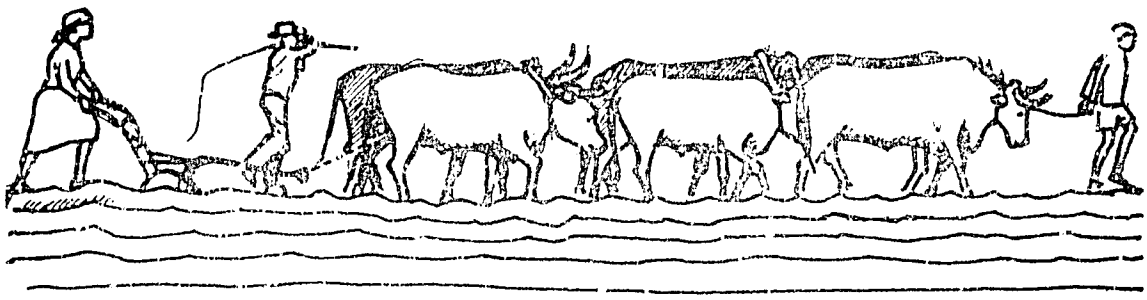
AGRICULTURAL TECHNOLOGY IMPROVEMENT PROJECT (ATIP)

LIVESTOCK MANAGEMENT IN SHOSHONG AND MAKWATE

NUMBER: ATIP WP - 20

BY

DOYLE BAKER



Agricultural Technology Improvement Project
Department of Agricultural Research
Ministry of Agriculture
P / Bag 0033
Gaborone
Botswana

Telephone 352381 Ext. 260
A GOB / MIAC / USAID Project

AGRICULTURAL TECHNOLOGY IMPROVEMENT PROJECT

(ATIP)

WORKING PAPER

LIVESTOCK MANAGEMENT IN SHOSHONG AND MAKWATE

NUMBER: ATIP WP-20

BY

DOYLE BAKER

DEPARTMENT OF AGRIC. RESEARCH
MINISTRY OF AGRICULTURE
BOTSWANA

MID-AMERICA INTERNATIONAL
AGRICULTURAL CONSORTIUM
(MIAC)

AUGUST 1988

PRINTED: 10/08/88

ADDRESSES:

P/BAG 0033 GABORONE | P. O. BOX 10 MAHALAPYE | P.O. BOX 10275 TATITOWN (FRANCISTOWN)

ATIP WORKING PAPERS CONSIST OF METHODOLOGICAL AND EMPIRICAL MATERIAL WHICH HAS BEEN REVIEWED INTERNALLY BY ATIP BUT DOES NOT NECESSARILY REFLECT THE VIEWS OF THE DEPARTMENT OF AGRICULTURAL RESEARCH, MINISTRY OF AGRICULTURE, BOTSWANA

PREFACE

ATIP working papers consist of methodological and empirical material which has been reviewed internally by ATIP. Working papers are prepared and circulated to make ATIP research findings easily available to GOB personnel and researchers interested in Botswana farming systems. Any interpretations or conclusions presented do not necessarily reflect the views of the Department of Agricultural Research, USAID or MIAC.

This paper gives an overview of livestock management practices in Shoshong and Makwate. Management practices are compared for cattle, smallstock, donkeys and chickens. The analysis covers the following topics:

(a).Animal ownership patterns
(b).Herd/flock demographic compositions
(c).Inventories and inventory changes,
(d).Reproduction patterns and practices
(e).Worker categories responsible for tending and managing animals
(f).Husbandry practices relating to watering, feeding, and health care
(g).Major uses of each type of livestock

The paper is based on a single-visit survey administered in 1985 to 88 households. Partial results from the 1985 Livestock Practices Survey were presented in ATIP Research Report Number 1 [ATIP, 1986]. This paper presents a more comprehensive analysis and includes additional data relating to interest in forage crops.

ACKNOWLEDGEMENTS

Dr Berl Koch made helpful comments on the survey design. The survey was enumerated by the following ATIP staff members:

(a).Robert Mosojane (DAFS)
(b).Chada Tibone (DPS)
(e).John Lesotlho (DPS)

J. Lesotlho also supervised the survey enumeration. Two students on term break from BAC helped with survey enumeration, Mr L. Monkge and Mr Nkwe.

Data entry was done by P. Monyane and K. Seleka.

CONTENTS

1. INTRODUCTION..... 1

1.1 Objectives..... 2
1.2 Methods..... 2

2. LIVESTOCK INVENTORIES..... 3

2.1 Ownership Patterns..... 3
2.2 Herd and Flock Composition..... 6
2.3 Inventory Change Patterns..... 8

3. MANAGERIAL RESPONSIBILITY AND OBJECTIVES.....11

3.1 Spatial Location.....11
3.2 Who Tends, Manages and Milks.....12
3.3 Frequency of Inspection.....13
3.4 Major Uses of Animals.....14

4. HUSBANDRY PRACTICES.....17

4.1 Breeding.....17
4.2 Herding, Kraaling and Penning.....19
4.3 Watering.....21
4.4 Feeding.....23
4.5 Health Care.....24

5. FORAGE CROPS.....25

5.1 Level of Interest.....26
5.2 Severity of Constraints.....27

6. CONCLUDING COMMENTS.....27

REFERENCES.....28

TABLES

1. Cattle Ownership..... 3
2. Cattle Owners Besides the Household Head..... 4
3. Smallstock Ownership..... 5
4. Chicken Ownership..... 6
5. Donkey Ownership..... 6
6. Cattle Herd Structure..... 7
7. Demographic Composition for Smallstock..... 7
8. Demographic Composition for Chickens..... 8
9. Demographic Composition for Donkeys..... 8
10. Livestock Inventories and Inventory Changes..... 9
11. Inventory Change Rates by Herd/Flock Size.....10
12. Patterns of Inventory Changes by Herd/Flock Size.....10
13. Where Cattle are Kept.....11
14. Primary Individuals Responsible for Tending, Milking and Managing.....13
15. How Often Household Heads Inspect.....13
16. Major Uses of Cattle.....14
17. Major Uses of Smallstock.....15
18. Major Uses of Chickens.....15
19. Major Uses of Donkeys.....16
20. Most Important Uses of Livestock.....16
21. Reproduction Patterns and Practices for Cattle, Donkeys, Goats.....18
22. How Obtain Bulls.....18
23. Chicken Reproduction Practices.....19
24. Cattle Herding and Kraaling.....20
25. Donkey Kraaling During Cropping Season.....20
26. How Often Pen Chicken.....20
27. How Often Water.....21
28. Kilometres to Water.....21
29. Where Obtain Water.....22
30. Supplemental Feeding and Minerals for Cattle, Smallstock and Donkeys.....23
31. Feeding and Minerals for Chickens.....24
32. Parasite Control and Vaccination for Cattle, Smallstock and Donkeys.....25
33. Normal Monthly Interval Between External Parasite Treatments for Cattle and Smallstock.....25
34. Want to Grow Forage Crops.....26
35. Which Animals Want to Feed.....26

1. INTRODUCTION

Livestock are the primary source of rural incomes in Botswana, and account for most of agriculture's share of the gross domestic product. Because of the importance of livestock in national development, the primary thrust of livestock research from independence until the end of the 1970s was developing improved breeds and management practices for commercial beef production [APRU, 1980]. Little attention was given to communal area practices.

The shortcomings of commercially-oriented research and extension programmes were recognized in the late 1970s. Since then there has been a substantial expansion of research on communal areas production. A multi-year study on livestock production and management in communal areas was commissioned by the Ministry of Agriculture, with financial support from the European Development Fund. Findings were summarized in Carl Bro [1982]. During the livestock study, two annual livestock surveys were initiated: a large-scale livestock management survey and a case-study herd management survey. Responsibility for both surveys was assumed by the Division of Planning and Statistics five years ago.

Some of the most detailed information on communal area livestock management and productivity was generated by the former Integrated Farming Pilot Project (IFPP), in collaboration with APRU and ILCA. Between 1980 and 1984, several herds were monitored in the Pelotshetlha area. Preliminary results were presented in Flint, Bagwasi and Rose [1984]. Flint [1986] further characterized cattle and smallstock management practices on the basis of a farm management survey carried out during the 1982-83 season.

There have also been several useful monographs on livestock husbandry produced in conjunction with various national research programmes. For example, on the basis of research carried out in collaboration with the water points survey, Bailey [1982] described cattle husbandry practices, with a focus on land and water resource use, and analysed herd productivity. Gulbrandsen [1980] also provided some information on husbandry practices and the sociology of "agro-pastoralism."

In 1982, the status of communal area livestock research was reviewed and discussed in a workshop entitled: "Priorities for Communal Area Livestock and Range Research." The conference proceedings, edited by Roy Behnke [1982], revealed a reasonable degree of consensus about the problems plaguing communal area production, including overstocking, infrequent watering, irregular use of mineral and food supplements or veterinary inputs, nutrition maintenance during winter, etc. There was less consensus on future research priorities and research procedures.

One of the main debates at the 1982 conference was whether future communal area research should be carried out in communal areas, in conjunction with livestock owners. The alternative would be to create conditions on APRU ranches which more closely approximated the managerial environment encountered in the communal areas. For either approach, there obviously is a need for baseline information on communal area management.

It is not clear that a sufficient baseline on communal area livestock management exists, despite the number of studies which have been carried out during the past decade. Area coverage has been limited and most studies have been biased toward larger herds as a result of sampling procedures which have focused on borehole syndicates. Moreover, as most of the 1982 workshop participants agreed, additional information is needed on herd owner objectives. The 1982 workshop revealed another information gap which has

not been subsequently addressed: nothing was said about existing management practices or research priorities for donkeys or poultry. The omission reflected the fact that nearly all communal area livestock research has to date focused on cattle, with a minor allocation of research resources to smallstock.

1.1 OBJECTIVES

The Mahalapye farming systems team has not been in a position to make a substantial contribution to communal area livestock research. The mandate of the team has been to focus on farming systems diagnosis and arable farming technology improvement. Nevertheless, there was a need for information on livestock practices in order to assess the crop-livestock interface. In addition, ATIP expects that as additional trained personnel become available, farming systems research in the Mahalapye area will encompass an expanded livestock research agenda.

To assess crop-livestock interactions and generate baseline information on farmers' practices and problems, a livestock management survey was administered in 1985. In keeping with the research emphasis established by the former livestock scientist on the Francistown team, Berl Koch, the survey encompassed smallstock as well as cattle. Donkeys and poultry management practices also were covered, because of the contribution of donkeys to arable farming and the role of poultry in household nutrition. A special forage schedule was included in the survey in order to assess interest in forage crops, and constraints on growing forages.

This paper summarizes findings from the 1985 Livestock Practices Survey. The report has five specific objectives:

(a).To provide baseline information on livestock ownership and husbandry practices
(b).To identify the major uses of livestock
(c).To compare cattle husbandry practices with those found in other areas
(d).To compare findings for different types of animals
(e).To compare findings by herd/flock size

Section 2 covers livestock inventories, including herd ownership patterns, herd and flock demographic compositions, and inventory change patterns. Section 3 gives findings on managerial responsibility and the major uses of animals. Section 4 presents findings on husbandry practices. Section 5 addresses interest in and constraints on growing forage crops.

1.2 METHODS

Data on livestock practices were collected through a single-visit survey administered during September 1985 in Shoshong and Makwate villages. The questionnaire had separate schedules covering production practices for cattle, goats and sheep, donkeys and chickens. A schedule was administered if any member of a household owned that particularly type of livestock. In addition, there was a forage screening schedule designed to identify which farmers had appropriate circumstances for growing and storing forage crops. The forage schedule was administered to cattle-owning households.

The questionnaire was administered to households which had participated in the 1983 Crop Management Survey. The Crop Management Survey sample included 116 households, but only 88 could be recontacted during the month of the livestock survey. The original set of households included 50 ATIP

cooperators and 66 randomly selected households. The ATIP cooperators were selected using stratified randomly sampling but, to the extent possible, the proportion of households selected in each stratum reflected the proportion of households in that stratum in the population of Shoshong and Makwate villages. Therefore, the enumerated households should be representative of Shoshong and Makwate villages. Additional details on sample selection for the Crop Management Survey are given in Baker [1988].

For purposes of data analysis, the population sampled for each type of animal was sub-divided into two groups on the basis of the number of animals owned. In each case, the dividing point was approximately the median number of animals owned. This was done in order to assess whether owners of very small numbers of animal use different managerial and husbandry practices than do owners of more animals.

2. LIVESTOCK INVENTORIES

This section starts with a description of livestock ownership patterns. This is followed by an overview of the demographic composition of herds and flocks and then a summary of inventory changes. Since the data are based on a single-visit survey, the data presented should be viewed only as being indicative of actual patterns. There is no way of determining the accuracy of specific numbers.

2.1 OWNERSHIP PATTERNS

Livestock ownership patterns are summarized in Tables 1 to 5. The first two tables cover cattle ownership, and the following tables refer to smallstock, chicken and donkey ownership. In each table the number and percentages of households owning animals are shown with at least one sub-division by herd/flock size. All tables also distinguish results for sub-populations, taking into account village location, gender of household head and cattle assets.

TABLE 1: CATTLE OWNERSHIP

	-----VILLAGE-----		SEX OF HEAD		
	SHOSHONG	MAKWATE	MALE	FEMALE	ALL
NUMBER OF HOUSEHOLDS	50	38	51	37	88
NUMBER OWNING:					
1-15	7	2	5	4	9
16-35	6	7	11	2	13
36-70	6	4	8	2	10
71+	7	2	8	1	9
Any Amount	26	15	32	9	41
PERCENT OWNING:					
1-15	14	5	10	11	10
16-35	12	18	22	5	15
36-70	12	11	16	5	11
71+	14	5	16	3	10
Any Amount	52	39	63	24	47

Table 1 shows that 47 percent of the households participating in the survey owned cattle. Twenty-two households owned less than 35 cattle while 19 owned 36 or more. Significantly more Shoshong and male-headed households owned cattle than did Makwate and female-headed households, respectively. The gap by gender was particularly large. Not only did more male-headed household own cattle, those that did own cattle usually owned more cattle than did cattle-owning female-headed households.

The proportions of households owning cattle in this sample correspond reasonably well with findings from other studies. However, Koch and Matlho [1984] reported that only 30 percent of 42 households participating in a livestock survey in the Tutume District owned any cattle. Also, the herds monitored by Flint [1986] in the Pelotshetlha area were slightly smaller on average than were the Shoshong and Makwate herds.

Flint, and others, expressed concern that livestock research should take into account the fact that several people might own the animals kept in any given herd. Little information is available, however, on who among household members actually owns cattle besides the household head. The 1985 survey respondents were asked this question with respect to the cattle kept in the household herd. Results are shown in Table 2.

Whether referring to smaller or larger herds, multiple individuals owned some of the cattle kept in a common herd. More than 40 percent of the respondents said that the spouse of the head and the sons of the head owned cattle kept in the household herd. Only 15 percent of the respondents, in contrast, said that the household head owned all the cattle kept in the household herd. It was more common to find sons and daughters owning animals among the households owning (in aggregate) larger number of animals. Thus one component of herd growth is the number of people owning animals which are kept in a common herd (not just the number of animals owned by the household head).

TABLE 2: CATTLE OWNERS
BESIDES THE HOUSEHOLD HEAD

HERD SIZE:	1-35	36+	ALL
	(Pct of Households)		
No One	16	16	15
Spouse	41	47	44
Son	27	58	41
Daughter	18	42	29
Brother or Sister	14	5	10
Parents	9	5	7
Other Relatives	9	5	7
Non-Relatives	14	0	7

Table 3 shows that more households owned smallstock than did cattle. Most smallstock-owning households kept goats while few owned sheep. The number of smallstock owned was quite similar to the Pelotshetlha sample monitored by Flint [1986]. Koch and Matlho [1984], in contrast, reported that a surprisingly low percentage of households owned smallstock in the Tutume

District -- only 40 percent of his sample.

There were significant differences in smallstock ownership by village and household type. More Shoshong, male-headed and cattle-rich households owned smallstock, and tended to own more smallstock, than did their comparison household categories. Flint also found a significant relationship between cattle and smallstock ownership.

Among smallstock-owning households, approximately 56 percent owned less than 15 animals, while the rest owned 16 or more animals. Fifteen animals, therefore, will be used during the rest of the paper to distinguish larger owners from smaller owners of smallstock.

TABLE 3: SMALLSTOCK OWNERSHIP

	-----VILLAGE-----		SEX OF HEAD		CATTLE ASSETS		
	SHOSHONG	MAKWATE	MALE	FEMALE	0-35	36+	ALL
NUMBER OWNING:							
Goats:							
1-15	13	16	14	15	22	7	29
16+	13	8	17	4	12	9	21
Sheep:							
1-15	4	4	8	0	5	3	8
16+	1	2	3	0	2	1	3
Both:							
1-15	12	16	13	15	22	6	28
16+	14	8	18	4	12	10	22
Any Amount	26	24	31	19	34	16	50
PERCENT OWNING:							
Goats:							
1-15	26	42	27	41	34	29	33
16+	26	21	33	11	19	38	24
Sheep:							
1-15	8	11	16	0	8	13	9
16+	2	5	6	0	3	4	3
Both:							
1-15	24	42	25	41	34	25	32
16+	28	21	35	11	19	42	25
Any Amount	52	63	61	52	53	67	57

Chickens were owned by nearly all of the households which participated in the survey (Table 4). There were small differences in the percentages of households which owned chickens by location or household type, but Makwate, male-headed and cattle-rich households generally owned more chickens. The median number owned was 11 chickens. The median number of roosters and hens owned was only between four and five, however. Again, Koch and Matlho's [1984] numbers from Tutume District were quite different. He reported that only 41 percent of households owned any chickens.

TABLE 4: CHICKEN OWNERSHIP

	-----VILLAGE-----		SEX OF HEAD		CATTLE ASSETS		
	SHOSHONG	MAKWATE	MALE	FEMALE	0-35	36+	ALL
NUMBER OWNING:							
1-10	27	12	18	21	32	7	39
11+	19	20	28	11	24	15	39
PERCENT OWNING:							
1-10	54	32	35	57	50	29	44
11+	38	53	55	30	38	63	44
Any Amount	92	84	90	86	88	92	89

More Shoshong and Makwate households owned donkeys than did households in either the Peloshetlha or Tutume areas. Table 5 shows that one-third of the enumerated households owned donkeys, approximately half owning six or more animals. Donkeys ownership was concentrated in Makwate village, where more than half the households owned donkeys. As with all the other types of animals, more male-headed households owned donkeys than did female-headed households, and those that did own donkeys tended to own more donkeys. Unlike the patterns observed for the other animals, however, there was an inverse relationship between donkey ownership and cattle ownership. Only 21 percent of cattle-rich households owned donkeys, and only four percent owned more than five donkeys.

TABLE 5: DONKEYS OWNERSHIP

	-----VILLAGE-----		SEX OF HEAD		CATTLE ASSETS		
	SHOSHONG	MAKWATE	MALE	FEMALE	0-35	36+	ALL
NUMBER OWNING:							
1-5	6	10	10	6	12	4	16
6+	3	10	13	0	12	1	13
PERCENT OWNING:							
1-5	12	26	20	16	19	17	18
6+	6	26	25	0	19	4	15
Any Amount	18	52	45	16	38	21	33

2.2 HERD AND FLOCK COMPOSITION

Herd and flock composition was examined to see whether the age and sex composition differed between larger versus smaller herds and flocks. Few differences were found for any of the animals. Findings by type of livestock and herd/flock size are summarized in Tables 6 to 9.

With reference to cattle (Table 6), bulls consistently ranged between two and four percent of cattle herds, oxen were between 13 and 15 percent, cows around 60 percent, and calves from 20-25 percent. Perhaps most surprising was the proportion of households with few animals in total which, nevertheless, kept oxen and bulls. More than forty percent of the

households having less than 15 cattle had at least one bull and one third kept some oxen.

TABLE 6: CATTLE HERD STRUCTURE

	---NUMBER OF CATTLE OWNED---				
	1-15	16-35	36-70	71+	ALL
PCT. HH WITH >0:/a					
Cows	100	100	100	100	100
Calves	78	85	100	89	88
Oxen	33	69	100	89	73
Bulls	44	38	80	89	61
AVERAGE NUMBER:					
Cows	6.1	13.0	23.8	37.1	19.4
Calves	1.9	4.7	9.5	15.4	7.6
Oxen	1.2	3.2	5.8	10.3	5.0
Bulls	0.4	0.4	1.0	1.7	0.8
ALL	9.6	21.3	40.1	64.5	32.8
PERCENT OF HERD:					
Cows	64	61	59	58	59
Calves	20	22	24	24	23
Oxen	13	15	14	16	15
Bulls	4	2	2	3	2

a. Based on households which owned cattle. See Table 1 for the number of households in each herd size category.

Bailey [1982] and Flint [1986] both reported that the herds they studied had more oxen (and tollies) relative to cows. In general, cows constituted around 45-50 percent of their herds and oxen and tollies were in the range of 30-35 percent. This difference likely reflects the fact that Makwate households generally relied on donkeys for ploughing. Many Shoshong households used tractors rather than oxen. Thus the demographic structure of cattle herds in Shoshong and Makwate was seemingly more oriented toward reproduction and milk output than in the other areas.

TABLE 7: DEMOGRAPHIC COMPOSITION FOR SMALLSTOCK

	-------GOATS-------				
	1-15	16+	ALL	SHEEP	ALL
AVERAGE NUMBER:					
Billies/Rams	0.9	4.8	2.7	1.0	3.7
Nannies/Ewes	4.4	15.5	9.2	2.0	11.2
Kids/Lambs	2.1	11.5	6.2	1.1	7.3
ALL	7.4	31.8	18.1	4.1	22.2
PERCENT OF HERD/FLOCK:					
Billies/Rams	12	15	15	24	17
Nannies/Ewes	59	49	51	49	50
Kids/Lambs	28	36	34	27	33

Goat herds and sheep flocks were similarly dominated by females and offspring, again with little variation due to the total number of animals owned. Goats herds comprised 15 percent billies, 51 percent nannies and the rest kids. Sheep flocks were similarly structured, with a slightly higher proportion of rams. With goats there tended to be somewhat higher shares of offspring as more animals were owned in total.

TABLE 8: DEMOGRAPHIC COMPOSITION FOR CHICKENS

	1-10	11+	ALL
AVERAGE NUMBER:			
Roosters	0.6	1.5	1.0
Hens	2.4	5.4	3.9
Chicks	2.6	10.4	6.5
All	5.6	17.3	11.4
PERCENT OF HERD:			
Roosters	10	9	9
Hens	43	31	34
Chicks	47	60	57

Table 8 shows that chicken flocks were dominated by hens and chicks, accounting for 34 and 57 percent of the flocks, respectively. The average proportions of roosters, hens and chicks did not change depending on the total number of chickens owned but the proportion of households owning a rooster did change. Among households owning less than ten chickens, under half owned a rooster. More than 90 percent of the households having more than 11 chickens had a rooster.

TABLE 9: DEMOGRAPHIC COMPOSITION FOR DONKEYS

	1-5	6+	ALL
AVERAGE NUMBER:			
Male	1.6	4.5	2.9
Female	1.6	4.0	2.7
Young	0.5	1.3	0.9
ALL	3,7	9.8	6.4
PERCENT OF HERD:			
Male	43	46	45
Female	43	41	42
Young	14	13	14

There was not a sexual bias in the donkeys owned, with adult males and female each accounting for around 45 percent of the animals owned. Fewer households having less than six donkeys had young donkeys, 50 percent of households compared to more than 80 percent of households which had more than six donkeys in total.

In summary, farmers had similar strategies for the demographic compositions of their herds and flocks, except for donkeys. For cattle, smallstock and chicken, farmers maintained a breeding-oriented demographic composition. It is generally possible to rely on males owned by other farmers, so males were not needed by all livestock owners.

2.3 INVENTORY CHANGE PATTERNS

Inventories and inventory changes for 1984-85 are summarized in Table 10.

TABLE 10: LIVESTOCK INVENTORIES AND INVENTORY CHANGES

	CATTLE	SMALLSTOCK	DONKEYS	CHICKENS
NUMBER OF HOUSEHOLDS	41	50	29	78
BEGINNING INVENTORY	34.4	17.2	7.1	15.3
ADDITIONS DUE TO:				
Birth	9.6	9.6	1.0	6.4
Exchanges/a	1.7	0.5	0.4	0.8
OFFTAKE DUE TO:				
Sales	3.9	<0.1	0.1	0.9
Slaughter	0.3	1.4	0.0	3.7
Exchanges/b	0.3	0.6	0.4	0.6
DELETIONS DUE TO:				
Death	6.2	2.2	0.7	4.4
Loss	2.1	0.7	0.7	1.4
ENDING INVENTORY	32.8	22.2	6.4	11.4

a. Includes purchases, gifts received and trades.
b. Includes gifts given, trading away.

Livestock inventories averaged 34 cattle, 20 smallstock, seven donkeys, and 13 chickens, respectively, for households which owned any of each type of animal. As has been found in other livestock inventory surveys [Carl Bro, 1982; Bailey, 1982; Flint, 1986; Koch and Matlho, 1985; Phuti, 1985], the primary source of additional animals was births. Deaths and losses were major causes of deletions, not just sales.

During the year preceding the survey, cattle inventories declined slightly. Somewhat larger reductions were recorded for donkeys and chickens. In contrast, smallstock inventories increased by 29 percent.

Table 11 gives a summary of inventory change rates by herd/flock size categories. Offtake rates were 15 percent for cattle, 10 percent for smallstock and 39 percent for chickens. Death rates were lowest for donkeys, increasing to 18 percent for smallstock, 21 percent for cattle and 33 percent for chickens. There was no significant relationship between offtake rates and the number of animals owned. Number of animals owned was inversely related to death rates, perhaps reflecting better husbandry by larger-scale owners, as is discussed below.

TABLE 11: INVENTORY CHANGE RATES BY HERD/FLOCK SIZE

	NET CHANGE	OFFTAKE RATE	DEATH RATE
	(Percentages)		
CATTLE:			
1-35	-8	14	24
36+	-4	17	18
ALL	-4	15	21
SMALLSTOCK:			
1-15	21	11	23
16+	33	10	12
ALL	29	10	18
CHICKENS:			
1-10	-56	49	49
11+	-2	35	25
ALL	-26	39	33
DONKEYS			
1-5	-9	--	9
6+	-10	--	9
ALL	-10	--	9

Inventory change patterns by herd and flock size were assessed, in addition to the actual inventory change rates. Results are summarized in Table 12. More households traded to get cattle than purchased cattle. The proportion of households purchasing cattle was greater among households with larger cattle herds. A higher proportion of households with larger cattle herds also sold, slaughtered, and traded away their cattle.

TABLE 12: PATTERNS OF INVENTORY CHANGES BY HERD/FLOCK SIZE

	--CATTLE--		SMALLSTOCK		-CHICKENS--		--DONKEYS--	
	1-35	36+	1-15	16+	1-10	11+	1-5	6+
	(Percent of Households)							
ADDITIONS:								
Births	100	100	100	100	100	100	56	85
Purchases	14	26	18	27	18	23	19	23
Trade to Get	27	21	14	5	8	5	0	0
Gift Received	0	5	4	0	13	18	0	0
OFFTAKE:								
Sales	77	95	0	5	31	22	6	15
Slaughter	18	37	46/a	91	74	100	0	0
Give Away	5	11	11	14	23	41	6	15
Trade Away	9	21	4	11	5	5	6	8
DELETIONS:								
Death	77	89	64/b	86	69	69	44	62
Loss	45	58	18/b	41	23/b	49	19/b	54

a. Differences by size significant at >.99 level.
b. Differences by size significant at >.9 level.

Trading animals was not as common for goats, sheep and chicken as it was for cattle, nor was the selling of animals. There were few households which

ever sold smallstock. Chickens were given away by a number of households, particularly for those with above median size flocks. The most common means of disposal for smallstock and chickens was slaughtering. A smaller proportion of households with fewer animals slaughtered any animals, as might be expected. Regardless of animal type, the share of households experiencing deaths and losses tended to be lower among households with fewer animals.

3. MANAGERIAL RESPONSIBILITY AND OBJECTIVES

This section covers the spatial location of animals (at lands and villages versus at cattle posts), who actually tends animals and makes managerial decisions, how often household heads inspect their animals, and the major uses of animals.

3.1 SPATIAL LOCATION

Most smallstock and chickens were kept in the village or at the lands. Owners of large cattle herds often kept some smallstock at their cattle posts, particularly if large numbers of smallstock were owned. In Shoshong, donkeys generally were kept in the lands area. In Makwate, donkey movement was not regulated. Consequently, donkeys moved on their own between the lands and adjacent cattle post areas.

Data on the location of cattle are summarized in Table 13. Relatively few farmers split their cattle between a cattle post and the lands/village area at any given time, but there was some movement between locations at different periods of the year.

TABLE 13: WHERE CATTLE ARE KEPT

	---CROPPING SEASON---			--------WINTER--------		
	DRAUGHT	COWS/a	OTHER	DRAUGHT	COWS	OTHER
	(Percent of Households)					
1-35 CATTLE:						
Cattle Post	43	50	47	93	50	47
Lands/Village	43	50	53	7	50	53
Both	14	0	0	0	0	0
36+ CATTLE:						
Cattle Post	59	58	72	94	68	72
Lands/Village	35	37	22	6	26	22
Both	6	5	6	0	5	6
ALL HERDS:						
Cattle Post	52	54	59	94	59	59
Lands/Village	39	44	38	6	39	38
Both	10	2	3	0	2	3

a. Refers to lactating cows.

The main seasonal movement was for draught animals. Most households moved their draught animals to their cattle post during winter. Around half kept their draught animals at the lands during the cropping season. Sixty percent of the households, however, generally kept their draught animals at the cattle post even during the cropping season. This can lead to problems

in managing timely ploughing.

Contrary to standard descriptions of cattle management in Botswana, there was not a pronounced seasonal movement of lactating cows, particularly in Makwate. Around forty percent of the households kept their cows in the lands/village area during winter and summer. Households with more animals kept a larger share of their animals at the cattle post, as would be expected.

Flint [1986] gave more detail on seasonal patterns for cattle movement, based on monitoring data of the numbers of animals. The patterns he described were generally similar to those in Shoshong and Makwate. For example, in most months 30 to 40 percent of the animals were kept in the lands area. There was a brief peak of 65 to 75 percent of animals during the ploughing period -- in November and December. Flint's data, however, show a higher percentage of animals were moved to the lands area during winter than is implied by the household level data from Shoshong and Makwate.

The difference in findings about spatial location stems from features of the research sites. There is substantial permanent settlement in the Pelotshetlha area even though it is considered to be a lands area. Therefore, households often keep their animals in the vicinity of their lands compounds during winter. This is similar to the pattern in Makoro (the third research site of the Mahalapye team). In contrast, Makwate is a small village which used to be a cattle post. The current cattle posts are quite near the village and most farmers can easily visit cattle posts and return within a day. Therefore, there is little incentive to move cattle to the lands area. In both Shoshong and Makwate, there are no boreholes and relatively few wells in the lands area. This prevents a comparable winter movement of cattle to the lands area as was found for Pelotshetlha farmers.

3.2 WHO TENDS, MANAGES AND MILKS

Findings on which workers were responsible for tending and management confirmed well-known patterns, as can be seen in Table 14. Nearly all herding and management of cattle was done by males. Approximately one-third of cattle-owning households relied on non-household males for tending labour. For comparison, Bailey [1982] found that family members accounted for 83 percent of cattle tending labour.

Donkey and smallstock tending and management also were male-dominated activities, though females managed donkeys in 25 percent of households and managed smallstock in 35 percent of households. The greater role of females in smallstock tending, milking and managing (relative to cattle tending) also was found by Flint [1986]. Nearly all households relied on females for managing their chickens. Non-household workers played a minor role with reference to smallstock, donkeys or chickens.

TABLE 14: PRIMARY INDIVIDUALS RESPONSIBLE FOR TENDING, MILKING AND MANAGING

	------HOUSEHOLD------				----NON-HOUSEHOLD-----			
	--MALES--		FEMALES		--MALES--		FEMALES	
	<16	16+	<16	16+	<16	16+	<16	16+
	(Percent of Households)							
CATTLE at CP:								
Tend	7	60	0	0	9	24	0	0
Milk	3	59	0	0	9	29	0	0
Manage/a	0	84	0	7	0	9	0	0
CATTLE AT L/V:								
Tend	3	65	0	0	0	32	0	0
Milk	0	65	0	0	0	35	0	0
Manage	0	77	0	3	0	20	0	0
SMALLSTOCK:								
Tend	32	26	3	29	4	6	0	0
Milk	45	16	9	17	7	7	0	0
Manage	0	63	0	35	0	0	0	2
DONKEYS:								
Tend	23	48	2	18	7	2	0	0
Manage	0	75	0	25	0	0	0	0
CHICKENS:								
Tend	2	8	1	87	1	0	0	3
Manage	0	16	0	80	0	0	1	4

a. Includes responsibility for sales, purchases, vaccinations, etc.

3.3 FREQUENCY OF INSPECTION

Information on how frequently the heads of households inspected their animals is summarized in Table 15.

TABLE 15: HOW OFTEN HOUSEHOLD HEADS INSPECT CATTLE

	NEARLY EVERYDAY	1-4 TIMES PER MONTH	EVERY 2-3 MONTHS	< ONCE PER 3 MONTHS
	(Percent of Households)			
CATTLE AT CP:				
1-35	8	42	25	25
36+	19	25	13	44
CATTLE AT L/V				
1-35	50	33	0	17
36+	27	36	9	27
SMALLSTOCK:				
1-15	54	25	4	18
16+	64	14	0	23
DONKEYS:				
1-5	38	31	0	31
6+	54	23	0	23
CHICKENS:				
1-10	69	8	3	21
11+	59	8	8	26

Most household heads inspected their animals on a regular basis. Inspection was less frequent for cattle kept at cattle posts and for donkeys. More than half of the household heads inspected their cattle at the cattle posts once every two to three months or less. Relatively fewer owners of larger cattle herds inspected their cattle regularly, particularly cattle kept in the lands/village area. Frequency of inspection did not differ significantly according to the numbers owned for the other animals.

3.4 MAJOR USES

In order to help determine herd/flock owner objectives, respondents were asked how their households use animals. Each respondent was read a list of options. For cattle, the list covered various options relating draught and live animal, meat, and milk disposal. Smallstock options included the latter three, while donkey options include draught and animal disposal. The options for chickens related to animal, meat and eggs disposal. Implicit in the research approach is the assumption that the percentages of households using different enterprise outputs reflect households' objectives in maintaining particular enterprises.

Table 16 shows that the major uses of cattle were for animal sales to traders and household milk consumption. Only one-quarter of households ate any animals during the year preceding the survey and only 20 percent used cattle for household fieldwork. Few households had made meat and milk sales. There were small differences in the percentages of households selling animals or drinking milk by herd size, but a larger share of herd owners owing more than 35 cattle did slaughter cattle and used cattle for traction than did owners having fewer animals.

TABLE 16: MAJOR USES OF CATTLE

	1-35	36+	ALL
	(Pct of Households)		
LIVE ANIMAL DISPOSAL:			
Sold to Trader or Dealer	73	84	78
Sold to Another Household	9	26	17
Gave Away	5	11	7
MEAT DISPOSAL:			
Sold to Trader or Dealer	5	16	10
Sold to Another Household	0	11	5
Gave Away	0	5	2
Ate	18	37	27
MILK:			
Sold	14	11	12
Drank	86	89	88
DRAUGHT USES:			
Household Field	14	26	20
Other Fields	9	21	15
Gathering or Transport	5	11	7

The most common uses of smallstock were home consumption of milk and meat (Table 17). The proportion of households which slaughtered smallstock for home consumption was significantly related to the number of smallstock owned. In contrast to cattle sales, smallstock sales -- whether meat or

live animals -- more often were made to other households rather than to traders or general dealers.

TABLE 17: MAJOR USES OF SMALLSTOCK

	1-15	16+	ALL
	(Pct of Households)		
LIVE ANIMAL DISPOSAL:			
Sold to Trader or Dealer	4	9	6
Sold to Another Household	14	27	20
Gave Away	11	14	12
MEAT DISPOSAL:			
Sold to Trader or Dealer	11	9	10
Sold to Another Household	14	32	22
Gave Away	14	9	12
Ate	57/a	95	74
MILK:			
Sold	0	5	2
Drank	82	91	68

a. Significant difference by size at >.99 level.

Table 18 shows that the most common uses of chickens were home consumption of meat and eggs. For both products, there was a significant relationship between the proportion of households and number of animals owned -- as would be expected. Few households sold chickens to traders or sold meat to either traders or other households.

TABLE 18: MAJOR USES OF CHICKENS

	1-10	11+	ALL
	(Pct of Households		
LIVE ANIMAL DISPOSAL:			
Sold to Trader or Dealer	15	0	8
Sold to Another Household	18	21	19
Gave Away	15/a	33	24
MEAT DISPOSAL:			
Sold to Another Household	3	5	4
Ate	85/a	97	91
EGGS DISPOSAL:			
Sold	8	15	12
Ate	40	28	63

a. Significant difference by size at >.9 level.

Donkeys were used only for draught purposes, mainly for household fieldwork, gathering firewood, and fetching water. Seventy-five percent of households owning fewer than six donkeys were still able to use donkeys for fieldwork and gathering activities. This was because only two or four donkeys normally were used for these activities.

TABLE 19: MAJOR USES OF DONKEYS

	1-5	6+	ALL
	(Pct of Households		
ANIMAL DISPOSAL:			
Sold to Another Household	13	15	14
Gave Away	0	8	3
DRAUGHT USES:			
Household Field	75	100	86
Other Fields	25	46	34
Gathering	75	92	83
Transport	38	62	48

Survey respondents also were asked to rank the most important uses of their animals. This question was open-ended so it took into account subjective appraisal of the importance of different animal uses, as well as their frequency across households. In data analysis, the responses were aggregated using inverse weighting. Thus one respondent saying a use was the most important was weighted equivalent to two farmers saying a use was the second most important to their households. Findings are summarized in Table 20. In nearly all respects, the results confirm the rankings of objectives implicit in Tables 16 to 19.

TABLE 20: MOST IMPORTANT USES OF LIVESTOCK

ANIMAL	RANK	USE	PCT POSSIBLE
CATTLE	1	Drink Milk	72/a
	2	Sell to Traders	50
	3	Draught for Household Fieldwork	17
	4	Eat Meat	11
	5	Sell Milk	9
SMALLSTOCK	1	Drink Milk	83
	2	Eat Meat	43
	3	Sell/Trade to Other Households	20
	4	Sell/Trade to Traders	9
	5	Give Away	5
CHICKENS	1	Eat Meat	80
	2	Eat Eggs	40
	3	Sell to Other Households	13
	4	Give Away	9
	5	Sell Eggs to Other Households	8
DONKEYS	1	Draught for Household Fieldwork	76
	2	Collect Firewood, Water, Thatch	56
	3	Transport People & Goods	20
	4	Draught for Other's Fieldwork	15

a. The sum of percent possible across all responses for each type of livestock is 200.

Table 20 shows that both cattle and goat-owning households ranked milk consumption as a more important use of animals than sales. This in part reflects the fact that many surveyed households had few animals and therefore could not sell animals on a regular basis. As noted above, cattle were generally sold to traders while goats were more frequently sold to other households (or as meat). Draught power was a surprisingly low priority for cattle owners. Donkeys were kept only for their traction services. Chickens were primarily kept for home consumption, as opposed to sale, even though inventory figures indicated that few chickens were eaten during the year of the survey.

For each type of livestock, essentially the same rankings of major uses were given by owners of small and large numbers of animals. Perhaps there was an increasing commercial orientation as animals number increased, as Behnke [1983] has argued with respect to cattle. However, this is not evident from the owners' statements at to their most important uses of livestock enterprise products. In brief, even larger scale owners generally ranked home consumption and draught uses of animals as priority uses, while owners of fewer animals mentioned the importance of sales just as often did larger-scale owners.

Comparing across animals, the pattern which emerges is that cattle, smallstock and chickens are stores of wealth which also generate food consumption products for home consumption. Because of their relative value, the different animals are like currency with different denominations. When a lot of cash is needed, cattle are sold. Since there is a limited amount of cash circulating in the villages, cattle are sold to traders. Cattle are too valuable to eat, unless one dies or there is an important celebration. When smaller amounts of money are needed, goats are sold. Goats also can be eaten more regularly, since a household can consume most of a goat, and easily sell or give away the rest of the meat. Goat meat sales are a good way to attract people when beer is being sold. Chicken are, relatively speaking, the small change. They are good not only for small sales, but serve as appropriate gifts.

4. HUSBANDRY PRACTICES

Research on husbandry practices focused on reproduction management, watering, parasite control, vaccination, and supplemental feeding. Again, the main interest was in identifying differences in the treatment of different animals and between owners of small versus large numbers of animals.

4.1 BREEDING

A profile of reproduction patterns and practices is presented for cattle, donkeys and goats in Table 21. The average ages when animals typically had their first offspring were estimated by farmers to be 36 months for cows, 27 months for donkeys, and 11 months for nannies. During the year preceding September, 1985 more that two-thirds of households owning goats or cattle experienced offspring deaths, compared to only ten percent for donkeys. The mortality rate for calves was 21 percent and was 25 percent for kids. Gulbrandsen [1980] also noted that calf mortality was high and constituted a major management problem.

TABLE 21: REPRODUCTION PATTERNS AND PRACTICES FOR CATTLE, DONKEYS AND GOATS

	CATTLE	DONKEYS	GOATS
WHEN HAVE FIRST OFFSPRING (Months)	36	27	11
WHEN USUALLY BORN (% HH):			
October-December	46	28	10
January-March	37	24	8
April-June	10	14	40
July-September	7	10	42
NUMBER OF OFFSPRING BORN/a	9.6	1.0	8.4
HOUSEHOLDS WITH OFFSPRING DEATHS (%)	71	10	66
NUMBER OF DEATHS/a	2.0	0.1	2.1
MORTALITY RATE (Weighted Average)	21%	14%	25%
PERCENT ADULT MALES NOT CASTRATED	15	56	32
AGE WHEN CASTRATE (Months)	8	26	7
HOW CASTRATE (% HH):			
Burdizzo	98	96	56
Knife	0	4	28
Both	2	0	16

a. Numbers refer to the 12 months preceding the survey.

There appeared to be some seasonality in cattle and goat births, even though no attempt was being made to regulate breeding. Most goats were born during winter, while calves generally were born during spring and early summer. Birthing seasonality was less pronounced for donkeys.

Most male cattle were castrated, as were two-thirds of billies, but less than half the male donkeys. Essentially all cattle and donkey castrations were done with burdizzos (a pinching implement), while more than forty percent of goat-owning households did some castrations with knives. Koch and Matlho [1984], for comparison, said that all excess male cattle in his Tutume District sample were castrated, as were 95 percent of male goats. Koch also reported that 90 percent of goat castrations were done with burdizzos.

One of the important cattle management issues in Botswana has been the prospects for upgrading herds through purchasing and breeding exotic species. Table 22 shows how bulls were obtained.

TABLE 22: HOW OBTAIN BULLS

	1-35	36+	ALL
	(Pct of Households)		
From Own Herd	50	58	54
Buy From Neighbour	14	21	17
Buy From Trader	0	11	5
Get From Live. Prod. Unit	0	5	2
Artifical Insemination	0	0	0
Rely on Neighbours' Bulls	36	5	22

Less that one-quarter of the households purchased bulls, and most that did purchase bulls bought them from neighbours. In most cases, bulls were obtained by selecting offspring from one's own herd. Twenty-two percent of the households merely relied on whatever bulls happened to be grazing in the vicinity of their cows. Given current patterns and the herding and kraaling patterns described below, the prospects for controlled breeding programmes would not appear to be promising regardless of potential benefits.

With reference to chicken reproduction, owners were asked about the usual disposition of eggs. Findings are summarized in Table 23. Respondents reported that slightly over twenty percent of the eggs were eaten and just under ten were sold. Of the eggs not eaten or sold, 75 percent generally hatched and about half of the hatched chicks survived to become adults. There were no significant differences in these patterns associated with different numbers of chickens owned. However, more than a third of the people with less than ten chickens relied on their neighbours' roosters, compared to only five percent of those with more than ten chickens.

TABLE 23: CHICKEN REPRODUCTION PRACTICES

	1-10	11+	ALL
PERCENT OF EGGS:			
Eaten	22	23	22
Sold	9	9	9
PERCENT OF EGGS WHICH HATCH/a	73	76	75
PERCENT OF CHICKS WHICH SURVIVE	40	51	46
WHERE GET ROOSTERS (%HH):			
Raise	54	90	72
Buy from Neighbour	10	13	12
Trade for Them	3	0	1
Rely on Neighbours'	33	5	19

a. Of eggs not sold or eaten.

4.2 HERDING, KRAALING AND PENNING

Cattle owners were asked whether they (or their herders) actually herded their cattle during the day or kraal them at night. Somewhat different patterns emerged with reference to location and herd size, as is shown in Table 24.

At the cattle post, essentially no cattle were herded during the day but nearly sixty percent of the households put the cattle in kraals at night. In the lands/village area, more than eighty percent of the households herded during the day and kraaled at night, at least during the cropping season. Half of the households stopped herding during the day during winter. More than twenty percent of the households neither penned nor kraaled their cattle post animals at anytime. Households with larger cattle herds tended more frequently to herd and kraal their animals.

TABLE 24: CATTLE HERDING AND KRAALING

	----CATTLE POST----			--LANDS & VILLAGE---		
	1-35	36+	ALL	1-35	36+	ALL
	(Percent of Households)					
Only Herd during Day	0	6	4	0	0	0
Only Kraal at Night	50	63	57/a	8	9	9
Herd and Kraal:						
Most of Time	8	0	4	25	45	35
Crop Season Only	8	19	14	58	36	48
Neither Herd Nor Kraal	33	13	21	8	9	4

a. Several respondents said they only kraal cows.

Flint [1986] and Bailey [1982] described quite similar herding and kraaling patterns in their studies, particularly with reference to the seasonal variation in kraaling. Flint [1986] also pointed out, as did Gray [1986] and Gulbrandsen [1980], that calves are kraaled much of the time for the first several months in order to protect them.

In both Shoshong and Makwate, donkeys were hobbled to keep them from wandering too far away, at least when they were being used regularly. Regular kraaling of donkeys was not so common, as is shown in Table 25. Also, donkeys were rarely herded during the day. However, it was a common practice to put donkeys in a village or lands area kraal on nights before farmers expected to plough.

TABLE 25: DONKEYS KRAALING
DURING CROPPING SEASON

	1-5	6+	ALL
Most Days	19	23	21
Some Days	44	31	38
Rarely or Never	38	31	34

Most households allowed their chickens to run freely about the lands or village compound, scavanging for food. As shown in Table 26, under 20 percent regularly penned their chickens, at least at night. However, the fencing around most compounds helped protect chickens.

TABLE 26: HOW OFTEN PEN CHICKEN

	1-10	11+	ALL.
	(Pct of HHs)		
Everyday	18	21	19
Most Days	3	0	1
Rarely or Never	79	79	79

4.3 WATERING

Findings on watering for cattle, smallstock and donkeys are presented in Tables 27 to 29. Table 27 shows the frequency of watering and Table 28 the distance to water. Table 29 shows the primary water source. Regardless of animal type or number owned, most animals were watered on a daily basis and had less than five kilometres to go to water.

TABLE 27: HOW OFTEN WATERED

	TWICE DAILY	ONCE A DAY	EVERY 2ND DAY
	(Pct of Households)		
CATTLE AT CP:			
1-35	0	83	17
36+	13	75	13
ALL	7	79	14
CATTLE AT L/V:			
1-35	25	25	50
36+	0	91	9
ALL	13	57	30
SMALLSTOCK:			
1-15	32	57	11
16+	18	78	5
ALL	26	66	8
DONKEYS:			
1-5	0	75	25
6+	0	85	15
ALL	0	79	21

TABLE 28: KILOMETRES TO WATER

	<1	1-5	>5
	(Pct of Households)		
CATTLE AT CP:			
1-35	42	58	0
36+	81	19	0
ALL	64	36	0
CATTLE AT L/V:			
1-35	25	42	33
36+	27	55	18
ALL	26	48	26
SMALLSTOCK:			
1-15	86	14	0
16+	64	32	5
ALL	76	22	2
DONKEYS:			
1-5	75	19	6
6+	31	54	15
ALL	55	34	10

Watering appeared to be the greatest problem for cattle kept at the lands or in the village area. Around two thirds of the cattle herds at cattle posts were located within one kilometre of water, compared to only a quarter of the herds kept in the lands/village area. The distance to water was consistently less for owners of larger herds. Owners of larger herds also watered their animals daily. Half of the owners of small herds reported than they watered their cattle in the lands area only every other day, compared to less than ten percent of the owners of large herds. The frequency of cattle watering at cattle posts was about the same at that reported by Bailey [1982] and Koch and Matlho [1984], but cattle at the lands were watered less frequently than generally has been reported in other studies.

Smallstock were watered more frequently than cattle, and the distance to water generally was less. Unlike cattle, the distance to water for smallstock tended to be less for owners of smaller numbers of animals.

The primary source of water for cattle was wells, at both the lands area and cattle posts. In the lands areas, nearly half the owners relied on depression area and reservoirs. These water sources generally are dependent on rain and this is a major reason cattle are removed to the cattle post during winter. Boreholes were used to water 21 percent of the cattle herds kept at cattle posts, but no herds were using boreholes in the lands area. Owners of small cattle herds were more dependent on unreliable depressions areas than were owners of large herds. Most smallstock and nearly all chickens received water from standpipes located in the villages.

TABLE 29: WHERE OBTAIN WATER

	BOREHOLE/ STANDPIPE	DEPRESSION/ RESERVOIR	WELL
	(Percent of Households)		
CATTLE AT CP:			
1-35	8	33	58
36+	31	6	63
ALL	21	18	61
CATTLE AT L/V:			
1-35	0	50	42
36+	0	36	64
ALL	0	48	52
SMALLSTOCK:			
1-15	68	11	21
16+	60	9	36
ALL	64	10	28
DONKEYS:			
1-5	38	25	38
6+	23	77	31
ALL	31	34	34

Bailey [1982] also found that most cattle were watered using boreholes and wells. Flint only distinguished between dams and boreholes. Unless his borehole category included wells (which is not clear in the report), then cattle herds in Pelotshetlha were more dependent on boreholes than found in either this study or the one by Bailey. Flint, for example, found that more than 90 percent of the herds were watered at boreholes during the winter

months. Koch and Matlho's [1984] findings were quite different from either this survey or the other studies. Koch and Matlho said that 70 percent of the herds in his Tutume sample were watered at lakes, ponds or rivers. Although not stated in the report, these figures must have applied to primary sources during summer.

4.4 FEEDING

Data on supplemental feeding and the provision of minerals are shown in Table 30. In the Shoshong and Makwate sample, less than thirty percent of either cattle or goat-owning households provided supplemental feed or minerals. Salt was the most commonly provided supplement. More owners of larger cattle herds provided hay, bonemeal, dicalcium phosphate and salt than did owners of smaller herds. In a sole exception to the notably lower standard of husbandry management accorded donkeys, a relative high proportion of donkey owners provided supplemental feed to their donkeys.

The figures for cattle in this survey generally are lower than those reported by Gulbrandsen [1980], Flint [1986] and Koch and Matlho [1984], but are higher than those given by Bailey [1982]. Gulbrandsen, for example, showed that 56 percent of households in his study provided supplemental feed to cattle, included 15 percent which did so on a regular basis. Sixty-five percent of his households provided salt, at least on occasion. Koch and Matlho reported that 33 percent of the Tutume area households provided supplemental feed to smallstock and 17 percent provided feed supplements to cattle. Nearly 90 percent of the herd managers in the Pelotshetlha area provided salt at some time and 73 percent provided bonemeal [Flint, 1986].

Flint provided additional insight into feeding practices by monitoring actual supplementation patterns on a monthly basis. He showed that the number of herd managers actually providing feed or mineral supplements at any given time is much lower than the proportion that do so on occasion. Thus, even the relatively low figures commonly reported for feeding and mineral supplementation might well overstate how much nutrient supplementation animals typically receive.

TABLE 30: SUPPLEMENTAL FEEDING AND MINERALS FOR CATTLE, SMALLSTOCK AND DONKEYS

	GRAIN/ RESIDUES/a	HAY	PROTEIN	BONEMEAL	DICAL. PHOSP.	SALT	NONE
CATTLE							
1-35	0	0	0	14	5	18	82
36+	0	11	0	26	11	37	58
ALL	0	5	0	20	7	27	71
SMALLSTOCK:							
1-15	7	0	0	7	7	18	82
16+	18	0	0	5	0	23	73
ALL	12	0	0	6	4	20	78
DONKEYS:							
1-5	38	13	0	6	0	19	50
6+	15	8	0	8	8	31	62
ALL	28	10	0	7 7	3	24	55

a. Includes residues from threshing floor and beer brewing.

Table 30 suggests that owners of larger number of animals tend to take better care of them. For example, 82 of owners with less than 35 cattle provided no feed or mineral supplements compared to 58 percent of those owning more than 36 cattle. Flint and Bailey, both of whom monitored practices intensively, reported a strong correlation between the number of animals owned and use of recommended feeding and health care practices.

Table 31 turns to feeding and mineral supplementation for chickens. Chickens were the only type of animal which were fed regularly. Eighty-five percent of the owners fed their chickens left over grain or meal, 90 percent fed them sorghum bran (called "lese") and 71 percent fed beer residues (called "moroko"). Essentially no mineral supplements were provided to chickens.

TABLE 31: FEEDING AND MINERALS FOR CHICKENS

	1-10	11+	ALL
	(Pct of Households)		
Sorghum/Maize Bran	85	95	90
Left Over Grain/Meal	82	87	85
Beer Residues	67	74	71
Bonemeal	0	0	0
Dicalcium Phosphate	0	0	0
Salt	5	8	6

4.5 HEALTH CARE

An overview of health care practices for cattle, smallstock and donkeys is given in Table 32. Most cattle-owning households treated for external parasites and vaccinated their cattle for various reasons. Dosing was more common in larger herds but a greater share of small herd owners hand applied "tick grease." Relatively few cattle owners did no parasite control practices. The proportions of cattle managers which dosed and dipped were about the same as reported by Koch and Matlho, but were lower than found by Flint. Flint said that 61 percent of the households in the Pelotshethla sample dipped cattle and 71 percent used tick grease.

The level of health care was somewhat worse for smallstock compared to cattle, and was much worse for donkeys. Few donkey-owning households, for example, treated for parasites and none vaccinated their donkeys.

Relatively few households treated any animals for internal parasites. More smallstock-owning households dosed for parasites than did cattle owning-households. The proportion of households dosing was directly related to the number of animals owned for both cattle and smallstock.

TABLE 32: PARASITE CONTROL AND VACCINATION FOR CATTLE, SMALLSTOCK AND DONKEYS

	DOSE	DIP	SPRAY	GREASE	NONE	VACCINATE
	(Percent of Households)					
CATTLE AT CP:						
1-35	0	25	58	58	8	92
36+	25	31	50	56	13	94
ALL	14	29	54	57	11	93
CATTLE AT L/V:						
1-35	0	50	17	42	17	92
36+	9	36	18	27	36	55
ALL	4	43	17	35	26	79
SMALLSTOCK:						
1-15	11	14	4	39	39	14
16+	36	14	14	50	27	45
ALL	22	14	8	44	34	28
DONKEYS:						
1-5	0	0	6	6	88	0
6+	0	8	0	23	69	0
ALL	0	4	3	14	79	0

While most cattle and smallstock owners tried to control parasites, treatment was not very frequent. As shown in Table 33, only 15 percent of cattle-owning households treated any animals in their herd on a monthly basis (or more often). More than forty percent of the owners treated their animals less frequently than once every six months. Bailey and Flint also reported that cattle were not treated as frequently as they should be to effectively control ticks.

TABLE 33: NORMAL MONTHLY INTERVAL BETWEEN EXTERNAL PARASITE TREATMENTS FOR CATTLE AND SMALLSTOCK

	<1	2-3	4-6	7-12	>12
	(Percent of Households/a)				
CATTLE AT L/V:					
1-35	23	18	14	27	18
36+	5	42	11	21	16
ALL	15	29	12	24	17
SMALLSTOCK:					
1-15	14	14	11	14	46
16+	0	27	18	14	41
ALL	8	20	14	14	44

a. Households which treated at some time.

5. FORAGE CROPS

Few livestock owners ever provided supplemental feed to their cattle, smallstock or donkeys, as reported above. Perhaps in the past this was not necessary because animals were able to obtain their requirements through grazing and browsing. Under the combined pressure of growing national cattle and smallstock inventories and drought, farmers may have to begin

growing forage crops in order to supplement feed. Growing of forages is already an extension recommendation. Because the growing of forage crops is a potentially important crop-livestock enterprise linkage, 42 cattle owners were asked a series of questions about their interest in forage crops and the constraints they might face in adding forage crops to their cropping systems. This section summarizes findings.

5.1 LEVEL OF INTEREST

Table 34 shows that nearly seventy percent of the respondents said they would be interested in forage crops, with no differences by size of herd or village. More interest was expressed in perennial crops, both legumes and grasses, than in annuals. There was a slight bias in favour of grasses.

TABLE 34: WANT TO GROW FORAGE CROPS

	-----VILLAGE-----		---CATTLE----		
	SHOSHONG	MAKWATE	1-35	36+	ALL
NO. RESPONDENTS	22	20	26	16	42
	(Percent Wanting To Grow)				
ANY TYPE	68	70	69	69	69
ANNUALS:					
Grasses	18	0	12	13	12
Legumes	5	0	4	0	2
PERENNIALS:					
Grasses	23	40	31	31	31
Legumes	27	20	15	38	26
DON'T KNOW	23/a	25	27	19	24

a. Sum of annuals, perennials and don't know can exceed percent wanting to grow any type because some respondents said they wanted to grow more than one type.

TABLE 35: WHICH ANIMALS WANT TO FEED

	-----VILLAGE-----		---CATTLE----		
	SHOSHONG	MAKWATE	1-35	36+	ALL
	(Percent of Those Wanting to Feed)				
All Donkeys	47	7	22	25	28
All Cattle	53	36	56	19	45
All Goats	40	29	33	25	34
Draught Animals Only	7	7	6	9	7
Pregnant and Lactating Animals Only	0	43	28	9	21
Preg., Latating and Draught Animals Only	20	7	0	36	14
Bull Only	0	7	6	0	3

Table 35 shows which animals the respondents would want to feed. Most respondents said that they would want to feed all the animals in their herds. Approximately 30 percent said they would focus on pregnant and lactating animals and 20 percent said they would feed draught animals. A larger share of owners with more than 35 cattle said they would concentrate feeding than did owners with smaller herds.

Interest in forages stemmed primarily from concerns over weak draught animals and inadequate milk production. Nearly two out of three of the respondents who used draught animals said that their animals were too weak to plough. Respondents from Shoshong were particularly concerned about the weakened status of their draught animals. With respect to milk production, only 36 percent felt they were obtaining enough milk. Almost a third felt their goats were giving too little milk and 60 percent felt that they would like to get more cow milk. More than half the respondents felt that feeding forage crops would increase milk production while most of the rest said they did not know whether forages would help.

One potential rational for feeding forages is to reduce calf or kid mortality. Less than forty percent of the respondents felt that calf or kid mortality was a major problem and only a quarter felt that forage crops would help reduce mortality.

In summary, the survey results relating to farmer interest suggests that there was interest in forage crops, but the nature of the interest was not well defined. For example, few farmers had realistically figured out which animals should receive priority in a feeding programme. Also, more than a third of the farmers did not know which type of forage they would prefer (annual or perennial, grass or legume). Many did not feel they faced the problems supplemental feeding is supposed to address and, if they did face the problems, many did not know whether feeding forage crops would help. Most likely, farmers have developed a general interest because they have heard about forages from extension agents. This sort of general interest is not likely to be a strong basis for introducing forages, particularly if farmers face resource constraints preventing the introduction of forages.

5.2 SEVERITY OF CONSTRAINTS

Findings from the forage schedule suggest that farmers did indeed face several constraints which in most cases would prevent the introduction of forage crops. For example, 60 percent reported they did not have enough land, 71 percent said they did not have adequate quality fencing, 90 percent did not have enough labour to cut and stook forages, and 88 percent did not have the labour to build a storage rack. In addition, less than half the households owned a cart which could be used to transport the forage crops from their field to their cattle post (or to the village). Even if transport could be arranged, the average distance to the cattle posts was 25 kilometres.

6. CONCLUDING COMMENTS

One of the key concerns emerging from this survey and other studies are the high death rates for all animals (possibly excepting donkeys), particularly offspring mortality. There is a need to explore the advantages of increasing supplemental feeding and minerals, and parasite control, although the VAs have obviously had some success in promoting external parasite control among cattle owners.

From a farm management perspective, the relative importance of milk consumption for both goat and cattle owners needs to be heeded in considering interventions. Based on the survey and informal observations, chickens could play a larger role in providing meat protein if hatchability and survival rates could be improved.

The survey showed that husbandry practices generally were worse for smallstock and chickens than they were for cattle. There was very poor husbandry for donkeys. Also, the survey showed that owners of smaller numbers of animals tended to have poorer quality husbandry than did owners of larger numbers of animals. While there clearly is room for improvement by large-scale cattle owners, perhaps more extension resources should be devoted to promoting improved husbandry practices for smallstock, chickens and donkeys -- and improved practices by small-scale owners in general.

Given the problems faced in growing, harvesting, storing and transporting forages, it is not likely many farmers will begin growing forages unless substantial benefits can be demonstrated. This fact is not currently appreciated. Most forage-related research currently is focused on crop/variety selection and forage crop agronomy, with an emphasis on the establishment problems of perennial grasses.

REFERENCES

Agricultural Technology Improvement Project (ATIP). Farming System Research Activities at Mahalapye: Summary of Activities, 1982-85. ATIP Research Report 1. Gaborone: MOA, 1986.

Bailey, C. "Cattle Husbandry in the Communal Areas of Eastern Botswana," Unpublished Ph.D. dissertation, Cornell University, 1982.

Baker, D. Household Circumstances and Farming Practices in Shoshong and Makwate: Tables and Summary Findings from the 1983 Crop Management Survey. AITP Working Paper 17. Gaborone: MOA, ATIP, 1988.

Behnke, R. (editor) Communal Area Livestock and Range: Research Priorities. Workshop Proceedings and Final Recommendations. Gaborone: MOA, 1982.

Behnke, R. "Production Rationales: The Comercialization of Subsistence Pastoralism." Nomadic Peoples 13: 3-33, 1983.

Carl Bro International. An Evaluation of Livestock Management and Production in Botswana with Special Reference to Communal Areas (3 volumes). Gaborone: MOA, 1982.

Flint, M. Crop and Livestock Production in the Pelotshetlha Lands Area: The Main Report of the 1982/83 IFPP Farming Management Survey. Gaborone: MOA, 1986.

Flint, M., T. Bagwasi and T. Rose. A Preliminary Report on the APRU/IFPP Cattle Survey, 1980-1983. Lobatse: MOA, IFPP (mimeo), 1984.

Gray, R. (editor) Cattle Post-Lands Interaction Study. ATIP Working Paper 7. Gaborone: MOA, ATIP, 1986.

Gulbrandsen, O. Agro-Pastoral Production and Communal Land Use: A Socio-Economic Study of the Bangwaketse. Gaborone: MOA, 1980.

Koch, B., and W. Matlho. Livestock Inventory Changes on ATIP Farms in 1984. ATIP Progress Report F85-2. Gaborone: MOA, ATIP, 1985.

Koch, B., and W. Matlho. Livestock Practices Survey. ATIP Progress Report F84-2. Gaborone: MOA, ATIP, 1984.

Phuti, L. Herd Management Study Results 1984. Gaborone: MOA, 1985.