensure good pest control this is a disadvantage as preferable the whole herd should be dipped at the same time (Hunter 1996).

The veterinarian assistants get little training and there is a lack of training facilities in Maluti according to a key-informant and the veterinarian assistant confirmed that the training period was too short. With a poorly educated veterinarian assistant there is a risk of wrong diagnosis of diseases and insufficient handling of diseases. Farmers telling us that the cattle normally die after the getting sick, points to late diagnosis and lack of the correct of disease handling. There is a lack of data here to confirm this conclusion, as we couldn't reach the veterinarian, we do not have any statistic information about frequency of each disease and the mortality rate. No direct observation was possible in this case.

Control of Diseases

The main objective of the control of animal diseases is to reduce animal diseases to some acceptable level. The intervention against external parasites is characterized by simultaneous cure and prevention. The main method in the intervention against parasites is dipping of the animals in the dipping tanks. By this method external parasites are eliminated and it also prevent cattle against further infestation. Practically, the dipping of the cattle are at the dipping tank in Makomereng is an intervention that is repeating every two weeks, during the whole year according to cattle owners. Sometimes, during the dry season and less infestation of the parasites during this period can increase interval between the dipping. Actually the last dipping, before the one seen during the fieldwork, was hold in the June 2001, which are about 12 week interval. The veterinarian assistant, together with his wife, is responsible for the preparation of the dip washer, using of the chemical substances-acaricides and evidence of the number of dipped cattle and they owners. The dipping of the cattle is obliged and

farmers would be charge if they do not dip their animals according to the veterinarian assistant, we tried to triangulate these information but we could not get hold of the authorities to confirm that. The Analyze of the evidences from the previous dipping, provided by veterinarian assistant, show the absence of many cattle from the dipping (appendix 3). The various measures such as grass burning, cultivation of land and starvation by the removal of stock from pastures for long periods playing a part in the control of tick population, but are not effective as is dipping.

The local healer in Pepela practice some treatments, mostly against babesiasis and heartwater, with natural medicaments, prepared from local plant species. He believes in efficiency of this medicaments but it is difficult to compare with efficiency of commercial medicaments. We did not have enough time to go more deep in this investigation.

In the case of the death of animals, farmers have to report it to the veterinarian assistant and they are supposed to handle the spleen to him. There she would take smears from it and give them to the veterinarian in Maluti. The farmers would be charge by 500 R if they would not report the death and give the spleen. When we asked the farmers, only one confirmed this information. All other farmers told us that there is no legislation of reporting animals that die from sicknesses. Unfortunately we could not triangulate this information, as we didn't get hold of the chief in Makomereng in order to verify the fines. Neither do we have information from the veterinarian to understand fully how effective this system is. However, our data indicate that the veterinarian might not get important information about diseases which can constraints the control of them. There is no research station in Maluti, which is of disadvantage due to key-informant which also constraints the identification and control of diseases in the area.

New Patterns of Keeping Cattle

Due to the cattle theft the farmers told us that they have adopted new ways of keeping cattle (and to some extent other ruminants). Instead of taking them to the mountains were they could stay for a long time they are now brought to the mountains every morning and taken home at evening. In the dry season they are kept close to the village where they graze around the village and are fed with crops residues. This may have some consequences for the health of the animals. Grazing animals scattered on abundant pasture are probably in the safest possible environment with respect to disease risk as the danger of infectious diseases spreading is minimal (Hunter). Grazing closely by the village can increase the risk of sicknesses in the cattle. Close to the village we observed that the grass was infested with larvaes. One of our key-informant told us that these larvaes are causing illnesses in the cattle; a swollen belly and the appetite may be impaired. It has been demonstrated in studies in West Africa, where cattle have been kept close together that a build up of infectious worm larvae can

occur. This is explained by the live cycle of the worms, which hatched from worm eggs passed out in the faeces. As a result the cattle, particularly weaned calves, acquire significant worm burdens to the detriment of their general condition (Hunter). Farmers confirmed that the calves are often heavily infested with worms.

Description of Grazing Areas

The grasslands in the mountains were considered the best. These grasslands were found to have a high diversity of grasses. The grasslands were solely vegetated by grasses. On the other hand they carry a low plant density (89 grasses pr. m2) and a great part of the ground (33.3%) was not vegetated. There was generally a shallow and rocky topsoil. These areas could prone to erosion but did not show significant signs of it.

The village grassland (which were considered as poorer grasslands) had a lower species diversity with around 50% less grass species than the mountain grasslands. But here, there was a high plant density (320 grasses and 39 other plant species pr. m2). Only 5.3% of the ground was uncovered. These grasslands were also vegetated by other herbaceous species, e.g. small *Helycrysum* species, which might be considered as weeds in this context, but we don't have more information on this. Direct observations by professor Absalom from University of Swaziland, who assisted us in the village walk, revealed a high predominance of unpalatable grasses, however these observations cannot be confirmed by precise data. Our figures on ground coverage show some degree of a good pasture condition.

The nutritional status was low in all sampling sites with regard to plant available nutrients (N, P and K). Appendix 5 contains the details of the results of the vegetation analysis and the soil samplings.

Erosion

We didn't identify great signs of erosion in Pepela and surroundings except from one big expanding donga situated by the foothill of one of the mountains where cattle often grazes.

Otherwise erosion was only very localised (e.g. near the dipping site, along cattle tracts, in some instances along the road) and did not seem to pose a significant threat to the natural resources nor the livelihoods of the people of Pepela. In the periphery zone of the village grasslands a naturally recovered donga was identified.

We didn't go deep enough into the local people's perception of the state of the environment to be able to say if erosion or grassland degradation was regarded as a threat. One person who was interviewed on this topic though did not even see the big donga as a problem and expressed that it

had always been there and that it was not expanding (though we could see by our observations that it was not stabilized). The same person said that there was no better and worse grasslands, they were all good. This informant attributed no differences to soils either although other informants were able to share more knowledge with us on this topic. Some other informants were able to identify good and bad grasslands for us. We did not rely quite on the first informant because of the obvious mismatches between what he had said and what we could observe. We think that either he did not have any opinion about these issues or he did not want to share it with us.

Discussion on Soils and Vegetation

It is difficult to do some concluding comparisons between the two areas when information is lacking about which grasses are palatable and unpalatable. In the mountain top there was a quite high biodiversity. On the other hand a great proportion of the ground was bare (33%). This indicates that the mountain grasslands could be quite prone to erosion. We cannot say whether the composition of grass species is good or bad. The village grasslands exhibited a lower biodiversity, but not tragically low (8 different evenly distributed grass species). On the other hand there was a high density of grasses in this site (320 grasses pr. m^2 compared to 89 grasses pr. m^2 in the top of the mountain) and only a mere 5.3% of the ground was uncovered by vegetation. In respect to diversity of the grasses the village grasslands seems to be overgrazed. Yet, they are much more densely vegetated, which reduces the risk of erosion. We are thus not able to draw any clear cut conclusions to verify or to talk agains the peoples' perceptions of what are good and bad pastures.

According to the National State of the Environment Report, communal areas seem to have about twice the perceived level of land degradation of commercial managed rangelands (Dept. of Env. Affairs and Tourism, 1999). Presumably, this is due to historical reasons -i.e. overpopulation in homelands. But a new trend goes towards the under-utilisation of many communal lands because of less reliance on agricultural production, as other sources of income gain in importance (Dept. of Env. Affairs and Tourism, 1999).

We did not find signs of great environmental disturbance, rather historical signs that show there has been some degradation at some time, but the pressure that had caused it has now been leavened. For instance is the biodiversity of grasses low in the village compared to the mountains but densities very high. A naturally restored donga was identified and could also point this way. This could harmonate quite well with the history we've been told by some informants, who expressed that there were so any cattle heads in the 80'ies that it put too much pressure in the natural resources although a qualified conclusion on this is difficult to make on such a meagre basis of evidence.

Land tenure System on Rangeland

Review of the literature on land tenure in South Africa made us expect to identify a common property regime on the rangeland in the study area. However we could not observe any kind of arrangement of inclusion and exclusion of some groups of people that could confirm this assumption. Informants revealed that the grazing pastures are open to all livestock owners, also from the surrounding villages. The land tenure arrangement on rangeland could therefore more be characterized as open access – a least it was not possible to identify The only arrangement found on the rangeland was the prohibition of letting animals graze during spring and summer on the southeastern part of the village where thatching grass grew. The issue of land tenure was also investigated in a time perspective because we thought that the little number of cattle at the moment had made the arrangement on rangeland disappear. However, the informants came to rather different conclusion on whether or not a communal land tenure arrangement existed in the past, and therefore no conclusion can be made on this aspect. During the first days of the fieldwork we concluded that land tenure was not a factor determining livestock production in the village at the moment and we therefore did not devote more time to this topic[8].

Breeds

Trough direct observation and informal interviews we could identify three most representative and economic important breeds and collect information related to the animal breeding practices.

The local herds of cattle are characterized by high diversity of types and breeds, high phenotype/environmental interaction (body size, endurance) and differences in the phenotype and genotype structure within the local herds. The most representative and economic and social important breeds in the study area are Africaner, Drakensberger as pure breeds and local breeds are crossbreeds or interbreeds.

The characteristic and special quality of the Africander breed is high adaptability to the tropical and subtropical climates with moderate humidity or aridity (Porter, 1991). Main physical characteristics are large and muscular body, red to brown coat colour and prominent hump in the male. It is a multi purpose cattle, mainly used for production of meat and milk and utilization of draught power (FAO, 2001),

[8] The issue of land tenure arrangements on cropping fields was not investigated in our study.

The Drakensberger is well adapted to wide range of pastures from lowlands to highlands. They are both used for production of meat and milk and animal traction (FAO, 2001).

Most of the local breeds are crossbreeds between Africander and Drakensberger with influence of other breeds used in this area. They are acclimated to the local environment and probably possess desirable genetic traits. Main physical characteristics of the local crossbreeds are almost the same to the physical characteristics of Africander and Drakensberger. The exception is colour, and local breeds are different coat coloured. Main use is multipurpose; meat, milk, animal traction and special uses as cow dung and skin.

The reproduction system is based on natural, non-controlled mating between the three main breeds. Artificial insemination is unknown, as well as other methods of controlled breeding. Consequently, the absence of breeding practices, together with environmental influence has caused some negative changes of productive characteristics of two pure breeds, Africander and Drakensberger. The process of adoption to the local environment has caused decrease in some productive characteristics, what is possible to forfity by the comparison with productive standards and normative of the breeds.

Production System

The production system in the study area could be described as a mixed farming system. According to the main characteristics and intensity of the production, this system classified as subsistence to semi-subsistence, mostly non-commercial extensive production system characterised also as smallholder farming.

The common pastures, which surrounding village Pepela, are main grazing areas. The cattle herds are moving over the pastures from early morning to the evening. Herdsman or children herd the cattle on the pastures. At night the cattle are housed or kept close to the homesteads. The degree of utilization of pastures refers to the rapid seasonal changes in fodder availability and quality, which are influenced by changes between dry and wet seasons. The positive impacts of grazing cattle on the pastures could be expressed mostly trough the natural nutrition cycles and another related issues. Another important production on the common grazing areas in Pepela is a small ruminant production. The sheep farming, after the cattle breeding, is the second important income generating activity generated from the grasslands. The sheep farming in Pepela is characterised by small flocks, high diversity in types and breeds of sheep and problems related to the parasites as vectors of animal diseases. The role and importance of poultry production in the investigated are not bee discussed here, but it is possible to mention that is difficult to find any household without poultry. There are

few poultry projects, on a common and local level, which have to improve and increase poultry production and its importance.

Multi-purpose Use of Cattle

Cattle in the study area provide a number of goods and services. Milk and cow dung were mentioned as the most frequently use of cattle although large differences occurred among the informants. While the milk is mainly for home consumption, cow dung had several uses where fertilizer was the most important followed by house construction and finally as fuel. The following goods and services were all mentioned in varies degrees by our informants:

transport of firewood, cash sales, hides, Lobola and religious / feast purposes.

Lobola is the term used to describe the traditional practice where the groom pays the bride's parents by giving a number of cattle (decided upon by both parties) for the hand in marriage of their daughter. In households where this practice was identified a number of 6-8 cattle were paid. This is not a trading process but a cultural practice of sealing a relationship between the two families. This practice is on the decline because of the scarcity of cattle and there is a preference for cash rather than cattle. As one lady said it is better to have the money, although they also disappear!

Due to the thefts a number of expected uses of cattle were not identified. E.g. hardly any ploughing and sowing took place using oxen the last years, and the few families who had the possibility did not lend out, because their oxen were too young[9]. Because of rebuilding of the herds, people had stopped selling and slaughtering their cows, although selling out is normally an important income and cattle is viewed as 'rural savings' (Cousin 1996).

We can conclude that talking about multi-purpose use of cattle certainly gave meaning in the study area. It should also be mentioned that gender differences in ranking of the importance of the different uses of cattle can appear but we did not go deeper into this aspect.

Access to Market

The infrastructure in the study area was characterised by dirt roads (even though it was visited in the dry season) and a long distance to markets. Although the village was attended daily by a bus the lack

[9] Normally, four oxen are used for draught, although one informant stated that he could still use his oxen for sowing even though he only owned two.

of easy access to a market in a bigger city was frequently mentioned as a constraint to further development in the village and the production of crop and livestock products for commercialisation. A few interesting observations should be mentioned from our data. As an effect of the cattle theft the "mobile" cattle auction had stopped coming to the village. This meant that the (few) people who wanted to sell a cow or two had to arrange it themselves which meant expenditure on transport and a camp to sleep overnight in the city. Regarding mohair wool from the sheep the same problem appeared. The response of the few richer farmers was to collect their piles and go by car to Cocksberg or Durban. However, according to our informants, the poorer household who did own sheep did not know about this social network and kept their wool for next year to lower down their transport cost or see if the buyer would return. Off course it should also be mentioned that the bad infrastructure has an effect on the access to and distribution of medicine and assistance for the animals as well as for fertilizer and other inputs to the agricultural activities in the village.

Evaluating Methods and Data

This section contains an evaluation of the applied methods from the field of natural and social sciences. Furthermore the success of the overall approach, our combination of topics in order to discipline and data triangulation, is discussed. This section also reveals some subtopics to our research subject that could well diserve further investigation, maybe from our successors, the next SLUSE groups in South Africa.We felt, from the start, that it was important to investigate aspects of animal health, and its interrelation with e.g.the nutritional status of the animals. In the beginning of our study it was clear, as we also had expected from our literature studies, that livestock health (esp. tick-born diseases) were important issues in Pepela. We also felt that in the beginning of our study after conducting our problem and solution diagram, that the main problems were more related to the cattle than on other livestock (the issue about cattle theft, for example). Before our data sampling we could not recognize the importance of other kind of livestock production. But this was clearly seen later during the analysing of the data. After the analysing of the data when we saw that poultry is the most preferred income generating activity. More emphasis should have been put into this direction, but we were not flexible enough on field in order to percieve this in time an to react upon it by changing our focus (to e.g. poultry or sheep). The attempt to assess the state of the grasslands by soil testing and looking at the vegetation was not very successful because we ended up with data which could not give us as precise information as we wanted. The aim was to detect signs of rangeland degradation. Instead we ended up with a lot of measurements, which are all very relative and cannot lead us to any definite conclusion. One way of avoiding this problem could have been to focus on fewer parameters, like e.g. the distribution of palatable and unpalatable grasses or maybe just a few indicator species as an indication of rangeland condition. By focusing solely on this, we might have been able to prepare ourselves better prior to the field trip and maybe we would have got better results. Of course, we still would have had the season against us (many plants were at an

unrecognisable stage) and, as previously mentioned, we had hoped on some help in this field from our South African co-students.

A parallel way of investigating rangeland conditions would have been to deal more with the issue in interviews. We recognise that we did too little about extracting the local knowledge from the people although we actually had planned to do it before the field trip. We wanted to understand livestock owners' perceptions of environmental issues as land degradation, and vegetation species: Which grazing areas are considered best, and why they are preferred? We also expect that we could have got valuable information on e.g. indigenous perceptions of soil fertility and nutritional quality of plant species. This part of the investigations were left aside during the field stay mainly due to the time pressure and perhaps also because it just was difficult to get started asking people about their knowledge on particular issues. If we had put more emphasis on this part of the study from the start, we might have had better chances to perform it.

Yet another issue we could have dealt with is the management of cow dung for fertilizer and its interrelations with agriculture. Looking at the mixed farming systems could have been an interesting addition to understanding the importance and multipurpose use of cattle.

Overall we find that we had a very broad research field, because we tried to use as many methods as possible to illuminate our main research question from many angels. However, another time, with the knowledge we now have on the complexity of the "real world" as well as the challenge of working interdisciplinary, we would narrow down our research question. At the same time we must say that despite of a number of gaps in the data collected we think that we did illuminate several aspects concerning livestock in the study area. It should also be mentioned that a lot of the interrelations between the different areas first did appear afterwards in our analysis of the data. The fieldwork in Pepela has been an exiting experience for all participants. It was a great and sometimes overwhelming challenge to have an interdisciplinary approach due to our different understandings of what is field work, science, and the proper methods to investigate a subject matter. We must conclude that working interdisciplinary is a learning process, which for us has just begun.

Conclusion

The aim of this study was to identify the factors that determine livestock production in the study area. Broad ranges of methods from the fields of natural science and socio science have been applied.

Various livestock species have been identified in the study area, including cattle, goats, sheep and poultry, but also other as e.g. pigs and horses.

The interrelated factors that determine livestock production in Pepela are: Animal health and nutrition factors, which make a constant limitation on productivity, the base of natural resources, which consist of different grazing areas, and the preferences which are the basis for choice when people engage in the different stockholding activities. On top of this stock theft is an external factor that places a great limitation to livestock keeping, and which has led to a change in the traditional patterns of the use and management livestock.

Diseases are limiting all livestock production and the veterinarian services provided in the area play an important role in their control. Diseases are perceived as a great problem in the village. How greatly diseases determine the livestock production, and how the veterinarian service, which seems to be poor in area, influence the livestock production cannot be seen from our data.

No significant signs of environmental disturbances were identified on the rangelands surrounding the village however; the collected data is insufficient to draw final conclusions on this. However, previous degradation seems to have occurred. This corresponds well with the declining numbers of cattle during the last 15 years. However, no definite conclusion can be made on this aspect that did not seem to place a limitation on the current livestock production.

Stock theft and especially cattle theft is regarded as the most serious problem regarding livestock production in Pepela. Several effects of the cattle theft were identified. These are: lack of cow dung for fertilizer, insufficient draught power and new patterns on the management of livestock. We found that cattle theft is threatening the livelihood security for both poor and richer households.

Poultry was the most important in terms of home consumption and income and were widely kept in the village. Goats, which traditional are not important in relation to income, can now seen as an important species. Sheep were important, and ranged high in terms of income, however keeping sheep is also connected with expenditures above the average, and this means that sheep-keeping is reserved for the more wealthy households.

A preference for cattle is on decline, but it still keeps some importance mostly due to cultural reasons and due to the multipurpose uses. 46 % of the households keep cattle. Cattle numbers are declining, mainly due to theft and this has resulted in a change in people's preferences for livestock species. Although the preference for cattle is declining, some people still try to rebuild their cattle herd in order to sustain the important services that cattle can provide.

We detected new patterns in keeping the cattle. Due to cattle theft the animals are know taken to the mountains and back home in the evenings instead of keeping them for a long period in the mountains. This may have consequences for the cattle health as an increased risk of spreading of diseases when cattle are kept closer. However, a possible increase in diseases over a time period was not investigated and due to the lack of data no definite conclusion can be made.

. Due to time constraints we did not succeed in redirecting our focus more to other animal species, which we recognize as a problematic aspect of our research.

References

Anderson, J.M. and Ingram, J.S.I. (1996): Tropical Soil Biology and Fertility. A Handbook of Methods. 2nd edition. CAB International.

Barnard, R. Newby T. (2001): Overview of chapter. In: Sustainability of Terrestrial Ecosystems. National State of the Environment Report - South Africa.
www.ngo.grida.no/soesa/nsoer/issues/land/index.htm.

Berlinger,S (2001): Disease issues can have serious effects on nutritional status. In:
Cattle Today, online issue, No 124, February 2001, Fayette, AL, USA. Cited 28th November 2001, Last modified 15th August 2001.
http://cattletoday.com/archive/2001/February/Cattle_Today124.shtml

Blair, J.M., Bohlen, P.J. and Freckman, D.W. (1996): Soil Invertebrates as Indicators of Soil Quality. In: Doran, J.W. and Jones, A.J. (Eds.). Methods for Assessing Soil Quality. SSSA Special Publication Number 49. Soil Science Society of America, Inc. Madison, Wisconsin, USA.

CARE Bolivia (1999B): Enfoque de Seguridada de medios de Vida del Hogar. La Paz, Bolivia.

Carney, D. (1998): Implementing The Sustainable Rural Livelihoods Approach**.** Development Edition, Johanesburg, South Africa.

Casley,D.J and Kumar,K.(1988): The collection , Analysis, and Use of
Monitoring and Evaluation Data. World Bank, Washington D.C.

Chambers, R. (1992): Participatory rural appraisals; past, present and future. Forests, Trees and People. Newsletter No. 15/16, pp.4-9.

Chesworth, J. (1992): Ruminant Nutrition. Tropical Agriculturalist, Macmillan Press Ltd., London, UK.

Cousin, B. (1995): A role of common property institutions in land redistribution programmes in South Africa. Gatekeeper Series, No. 53.

Cousin, B. (1996): Range Management and land reform policy in pos-apartheid South Africa. Land Reform and Agrarian Change in Southern Africa, Occasional Paper Series, No.2.

Cullen, P.T. (1991): Farm Animal Health, Pergamon Press, Oxford, UK.

Department of Environmental Affairs and Tourism (1999): National State of The Environment Report - South Africa. **http://www.ngo.grida.no/soesa/nsoer/**

Doran, J.W. and Jones, A.J. (1996): Methods for Assessing Soil Quality. SSSA Special Publication Number 49. Soil Science Society of America, Inc. Madison, Wisconsin, USA.

Duvel, G.H. and Afful, d.b. (1996): Sociocultural constraints on sustainable cattle production in somme communal areas of South Africa. Development Southern Africa, 13(3).

FAO, DAD-IS (2001): Food and Agriculture Organization of the United Nations, DAD-IS Breeds database, Rome, Italy. Cited 12th November, Last modified 30th April 1998.
http://dad.fao.org/en/Home.htm

Fox, R. and Rowntree, K. (2000): The Geography of South Africa in a Changing World. Oxford University Press, Oxford, UK.

Furze, B., De Lacy, T and Birckhead, J. (1996): Culture, Conservation and Biodiversity. John Wiley and Sons Ltd., Chicester, UK.

Hall, H.T.B. (1985): Diseases and Parasites of Livestock in the Tropics, 2nd edition, Intermediate Tropical Agriculture Series, Longman Ltd., London, UK.

Hunter A. (1996): Animal health, Volume 1 General principles. Macmillan Press Ltd., London, UK.

Kirsopp-Reed,K. (1994): A review of RRA methods for Research and development. In: Kirsopp-Reed and Hinchcliffe, F. (1994): RRA Notes, No 20, Special Issue on Livestock. International Institute for Environment and Development.

Kothmann, M. M. and R. T. Hinnant (1998): *Current Veterinary Therapy 4: Food Animal Practice.* Eds. Jimmy L. Howard and Robert A. Smith. W.B. Saunders Company. Philadelphia,USA, p.163-176,

Laier, Julie Koch; Et problematisk parforhold. Veje til Viden. Den Ny Verden 3.

Center for Udviklingsforskning, København, Danmark.

Low, A.B. and Robelo, A.G. (1996): Grassland biome. In: Low, A.B. & Robelo, A.G.(Eds.) Vegetation of South Africa, Lesotho and Swaziland. Dept. Environmental Affairs and Tourism, Pretoria, South Africa.

Matose, F and Mukamuri, B (1994): Rural people's knowledge and extension practice: trees, people and communities in Zimbabwe's communal lands. In: Beyond Farmer First. Rural people's knowledge, agricultural research and extension in practice. Scoones, I and Thompson, J (Eds.). Intermediate Technology Publications, Ltd. International Institute for Environment and Development.

Maloti-Drakensberg Transfrontier Project (1999): Annex 7: Rangeland Management and Biodiversity.
www.gefweb.org/wprogram/Feb00/wb/Reg_Maloti/Part%20IV.doc

Matose, F and Mukamuri, B (1994): Rural people's knowledge and extension practice: trees, people and communities in Zimbabwe's communal lands. In: Beyond Farmer First. Rural people's knowledge, agricultural research and extension in practice. Scoones, I and Thompson, J (Eds.). Intermediate Technology Publications, Ltd. International Institute for Environment and Development.

May, Julian (2000): The structure and composition of rural poverty. In: Cousin, Ben (2000): At the crossroads: Land and Agrarian Reform in South Africa into the 21st Century. Papers from a conference held at Alpha Training Centre, Broederstroom, Pretoria on 26-28 July 1999. Programme for Land and Agrarian Studies (PLAAS), Scohool of Government at the University of the Western Cape and National Land Committee (NLC). Braamfontein, South Africa.

Mikkelsen (1995): Methods for Development Work and Research. Sage Publications, London, UK.

Miller, R.W. and Gardiner, D.T. (1998): Soils in our environment. 8th edition. Prentice Hall, USA.
Oksen, P. (2001): Lecture notes, IU/RUC.

Payne, W.J.A. (1990): An Introduction to Animal Husbandry in the Tropics, 4th edition, Longman, London, UK.

Pegram, R.G. and Tacchel,R.J. (2001): Tick control: New concepts. FAO, Rome, Italy. Cited 23rd November 2001 Last modified 17th April 1999.
www.fao.org/ag /aga/agap/war/warall/u955b/u955b04.htm

Porter, V. (1991): Cattle, A Handbook to the Breeds of the World. A&C Black, London, UK.

Pratt, B. and Boyden, J. (1985): The Field Directors' Handbook. An Oxfam Manual for Development Workers. Oxford University Press, Oxford, UK.

Scoones, I. and Thompson, J (1994): Knowledge, power and agriculture -towards a theoretical understanding. In: Beyond Farmer First. Rural people's knowledge, agricultural research and extension in practice. Scoones, I and Thompson, J (Eds.). Intermediate Technology Publications, Ltd. International Institute for Environment and Development.

Scoones, I. (1994): Browse ranking in Zimbabwe. In: Kirsopp-Reed and Hinchcliffe, F. (1994): RRA Notes, No 20, Special Issue on Livestock. International Institute for Environment and Development.

Shackleton, SE., Shackleton, CC., and Cousin, B. (2000): **The economic value of land and natural resources to rural livelihoods: Case studies from South Africa. In: Cousin, Ben (2000): At the crossroads: Land and Agrarian Reform in South Africa into the 21st Century. Papers from a conference held at Alpha Training Centre, Broederstroom, Pretoria on 26-28 July 1999. Programme for Land and Agrarian Studies (PLAAS), Scohool of Government at the University of the Western Cape and National Land Committee (NLC). Braamfontein, South Africa.**

Sikana, P (1994): **Indigenous soil charecterization in northern Zambia. In: Beyond Farmer First. Rural people's knowledge, agricultural research and extension in practice. Scoones, I and Thompson, J (Eds.). Intermediate Technology Publications, Ltd. International Institute for Environment and Development.**

SLUSE homepage **http://www.agsci.kvl.dk/sluse/** 2001-11-30

Suthers, R.W. (1986): Ticks and Tick-borne Diesease. ACIAR proceedings No.17.

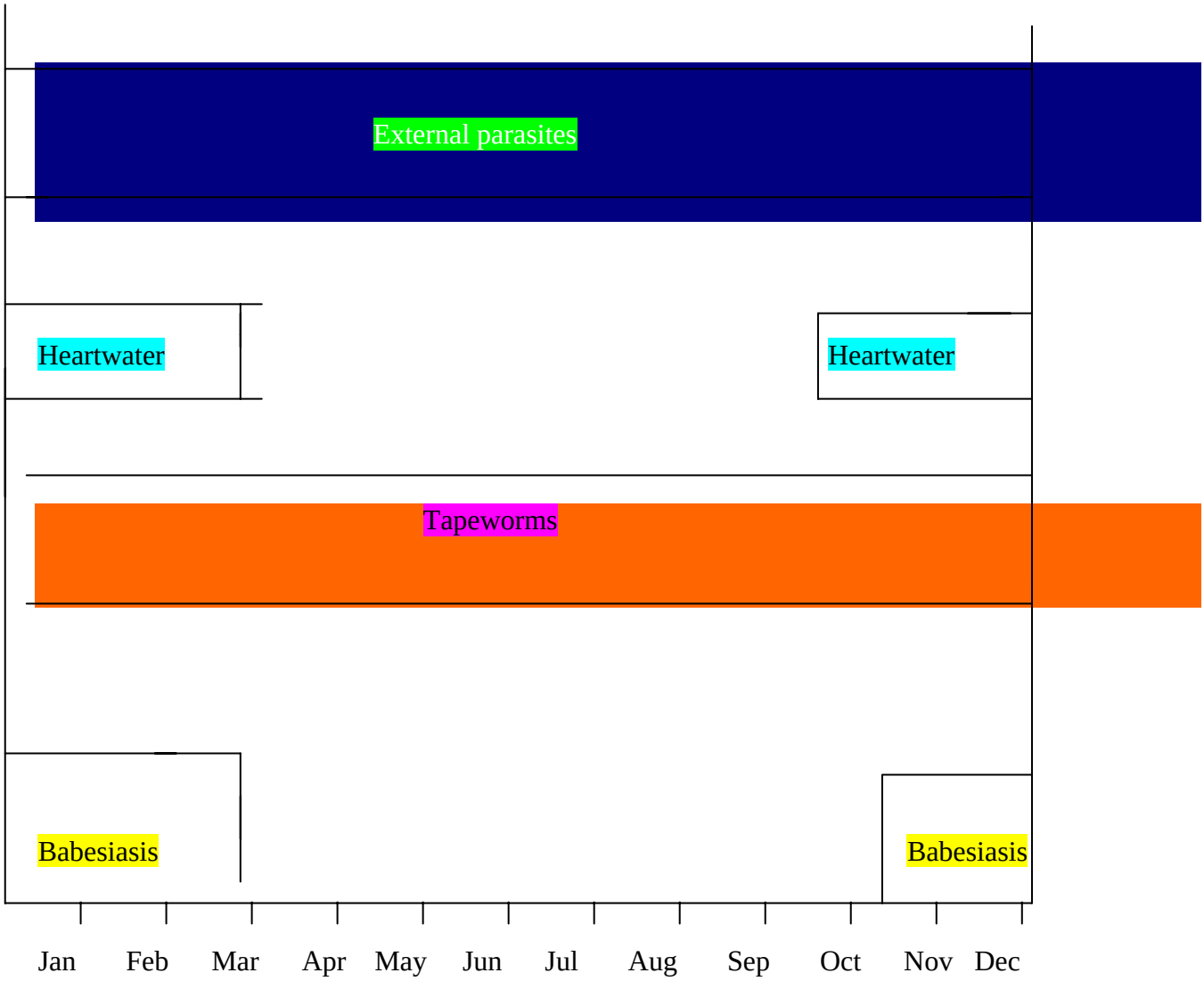
Totolo, O. (1998): Rangeland issues in Botswana. In: Environmental issues in Botswana. Lightbooks, Lentswe LaLesedi (Pty) Ltd, Botswana.

Tyler, L (1990): Maintenance of Health, a chapter in Payne, W.J.A. (1990) An Introduction to Animal Husbandry in the Tropics, 4th edition, Longman, London, UK.

Appendices

Appendix 1

Livestock Disease Calendar



Appendix 2

Interviews guide

Questions about health related issues

1. Do you have problem with diseases in your animals? If yes,
2. What are the main diseases affecting your cattle/sheep/goat?
3. What are the symptoms of this disease?
4. Does it affect one animal or all the animals at the same time?
5. What is causing the disease?
6. Are there any ways to prevent or avoid this disease?
7. Are there traditional treatments to cure this disease?
8. If answer is yes,
    i. What are they?
    ii. Do they cure the disease?
9. Are there western medicines to cure this disease? if answer is yes
    i. Do they cure the disease?
10. What do you do if your animal gets the disease?
11. Do you get help from the veterinarian assistant? If not, why not?
12. If cattle get sick or die, do you have to report it to the authorities or veterinarian assistant?
13. (Optional question: How many animals did you loose from this disease last 12 months?)

Questions about the dipping system for cattle owners

1. How often are the cattle dipped?
2. When do you start taking your calves to the dipping tank?
3. How do you know about the dipping days?
4. Do people always take the cattle to the dipping tank?
5. Are you satisfied with the dipping system?
6. How could it be better?
7. What happens if people do not take their animals for dipping?
8. If there are lot of ticks can you ask for an extra dipping day?
9. Are people here in Pepela comfortable about the dipping system?

Guiding questions for socio-economic aspects

How many cattle does your family have this year? (herd size, herd composition)?
How many goats/sheep?
Did you always have cattle? How did you get it (bought, inherited)? / Why do you not keep cattle?
Are many people outside the village keeping cattle here?
Why is it good to have cattle?
What are the most important reasons? Why?
Are cattle important to get food and money?
How was it 10 years ago? (Do you have cattle for other reasons today)?
What about the future?

Problems regarding cattle (raids, livestock prices)?
How could the condition of the stock be improved?

Lack of labour:
Are there people to take care of the cattle (gender, daily routines)?
Do women get involved in livestock?
What do they do?
Why? Has it changed?

Marketing system and infrastructure:
Lack of capital?
Migration!
Future?

Wealth:
How will you know if a person is rich / poor? How much cattle does a rich person have?

Land tenure:
What kind of system do you have for grazing areas?

Appendix 3

Official records of Livestock

Date	Total forward	cb	death	pi	po	on reg	seen	missing
13.04.00	559	16	9	0	4	574	336	238
15.06.00	574	3	7	0	2	568	364	210
13.07.00	568	1	2	0	10	557	400	157
17.08.00	557	4	4	0		557	355	202
19.10.00	557	12	8	0	3	558	325	235
30.11.00	558	15	3	0	2	568	279	148
25.01.01	568	19	12	0		575	395	180
08.02.01	575	4	6	0	68	505	393	112
22.02.01	505	2		0	59	449	342	107
08.03.01	449			0	82	371	358	13
02.04.01	371	1		0		372	365	7
09.05.01	372	2	1	0		373	358	7
24.05.01.	373		1	0		373	363	9
27.06.01	372		1	0		370	363	9
18.10.01	371	32	6	0		397	387	10

Table 1 Official records from the dipping service.

Key:

cb=calves born since last dipping day

pi= number of cattle permissed in to the area

po=cattle permissed out of the area

seen= cattle seen on at the dipping tank

missing =cattle missed from dipping tank

Death= cattle number died since last dipping day

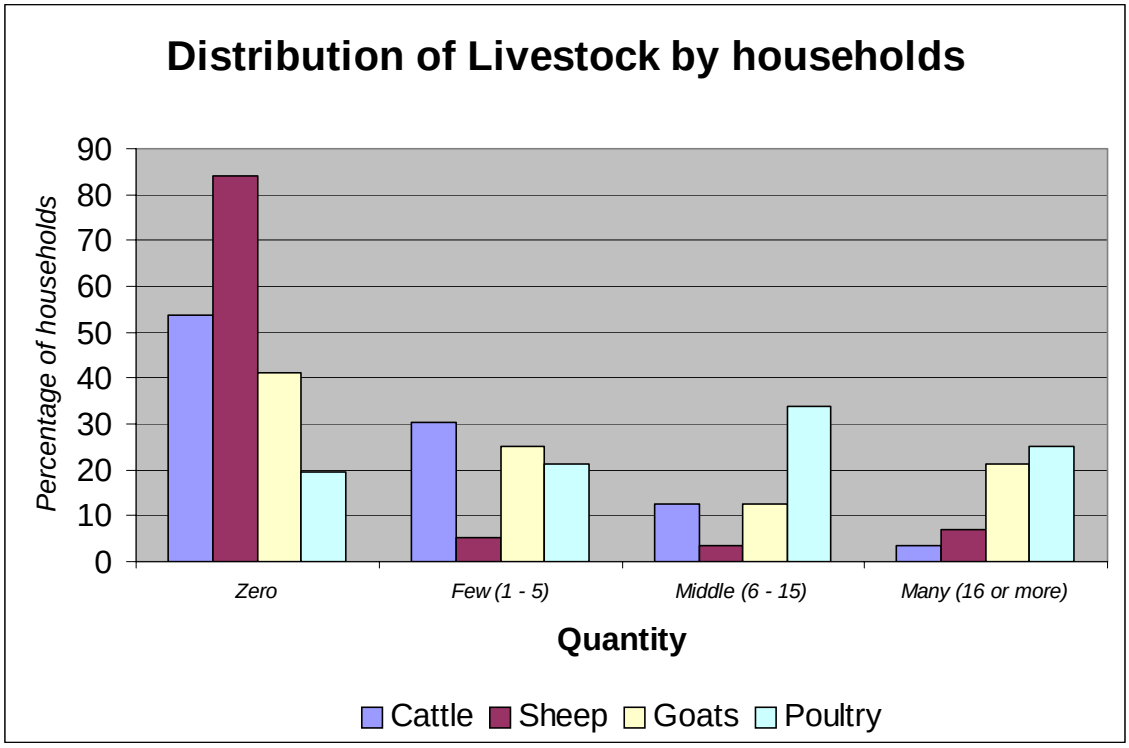
Today reg= cattle on records after taking into account cb,pi,po and death

Total forward=Number of cattle on records from last dipping day

Appendix 4

Distribution of Livestock by households. Numbers from the social and household mapping.

	Zero	Few	Middle	Many		Zero	Few (1 - 5)	Middle (6 - 15)	Many (16 or more)
Cattle	30	17	7	2		53,57143	30,35714	12,5	3,571429
Sheep	47	3	2	4		83,92857	5,357143	3,571429	7,142857
Goats	23	14	7	12		41,07143	25	12,5	21,42857
Poultry	11	12	19	14		19,64286	21,42857	33,92857	25



Appendix 5

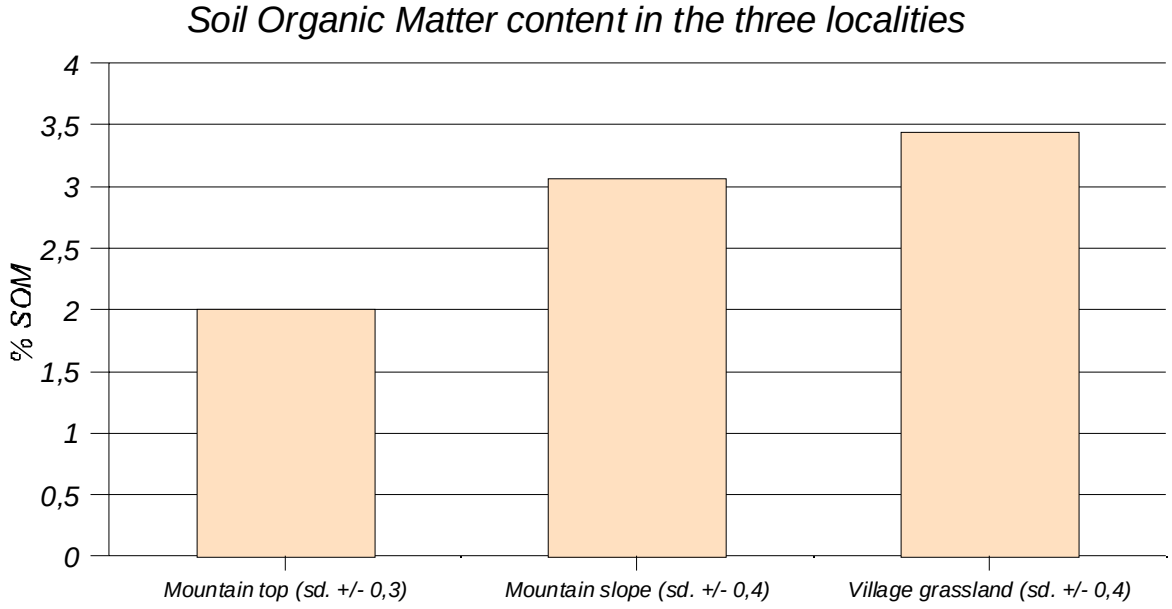
Results from the soil tests

Location	Texture	pH	NO_3^-	NH_4^+	K	P	SOM
Mountain (top)	Silt loam Silt loam Silt loam	6.0 6.5 5.5	0 VL VL	VL VL VL	L L L	VL VL VL	2,00 ±0,29
Mountain (slope)	Loam Loam Loam	6.5 5.5 6.0	VL VL VL	VL VL VL	L L L	VL VL VL	3,06 ±0,45
Village grassland	Light clay Light clay Clay loam	5.5 5.0 6.5	VL VL VL	VL VL VL	L L L	VL VL VL	3,44 ±0,42

Table 2.Results from the soil tests. L = Low. VL = Very Low.

Soil organic matter:

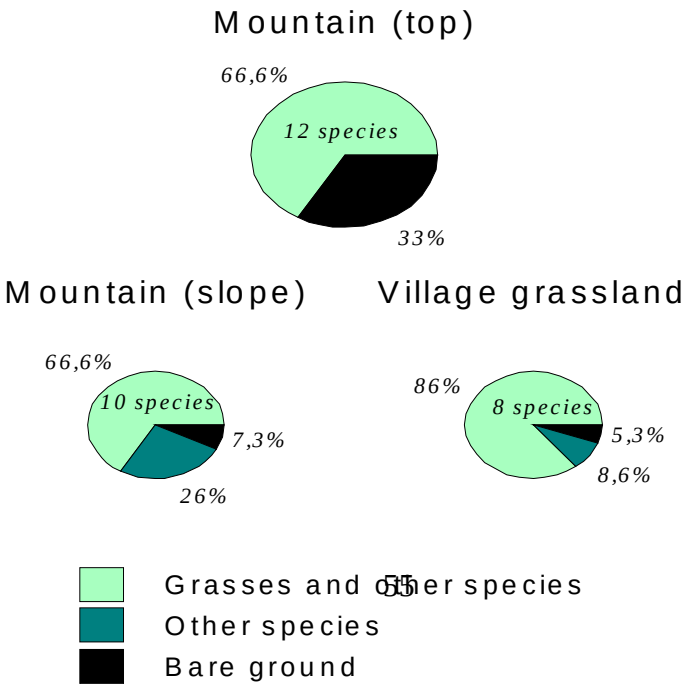
	%C	tørstof %	%C på tørstof	SOM %	average	sd. (±)
1	1,31085	0,96	1,25841	2,170	2	0,29
2	1,04335	0,93	0,97031	1,673		
3	1,38215	0,91	1,25775	2,170		
4	2,32986	0,88	2,05028	3,535	3,06	0,45
5	1,72705	0,89	1,537	2,650		
6	1,96675	0,88	1,73074	2,984		
7	2,42015	0,9	2,17813	3,755	3,44	0,42
8	2,37055	0,88	2,08608	3,600		
9	1,86615	0,92	1,716858	2,960		



Vegetation				
	Mountain (top)	**Mountain (slope)**	**Village grassland**	**Palatability**
Eragrostis capensis	*	***	**	-
Eragrostis sp.	*	*	**	-
Eurochloea sp.		**		+
Elinurus muticus	*			-
Heteropogon contortus	*			
Pennisetum sp.		**	*	+
Poa annua		*		
Sporophora sp.		**		-
Trodypogon spicatus	*			
other unidentified grasses	** 1)	** 1)	** 1)	
Sedges	* (2 species)		* (2 species)	

Table 3. Numbers of grasses and sedges in the three locations. Key: **) present **) very prevalent *)dominating by 50% 1)some of them very dominating***

	Mountain (top)	Mountain (slope)	Village grassland
grasses and sedges	66.6	66.6	86.0
other species	0.0	26.0	8.6
bare ground	33.3	7.3	5.3



Appendix 6

Seasonal calendar of fodder and browse availability