

UNIVERSITY OF CAPE COAST

**MORTALITY IN SMALL RUMINANTS AND IMPLICATIONS FOR
LIVELIHOODS OF THEIR KEEPERS IN THE SAVELUGU-NANTON
DISTRICT OF THE NORTHERN REGION OF GHANA**

BY

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DECLARATION

I hereby declare that this dissertation is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere.



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19th October, 2006

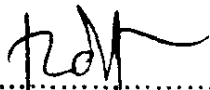
SUPERVISORS' DECLARATION

We hereby declare that the preparation and presentation of this dissertation were supervised in accordance with the guidelines on supervision of dissertation laid down by the University of Cape Coast.



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19th October, 2006

DEDICATION

To my late parents, who I miss a lot; my mother whose strength and energy nurtured me, and taught me how to survive.

And my father, whose gentleness and passion for hard work showed me how to love, made me more determined and freed me to fend for myself, and the community. He taught me how to fish, instead of feeding me with fish.

To the present generation, Adams, Mariam, Junior, Lateefa and Abdul-Shakur, I sincerely hope you will take a cue from your father's dedication to knowledge and make the world better for yourself.

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ABSTRACT

Despite the many roles small ruminants play in the livelihoods of rural small holder farmers, high mortality in small ruminants has been identified as the major constraint impeding productivity, and hence the livelihoods of small ruminant keepers. In the Savelugu-Nanton district estimated losses in livestock output due to mortality of small ruminants are in the tune of 35%. The present study focuses on the implications of these losses due to mortality in small ruminants in the district and suggests ways of reducing the losses.

A multi-stage sampling procedure involving randomization, stratification and purposive sampling was employed. Data collection, processing and analyses were done from October 2004 to January 2005. The results of the study revealed that certain socio-economic and cultural information of the respondents have an effect on mortality of small ruminants. Included in this list were the main occupation of the farmer and the level of education. Small ruminant keepers (n=179) were mostly crop farmers (98%) and therefore had little time for their animals. About 56% had no formal education, making technology transfer in animal health an uphill task. About 90% of respondents had no access to animal health services (technical officers and a veterinary clinic) and supporting institutions such as drug centers and markets.

The production systems practiced were predominantly the extensive (62%) and the semi-intensive (38%) systems. Mortality in both production systems depended on the type of management, with the extensive system registering 25.5% of mortality in sheep and 24.3% in goats. The mortalities for the semi-

intensive system were 30.3% and 24.1% for sheep and goats respectively. These differences could be attributed to poor sanitary conditions of the pens and the uncontrollable nature of breeding practiced. The major causes of death were found to be diarrhoea diseases (24.7%), respiratory syndromes (20.8%) and starvation (20.25%). The mortality rate for lambs and kids born in the dry season peaked at 60%, while those born in the rainy season recorded nearly 40%, due to stunted growth, heavy worm burden and tick infestation

Based on the findings, small ruminant keeping in the district needs careful education in order for farmers to realize the potential in these animals. To the rural smallholder small ruminant keeper, cash at hand from the sale of his animals, is worthier than getting meat for consumption. The cash is used to satisfy various ends such as customary rites and festivals, purchasing agricultural inputs, building houses and purchasing sufficient grain for the lean season.

Unless farmers start viewing livestock keeping as a business, livestock development efforts would stagnate for a long time to come. Livestock specialists have a vital role to play by encouraging the use of simple but cost effective mortality reducing strategies in a systemic way.

LIST OF ABBREVIATION

ADF	-	African Development Fund
ADP	-	Area Development Programme
AEA	-	Agricultural Extension Agents
AHPC	-	Animal Health and Production College
ARI	-	Animal Research Institute
CLW	-	Community Livestock Worker
CSIR	-	Council for Scientific and Industrial Research
DADU	-	District Agricultural Development Unit
DDA	-	District Director of Agriculture
FAO	-	Food and Agriculture Organization
FASDEP	-	Food and Agricultural Sector Development Policy
GDPC	-	Ghanaian Danish Community Programme
GDHS	-	Ghana Demographic Health Survey
GLSS	-	Ghana Living Standard Survey
IDL	-	International Development on Livestock
IFAD	-	International Fund for Agricultural Development
ILCA	-	International Livestock Centre for Africa
ISNAR	-	International Service for National Agricultural Research
JSS	-	Junior Secondary School
LBS	-	Livestock Breeding Station
LDP	-	Livestock Development Project

MOFA	-	Ministry of Food and Agriculture
NARP	-	National Agricultural Research Project
NGO	-	Non-Governmental Organization
NLSP	-	National Livestock Services Project
PPR	-	Peste des petites ruminants
RLRL	-	Role of Livestock in Rural Livelihoods
SADEP	-	Smallholder Agricultural Development Programme
SPSS	-	Statistical Package for Social Sciences
SRDP	-	Smallholder Rehabilitation and Development
TCRV	-	Tissue Culture Rinderpest Vaccine
UER	-	Upper East Region
UES	-	Unified Extension Services
UNICEF	-	United Nations International Children's Emergency Fund
UWR	-	Upper West Region
VSD	-	Veterinary Services Division of MOFA
WAD	-	West African Dwarf
WVI	-	World Vision International

TABLE OF CONTENTS

	PAGE
Declaration	i
Dedication	ii
Acknowledgement	iii
Abstract	v
List of Abbreviations	vii
Table of Contents	ix
List of Tables	xiii
List of Figures	xiv

CHAPTER ONE: INTRODUCTION

1.1	Background	1
1.2	Statement of the Problem	6
1.3	Research Questions	9
1.4	Objective of the Study	10
1.5	Specific Objectives	10
1.6	Limitations to the Study	10

CHAPTER TWO:**LITERATURE REVIEW**

	PAGE
2.1 Small Ruminant Production Systems in the Northern Region	12
2.2 Climatic Factors	17
2.3 Management Systems	18
2.4 Animal Breeds	19
2.5 Health and disease conditions	20
2.5.1 Causes of Lamb and Kid Mortality	21
2.5.2 Diarrhoea of Sheep and Goats	23
2.5.3 Respiratory/Pneumonia Syndromes	23
2.5.4 Ticks and tick-borne Diseases	24
2.5.3 Abortions and Neonatal Deaths	25
2.6 Starvation	25
2.7 Age and Season of Mortality	26

CHAPTER THREE: METHODS

3.1 General Overview	28
3.2 The Study Area	28
3.3 Socio-Economic Profile of the Study Area	32
3.4 Design of the Study	34
3.5 Sampling Technique	34
3.6 Survey Instrument	38
3.7 Pre-Testing	38

3.8	Training of Enumerators	39
3.9	Data Collection Procedure	39
3.10	Data Processing and Analysis Procedures	39

CHAPTER FOUR: RESULTS

4.1	Response Rate of farmers	40
4.2	Farmer's Background Information	41
4.3	Flock Structure	41
4.4	Season and frequency of Births	43
4.5	Management Systems	43
4.6	Mortality Rates of Sheep and Goat Flocks	45
4.7	Other Findings	46
4.8	Livelihoods	49
4.9	Animals Health Services Delivery to Livestock Keepers	51

CHAPTER FIVE: DISCUSSION

5.1	Background Information	56
5.2	Flock Size	58
5.3	Season of Lambing/Kidding	58
5.4	Influence of Type of Birth	60
5.5	Mortality Rates	61
5.6	Livestock Extension Services and Development Policies	66

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1	Conclusions	70
6.2	Recommendations	72
	REFERENCES	76
	APPENDICES	90

LIST OF TABLES

	PAGE
3.1 Sample size per operational area	35
3.2 Number of animals involved in the Demonstration	37
4.1 Actual numbers of questionnaires returned and response rate by operational zone.	40
4.2 Demographic Information	41
4.3 Type of birth by species	42
4.4 Ranking of common causes of death in lambs/kids	42
4.5 Season and frequency of lambing and kidding in 2004	43
4.6 Mortality Rates for Sheep and Goats in 2004	45
4.7 Age class Distribution of Deaths (2004)	45
4.8 Major constraints limiting the productivity of small ruminants in the S/N district.	47
4.9 Proportion of responses about animals that experienced delivery problems at parturition	48
4.10 Comparison of mortality rates for the two management systems	49
4.11 Livelihood Outcomes from Sale of Livestock	50
4.12 Reasons/Purpose for Keeping Small Ruminant	51
4.13 Services provided by Institutions and Agencies to Livestock Keepers (Focus Group Discussion)	52
4.14 Reasons for Treating Sick Animals (Focus group discussion)	53
4.15 Results of demonstration with small ruminant keepers in Tibali.	55

LIST OF FIGURES

Fig.1	Map of Ghana showing Savelugu/ Nanton district	29
Fig.2	Map of the Savelugu/ Nanton district	31
Fig.3.	Pie chart showing respondents practicing various management systems	44

CHAPTER ONE

INTRODUCTION

1.0 BACKGROUND

The importance of small ruminants in the tropics is well recognized. In Ghana, and especially in the Northern Region, small ruminants are important to the smallholder rural farmer (Karbo et al. 1999) and to the nation at large (CSIR and ISNAR, 1989). Livestock production is an important feature in Ghana's agriculture, contributing largely towards food needs, providing draught power and generating income (Addo-Kwafo et al. 2000).

Despite the vast forage resources, Ghana's livestock population is modest, with about 1.3 million cattle, 2.7 million goats, 2.5 million sheep, 0.3 million pigs and 18.0 million poultry (Ashley and Annor Frempong, 2003). Projections, however, show that increases have been made in cattle, sheep, goat and poultry populations in the country over the last decade. The projected rates of annual growth for sheep and goats are 3.1% and 4.8%, respectively (Koney, 2004).

The per capita annual consumption of livestock products in Ghana is 1.08 kg for beef, 0.7 kg each for small ruminants and poultry meat, 0.49 kg of pig meat and 0.46 litres milk (African Development Fund, 2001). The country therefore, needs to quadruple efforts in livestock production, to be able to satisfy the daily protein requirements of the citizenry, in order to keep a healthy labour force.

Small ruminant production offers rapid growth opportunities for agrarian economies of the developing world and particularly Ghana where, in the small ruminant sub-sector of the economy the necessary markets exist, the demand for

meat and meat products is high, the potential for increased production of feed is also high, while the technology for controlling diseases and improving productivity is available (Ashley et al.1999).

In Ghana, livestock-keeping contributes immensely to the livelihoods of rural households. Ashley and Annor-Frempong (2003) estimated that 76% of Ghana's rural households keep some livestock, indicating that about 12 million Ghanaians are engaged in the livestock sector. Furthermore, the same authors revealed that for small ruminants 34% and 31% of Ghanaian rural households keep goats and sheep respectively. Ashley et al. (1999) explained that small ruminants are a key feature of livestock-keeping of the rural people because of the numerous and diverse ways in which small ruminants support livelihoods.

Ghana's rural development indicators show that the rural population represents 63% of the total population of 19.2 million, and 85% of farmers are small holders, with less than two hectares of land. These farm under rain-fed conditions, producing food crops and livestock for subsistence (African Development Fund, 2001).

In the northern sector of Ghana for instance, livestock are referred to as a "walking bank" of capital and provide financial security, which is considered a buffer in periods of crop failure, economic stress, disasters and conflicts. Livestock production therefore serves as a risk-coping strategy (Gaari-Kweku, 1992; Adolph, et al. 1993; Naandam, 2001). Apart from the diversity of ways that livestock support livelihoods, their contribution is further magnified in Ghana because livestock

keeping is practiced mostly by people (98%) who are also crop farmers (Gaari-Kweku, 1992).

In the two ecological zones of northern Ghana, crop farming is mainly dependent on rainfall, which has a unimodal character, making crop farming a seasonal occupation. Livestock keeping provides substantial household cash income though, particularly for small – scale farmers enhancing food security in many rural households. According to Karbo et al. (1998b), farmers in the Upper West Region ranked livestock as their primary source of income, while those in the Upper East Region and the Northern Region considered it as an income generating source, providing cash income at very hard times (Alhassan et al. 1995).

Forty-three percent of the population in Ghana is classified as living in poverty or extreme poverty (GhanaAlert, 2000). Two million people classified as living in poverty are unable to meet their food and other needs, while six million classified as living in extreme poverty are unable to meet even their most basic food needs (Ghana Statistical Services, 1999). Sixty-three percent of those identified as poor are in the agricultural sector, engaged in small ruminant keeping (DFID and MOFA, 2002).

The erratic rainfall pattern coupled with the rudimentary technology used in most livestock production systems lead to fluctuations in meat supply and protein intake of the people. This causes food insecurity and the consequent poverty among rural households. In times of insufficient crop production, livestock, mainly small ruminants and poultry, become the main source of food and income. In these

regions too, livestock keeping serves as an insurance against food deficits that frequently occur (DFID and MOFA, 2002).

As a primary source of monetary income to households, livestock is used for the purchase of inputs for crop farming (Bruce et al. 1991). It is this linkage which livestock has with crop farming, towards supporting the livelihoods of the rural people, which makes livestock - keeping crucial to the optimization of food security and livelihoods (DFID and MOFA, 2002).

A key feature of livestock - keeping by the poor is the diversity of ways in which livestock support food security and livelihoods. Thus any intervention aimed at the poor should account for this diversity if it is to be effective. Livestock is one of the most important sources of household cash for poor livestock keepers which when derived from small animals such as goats and sheep can easily be sold in small regular amounts (Fitzhugh, 1992; Waters-Bayer and Bayer 1992). Poor households, in most cases, exchange livestock products for grain, thereby greatly enhancing food security.

Livestock are one of the few natural capital assets owned by poor households, and can be crucial in maintaining household survival in times of crisis (Webb et al. 1992). Livestock can be accumulated in good times and sold when the need arises, such as for payment of school fees, health care, building houses and other social responsibilities. The manure from livestock also improves soil fertility, while small ruminant sales generate cash for the purchase of farm implements and fertilizers (Karbo, et al. 1999).

Sheep and goats play a vital role in the household economy by being sold at the market to meet compelling financial obligations or slaughtered for home consumption (Ademosun, 1988). The size of these animals makes them ideal for household consumption; the slaughter of a sheep or goat is more likely to supply the nutritional requirements of a family household. Livestock are also pivotal to the farming systems practiced by the rural people, providing draught power and manure (Karbo et al.1999; Okali, 1992).

Ademosun (1992) stated that sheep and goats serve primarily as sources of meat, milk, skins, manure and income. Livestock are particularly important to women because they tend to be the most rewarding income-generating activity for them (Okali, 1992; Richter, 1997). Small ruminants also serve a number of socio-cultural functions such as bridal wealth, religious festivities and customary rites, gifts or loans, thereby strengthening social bonds. The World Bank (1997) noted that sheep and goats' manure together with readily available waste dry matter, could be a source of biogas production.

Little capital investment in buildings or other materials is required for their upkeep; space and maintenance requirements are also low, while reproductive efficiency is high (Ademosun, 1988; Fianu and Amponsah, 1992). Their short reproductive cycle gives them a major role in helping many farm families survive and make a fresh start in times of conflicts or disasters etc (Adolph et al.,1993). Goats especially are prolific, producing on average of three (3) kids per doe a year. These and other reasons make small ruminants easy to maintain and use as a livelihood and risk-coping strategy. Under sound management, reproductive

efficiency in goats and sheep will rise and farmers can reap the reward of their labour.

In most of the African continent, small ruminants use a primary resource, grass, which cannot be used directly by man. In areas where they are kept, their relatively short reproductive cycle allows livestock populations to be quickly restored after devastating epizootics, disasters and conflicts, thus allowing the rapid establishment of new flocks managed by improved husbandry practices (Jarvis, 1990).

For these advantages and potentials, smallholder farmers within the rural sector of Ghana can actively incorporate small ruminants into small-scale crop farming systems for economic improvement of the individual households, and the rural economy in general.

The Savelugu-Nanton district is typically rural, inhabited by illiterate farmers. Though there is vast expanse of land, and the vegetation is suitable for small ruminant keeping, many constraints including mortality hamper small ruminant production and productivity, thus threatening the very livelihoods of the population.

1.2 STATEMENT OF THE PROBLEM

Despite the multi-purpose roles small ruminants play in the livelihoods of rural people, there are certain constraints affecting their development in sub-Saharan Africa, and Ghana specifically. Ibrahim (1998) identified the constraints affecting the productivity of small ruminants in sub-Saharan Africa to be, health,

genotype and feed supply, farming systems management, land resources and tenure policy, and institutional reforms.

Koney (2004) identified the constraints in Ghana to include:

- 1. Conservative attitudes of farmers**
- 2. Poor infrastructure and communication systems**
- 3. Occasional shortage of basic but important drugs**
- 4. Irregular availability of feed and water**
- 5. Inadequate extension services and personnel**
- 6. Poor sales outlets**
- 7. Urbanization (expansion of cities and infrastructural development)**
- 8. Diseases and mortality**
- 9. Land ownership/land tenure system**
- 10. Theft.**

DFID and MOFA (2002) listed high mortality in livestock, resulting from disease incidence, poor hygiene and management practices, as the most important constraint to livestock development in Ghana, specifically in the Guinea Savanna where the Savelugu-Nanton district is situated.

A number of livestock development programmes or projects have been carried out with the objective of encouraging smallholder farmers to improve upon production and productivity of small ruminants and poultry, as a means of increasing meat production and rural household income. The main emphasis in one of these projects, the National Livestock Services Project (NLSP) were on animal health, nutrition, breed improvement, water supply, credit and institutional support

for the livestock breeding station at Pong-Tamale, in the Savelugu-Nanton district. The objective was to multiply animals, and sell rams to small scale farmers for cross breeding. However, it almost became impossible to sell offspring from the foundation stock to farmers, because of high mortality within the foundation stock and their cross breeds (LBS Reports, 1992 –1996, unpublished). Annan (1997) found an overall mortality rate of 24.6% and 12.4% for Sahelian and Djallonke sheep, respectively kept under an improved semi- intensive system of management.

Given the importance of small ruminants to rural livelihoods and their role in poverty reduction, the effects of mortality of these animals on the livelihoods of the owners cannot be underestimated. The Savelugu-Nanton District Assembly's five-year development plan (2001–2006) identified livestock keeping as a high potential area for rapid economic growth. However, high mortality resulting from disease, bad husbandry and management has been identified as crippling livestock production. Alhassan et al. (1995) estimated that losses due to disease and other factors are in the tune of 35% of livestock output.

Mortality control strategies have the greatest effect on livestock production (Upton, 1985). In Upton's model, if mortality of breeding goats was reduced by 16% through mortality reducing programmes, then a net meat output of \$40.23 could be obtained per dwarf goat, as compared to \$25.53 in the low state of productivity. The net increase of \$14.70 per doe was found to be higher than the cost of health investment and maintenance costs.

This study is therefore justified for the following reasons:

1. Only few detailed surveys on mortality of small ruminants have been conducted in the district.
2. Small ruminants play a major role in the livelihood of both the rural and urban poor. For farmers to achieve food security as prescribed by the United Nations food security agenda, urgent attention should be paid to the health of small ruminants in order to curtail the following: mortality, high reproductive inefficiency in livestock, loss of value of livestock and livestock products, economic loss due to high costs of veterinary care and extension services, and lastly, the inabilities of farmers to cope with vulnerabilities and trends in livestock - keeping.

1.3 RESEARCH QUESTIONS

To assist in determining the implications of mortality of small ruminants on the livelihoods of their keepers, and to recommend appropriate interventions for reducing mortality in two different traditional small ruminant production systems practiced in the district, the following research questions were asked.

1. What is the magnitude/extent of mortality in sheep and goats reared in two village management systems - the extensive (free- range) and the semi-intensive (back yard) systems in practice in the Savelugu-Nanton District?
2. Which species and age groups of small ruminants are severely affected and in what season of the year do farmers experience most deaths in their flock?
3. Is it rewarding to adopt modern technologies to reduce mortality in sheep and goats?

1.4 OBJECTIVES OF THE STUDY

The overall objective of the study is to determine the mortality rates of sheep and goats due to health problems, in the study area, identify and devise strategies to improve sheep and goats survival, thereby, increasing stock productivity and improving the livelihoods of small ruminant keepers.

1.5 SPECIFIC OBJECTIVES:

The specific objectives of the survey are as follows:

1. Assess the magnitude/extent of mortality of small ruminants in the district.
2. Identify disease prevalence and the pattern of disease distribution according to age class, seasonal distribution of birth and mortality in sheep and goats.
3. Describe the implication of mortality of sheep and goats on their keepers' livelihoods, and also recommend strategies to reduce the mortalities among sheep and goats.

1.6 LIMITATIONS OF THE STUDY

The difficulty with most semi-structured interviews is related to respondents' willingness to participate in the study. In urban Savelugu, the focus group discussion with livestock keepers had to be postponed several times because the leadership of the farmers groups doubted the credibility of the enumerators and therefore had to seek clarification from the District Agricultural Development Unit (DADU) before agreeing to be interviewed. They argued that all benefits of projects undertaken have gone to only

undertaken have gone to only the elite and more privileged in the society, while the poor segment of the society suffered.

In Pong Tamale, Diare and some other settlements people refused to be interviewed, claiming that in spite of the numerous projects and Programmes of MOFA and the abundant wealth of research done in the district no positive change has occurred in their lives (personal communication, Haruna Yakubu). This limitation could also be attributed to the fact that respondents were not adequately conscientized to realize the benefits of the study.

Generally, in the Muslim dominated areas like this district, the Ramadan and the succeeding month were a hindrance to interviews, as the respondents refused entirely to answer questions or had very little patience when interviewed because they were fasting. In these communities too, women were not allowed to participate without the presence of the male household member or the husband's consent.

Transportation was one other difficulty the enumerators had to face. The poor road network, and exorbitant transport fares, made movement from one settlement to the other extremely difficult, tiring and time-consuming.

CHAPTER TWO

LITERATURE REVIEW:

2.0. SMALL RUMINANT PRODUCTION SYSTEMS IN THE NORTHERN REGION:

Small ruminants appear to be a major under-exploited food and capital resource in the Savanna ecological zone of Ghana. They are raised exclusively for meat; they also provide a flexible financial reserve for the rural population and play important social and cultural roles (Wilson et al, 1985).

All available evidence suggests that goats and sheep are owned by a large proportion of the rural population in the humid and sub-humid zones (International Livestock Centre for Africa (ILCA), 1980). Ownership is by individual men or women or by kin groups (Oppong, 1973). Both groups of owners have relatively limited resources and skills in livestock husbandry, majority of them being illiterate and poor (Gatenby, 1986). In northern Ghana, the majority of rural livestock keepers are male farmers engaged in crop farming, or women engaged in petty trading and food processing (Karbo et al, 1998a). The most common feature of this production system is the integration of livestock with crop production; few forage crops are grown, but manure is not generally returned to the plots to increase soil fertility and livestock productivity (Atengdem and Dery, 1991).

The nature of small ruminant production varies from an extensive, low-input scavenging type, to a more intensive system with confinement of animals (Ockling, 1987; Koney, 2004). Although, there has been no systematic study of the production systems in the Savelugu-Nanton district, it is probable that the majority

of livestock are kept in free-roaming flocks made up of various sexes and ages (Bonniwell, 1983). Keepers of free-roaming animals do not generally provide feed, housing and veterinary care; there is also no control of reproduction (Ockling, 1987). Major investments in small ruminant production are in the form of acquisition of new stock either through purchase, inheritance, or gifts. Adequate care taking of animals is generally not practiced, as livestock are left in the care of children, women and the aged. The production systems practiced in this ecological zone (the Guinea Savanna) is similar to that reported by Oppong (1973). It is one in which animals are generally not herded but left to graze and find water and sometimes shelter, on their own.

Adam et al, (1995) also described the same type of production system for two coastal districts of the Central Region of Ghana where too small ruminants were kept mainly by small holder crop farmers and fishermen. They observed that keeping of livestock was of secondary importance to the rural people. FAO (1981) reported that subsistent rural households own 96% of small ruminants in Ghana, managing these animals under uncontrolled traditional management systems.

The World Bank (1992) described the traditional production system as consisting of animals roaming freely in village compounds, roadsides, and uncultivated areas of grass and browse. The animals are confined or tethered in the rainy season to avoid crop damage. They generally receive little attention, apart from being fed household scraps; inbreeding is rampant and mating occurs in young females before they become mature, leading to dystocia-related cases, such as stillbirths and abortions (Oppong, 1987). The shelters provided are usually

poorly constructed, overcrowded, and poorly ventilated. This exposes animals to environmental stresses, resulting in high prevalence of diseases, especially pneumonia and diarrhea during the rainy season (Ockling, 1987).

Small ruminants are kept as an adjunct to the main business of cropping. A few households and big families own more than twelve (12) sheep and or goats, but management and other inputs for their upkeep are low (Upton, 1985, Kaufman, et al, 1986). While animals may be confined for all or part of the day, the provision of special purpose housing is the exception rather than the rule in many rural settlements in the district (Awumbilla and Zakaria, 1992). Free roaming animals scavenge around the village on old cultivated fields, or on areas of regrowth of vegetative cover after the Savanna fires. A threat nowadays to the survival of these animals in both village and larger towns is the indiscriminate disposal of plastic bags and theft (Ademosun, 1992). The colour, the taste of salt or flavour of emptied contents of these polythene bags attract the animals who fall victims to bloat or *ruminal tympani* (Addo- Kwafo et al, 2000)

In the Savelugu–Nanton district, the traditional small ruminant production system has been practiced over the centuries, but with urbanization, migration and technology, two distinct types of traditional production systems have evolved. These are the traditional village, open, uncontrolled system, otherwise referred to as the extensive system or free-range, and the traditional, partially confined village controlled system (the semi-intensive system) (Alhassan et al, 1995).

The traditional village system is not a husbandry system in the strict sense of the term, as livestock owners do not actually look after their animals at all and do

not keep any production records. The average number of animals owned are very small, about two to six animals per household, with goats outnumbering sheep (Awumbilla and Zakaria, 1992). The World Bank (1992) observed that small ruminants are kept in small numbers, averaging 10 -15 heads per individual.

In the long dry season where water is a scarce for both livestock and man, the animals trek long distances sometimes up to five kilometers in search of water and feed. In the rainy season, when the cultivated fields are far away from the village or are protected, they graze near the huts in the savanna (Alhassan and Barnes, 1993). They are tethered to a stake or kept inside an enclosure throughout the day to prevent damage to crops in intensively farmed areas. Feed, consisting mainly of browse, is cut and carried to the animals in confinement. The animals may also be left at the mercy of the rain and variations in temperature; such factors contribute to the high rates of mortality (Adeoye, 1985). By-products of food processing and kitchen waste (e.g. cassava peels, rice bran, and ground nut haulms) are important under this system of management (Karbo et al, 1998b). Supplementary feeding with crop residues has been in practice for a long time, but no conscious efforts have been made to conserve them (Salia, 1990). Mineral supplements are a rare ingredient in the daily ration for small ruminants except occasionally, some common salt is given them (Atta-Krah and Reynolds, 1987).

The declining soil fertility in most parts of northern Ghana is due to the deficits in essential minerals like Sodium (Na), Potassium (K), Calcium (Ca), Phosphorus (P), Copper (Cu), and Zinc (Zn), in both soils and plants (Karbo, et al 1999).

Animals using pasture on such soils record subnormal levels of essential minerals in tissues with varying degrees of deficiency (Attah – Krah and Reynolds, 1987). Thus Karbo et al, (1999) suggested the use of “*Siella*”, a form of clayey soil found in riverine areas, as a substitute for conventional mineral supplements. “*Siella*” contains these minerals and can be processed into saltlick for confined or free roaming livestock. The use of conventional mineral supplements in the form of saltlick, bone meal and dicalcium phosphate, often recommended by livestock specialists to provide mineral supplementation to animals is an inappropriate technological advice, because in most parts of the hinterland, these products are unavailable. Even in the urban centres where they are found, the price is often prohibitive and affordability becomes a problem (Ashley et al.1999). Most livestock in this zone are reared by small holder, poor, rural farmers who cannot afford the supplements (Karbo et al, 1998a). The use of purchased feed and veterinary inputs is not widespread and is not patronized (Koney, 2004).

Although their productivity is low, relative to the high genetic potential, the local breeds (West African Dwarf Sheep and Goat, Sahelian Sheep and Goats and their crosses) are highly efficient in terms of the objectives of the livestock keepers (Charry, et al, 1992). They are raised primarily as a source of cash and meat, though they are usually slaughtered only on special occasions such as ceremonies or festivals e.g. at Christmas, Easter and the Muslim festival of Id-el Adha (Mack, 1985). They provide delicious meat, a source of cash for emergencies, and a degree of food security in the event of crop failure (Waters- Bayer and Bayer, 1992).

2.2 CLIMATIC FACTORS

The climate affects the vegetation and subsequently the supplies of feed and water for ruminants. Other factors of the climate are mainly due to the effects of temperature, radiation and humidity.

The rainy season and the dry cold harmattan weather predispose sheep and goats to cold-related diseases such as pneumonia and PPR (Ansaayiri, 1996). The rainy season also creates high humidity and high ambient temperatures. This provides an ideal environment for the growth of disease vectors and pathogens (Oyenuga and Nestel, 1984). This explains the high incidence of helminthosis, gastro-enteritis, pneumonia, PPR and tick borne diseases during the rainy season (Annor, et al, 1996).

During the dry season, the grasses are consumed by bushfires. This leads to starvation and subsequent death of stock. Water shortages in the dry season is a deterrent to healthy livestock keeping. Ansaayiri (1996) attributed the cause of mortality in sheep during the hot dry season (February to April) in the Northern Region to feed scarcity (both in quantity and quality), and the residual effects of the preceding cold harmattan months (December and January). According to the author, lambs that died in the early rains (May-July) would have suffered from the adverse effects of this period namely: poor nutrition, disease and parasite burden. Seasonal variations in mortality and their causes have been reported in other studies (Fall et al, 1982, Kabuga and Akowuah, 1990).

2.3 MANAGEMENT SYSTEMS

The two management systems, the extensive and semi-intensive are the most widely practiced in the Northern Region by both rural and urban dwellers, despite their wealth status (Gaari- Kweku, 1992). Though the cost of production is low in the extensive system compared to the semi-intensive system of management, the production risks under the semi- intensive system are higher (Gatenby, 1986). Diseases and infestation by parasites during the rains cause heavy losses in rural sheep production in the form of mortality, where both systems of management are practiced (Ndamukong, 1985).

Regular dipping against ectoparasites such as ticks, and deworming of the flock are practiced by some farmers in the semi-intensive but rarely in the extensive system (Ansaayiri, 1996). According to the author, these practices are carried out more in the rainy season, when ticks and worms were much more in evidence. Sick animals were treated with appropriate drugs provided by staff of the Veterinary Services Department. Vaccinations are also carried out against endemic diseases such as peste de petites ruminants (PPR), anthrax, and tetanus. These services are usually patronized by the rich stockowners who can afford the high fees charged.

Few poor rural farmers in the Northern Region seek help from veterinary personnel due to isolation from marketing centres, unavailability of veterinary services, logistics and high cost of veterinary drugs (Awumbilla and Zakaria, 1992).

In the extensive system, breeding is uncontrolled and haphazardly done with males running along with the females; indiscriminate mating is the order of the day

(Annor et al, 1996). Because of the high ritual value of the rams festive occasions like Christmas, Easter and the Id-el Adha festival of Muslims many males are kept in even the smallest of village flocks (Jahnke, 1982). In big towns, fattening of sheep for ceremonial feasts occurs, and this generates income for the family or the individual. The sheep, usually an entire Sahelian or Sahelian x West African Dwarf ram, is kept intensively (Oppong, 1997). It is given copious forage ration, with by-products from the family's food such as cassava and yam peels, rice and maize bran and various concentrated foods. This is usually linked with Muslim traditions. In this type of management, the main concern is prestige and financial (Charry et al, 1992).

Some sheep and goat keepers in the semi-intensive system keep few records of date of birth, sex, mortality, but the majority of farmers do not (Annan, 1997). Record keeping is hardly done in the extensive system of management, as rural farmers keep some mental reckonings of events and figures of the production and productivity of their livestock.

2.4 ANIMAL BREEDS

The importance of adaptation of animal breeds to a particular environment cannot be overemphasized. Selective breeding of the animals found in this ecological zone is of utmost importance and constitutes another mechanism for disease prevention and control (Mathias and McCorkle, 1992).

In Ghana, Ockling (1987) noted that there are basically two main breeds of sheep and goats namely the West African Dwarf (WAD) type and the West African

Long-Legged (Sahelian) type which are indigenous breeds and are relatively adapted to the Guinea savanna. The Guinea Savanna zone supports trypanotolerant WAD sheep and goats and the large sized long-legged Sahelian breeds; these are also believed to be relatively resistant to most diseases (Ockling, 1987). Crossbreeding of these two breeds has gone on over the years and this was and still is the main thrust of the breeding programmes of the NLSP, SADEP and of late, the Livestock Development Project (African Development Fund, 2001). The West African Dwarf sheep, also known as the Djallonke is most widespread and is often used in breed improvement schemes by individual stockowners or parastatal farms and research stations. The Djallonke has fine hair and usually black and white in colour with the white hair coat more dominant. The average mature weights are in the order of 24 and 35 kg for females and males, respectively (Payne, 1994). The Sahelian breeds of both sheep and goats are large; mature males measuring up to 84 cm at the shoulder, long-legged, thin and long-tailed and possess moderately long floppy ears. Males are horned; the horns may be quite large, emerging sideways and slightly backwards with a twist. Mature live weights can be of the order of 45kg for females and 55kg for male sheep (Jarvis, 1990).

2.5 HEALTH AND DISEASE CONDITIONS

The climate of the savanna zone, characterized by erratic rainfall, low humidity and heat, provide ideal conditions for disease-causing organisms and vectors. Oppong (1973) Bonniwell (1978) and Adeoye (1985) have studied specifically

diseases of these animals in both the humid forest and savanna zones and considered the under listed as the most common disease conditions:

- a). Respiratory/pneumonia syndromes including PPR.
- b). Diarrhoea
- c). Abortions and neonatal deaths
- d). Ticks and tick-borne diseases
- e). Skin conditions
- f). Starvation

2.5.1 CAUSES OF LAMB AND KID MORTALITY

Perinatal lamb mortality has a complex aetiology, involving several factors that render intensively raised flocks very susceptible to disease and nutrient deficiency (Meller, 1988). Under extensive conditions of sheep production, starvation, dystocia, predation and exposure accounted for most of the deaths (Awumbilla and Zakaria, 1992). Infectious diseases, the authors argued were a relatively minor cause of mortality in small ruminants.

Meller (1988) suggested that lamb survival depended on the integration of the animal's physiological processes in the following critical areas:

1. Initiation and completion of the birth process.
2. In *utero* preparation of the lamb to face the challenges of the environment.
3. Preparation of the ewe for her postnatal nutrition.
4. Establishment of a good ewe-lamb bond.

Specific environmental causes of lamb mortality include inclement weather, exposing lambs to hypothermia and lack of shelter (Eales et al, 1982). The high mortality rates recorded for newborn lambs were due to exposure and starvation. The vigour of the lamb, principally manifested as "suckling drive" is reduced by lack of milk in the mammary gland, so that a vicious cycle is created as the sick ewe does not stand to be suckled due to pain (Oppong-Anane, 1992). Suckling vigour is also greatly reduced by the cold and inclement weather. This affects survival rates (Ndamukong, 1985).

Consistent hot weather during pregnancy, results in lightweight lambs being born (Hight, and Jury, 1970). Abortions are frequent occurrences in such conditions (Dennis, 1975). The total lack of colostrum and milk intake is the most common cause of starvation in sheep and goats (Osei-Somuah, 1996). It can be caused by severe weather, too much human intervention at lambing time, inadequate nutrition of the pregnant ewe, or even lack of "suckling vigour" of the lamb.

The infectious diseases causing neonatal lamb mortality can be acquired and may include bacterial septicaemia, especially caused by *Pasteurella haemolytica*, and toxæmia also caused by Clostridia species (Hight and Jury, 1970). In northern Ghana, tetanus is one of the most common infections in young lambs causing severe neuropathies and subsequent death (Awumbilla and Zakaria, 1992).

In conclusion, mortality of kids and lambs could be reduced by modifying the extensive traditional production system to a semi-intensive type that allows for

better management practices and care for the young ones especially during the pre-weaning stage (Turkson, 2003b).

2.5.2 DIARRHOEA OF SHEEP AND GOATS

This condition is usually associated with internal parasites, PPR, bacterial infections and consumption of fresh green herbage at the beginning of the rains (Salia, 1990). Deaths caused by parasitic gastro-enteritis range from 11-25% of all deaths in the Savanna ecological zone (Oppong, 1973; Smith et al, 1986), and these occur in lambs and kids up to 12 months of age particularly during the preweaning age of 3-6 months. These deaths occur mostly during the rains with a minor peak in April-May and in September (Bonniwell, 1978). *Haemonchus contortus* has been identified as the primary cause of death especially among Sahelian sheep flocks, though *Ostertagia sp.*, *Trichostrongylus sp.*, and nematodes (Bonniwell, 1978) also play a significant role.

Monieziasis was also found to have a heavy toll on lambs 3-6 months of age, and are the primary cause of mortality (11-25%) in both lambs and kids (Oppong, 1973; Borquaye, 1981). Coccidiosis is also of considerable consequence, and causes a lot of lamb mortality in the rainy season (Oppong, 1973; Oppong - Anane, 1992; Osei-Somuah, 1996).

2.5.3 THE RESPIRATORY/PNEUMONIA SYNDROMES

These are mostly of viral, bacterial and parasitic origin (Oppong, 1973). These conditions come as a result of animals being left at the mercy of the sun, rain, cold,

poor sanitation and overcrowding in the rainy months of May to October and also in the dry, harmattan, cold months of December and January. The pneumonias are the most common killing diseases accounting for over 35% of deaths (Oppong, 1973; Adeoye, 1985; Opasina, 1983); this includes *peste des petites ruminants* (PPR) also referred to as Diarrhoea/pneumonia complex caused by a virus (*Paramyxovirus*) that is enzootic in character. It is considered to be the most important single cause of high morbidity and mortality, often approaching 50-100% in sheep and goats; is mostly in the young between the ages of 4 and 12 months of age (Bonniwell, 1978, 1983; Opasina, 1983; Adekeye, 1984).

Awumbilla and Zakaria (1992) reported that PPR alone accounted for 14.4% and 13.9% of deaths in lambs and kids respectively in the West Dagomba District of the Northern Region. In the Ashanti Region, Tuah et al, (1988) found PPR as the highest cause of mortality on small holder sheep in the Bosomtwe District, accounting for as much as 63.6% mortality on one farm. Sheep and goats of all ages are affected, but lambs are more susceptible to diarrhoea/ pneumonia complexes (Adeoye, 1985).

2.5.4 TICKS AND TICK-BORNE DISEASES

Amblyoma variegatum sp.is occasionally found in the inter-digital cleft of sheep and goats causing severe pain, predisposing them to lameness, bacterial infection and starvation (Oppong, 1987). The lameness could sometimes be so severe that the animals are unable to go out to feed or are found dead in the fields. Heartwater, has been tentatively diagnosed in post mortem findings in both the

humid and sub-humid tropics (Opping, 1973; Bonniwel 1978). Annan, (1997) and Salia (1990) identified heartwater as a killer disease in Sahelian sheep and goats in the Livestock Breeding Station (LBS) in Pong Tamale.

2.5.5 ABORTIONS AND NEONATAL DEATHS

Abortions, stillbirths and pre-weaning mortality are, as a group, one of the limiting factors hampering the reproductive efficiency of sheep and goats in the sub humid and humid tropics (Opping, 1987). Incidence of 62.5% abortions has been reported in Nigeria (Osuagwuh and Akpokodje, 1985). The causes of abortion and stillbirths could be by a number of infectious diseases, febrile conditions, chemicals, poisons, plant toxins or starvation.

Triplet and twin pregnancies are also a principal cause of abortions and stillbirths (Osuagwuh and Akpokodje, 1985). Furthermore, the authors also reported high rates of abortions in goats during the dry season and this has been attributed to starvation. Opping and Yeboah (1981) also reported an incidence of 55% neonatal and perinatal deaths, in lambs a few weeks of age due to ataxia, mismothering and agalactia.

2.6 STARVATION

In spite of the apparent availability of herbage in the tropics, a number of animals die of starvation (Alexander 1984; Bossman and Ayeni, 1992). This is due to the non-availability of the right type of forage or the poor-nutritional value of the herbage around homesteads. Another cause of starvation is long confinement

either in stockades, pens or tethering during the cropping season, which results in what Bonniwell (1978) termed "starvation/confinement syndrome". Starved ewes are unable to suckle their young, which are abandoned in the fields. Starvation not only predisposes the animals to undercurrent infections but also results in stunted growth and abortions in pregnant ewes and nannies. Ansaayiri (1996) reported that starvation causes 30-50% of early lamb mortality irrespective of type of management system practiced in the Northern Region.

2.7 AGE AND SEASON OF MORTALITY:

Most deaths in sheep and goats in the Guinea savanna zone occur among 3 to 12 months old animals, more especially among those aged between 0 and 3 months (Annor et al, 1996). This trend is seen more clearly in restricted animals than in the free ranging ones. Mack et al, (1985) also observed mortality rates of 11% for free-ranging kids and 18–24% for restricted goats in Southern Nigeria. Rather high mortality values, 50% to 88% have also been reported by Oppong (1973) and Oppong and Yeboah (1981) in sheep and they attributed this to numerous management and unsanitary conditions.

Turkson (2003b) found that significantly higher proportions of kids and lambs up to 3 months of age died compared to kids and lambs of 4 – 12 months of age in the coastal savanna zone under the extensive system. This was explained by the fact that in the first weeks of life of newly born kids and lambs, they are more susceptible to pathogens and stress factors, leading to deaths. Awumbilla and Zakaria (1992) stated that this is the most critical period in the survival of kids and

lambs and it is associated with a lot of stress and environmental conditions such as torrential rains, cold inclement weather, bush burning and predation.

In the traditional system of management, the young lambs and kids go along with their mothers immediately after birth, often long distances in search of already scarce feedstuff and water especially in the dry season. This is stressful and exposes the kids and lambs to too many dangers namely, starvation, predation and straying and rejection (Oppong-Anane, 1992).

In the case of post weaned sheep, deaths occurred more in the dry than in the rainy season due to severe shortages of feed (Osei-Somuah, 1996). This, coupled with the poor quality of the herbage in the dry season, account for the relatively high adult mortality (Atta-Krah and Reynolds, 1987).

Annan (1997) reported that of the six major causes of death in both Sahelian and Djallonke, death from pneumonia was higher during the dry and cold period of the harmattan when night temperatures fall as low as 16⁰C, than other seasons of the year. The author also revealed that, high mortalities were recorded at the peak of the rainy season (July–August) when humidity was high.

CHAPTER THREE

METHODS

3.0 GENERAL OVERVIEW

This chapter describes the study area, the research design, and the demographic parameters of the target population in the study area. The sample and sampling procedures adopted for use in the study area are also highlighted. The development of the research instrument used to collect data, the mode of data collection; data processing and analysis are all described.

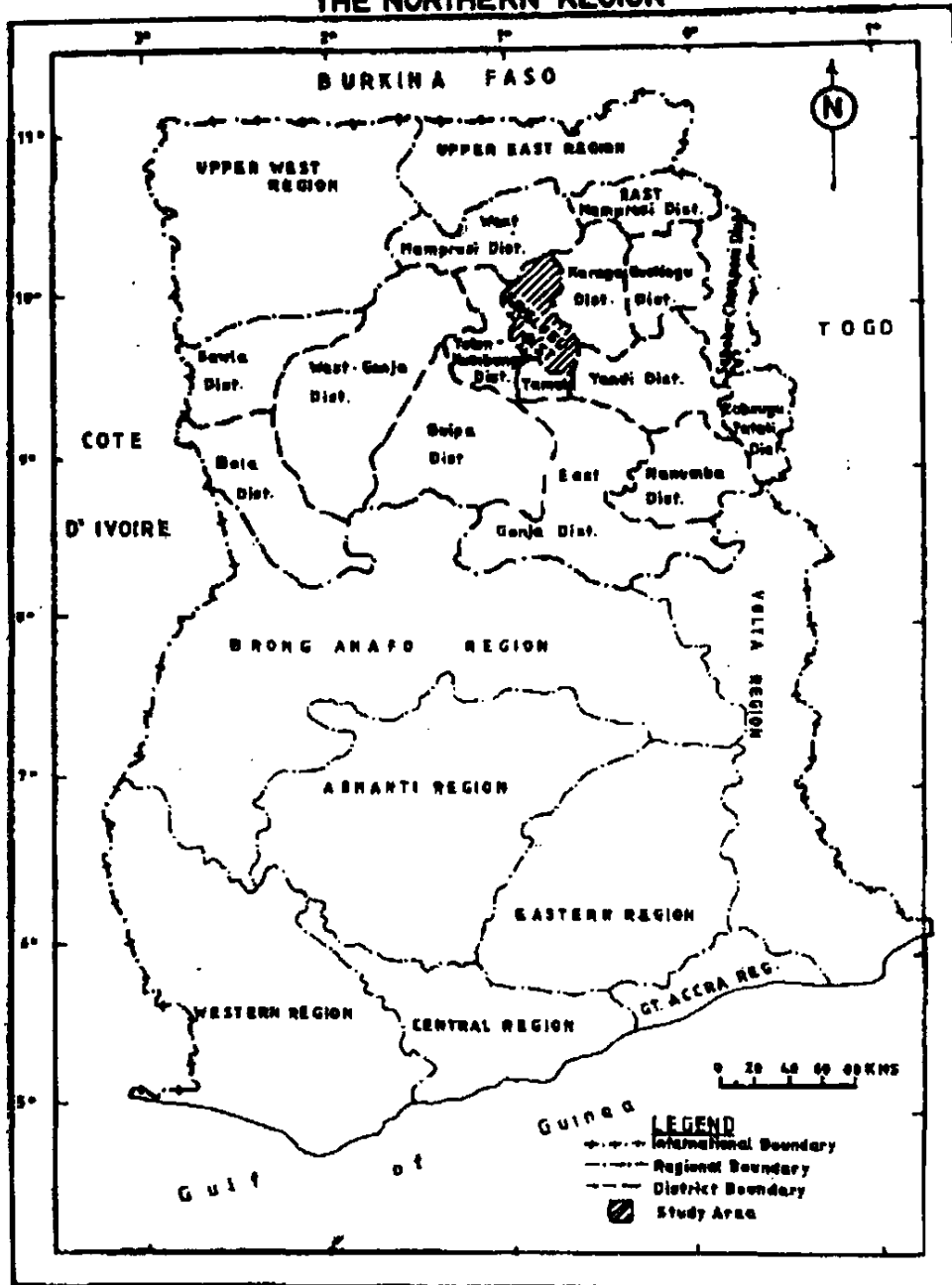
3.1 THE STUDY AREA

The study was conducted in the Savelugu-Nanton District (S/N) of the Northern Region of Ghana (Figure 1). The study was specifically conducted in the Savelugu-Nanton (S/N) district, because it has a high ruminant population: cattle (25,864), sheep (22,594) and goats (23,215) (District Agricultural Development Unit, Savelugu/ Nanton, 2004).

The S/N district is rural and inhabited mostly by the Dagomba ethnic group, a few settler fishermen, and civil servants working in Government departments. Most of the latter live in the Savelugu town (the district capital) and Pong Tamale where the Animal Health and Production College, the offices of the District Agricultural Development Unit (DADU), the Central Veterinary Laboratory, and the Tsetse Control Unit are located (Appendix III). The Livestock Breeding Station (LBS) of the Animal Production Department of MOFA is also located in the same area.

Fig.1

GHANA MAP SHOWING SAYELUGU NANTON DISTRICT IN THE NORTHERN REGION



SOURCE: RADU TAMALE.

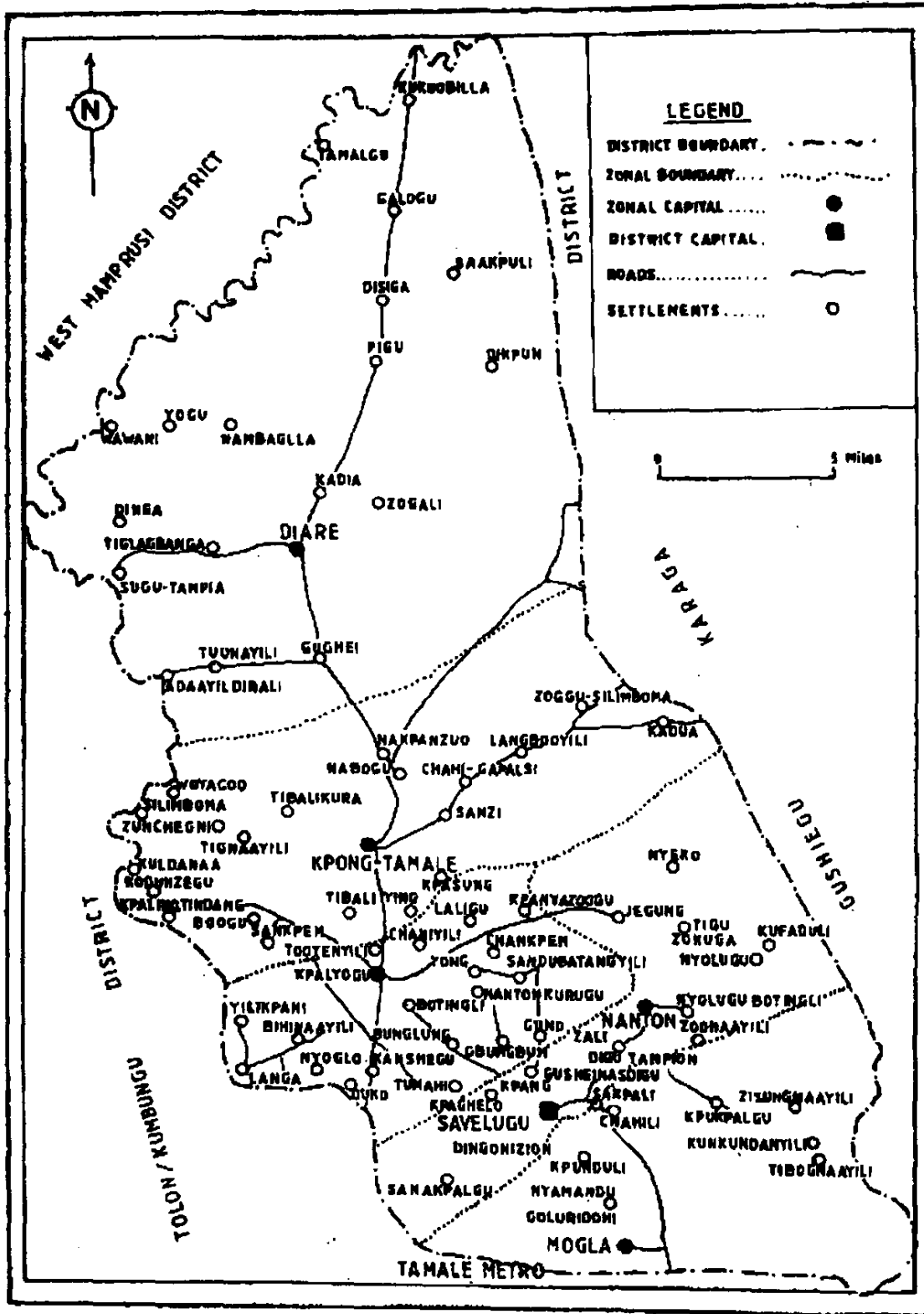
The district (Fig.2) shares boundaries with five other districts of the Northern Region, namely: Karaga and Gushiegu to the east, Tolon- Kumbungu to the west, Tamale Metropolis to the south, and the West Mamprusi districts to the north.

The choice of the district as the study area was based on its proximity to the Veterinary Services and Animal Production Directorates of MOFA, which are engaged in breed improvement, and health control of ruminants and pigs. The Savelugu-Nanton District covers an area of 1,760 km². The capital Savelugu is only 25 km away from Tamale, the regional capital. It is located on the Tamale – Bolgatanga highway and is fast developing into a municipality, and an important commercial center.

The district lies on latitude 09° 42 N and longitude 01° W. The vegetation cover is Guinea savanna with long grasses interspersed with short trees. It experiences a unimodal rainfall pattern, and according to Dickson and Benneh (1970), the rainfall pattern is characterized not only by its seasonality but also its erratic and variable nature. The mean annual rainfall is 1027mm with a range of 961.0 – 1088.mm (Meteorological Services Department, 2004). The present average number of days in the cropping season is 180- 200 days, with some years registering as low as 160 days.

Fig.2. Map of Savelugu- Nanton District showing the operational Areas.

SAVELUGU/NANTON DISTRICT SHOWING THE STUDY AREA



3.2. SOCIO- ECONOMIC PROFILE OF THE STUDY AREA:

The estimated population of the Savelugu- Nanton District in 2003 was 110,000 (District Planning Coordinating Unit, 2003). The main ethnic group is the Dagomba, who speak Dagbani. There are, however, other settler ethnic groups. The district is largely agrarian, with crop farming and livestock keeping being the major occupations of the people. A few however, are engaged in petty trading and small-scale enterprises basically, processing of agricultural and fish products. The small-scale industries found in the district include: shea- butter processing, groundnut oil extraction, local soap making, cotton spinning, rice processing, blacksmithing and several others. Agriculture is the main occupation of its inhabitants with ruminant and poultry keeping prominent in a mixed farming system. Situated in the Guinea Savanna ecological zone, cropping is very well integrated with ruminant keeping giving this zone a comparative advantage for ruminant production. A vibrant and booming livestock industry is the goal of the Savelugu/Nanton district's Five-Year Development Plan (2001-2006).

Women mainly manage these agro-based industries, while the men are engaged in crop farming during the cropping season and blacksmithing or mat-weaving in the dry season.

Social services and facilities, the indicators of the general standard of living, such as education, health, housing, portable drinking water, electricity supply and good road networks are generally poor. Banking institutions are lacking except for a recently commissioned rural bank, the Borimangu Rural Bank, located in Savelugu.

The bank is expected to offer credit facilities to farmers and people engaged in other agro-industrial and income-generating activities.

The capital, Savelugu, runs a weekly market for the sale of crops such as rice, maize, sorghum, millet and yams, and livestock of all species. The sale of livestock goes on throughout the year but much more intensive in the dry season, when cash is often needed to supplement food reserves or purchase other social needs.

Records from the District Assembly indicate that there is quite a number of Non-Governmental Organizations (NGO) operating in the district. For example in the Savelugu-Nanton District, there are as many as twenty-five NGOs operating. Prominent among them are the Area Development Programme (ADP) of the World Vision International (WVI). ADP distributes young ewes and does to school children and teachers in the rural areas for rearing as an income-generating activity. The Ghanaian Danish Community Programme (GDCCP) is engaged in agriculture and development activities. The International Fund for Agricultural Development (IFAD) and its subproject, the Small Holder Agricultural Development Programme (SADEP) have set up a number of demonstration farms for the sheep and goats nucleus breeding programme of the Animal Production Department of MOFA. Presently the Livestock Breeding Station (LBS) Pong Tamale sells Djallonke and Sahelian rams for breeding purposes to some rural people. The Livestock Development Project launched in June 2003 brought in its wake the formation of farmer-based organizations. These have found roots in the villages of the district.

3.3

DESIGN OF STUDY

The study was descriptive. This involved use of qualitative and quantitative data on small ruminant populations, management practices and the number of deaths (mortality), using a pre-tested questionnaire in interviews, by direct observation and focus group discussions with local farmers. Respondents were required to recall from memory facts and figures about their animals in 2003 and 2004. The design included a demonstration on the cost effectiveness of applying appropriate technology to reduce unwanted deaths in small ruminants, thereby reducing poverty and enhancing the livelihoods of a majority of rural dwellers.

3.4

SAMPLING TECHNIQUE

Given the limited time available, and together with the inadequacy of resources, a random sample survey was employed using a list of members of small ruminant keeper groups, who had been identified and were in the process of registering as Farmer-Based Organizations under the Livestock Development Project.

A multi-stage sampling technique was used. It involved stratification, randomization and purposive sampling. MOFA has divided the district into five zones, or operational areas. Each zone or operational area is made up of 15-30 settlements (Figure 2).

Since all settlements in a particular zone could not be visited, the settlements were randomly selected. This was done by tossing a coin in order to identify the number of settlements to be selected in an operational area. The highest cumulative number of "heads" obtained from five consecutive throws of the coin qualified that settlement for selection. In all, 30 settlements out of 78 were selected for interviewing. The focus group discussions took place in Savelugu and Diare. The targeted sample size was 200 farmers. The sample size per operational area is shown in Table 3.1. The table also shows the response rates.

Table 3.1 Sample sizes per Operational Area.

Operational Zone	Number of farmers interviewed or given questionnaires (sample size)	Number of interviews and questionnaires returned (sample size)
Savelugu	60	50
Pong Tamale	60	50
Diare	30	30
Nanton	30	29
Moglaa	20	20
Total	200	179

Source: Survey data, 2004

The respondents were categorized into the two production systems, that is; extensive (free-range) and semi-intensive. The sample size in each operational zone was based on the following criteria:

1. Presence of physical structures for housing small ruminants,
2. Number of sheep and goats in the holding,
3. Management practices and how long animals are confined, and
4. The time spent in grazing and if animals are controlled.

Four types of animal health interventions were experimented on in one of the villages over a period of six months. Tibali is about 1kilometer south of the Pong Tamale LBS and very close to the Animal Health and Production (AHP) College. The main objective was to ascertain the cost effectiveness of health interventions and their implications for livelihoods of the people. Discussions were held with four farmers, two from each type of management system. Emphasis was laid on management tasks, direct observation and recording of activities. The small ruminant farmers were educated on simple labour-saving management practices in small ruminant rearing.

Farmers, who had their constructed pens in bad shape, were encouraged to rehabilitate them and to ensure that the experimental animals were confined in the night, as usual. For those that did not confine their animals not much change was made; but they had to assemble the animal only when medications were to be given. In addition, the two farmers practicing the backyard system had to gather crop residues including cassava peels, stovers, and groundnut haulms and find some saltlick.

In all, forty-six sheep and nineteen goats were involved in the experiment as shown in Table 3.2.

Table 3.2 Number of animals involved in the demonstration in Tibali

Farmer	Extensive		Semi-Intensive	
	Number of sheep involved	Number of goats involved	Number of sheep involved	Number of goats involved
1	12	2	17	4
2	7	5	10	8
Total	19	7	27	12

Source: Survey Data 2004

The interventions that were carried out included:

1. Deworming with Albendazole bolus 2.3g every four weeks
2. Vaccination with 1ml of TCRV
3. Injection with appropriate dose of Oxytetracycline 20%, L.A at 30days interval.
4. Supplementary feeding with crop residues and salt lick all the time

Animals on free range did not receive supplementary feeding and salt lick. The aim was to find out if flock size would improve and mortality reduced to the barest minimum, thus giving the farmer substantial cash income. The number of small ruminants held by each farmer at the end of six (6) months of the demonstration, the number sold out, the number dead and any new purchases were recorded and analyzed.

3.5 SURVEY INSTRUMENT

A questionnaire (Appendix I) was prepared as the survey instrument and for focus group discussions a checklist (Appendix II A) was used to guide the enumerators. There were 36 main questions in all. Out of the 36 questions, four questions were close-ended requiring "yes" or "no" responses, twenty four questions required itemizing and ranking of responses and the rest (8) were open-ended questions requiring recall of facts from memory.

3.6 PRE – TESTING:

Twenty small ruminant keepers from both the extensive (free- range) and semi-intensive (backyard) systems from the Pong Tamale zone were randomly selected and used for pre-testing the questionnaire. The interviews were done on the 14th and 15th of October 2004. Findings and comments made by the farmers suggested that the focus group discussions should focus on the contribution of small ruminant keeping to the livelihoods of poor livestock keepers. The twenty respondents used in the pre-testing were excluded from the final sample size.

3.7 TRAINING OF ENUMERATORS

Five Agricultural Extension Agents (AEAs) and five students from the A.H.P. College were trained on how to administer questionnaires. An AEA and a student were paired for each operational zone and interviews began on the 17th October 2004. The enumerators were asked to make sure that they recorded exactly what the respondents said and where the English equivalents were ambiguous, the local names provided were to be recorded.

3.8 DATA COLLECTION PROCEDURE

Data for the survey were collected in the district over a period of three months commencing from October 2004 to January 2005. The interviews were done in the local language, Dagbani and in English or Hausa by the enumerators. Some literate ones were interviewed on the spot but others were asked to fill and return questionnaires. This arrangement perhaps accounted for the low response rate.

In the focus group discussions, English was mostly used but was translated into the local language where necessary. These discussions took place in Savelugu and Diare.

3.9 DATA PROCESSING AND ANALYSIS PROCEDURES

Data were processed and analyzed using a Statistical Package for Social Sciences (SPSS for Windows version 10.0). The data were presented in frequencies, percentages, and means.

CHAPTER FOUR RESULTS

4.1 RESPONSE RATE OF FARMERS

A total of 200 questionnaires were distributed to farmers in the five operational zones as indicated in Table 4.1; 179 questionnaires were returned in acceptable form giving a total response rate of 89.5%.

Table 4.1 below shows the number of questionnaires received from each zone and the response rate for each operational area.

Table.4.1 Actual numbers of questionnaires returned and response rate by operational zone.

No.	Operational Zone	Number of questionnaires issued	No. of questionnaires returned	Response Rate %
1	Savelugu	60	55	91.6
2	Pong-Tamale	60	60	100
3	Diare	30	27	90.0
4	Nanton	30	20	66.6
5	Moglaa	20	17	85.0
Total		200	179	89.5

Source: Survey Data (2004)

4.2 FARMER'S BACKGROUND INFORMATION

Table 4.2 shows the results of the demographic data contained in the questionnaire.

The household size of the district was between 15–25 people. Of these 98% of the respondents were married with about 80% of them being household heads. Table 4.2 presents the demographic information obtained from the study area and is the picture shown even in the focus group discussions.

Table 4.2 Demographic Information

Occupation		Education		Position		Sex	
Crop farming	Civil servant	Formal	None	Head	Member	Male	Female
72.7%	26.7%	44.1%	55.9%	79.9%	20.1%	90.5%	9.5%

Source: Survey Data 2004

4.3 FLOCK STRUCTURE

Respondents were asked to recall from memory the number of sheep and/or goats they had in the preceding year (2003) and the present year (2004). A total of (609) sheep and (502) goats was given.

Table 4.3 shows the most frequent type of birth of lambs and kids that respondents agreed occurred among their flock.

Table 4.3 Type of Births by Species

Types of Birth	Sheep		Goats	
	Frequency	Percentage	Frequency	Percentage
Single	83	49.1	72	47.7
Twins	17	10.1	27	17.9
Multiple	69	40.9	52	34.4
Total	169	100	151	100

Source: Survey data, 2004.

It is indicated here that, both sheep and goats delivered single lambs or kids most frequently (about 49% and 48% respectively). Twinning was low in both species. Common causes of deaths of lambs/kids reported by the keepers were attributed to the following conditions as ranked by participants at a focus group discussion (Table 4. 4).

Table 4.4: Ranking of common causes of death of lambs/kids

Condition	Ranking (Out of five)
Weakness of dam	++
Cold exposure of lambs/kids	+++
Lack of colostrum & milk	+++
Death of dams	+++
Absence of veterinary assistance	++
Prolapse of uterus	+
Abortion/still births	+++

4.4 SEASON AND FREQUENCY OF BIRTHS

The season in which most lambs and kids were born as stated in responses from the owners is shown on Table 4.5

Table 4.5 Season and frequency of lambing and kidding in 2004

Season	Sheep		Goats	
	Frequency	% Birth	Frequency	% Birth
Dry season (Nov. - May)	109	61.9	95	60.1
Rainy season (June - October)	67	38.1	63	39.9
Total	176	100	158	100

Source: Survey Data (2004)

It has also been shown here that about 40% of sheep and goats delivered in the rainy season.

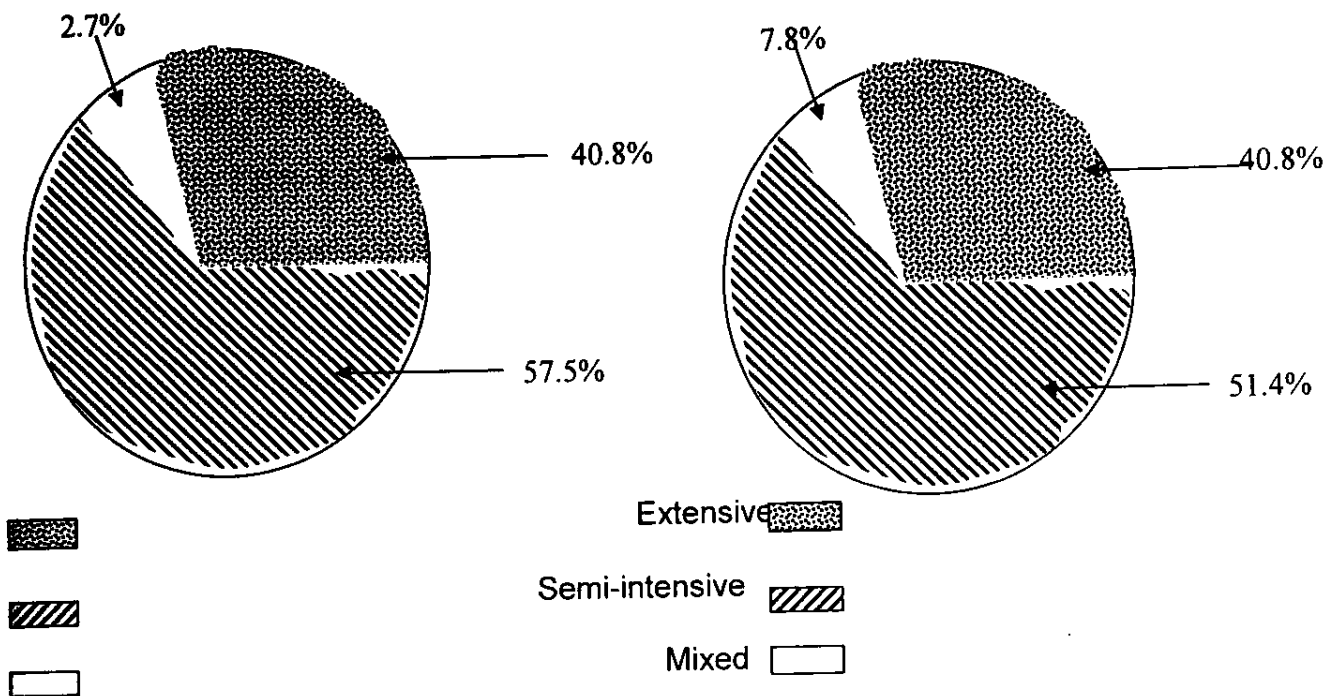
4.5 MANAGEMENT SYSTEMS

In order to explore certain aspects of the small ruminant production system, respondents were asked to mention the husbandry practices they used in the keeping of their small ruminants: these included housing, feeding, watering and supplementation.

This information was solicited during the focus group discussions.

Figure 3 is a pie chart showing proportions of respondents practicing the extensive, semi-intensive and a type of mixed management systems.

Fig.3. Proportions of respondents practicing different management systems.



As shown in Fig.3, 57.5% of respondents managed their sheep under a semi-intensive management system, while 40.8% left their sheep to freely roam and fend for themselves as is done in the extensive management system. With goat keeping, 51.4% of respondents said their goats were confined in makeshift shelters only in the rainy season (the semi-intensive system), while the rest indicated that their goats were freely roaming the streets and fields without any shelter at all. The mixed system comprises of small ruminant keepers, who hire small children, to herd these animals with cattle only in the rainy season.

4.6 MORTALITY RATES IN THE SHEEP AND GOAT FLOCKS

Mortality rate or death rate is the total number of deaths occurring in a specified population during the year 2004 divided by the average number of individuals in the population during the year 2004. The mortality rates are also shown on Table 4.6 below.

Table 4.6 Mortality Rates for Sheep and Goats in 2004

Sheep			Goats		
Number of sheep	Total number of dead sheep	% Mortality	Number of goats	Total number of dead goats	% Mortality
609	155	25.5	502	123	24.3

Source: Survey Data (2004)

Table 4.7 shows the age class distribution by specie in small ruminants in 2004.

Table: 4.7 Age class Distribution of Deaths in sheep and goats 2004

Age	Sheep		Goats	
	Frequency	Percent	Frequency	Percent
0 – 6 months	62	40.0	57	46.3
7 – 12 months	40	25.8	36	29.2
13 – 24 months	30	19.4	16	13.0
More than 24 months	23	14.8	14	11.5
Total	155	100	123	100

Source: Survey Data 2004

The results also showed mortality however decreased with age among sheep and goat flocks.

Respondents also indicated that in most of the settlements visited, there were no major outbreaks of disease in 2004, except in the Moglaa where an outbreak of PPR caused some deaths mostly in five sheep flocks, involving a total of 30 animals.

4.7 OTHER FINDINGS

Results of the survey also indicated that the majority of livestock keepers (44.1%) lived more than (5) kilometers from veterinary points and therefore their animals were not treated regularly and vaccinations were rarely carried out. While others lived barely one or two kilometers from veterinary points, only 50% of them received clinical treatments for their animals. About 65% did not vaccinate their animals, 87.7% received no surgical and obstetrical services when the need arose, and 75.4% did none of the recommended dipping/ spraying of their animals.

Table 4.8, shows the major constraints militating against productivity, in small ruminants in the study area. Table: 4.8. Major constraints limiting the productivity of small ruminants in the Savelugu–Nanton district.

Table 4.8 Major constraints limiting the productivity of small ruminants in the Savelugu-nanton district.

Constraints	Frequency (%)
Diseases	50
High cost of drugs	13
Death of lambs and kids	12
Inadequate veterinary coverage	11
Lack of knowledge on management skills	8
Ignorance of farmers and remoteness of location	6
Total	100%

SOURCE: Survey Data 2004

Diseases (50%) were the most important constraint hampering small ruminant productivity. Of the remaining fifty percent, the more worrying constraints were found to be; high cost of drugs, death of lambs and kids and inadequate veterinary coverage in that order.

Table 4.9 indicates the relative proportions of sheep and goats that encountered dystocia related problems during parturition in both extensive and semi-intensive management systems.

Table 4.9. Proportion of responses about animals that experienced problems at parturition

Management system	Sheep			Goats		
	No of parturition problem responses	Total number of responses	Percent parturition problem responses	Number of parturition problem responses	Total number of responses	Percent parturition problem response
Extensive	19	73	26.0	3	73	4.1
Semi-intensive	40	103	38.8	19	92	20.6
Average	59	176	64.8	22	165	24.7

Source: Survey Data, 2004

The table shows that sheep in the extensive system of management experienced more difficulties at parturition (26%) as compared to goats in the same system (4.1%). The table also shows that in the semi-intensive, the values for parturient difficulties are 38.8% and 20.6% for sheep and goats, respectively. This is an indication that the problems associated with the reproductive system are more prevalent in the semi-intensive management system.

Table 4.10 compares the mortality rates among sheep and goats in the two major management systems.

Table 4.10 Comparison of mortality rates for the two management systems

Management System	Sheep			Goats		
	Total no. sheep dead (2004)	Total no. sheep (2004)	Mortality rate	Total no. goats dead (2004)	Total no. goats (2004)	Mortality rate
Extensive	73	351	20.7	75	306	24.5
Semi-intensive	82	258	30.3	48	196	24.1
Total/Average	155	609	25.5	123	502	24.3

Source: Survey Data 2004

It was observed that about 30% sheep and 24% of goats died in the semi-intensive type of management.

4.8 LIVELIHOODS

Table 4.11 presents what respondents used the proceeds they obtained from the sale of small ruminants for. Small ruminants play a major role in the societal values of the inhabitants of the district. In addition to supplying meat for consumption, income is generated from the sale of small ruminants. The proportion of the income generated from the sale of small ruminants used for domestic needs such as grain purchases was found to be 62.5%. For utilities, education and health care, (7.7%) of respondents agreed they used small ruminants mainly to satisfy these pressing needs.

Table 4.11 Livelihood Outcomes from Sale of Livestock

Livelihood Outcome	Frequency	Percentage
When cash is needed for domestic needs	105	62.5
Outdoorings /Funerals/Marriages	26	15.5
To purchase inputs for the next cropping season	18	10.7
Payment of school fees, hospital and electricity bills	13	7.7
Building houses and buying new clothing	6	3.6
Total	168	100

Source: Survey Data (2004)

The results shown in Table 4.12 indicate the reasons for keeping small ruminants. For most livestock keepers, the most important motive for keeping small ruminants was for financial security to enable households and individuals to meet domestic, societal and customary responsibilities, followed by extra money to buy inputs for the succeeding cropping season. About 90% of respondents saw small ruminant keeping as a source of financial security as indicated in Table 4.12.

Table 4.12 Reasons/Purpose for Keeping Small Ruminants

Reasons/Purpose	Frequency	Percentage
To purchase inputs for the succeeding cropping season	16	80
Bringing in extra income to satisfy societal obligations	16	80
For funerals and other customary rites	12	60
A savings to ensure financial security	18	90
For marriage and building a house	8	40
As a business venture	12	60

Source: Survey Data (2004)

4.9 ANIMAL HEALTH SERVICES DELIVERY FOR LIVESTOCK KEEPERS

Table 4.13 presents the various animal health services that respondents were provided with in the year 2004 as reported in the focus group discussions in the two locations described earlier.

Table 4.13 Services provided by Institutions and Agencies to Livestock Keepers (Focus Group Discussion)

Services	Respondents	Respondents	Service Provider
	"Yes" %	"No" %	
Deworming	30	70	VSD
Spraying/Bathing/Dipping	12	88	VSD
Vaccinations (PPR, Anthrax)	30	70	VSD
Castrations	10	90	VSD
Clinical treatment	15	85	VSD
Buying pharmaceuticals	10	90	VSD, market
Advice on health of animals	7	93	VSD, APD, EXTENSION and NGOs
Advice on management of animals	40	60	MOFA, EXTENSION and NGOs
Surgical interventions	4	96	VSD
Credit facilities	11	89	WVI, SADEP

Source: Survey Data (Focus Group Discussion), 2004.

Table 4.13 showed that a large proportion of inhabitants did not use services provided by the Veterinary and Extension Services Directorates. The open market and VSD satisfy only 10% of respondent's drug needs while 96% and 93% of the respondents did not receive any help at from any of the agencies for surgical and extension advice. It also was noticed that only SADEP and WVI provided some sort of credit facility for farmers who wanted to either generate more income or for other motives.

Table 4.14 explains basic reasons for treating sick animals.

Table 4.14 Reasons for Treating Sick Animals (Focus group discussion)

Reasons	No of respondents	Scores	Percentage %
Desire to help sick ones recover (Humanitarian)	20	5	25
Bring about increase in productivity	20	18	90
To maintain a healthy flock	20	6	30
To ensure constant income source	20	18	90
To get a good price during the sale of the animal later	20	11	55
To avoid the spread of disease	20	12	60

Source: Survey Data (Focus Group Discussion), 2004

A major motive for treating animals as stated by the respondents was the possibility of increasing the productivity of the flocks. This scored (90%). The farmers also realized that, the spread of disease was of paramount concern to them, this reason scored (60%).

Table 4.15 below illustrates the impact the demonstration had on small ruminant productivity over a period of six months. There was no increase in flock sizes in the extensive system for both sheep and goats, but the two farmers lost

three (3) animals each (sheep and goats) through death, while they were able to cull altogether eight animals. This means that mortality rate in the extensive type of management was 31.6%. In the semi-intensive management system, the two small ruminant keepers altogether culled seven (11) animals, either selling them for cash income or satisfying other household commitments. All together for this category of keepers, the mortality rate after the demonstration for the same period was 7.4%. At the end of the demonstration, though for a short period of time, there was about 40% increase in the number of sheep and goats in the semi-intensive system of management.

Management Type	Farmer Identification	Sheep					Goats				
		No of Sheep at start (Nov' 04)	No. additions Birth/purchase	No. Dead	No. Culled	No. at the end of demonstration (April' 05)	No. Goats at start (Nov' 04)	No. Additions Birth/purchase	No. deaths	No. Culled	No at the end of demonstration (April' 05)
Extensive	2004/01	12	5	2	2	13	2	-	-	1	1
	2004/02	7	3	1	3	6	5	7	3	2	7
	Sub Total	19	8	3	5	19	7	7	3	3	8
Semi	2004/03	17	10	1	4	22	4	7	-	2	9
Intensive	2004/04	10	5	-	3	12	8	10	1	2	15
	Sub Total	27	15	1	7	34	12	17	1	4	24

Source: Survey data 2005.

CHAPTER FIVE

DISCUSSION

5.1 BACKGROUND INFORMATION

Examination of the results obtained from the study area revealed that a large number of sheep and goats are concentrated in the Savelugu and Pong-Tamale operational areas in the Savelugu–Nanton district. Incidentally, these are the largest zones in the district by way of human population and contained the highest concentration of civil servants, teachers and nurses who raise small ruminants in addition to their regular jobs. The response rate of 89.5% (Table 4.1) could have been higher except for such limitations as the timing, and the claim in certain settlements that research done in these areas in previous years had not enhanced their living standards. Nanton scored the lowest response rate because of transportation difficulties faced by the enumerators. This section sought to elicit demographic information about respondents. The information provided would help identify the socio-economic factors that influence the respondent's perception of mortality in small ruminants and the productivity level of his enterprise. To demonstrate the influence of the farmer's background on their livelihood coping abilities, the animal. The overall effect of these is the inability of the owner to keep the animals in good health, thus the frequent deaths and the loss of potential income for other investments.

The study estimated the proportion of total small ruminant income spent on animal health to be high (72%). This deters farmers from keeping large flock sizes.

The implication then would likely be one of minimizing expenditure by keeping smaller numbers.

Health interventions could have a beneficial impact on productivity. In La Côte d'Ivoire, the mortality rate to 150 days was 29.3% for sheep under traditional management system and under the controlled management system; this was 16.7% (Kaufmann et al 1986). After weaning, mortalities continued at a higher level in the uncontrolled traditional system such that by one year of age 48.1% of animals born had already died. The results showed that 72.7% of respondents were engaged solely in crop farming, while 26.7% were engaged in teaching and other government employment (Table 4.2). On educational background of respondents, 55.9% had no formal education (Table 4.2). Illiteracy was even higher in the hinterland where livestock keeping was the preserve of the aged and children. However, with the rest (44.1%), a high number (65%) had elementary education and worked mainly as operators, stockmen, carpenters and agricultural workers. Illiteracy was high among respondents and this confirms an assertion that "Menial work and agriculture is inversely related to education" (Ghana Statistical Services, 1999).

Low level of education could be a hindrance to effective extension work and could retard the assimilation of new and appropriate technology likely to improve animal health (African Development Fund 2001). Only 9.5% of respondents were female. The women were divorced, petty traders, teachers or nurses. Livestock keeping is considered a secondary occupation by most women and educated individuals (Karbo et al., 1998 a).

5.2 FLOCK SIZE

The average flock size in the area for sheep and goats was 5 to 8 heads and 4 to 12 heads respectively for those using the extensive system. Those who practiced the semi-intensive type of management kept between 8 to 15 sheep and 3 to 6 goats. The low average flock size for goats has to do with the belief that goats are perceived to be troublesome and are sources of conflict in cropping areas, whether in the countryside or in the urban areas when they are not in confinement all day. Many of the respondents gave various reasons for the preference of sheep in the farming systems. These include the following:

1. Sheep are docile, and do not demand too much control and labour.
2. Sheep could sell at a higher price at festive times
3. Sheep are easily marketable and in high demand in large markets.
4. Sheep are more presentable as a gift.

Dagombas believe that when large numbers of goats are kept, they tend to die because the goats feel their owner does not like their meat, the only reason for the goats' survival. Goats are believed to be always striving to satisfy their owners, but easily flee when disaster looms.

5.3 SEASON OF LAMBING/KIDDING

Multiple births were rather high and could constitute a cause of difficult delivery (dystocia) experienced periodically in the flocks. 63% of respondents recalled that a number of ewes and does were lost as a result of dystocia. The

remainder (37%) encountered still births, abortions and perinatal deaths in their flocks.

The study found out that dry season lambing (62%) and kidding (60%) greatly increased mortality. The births that occurred in both sheep and goats in the dry season were during the harmattan winds, dry ambient temperatures, and scarce feed and water sources.

It is interesting that 61.9% and 60.1% of sheep and goats owners, respectively, stated that their animals frequently lambed/kidded in the dry season (November to May). This season predisposes the young ones to respiratory/diarrhoeal syndromes that make them stunted, and emaciated for long periods of the year (, Fall et al, 1982; Kabuga and Akowuah, 1990, Salia, 1990; Gaari-Kweku, 1992; Ansaayiri, 1996). The non-availability of energy and protein rich feed sources for animals during the dry season, coupled with low humidity and water shortages make small ruminant keeping a risk-taking venture. Because of the entrenched poverty (Ghana Statistical Services, 1995), small ruminant keeping is a low-input, low output venture, only satisfying family needs, or livelihoods. The dry season, also the period of less "farm work" is spent pursuing other coping strategies notably hunting, mat weaving, charcoal burning, gathering firewood and vegetable gardening. These are not sustainable enough and are seasonal in nature. These temporary occupations take up much of their time, leaving little time for livestock activities.

The rainy season is not better either in terms of the feeding of small ruminants. Oyenuga and Nestel (1984) reported that the high humidity and

temperatures provide an ideal environment for the growth of disease vectors and pathogens. Oppong (1973) Bonniwell, (1978) and Oppong and Yeboah (1981) observed that the sunny, rainy, cold and often overcrowding condition as seen mostly in the rainy season (May to October) or the dry, month of December and January predispose small ruminants to pneumonias, accounting for over 20% of deaths. The conservation of high quality forages during the rainy season is highly recommended to be used as feed supplements, while conscious effort should be made at housing the animals permanently.

5.4 INFLUENCE OF TYPE OF BIRTH ON MORTALITY

Literature is full of reports of the influence of types of birth of lambs and kids mortality. For example, Wilson et al (1983) reported that the production system, the season of birth and the type of birth have an adverse effect on mortality rates of lambs and kids.

Single births in both species which were high (49.1% and (47.7% of sheep and goats respectively), could be the source of difficulty in delivery as single born lambs and kids tend to have higher birth weights, which predispose the dams to dystocia (Mack, 1982). Mortality was reportedly higher, 30.5% among sheep and 28.7% among goats in twin births. This relationship is associated with a decline in birth weight due to malnutrition and environmental stress (Alexander, 1984). Another important factor noted during the survey was the inability of the dams to produce enough milk to feed lambs/kids. Lack of milk, abortions/stillbirth, and feto-pelvic disproportions were listed as the most prominent causes of prenatal death (Refer

table 4A). Weak lambs and kids are therefore born, and may eventually die a few days after birth due to starvation and mismothering. Lambs and kids have to follow their mothers over long distances to get small and often infrequent portions of milk from the dams, leading to straying away, predation and death in a number of cases.

5.5 MORTALITY RATES:

The reported mortality rates for goats (24.3%) and for sheep (25.5%) were modest as compared to those reported by Awumbilla and Zakaria (1992). Reduction in mortality will lead to increase in revenue (Upton, 1985). De Haan and Umali (1992) estimated losses due to diseases and mortality in Sub-Saharan Africa to be in the tune of US \$2.0 billion annually. The monetary value for three (3) animals lost per respondent annually in this study could amount to about nine hundred thousand cedis and could bring about substantial losses over time. The likely impact on animal productivity would therefore be negative. The mortality rates showed a characteristic pattern with regard to age differences. The most critical period in the survival of both kids and lambs is the first three (3) months, which is also the preweaning period. This agrees with the work of (Turkson, 2003b). At preweaning age (0 to 6 months), mortality was 48.2% and 40.9% for kids and lambs respectively, while at post weaning (6 to 12 months), the rates fell to 30.5% and 28.7%, respectively. The trend, therefore, was that mortality in both species reduced with age. This also agrees with the findings of Mack et al (1985) who observed 11% mortality for kids and 18% to 24% for lambs. Observations by many farmers in the study area suggested that newborn female kids and lambs were smaller and weak, and died within the first 14

days after birth. This was also noted by (Annor et al. (1996). This observation was supported by the findings of Devendra and Burns (1970) that low birth weights and weak kids and lambs often die within 14 days after birth. Lighter kids are also far more susceptible to diseases of the respiratory and gastrointestinal tract (Oppong, 1973; Gyening, 1986; Bonniwell, 1993).

In all, 57.2% of respondents complained that it was not easy getting assistance from livestock specialists and especially veterinary personnel. The inputs were regarded as highly expensive for low income people. One farmer interviewed in Mogla reported that he lost 36 out of his flock of 52 sheep due to PPR because of the lack of veterinary personnel within his area to attend to his animals when the condition started.

The survey showed that diseases, high cost of drugs and death in lambs and kids were major constraints to small ruminant productivity within the district. Diarrhoea/dehydration, respiratory syndromes and starvation took precedence over the rest and these could likely be attributed to gastrointestinal parasites (Oppong, 1973; Gyening, 1986; Bonniwell, 1993). Other researchers (Devendra and McLeroy, 1982; Okali, 1989) recorded similar findings.

Attention should be paid to the lowering of high cost of drugs and health services delivery, as well as effective extension and regular vaccination programmes to curb the high lamb/kid mortality as pointed out by (Awumbilla and Zakaria, 1992).

Some constraints on animal health could have direct effect on mortality. For example, lack of feed and water, disease and housing do impede productivity and cause deaths. Others impact indirectly, for instance, lack of knowledge of

management practices, inadequate veterinary coverage, and the high costs of drugs are all hindrances to the health the Savelugu/Nanton district, mortality rates were higher in goats (48.9%) and in sheep (36.5%) kept under the free-range system, but much lower in the semi-intensive system.

Diarrhoea was reportedly the largest cause of deaths in both species. Farmers attributed the high incidence of diarrhea to the torrential rains of the past rainy season. It disagrees with the findings of Awumbilla and Zakaria (1992) who reported that diarrhoea alone caused about 34.7% of deaths in the Savelugu- Nanton district. The high incidence of diarrhoea could be attributed to gastrointestinal parasites. Organisms isolated from samples collected from kids and lambs passing watery faeces in the district included *Haemonchus contortus*, *Strongylidae* and *Coccidia* species (Central Veterinary Laboratory, 2004).

Diarrhoea and respiratory syndrome could all cumulate in PPR, and therefore could cause considerable damage especially where it is not diagnosed accurately (Bonniwell, 1983) Gyening 1986, Tuah et al, 1988).

Pneumonia or respiratory syndrome was the second most important cause of death. This agrees with the findings of Oppong (1973), working on the Accra plains, and Bonniwell (1978) in the Ashanti region. The high incidence of pneumonia in the study area could be due to the inclement weather during the rainy season and the severe harmattan period of long cold dry weather. Most of the small ruminants were not housed and therefore the young kids and lambs born in the open, face exposure to the vagaries of the weather.

Starvation, an important condition in both kids and lambs was third in the list as a cause of mortality. The long dry season experienced in the area, results in a period of poor nutrition, thus reducing the ability of dams to provide enough milk for their offspring. Oppong and Yeboah (1981) explained that starvation in kids was due to that fact that the WAD goat is not a dairy animal and as such under the poor plane of nutrition encountered by all types of animals in the area, they are unable to raise successfully more than one kid.

The extensive and semi-intensive systems are fairly similar in terms of management practices and have been in existence all these years in the S/N district. The reason for practicing the extensive system given by the respondents especially in smaller settlements (villages), can be explained as follows: the rural nature of the district and the small population density does not put pressure on land and the crop fields are usually more than 5km from homesteads. Animals are allowed even in the rainy season to graze around without destroying crops. In the semi-intensive system found mostly in the urban areas, crops are cultivated around homes and beyond. Animals may therefore be confined or tethered and released with some control in order that they may not destroy crops. This scenario may not apply in the dry season after all crops have been harvested.

Devendra and McLeroy (1982) observed that housing protects sheep from harsh weather. Since a proportion of respondents provided some form of housing for their animals it may be assumed that animals would be protected against extreme environmental conditions that could affect their health. The significance of this is that the provision of housing influences positively sheep and goats health. However, the

materials used for the design of the housing may be more critical than the provision of mere pens. Four farmers in Tibali complained that during a rainstorm in 2004, all their roofs and mud walls of their pens were destroyed resulting in the death of seven sheep and goats (personal communication with 4 farmers at Tibali during demonstration on animal health package (personal communication). For the free-roaming animals, scarcity of feed resources, water, predation and theft in the dry season have adverse effects on their survival. It is therefore suggested that proper housing for small ruminants should taken seriously.

A significantly high proportion of respondents (92.6%) did not provide salt lick for their animals. Salt lick provides minerals for animals, which are important in metabolism. Thus lack of salt lick may therefore impact negatively on the animals' health (Karbo et al., 1998a). The present study did not find out whether not providing salt lick was as a result of ignorance, unavailability of the commodity or affordability of it. It would therefore be prudent for future research to look at the importance of mineral supplementation so as to provide a more definitive conclusion.

In the observations of most respondents, the incidence of disease was high and the cost of drugs to treat sick animals was unaffordable. The farmers had to travel long distances to buy drugs at very exorbitant prices. Coupled with the high cost, is the lack of essential drugs or the packaging of these drugs was inappropriate for the use by the rural poor.

5.6 LIVESTOCK EXTENSION SERVICES AND DEVELOPMENT POLICIES

Many farmers travel long distances, more than 5 kilometres to access veterinary services, to purchase drugs and other inputs, suggesting that some communities have problems meeting animal health needs. This accessibility problem for some communities explains why about 57.2% had difficulty in getting help for their sick animals and about 90% of farmers had no access to veterinary and extension services.

Provision of livestock services to farmers has not been adequate. Currently, the government, through the MOFA maintains one livestock improvement station in Pong-Tamale, a major operational area of the Savelugu/Nanton District Agricultural Development Unit (DADU). A number of agricultural establishments complement the activities of the livestock subsector as shown in Appendix IIB. Karbo et al., (1998a) lamented that until recently government's support for the livestock subsector in northern Ghana was limited. In terms of budgetary allocation, the bulk of agricultural expenditure was and still is to the crop sector. The little that was spent on livestock in the post independence era in the 1960's centred mainly on the control of contagious diseases in cattle. Small ruminant production saw no funding until 1960's. The few livestock - based agricultural stations set up were wrought with problems. This was because the attempted improvements in the livestock industry were dependent on expensive inputs such as imported breeding animals and relatively expensive housing. As a result, husbandry practices on most stations did not lend themselves to easy adoption on local, smallholder farms in the surrounding areas.

Other projects, the Small Holder Rehabilitation and Development Project (SRDP) and later the Small Holder Agricultural Development Project (SADEP), both IFAD sponsored projects had as their objective the encouragement of smallholder farmers to improve the production and productivity of small ruminants as a means of increasing meat production and rural family income. The main thrust of these projects was on animal health, nutrition, breed improvement, water supply, credit and institutional support.

In order to improve livestock farmers' accessibility to animal health care services, the concept of Community Livestock Worker (CLW) was introduced. The CLW's after receiving intensive training on basic animal health care procedures were equipped with basic veterinary drugs and instruments. The unsustainable nature of the projects made it impossible to improve the lot of rural small holder farmers, as the projects were plagued with high mortality in sheep and goats due to ticks and tick-borne diseases, especially heartwater and PPR (Salia, 1990; Ansaayiri, 1996).

In addition, the National Agricultural Research Project (NARP) funded an animal - based farming system project, which used a systems approach to small ruminant housing, feeding (using crop residues, browse, legumes and concentrates) and the use of manure in an integrated crop-livestock management system. All these did not yield appreciable benefits for the poor rural farmers because of the apathy on the part of project beneficiaries and mismanagement on the other hand from the Project Coordinating Units (Alhassan and Barnes 1993).

It is interesting that despite the close proximity of the district to agricultural institutions and agencies, like VSD, APD, and Agricultural Extension Services, and

the ARI and the enormous work done by the Universities many smallholder farmers have not benefited from these services.

One stumbling block to livestock development is the country's agricultural policy. Ghana's agricultural policy is tied to various donor- funded programmes. A Food and Agricultural Sector Development Policy (FASDEP) document has been formulated to guide agricultural development in Ghana. Its impact is still to be assessed.

The current Unified Extension Services (UES) was created to remove duplication of activities whereby individual departments of MOFA provided separate extension services for farmers (MOFA, 2000). This policy has placed veterinary technical officers and animal husbandry bias extension staff in a situation whereby they educate farmers about all other areas including crop production. They have had no previous skills on crop-related disciplines.

Another policy has created frustration is the decentralization policy that empowers local government and allows for the development of agriculture on district basis. A large number of the District Directors of Agriculture (DDA's), are crop-biased, and therefore, do not put livestock as a priority in their work plans.

Also, the trade liberalization policy has led to significant dependence on the import of livestock and meat products. The removal of all subsidies on agricultural inputs has increased the price, not only of fertilizer, but also drugs and vaccines.

A recent study on the role of livestock in rural livelihoods (RLRL) concluded that current livestock development activities do not meet the needs of the majority of livestock keepers in Ghana. It found out that support aimed at helping the poor by

encouraging commercialization, in fact does little for them in terms of sustainable livelihoods (Ashley and Annor-Frempong, 2003). They suggested that livestock development policies should support poor farmers' existing livelihood strategies rather than fund increasing livestock production. They argued further that, such measures will go much further to lift farmers out of poverty and enhance suitable and equitable economic growth in the rural areas.

It is clear that a major proportion of the proceeds from the sale of small ruminants is used for satisfying needs and individual preferences like marriages (62.5% and 15.5%). It was estimated from the focus group discussions that the selling price of an adult sheep was on average about three hundred and fifty thousand cedis (¢350,000.00), with adult goats going for three hundred thousand cedis (¢300,000.00). The respondents said that they earned approximately one million, two hundred thousand cedis (¢1,200,000.00) per year from the sale of small ruminants. Their household earnings from other livelihoods amounted to about ¢450,000.00 per year on the average. Livestock development policies should therefore take into account the poverty reduction motive of farmers.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Attempts at improving the productivity of small ruminants over the decades have failed due to a number of factors including high rates of mortality. The numbers and productivity of these animals are still low, compelling the government to import more livestock and livestock products, thus crippling local meat production. The major causes of death are diarrhoea caused mostly by parasitic gastroenteritis, pneumonia, (especially PPR), abortions and neonatal deaths associated with starvation. These can be easily reduced in small ruminant flocks if conscious effort is made at housing animals by livestock-keepers.

Since more projects for livestock improvement are still under consideration, there is no doubt that livestock development will be the object of major efforts in the next few years. The Livestock Development Project launched in the year 2003 proposed to intervene in livestock production and meat processing since they are predominantly income-generating activities carried out by poor smallholder operators in rural areas. Poverty reduction and food security are the main focus of the project.

In recent years however, the traditional small ruminant management system (extensive) or free-range is gradually giving way to a semi-intensive type of rearing of sheep and goats in partial confinement in both villages and urban areas. Many small ruminant keepers have come to realize that small ruminant enterprises are a viable alternative to crop farming.

The study showed a marked difference in mortality of sheep and goats of different age groups, but recognizes that the most critical period in the survival of both kids and lambs is the first three (3) months of life (preweaning age). Protection from inclement weather conditions and preventive veterinary medicine should be the main focus of the accredited agencies for sustainable livestock production.

Diarrhoea was found to be the largest cause of death in both species and this could be attributed to gastrointestinal parasites. Pneumonia was the second most important cause of death. High incidence of respiratory syndromes were reported in the rainy season and the harmattan.

Starvation, which also causes mortality especially in underweight lambs and kids, occurs in the dry season because of non-availability of feed resources the dams are unable to provide enough milk for their offspring. All these can be curtailed if sound management practices like good feeding, housing and animal health practices are adopted.

To control the major disease conditions, prevention rather than treatment should be the strategy. The methods employed should be cost effective and economical. As most sheep and goats are kept in small household flocks of 5 - 8, expensive measures are likely to be unacceptable to the keepers. Disease prevention on a village wide basis, rather than individual flocks, would be more effective, both in terms of disease control and economics of production.

As many disease conditions can be traced to poor management and nutrition, the first principle should be the improvement on housing and the

management of small ruminants. This will eliminate incidence of pneumonia, helminthiasis, foot rot and tick infestation commonly associated with the rainy season.

Adequate feed and wholesome water will prevent some of the starvation and neonatal deaths, abortions and stillbirths. Confined animals should be fed with crop residues (cereal straws, maize cobs, groundnut haulms etc), by-products of food preparation (cassava and yam peels,) and agro-industrial products. Free ranging animals could also be fed the above supplementary feed each evening when they return from scavenging and occasionally during the day.

6.2 RECOMMENDATIONS

There are possibilities for reducing mortality in small ruminants via relatively simple health intervention packages. A health package, comprising vaccination against PPR, deworming and acaricide washing, should together with improved housing, feeding and mineral supplementation be put in place to reduce drastically the high incidence of mortalities, characteristic of the current small ruminant production system. A systems approach to production and healthcare delivery should be developed. It should encompass a herd/flock health management programme, with regular interaction of veterinarians, animal scientists, economists and sociologists with livestock farmers. At such discussions the factors leading to losses can be identified and measures to curtail losses can be discussed with the farmers, thus empowering them to make sound and professional decisions on management decisions.

Diagnostic work on the real causes of mortality should be effectively carried out having in mind the needs of livestock keepers. A needs assessment survey should be conducted to support the current base-line survey by the Institute for Social Scientific and Economic Research (ISSER) for the Millennium Challenge account. This approach will enable project officials together with beneficiaries to determine beforehand the strengths, weaknesses, threats and opportunities of the beneficiary communities. The multi-dimensional nature of livestock extension demands a holistic systems approach. Farmer education should be in the areas of nutrition, managerial skills, and breeding. A health management team comprising the above mentioned professionals should work together in a collaborative fashion. The role of the health management team should be to motivate and educate the small scale farmers to make appropriate management decisions. Farmers involved in the programme must be profit-minded and knowledgeable in the business of livestock keeping and should view livestock keeping as a business.

Community participation in the health management programme is very essential, and the district assembly's sub-structures, opinion leaders and Community Livestock Workers (CLWS) should be the link in executing animal health control programmes. District Assemblies should help the Veterinary Directorates in training more of these in livestock nutrition, breeding and management in addition to animal health.

Small ruminants should be considered as part of any future food security activities because of their important role in food security, poverty reduction and rural development in general. Animal health constraints to livestock production should be

investigated and appropriate and economically viable control programmes be developed for small scale farmers. This would involve the need for an innovative approach to the collection of animal health information and the provision of advice on vaccination and drug use (such as anthelmintics at a local level). Furthermore, appropriate research should focus on reproductive parameters of small ruminants to make them fast growing and increase carcass yield. A prerequisite for sustainable development of livestock is the development, testing under local conditions and promotion of appropriate and cost-effective techniques that use local and affordable resources. Policies, infrastructure and support services must be established with the collaboration and full participation of NGOs and the private sector to enable such technologies succeed and reach small holder farmers. Veterinary services and good breeding stock should be made available and affordable at convenient locations to farmers. Provision of credit in the form of loans, or grants for small scale producers should be emphasized, rather than the provisions of facilities (such as big abattoirs, dairy plants and feed mills) which are usually oversized, overstaffed and over equipped.

The Government should redefine public and private sector responsibilities in the livestock industry and get the private sector to provide goods and services, such as compulsory vaccinations, extension through the mass media and research that is patentable. This is to suggest that animal health, extension and research should be subcontracted to private veterinarians under partial payment. It is being recommended that support from donor agencies should concentrate on three main areas:

1. Formulation of livestock development policies that create a "level playing field" for all service providers, be it government, the private sector or non-governmental organizations. This will improve livestock production efficiency to reduce the negative impacts of mortality on the livelihoods of small ruminant keepers.

2. Adopting technologies for small holders which would be "low cost" and "user friendly" to allow their use by non-professional staff and groups e.g. CLWS. The CLW concept of the NLSP of MOFA should be reconsidered, and training of these strengthened especially where veterinary staff is lacking, considering the vast terrain of the district and the inadequacy of veterinary staff to handle veterinary technologies and crop extension simultaneously

3. More attention should be placed on the formation of Farmer based organizations or Co-operatives on processing and marketing of livestock products as envisaged in the FASDEP document

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APPENDIX 1

QUESTIONNAIRE:

The questionnaire seeks to solicit information on the extent/magnitude and prevalence of mortality in small ruminants (sheep and goats) kept under semi-extensive (free-range), and semi-intensive (backyard) systems. Any information provided would therefore be treated as strictly confidential. Your anonymity is highly guaranteed. The researcher would therefore be pleased if you could assure the questions as friendly as possible.

INTRODUCTION

1. Location:.....
2. Status of respondent: () Household head, () household member
3. Sex of respondent: () Male () Female.
4. Marital status () Single, () Married, () Divorced
5. Occupation:.....
6. Level of Education: () No school, () Basic Education ()
Secondary/Technical/Vocational, () Post-Sec/University?

PRODUCTION AND MANAGEMENT DATA

7. How many of the following animals do you keep now?

<u>Type of animal</u>	<u>Females</u>	<u>Males</u>	<u>Total</u>
Sheep...
Goats...

8. Indicate the age distribution in the flocks.
- 1. Sheep lambs (0-6 months) (6-12month) 12-24month (>24month)
 - 2. Goats kids (0-6month) (6-12month) (12-24month) (>24month)
9. Which of the following methods of rearing best suits your type of rearing?
- A extensive (free-range) system.
 - B Semi-intensive (backyard)
10. Indicate in which season of the year in 2004 you experienced more lambing/kidding in your flock. (November to May refers to the dry season; June to October is the rainy season).
11. Indicate what type of births occurred among your flock in the year 2004?
- Sheep Single Twins Triplets Quadruplets
 - Goats Single Twins Triplets quadruplets
12. What is the most frequent type of births among your flock?
- Sheep Single Twins Triplets Quadruplets
 - Goats single Twins Triplets Quadruplets

MORBIDITY AND MORTALITY DATA

Do you have problems during delivery of your lambs and kids?

- Yes No

14. What sort of problems do you encounter? List three problems.
-
-
-

15. Who came to your assistance when you had these problems? (Tick the correct one)

- () Veterinary TO.
- () Agric. Extension Agent.
- () Other farmers.
- () No person in particular.

16. How many of these animals encountered these problems during delivery?

- i. Sheep
- ii. Goats

17. Approximately how many sheep or goats got sick during the year 2004?

- i. Sheep
- ii. Goats

18. Were all of them treated and discharged? ()Yes ()No.

19. What did the person who person who gave the treatment say was wrong with them?

(Mention any three disease conditions that affected them).

- a.
- b.
- c.

20. How frequently do you receive this assistance?

() daily () Weekly () Monthly () when there is a problem with my animals.

21. How many of your animals recovered completely from these conditions after the treatment?.....

22. Describe 3 common signs of diseases you noticed among your animals during the year 2004 (Rank them)

Type of animal	Rainy season	Dry season
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a. Sheep:

Most common.....

Common.....

Least common.....

b. Goats:

Most common

Common.....

Least common.....

23. How many of your animals died in the year 2004?

a. 1. Sheep:

b. 2. Goats:

24. Did your community experience any major disease outbreak in the year 2004?

25. Indicate how many of these animals died or got lost due to the following conditions?

Type of Animal	Condition	Category			Total number died or lost
		Pre-weaned lamb/Kids	Weaned Lambs/kids	Post-weaned Lambs/Kids	
Sheep	Disease				
	Predation				
	Theft				
	Others				
Goats	Disease				
	Predation				
	Theft				
	Others				

26. From your observation, among which category of sheep or goats did you encounter most loss.

a. Sheep: () 0-6months () 6-12months () 12-24 months () >24months

b. Goats: () 0-6months () 6-12months () 12-24months () >24months

27. In your opinion, rank in order of importance the diseases mentioned below which cause deaths in your community.

a. () Diarrhoeal diseases

b. () Respiratory diseases

- c. P. P. R.
- d. Anthrax
- e. Abortions/Still births
- f. Bloat
- g. Starvation
- h. Tetanus
- i. Worm infestation
- j. Tick infestation

SERVICES

28. How far is the nearest veterinary clinic or staff from your community?

- Less than 1Km 1-2km 3-5km more than 5km

29. Tick which type of services you enjoyed from the veterinary staff in the year 2004?

- A clinical treatment
- B vaccinations
- C surgical treatment
- D dipping/spraying
- E Deworming
- F castration
- G Hoof trimming
- H others

30. Have you had the occasion to take your dead animal to the veterinary laboratory or clinic for help?

yes no.

31. Do you find it easy obtaining services from veterinary staff?

Yes No.

32. Why?

.....
.....
.....

33. Rank the following problems (in order of importance, ie descending order) as the most seriously affecting the health of your sheep and or goats.

- Disease
- Death of lambs/Kids
- lack of veterinary drugs to treat animals
- lack of knowledge on the management of animals
- high cost of veterinary services
- understaffed veterinary personnel
- inadequate animal health care delivery

34 How did you acquire the sheep and or goats you have now?

.....

35. During which times of the year do you normally sell out your culled sheep/goats? festivals out-doorings/funerals/marriages etc

when I need cash to prepare for the farming season

() pay school/hospital/electricity bills

36. Suggest 3 ways by which mortality among sheep and goats could be reduced or eliminated.

.....
.....

THANK YOU SINCERELY

APPENDIX IIA

FOCUS GROUP DISCUSSIONS

1. Reasons for keeping sheep and goats
2. Why preference for sheep or goats
3. The need to treat sick animals
4. Who met the health needs of the animals
5. Payments made per animal in treatment
6. Amounts willing to pay for various treatments
7. Approximate amount spent on the health of animals in a year
8. How long it takes to get help for the sick animals
9. Drug and Vaccine facilities visits
10. Preference for private veterinarian
11. Preference for mobile vet. Clinic
12. Estimated of monetary value of animals sold
13. Problems encountered with present animal health delivery system
14. Household expenditure on necessities for one year
15. Household earnings from other livelihoods
16. Accessibility to veterinary and extension services (a) Frequency of meeting Individual and community animal health needs. (b) Distances to and time Used in accessing certain animal health supporting institutions
17. Feed and provision of water and salt lack
18. Perceived constraints to effective animal health care delivery in the district and recommendation..

APPENDIX IIB

FOCAL GROUP DISCUSSION I

VENUE: SAVELUGU

DATE: 10TH DECEMBER, 2004

LOCATION: MARKET PLACE

NUMBER OF PARTICIPANTS: 22

NAME OF PARTICIPANT	LOCATION	PLACE OF DISCUSSION
Iddrusu Mahama	Savelugu	Savelugu Market
Nantogna Alhassan	Ying	square
Mr. Kobina Bruce	Savelugu	do -
Salifu Abubakar	Zoggu	
Liman Fuseini	Savelugu	
Atta Braimah	Moglaa	
Mensah Bonsu	Savelugu	
Halidu Sulemana	Savelugu	
Sister Rabiatu	Savelugu	
Chief Alhassan	Savelugu	
Chief Butcher	Savelugu	
Azindow Yipialana	Kugfon	
Abdullai Yakubu	Dist. Admins.	
Sumani Ishmael	Yipala	
Mahamadu Braimah	Savelugu	

Yussif Ali	Savelugu	
Abdalla Tahiru	Savelugu	
Hajja memunatu	Savelugu	
Tahiru Zankpanya	Tibali	
Tuonaa Ibrahim	Tibali	
Suleman S. Jagbesie	Pong Tamale	
Opoku Daniel	Pong Tamale	

APPENDIX IIC

FOCAL GROUP DISCUSSION II

VENUE: Diare

DATE: 13TH DECEMBER, 2004

LOCATION: T. O's Bungalow

NUMBER OF PARTICIPANTS: 19

NAME OF PARTICIPANT	LOCATION	PLACE OF DISCUSSION
Adams Sulemana	Diare	T.O's quarters
Haruna Yakubu	Diare	
Rahman Issah	Zosali	
Abdul Malik Tia	Zosali	
Abdulai Zamba	Kadia	
Rashid Awal	Diare	
Rukaya Ibrahim	Gushie	
Nakuahinaa	Diare	
Cletus Nantua	Diare	
Boniface Libie	Diare	
Tamba Zule	Dipali	
Abubakar Seini	Pigu	
Afa Imoro	Pigu	
Babatu Sampaga	Nabogo	
Linus Dery	Nabogo	

Chemego Ibrahim	Diare	
Mahama Mimuni	Diare	
Adisatu Adam	Diare	
Suleman S. Jagbesie	Pong Tamale	

APPENDIX III

Agricultural Establishment in the Northern Region.

1.	Animal Health and Production College	-	Pong Tamale
2.	Central Veterinary Laboratory	-	Pong Tamale
3.	Tsetse Control Unit	-	Pong Tamale
4.	Epidemiology Unit	-	Pong Tamale
5.	Ghana Cotton Company	-	Tamale
6.	Savana Agricultural Research Institute	-	Nyankpala
7.	Damongo Agricultural College	-	Damongo
8.	Seed Supply Company	-	Tamale
9.	Animal Research institute	-	Nyankpala