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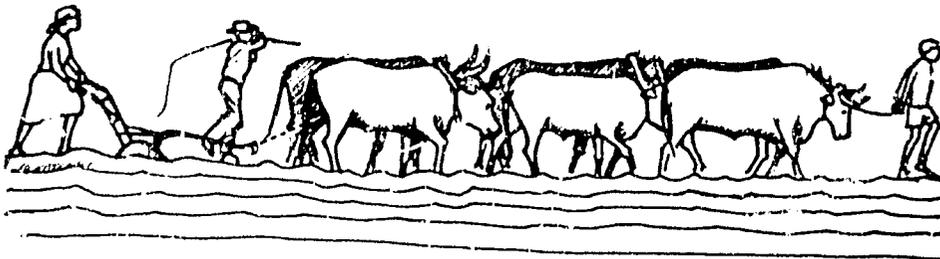
AGRICULTURAL TECHNOLOGY IMPROVEMENT PROJECT (ATIP)

DRAUGHT ARRANGEMENTS IN SHOSHONG AND MAKWATE

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BY

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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 GCB personnel and researchers interested in Botswana farming systems. The viewpoints expressed do not necessarily reflect the views of the Department of Agricultural Research, USAID or Kansas State University.

This paper gives information on draught arrangements in Shoshong and Makwite. The paper is based primarily on two surveys administered in 1983, the Draught Arrangements Survey and the Crop Management Survey. Partial results from the Draught Arrangement Survey were first presented in ATIP Research Report Number One.

There are three reasons why a comprehensive report on draught arrangements has been prepared for distribution at this time.

- (a). Ploughing situations changed dramatically during the 1980s drought. We feel it is useful to document ploughing situations and, in particular, draught arrangement patterns during the early stage of the drought as a baseline for monitoring post-drought recovery.
- (b). The 1983 Draught Arrangement Survey addressed one of the most important issues affecting farming households in Botswana -- access to traction resources. One of the main survey objectives was to determine the rights and obligations associated with use of different inter-household draught arrangements. This issue, if anything, became more important during the drought since a majority of households in the Central Agricultural Region had to shift to hiring or borrowing traction resources.
- (c). ATIP trial data have shown that two of the most promising changes farmers can make to increase arable production are double ploughing and row planting. To successfully implement either practice generally requires control over the timing and quality of ploughing (and planting). Therefore, it is important to know the amount of control farmers have over the timing and quality of ploughing when using different draught arrangements.

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Administration of the 1987 ARAP/DR Assessment Survey was supervised in the Ma'halapye area by A. Caplan (DAR) and C. Jonas (DPS). Enumerators for that survey included: (a) K. Ckaile (technical assistant, DAR), (b) C. Mahilo (technical assistant, DAR), (c) I.D. Bane (enumerator, DAR), (d) L. Mapena (technical assistant, DAFS), and (e) R. Serumola (enumerator, DAR).

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DRAUGHT ARRANGEMENTS IN SHOSHONG AND MAKWATE

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1. INTRODUCTION

At least until the early 1970s, cattle were the foundation of the Botswana rural economy. In addition to providing milk, meat and skins for home consumption and cash through sales, cattle were used by most households for ploughing their fields. Agricultural planners and researchers generally assumed that nearly all households owned the cattle which they used to plough their fields.

During the early 1970s, the viewpoint that most households ploughed with owned cattle was challenged. The Rural Income Distribution Study showed that around half of Botswana's rural households had too few animals to plough independently of other households [CSO, 1976]. At around the same time, Curtis [1972] described, in a study in the Manyana area, several inter-household arrangements through which a community's cattle resources are shared among households. In addition to owners ploughing with their own traction animals, Curtis identified four categories of draught arrangements:

- (a). Various forms of "putting in hands," in which members of a household without draught animals provided labour to assist a household which owned animals in exchange for ploughing being done on both households' fields
- (b). Ploughing together, in which two households each provided some animals and equipment
- (c). Hiring
- (d). Ploughing for close relatives

Since Curtis' seminal study, there have been some valuable case studies of draught arrangements being used elsewhere in Botswana. Alverson [1979] identified six categories of draught exchanges:

- (a). Providing labour in return for use of implements or cattle
- (b). Ploughing for another in return for use of the plough and oxen team
- (c). Ploughing together taking turns on each others fields
- (d). Ploughing for another in return for payment in kind
- (e). Hiring for money
- (f). Groups of people rotating to each others' fields

Behnke and Kerven [1983] presented several case studies from the Tswapong Hills which illustrated that there are complex networks of resource exchanges linking most households in a community. Behnke and Kerven argued that research which ignores linkages among households exaggerates the "economic isolation and self-sufficiency of individual households and promotes a distorted interpretation of the nature of economic relationships within and among households" [Behnke and Kerven, 1983:14].

In a valuable ethnography on "agro-pastoralism," Gulbrandsen [1980] provided further support for the proposition that household strategies cannot be properly understood without accounting for inter-household relationships. As Behnke and Kerven [1983] emphasized, this is particularly true with reference to the sharing of ploughing resources.

1.1 PROBLEM STATEMENT

It is now known that there are several ways of getting access to traction in Botswana, each associated with different rights and obligations. The patterns of rights and obligations can exert a major influence on cropping outcomes for different households. For example, draught-owning households should be able to do more of their ploughing and planting on days with good

soil moisture than can households which must depend on traction owned by other people. Untimely ploughing, stemming from a lack of draught control, often leads to inadequate and erratic plant establishment, which is one of the key constraints affecting crop production in Botswana [Oland, Alverson, Cummings, 1980; ATIP, 1986a].

Control over draught resources also affects the ability of households to implement improved technologies involving multiple tillage-planting operations. In ATIP trials, for example, households lacking control of draught resources consistently have had less success implementing trials involving either double ploughing or ploughing plus row planting than have draught-owning households [Baker, 1988]. Unequal control over draught resources, therefore, could lead to increasing income inequality among rural households since, as ATIP research has shown [ATIP, 1986a; ATIP, 1986b], double ploughing and row planting are two of the most promising interventions available to Botswana farmers. Households lacking control of draught resources would not be hurt only relatively. Since draught-owning households would need to use their draught resources more often after shifting to multiple tillage-planting operations, the access of other households to those resources would undoubtedly be reduced.

In brief, control of draught resources vitally affects both cropping outcomes and the opportunities for improving arable production. In the context of farming systems work, information about draught control contributes to problem diagnosis, targeting of recommendations, and ex ante technology impact assessments.

Despite the importance of draught control, there have been few systematic studies of the rights and obligations associated with different draught arrangements. The case studies cited above specified the nature of the primary resource exchange involved, but did not further identify the patterns of rights and obligations. Moreover, most of the case study material characterizes the specific networks of specific households, which stand in an uncertain relationship to the patterns existing in the community as a whole. An analysis of the rights, obligations, and perceptions of different arrangements based on survey data should complement the existing case studies.

1.2 OBJECTIVES

The objectives this paper are as follows:

- (a). To characterize patterns of draught use in Shoshong and Makwate villages in 1983, with particular reference to draught arrangements
- (b). To assess relationships between use of different draught arrangements and household circumstances, production practices, and cropping outcomes
- (c). To describe the managerial practices associated with use of owned animals and ploughing for relatives, and identify the rights and obligations associated with three specific inter-household draught arrangements: hiring, borrowing and cooperative ploughing
- (d). To interpret the significance of the survey findings for technological change in the light of draught use trends since 1982

1.3 SURVEY METHODS

This paper presents findings from two surveys administered in 1983: the Draught Arrangement Survey carried-out in February and the Crop Management Survey conducted in June. The core sample for both surveys was the ATIP cooperators selected in spring of 1982. The ATIP cooperators were selected using stratified random sampling procedures. The number of farmers selected in each stratum were proportionate to the representation of each stratum in the population. Therefore, the findings from the ATIP sample can be inferred to the population as a whole in the same sense as those from a random sample. Additional information on cooperator selection procedures can be found in ATIP [1986a].

The goal of the Draught Arrangements Survey was to characterize the social organization of ploughing in Shoshong and Makwate villages. The master schedule of the survey addressed ploughing situations, characteristics of households using different arrangements, and prior use of different arrangements. Five supplementary schedules addressed the use of owned traction, and the rights associated with the use of borrowed or managed traction, ploughing for or with relatives, hiring traction, or ploughing cooperatively. The supplementary schedules were administered to those households which had used each particular draught arrangement within three years preceding the survey.

The questionnaire was administered to 74 households; 50 ATIP cooperators, 11 randomly selected farmers in Makwate, and 13 additional households identified as being involved in cooperative ploughing arrangements with ATIP households. The second category of households was added to make the samples from each village approximately equal in size. The last category of households was added because few households either borrowed traction or ploughed cooperatively, relative to use of owned traction or hiring.

Because of the third group of households in the Draught Arrangements Survey, one cannot infer that the ploughing situations and household circumstances identified in that survey applied to the population as a whole in Shoshong and Makwate villages. For example, there was somewhat less ploughing for others than in the village population, because of the over-representation of households gaining access through cooperative arrangements.

To present results which can be inferred to the population as a whole, the findings on ploughing situations, presented in Section Two, and on household profiles, presented in Section Three, are drawn from the Crop Management Survey. The Crop Management Survey was administered to 116 households. The sample for the Crop Management Survey was the 50 ATIP cooperators plus 66 randomly selected households. This sample is statistically representative of the population in Shoshong and Makwate villages.

An overview of the Draught Arrangements and Crop Management Surveys sample composition is presented in Table 1. It should be noted the figures presented for "all" (in this table and other tables) refer to all survey participants, not all the population in the two villages combined. This is because the village samples are not weighted according to village population sizes. This weighting was not done because the concept of an integrated Shoshong-Makwate population has no research or policy relevance.

The findings from the 1983 surveys are supplemented with selected findings from the national Agricultural Survey, in order to characterize trends in traction used since 1982.

TABLE 1: SAMPLE COMPOSITION BY FARMER SELECTION PROCEDURE

	---ATIP---		CM SAMPLE		---DA SAMPLE---		
	MVRU	TRIAL/a	RAND	ALL	RAND	SELECT	ALL
NUMBER OF HOUSEHOLDS	27	24	65	116	11	13	74/b
	(Percent of Households)						
TYPE OF TRACTION:/c							
Donkeys	37	21	42	36	82	31	37
Cattle	30	25	39	34	18	15	24
Tractors	19	25	19	20	0	31	20
Tractors & Animals/d	11	25	2	8	0	15	15
Cattle & Donkeys	4	4	0	2	0	8	4
DRAUGHT ACCESS:							
Own or Co-Own/e	57	57	51	53	64	15	51
Borrow or Manage	8	4	10	9	18	15	9
Hire	24	34	29	24	0	23	24
Coop Arrangement	12	4	9	9	18	46	16

- a. The ATIP sample is divided into households which were participating in trials versus those which were participating in the Multiple Visit Resource Use (MVRU) Survey.
- b. One ATIP trials cooperator was not contacted in the Draught Arrangement Survey, so for that survey there were 50 ATIP farmers and 74 in total.
- c. The percentages are based on households which ploughed during 1982-83 season. Approximately 10 percent of the households did not plough that season.
- d. One household used donkeys, the rest used cattle.
- e. The Crop Management Survey distinguished between co owned and owned traction while the earlier Draught Management Survey did not. Approximately 12 percent of the households in each sub-sample co owned animals (or owned some of the animals in a draught team), rather than had complete ownership.

2. PLOUGHING SITUATIONS IN 1982-83

In 1983, 104 of the 116 households enumerated during the Crop Management Survey ploughed at least part of their field. This section summarizes the ploughing situations of these 104 households. In the context of this paper, ploughing situation refers to the types of traction used and the means used to gain access to that traction.

2.1 TYPES OF TRACTION USED

A profile of the types of traction used during the 1982-83 season is shown in Table 2. Almost the same number of households used cattle and donkeys for ploughing, but the use pattern was quite different. Nearly all the households which used donkeys, used donkeys as the sole type of traction. On the other hand, more than a quarter of the cattle-using households used a second type of traction. Most of those households hired tractors to supplement their cattle ploughing, and many in fact had more area ploughed by tractors than by cattle.

The large share of donkey using households reflects the influence of Makwate village. More than 80 percent of the Makwate households used donkeys for at

least some of their ploughing. This is atypical of villages in the Central Region. Baker [1984] reported that donkeys were the primary source of traction in approximately 15 percent of villages in the Central Agricultural Region in 1983. Donkey traction was, however, quite common in the Mahalapye East Agricultural District, which is where Makwate is located.

TABLE 2: TRACTION USED, 1982-83

	DONKEYS	CATTLE	TRACTORS	ANIMALS & TRACTORS	CATTLE & DONKEYS
NO. OF HOUSEHOLDS/a	39	30	23	10	2
	(Percent of Households/b)				
DRAUGHT ACCESS:					
Own	44	35	9	12/c	0
Borrow or Manage	22	78	0	0	0
Co-Own	46	31	0	15	8
Hire	27	7	53	10/d	3
Coop Arrangement	44	22	33	0	0
VILLAGE:					
Shoshong	9	37	39	15	0
Makwate	76	18	0	2	4
HOUSEHOLD HEAD:					
Male	31	34	27	5	3
Female	48	20	15	18	0
CATTLE ASSETS:					
0-15	56	26	14	4	0
> 15	19	32	36	15	4
ALL	38	29	22	10	2

Source: Crop Management Survey

- Does not include 12 households which did not plough in 1982-83. Of those, three previously had used donkeys and nine had used cattle.
- All percentages are based on the 104 households which ploughed.
- Own and co-own (below) refer to ownership of either traction source. In each case, the animals were owned (or co-owned) and the tractor was hired.
- Both the animals and the tractors were hired.

The relative importance of tractors was a surprising and more notable finding. In an ATIP census conducted in October, 1982, one-third of the Shoshong households reported that they had used tractor ploughing in the 1981-82 season, and only two percent percent of Makwate households had done so [Baker, Tjirongo, Monyatsi, 1983]. Within one season this increased to over 50 percent in Shoshong (although there was no change in Makwate). Therefore, in neither village were cattle the dominant traction source during the 1982-83 season. The importance of cattle relative to donkeys and tractors continued to decline during the subsequent seasons of drought.

Aside from village location, the patterns in types of traction differed according to draught access and cattle assets. Relatively few households which used owned draught, used tractors -- unless tractors were hired as a supplement. This, of course, reflects the expense of tractors. In

contrast, most households which borrowed, borrowed cattle. In most cases, this resulted from a permanent loaning of animals from elder brothers to their sisters (after fathers had died) or by fathers to their sons. Shoshong households which hired nearly always hired tractors but in Makwate households hired donkeys since tractors were not available. Most cooperative arrangements were used to gain access to donkeys. The cooperative arrangements for tractors involved driving for a tractor owner partially in exchange for being able to plough one's own field.

Poorer households, those with less than 15 head of cattle, mainly used donkeys for ploughing. This again reflects the influence of Makwate, since relatively few Makwate households had more than 15 cattle. However, more cattle poor households in Shoshong used donkeys than did cattle rich households -- as might be expected. Cattle rich households tended to hire tractors if they did not plough for themselves, accounting for the large share of rich households which used tractors (nearly half).

There were insignificant differences in traction used by gender of household head. A slightly greater share of female-headed households used donkey traction but otherwise approximately the same proportion used cattle and tractors. More male-headed households, however, used only tractors or cattle while nearly one-fifth of female-headed households had some ploughing done by both tractors and cattle.

2.2 DRAUGHT ACCESS

Table 3 identifies the primary form of draught access in 1983. Primary was determined on the basis of the greatest amount of area ploughed.

TABLE 3: PRIMARY DRAUGHT ACCESS, 1982-83

	OWN	BORROW/ MANAGE			
		CO-OWN	HIRE	COOP	
NO. OF HOUSEHOLDS/a	43	9	13	30	9
	(Percent of Households)				
TYPE OF TRACTION:					
Donkeys	49	5	15	21	10
Cattle	50	23	13	7	7
Tractors	17	0	0	70	13
Animals & Tractors	50	0	20	30	0
Cattle & Donkeys	0	0	50	50	0
VILLAGE:					
Shoshong	37	10	7	36	10
Makwate	47	7	20	20	7
HOUSEHOLD HEAD:					
Male	55	9	6	19	11
Female	20	8	23	45	5
CATTLE ASSETS:					
0-15	26	14	16	31	14
> 15	57	4	9	27	4

Source: Crop Management Survey

a. See notes a-d for Table 2.

Despite the important of tractors in 1983, the most common single means of draught access during the 1982-83 season was use of owned traction. Nevertheless, nearly 60 percent of the households either obtained their ploughing resources from other households or had to combine resources in order to form a traction team.

As is shown in both Tables 2 and 3, there were clear relationships between type of traction used and draught access. Approximately half of the donkey and cattle-using households owned the animals they used. Otherwise, cattle-using households obtained access by borrowing animals or combining owned animals with animals from others households in order to form a single team. Tractors nearly always were obtained by hiring, although there were four tractor-owning households.

Use of owned traction was somewhat more common in Makwate than Shoshong, while hiring was more common in Shoshong. Hiring was the primary form of access for nearly forty percent of Shoshong households, even though several of those households owned and used their own traction animals. In Makwate, only twenty percent hired while over a third worked out some way of gaining access through either borrowing or sharing traction resources.

There were differences in draught access by both gender of household head and wealth. A greater proportion of female than male-headed households relied on hired traction. Female-headed households also combined animals to form teams more than did male-headed households. Only one of the wealthier households borrowed traction (actually mafisa cattle), one entered a cooperative arrangement to gain access to draught, and two used co-owned teams. Otherwise, wealthier households ploughed with owned traction or, if they could not do so, hired a tractor.

2.3 SECONDARY TRACTION AND ACCESS ARRANGEMENTS

Data on the use of a second type of traction or access arrangement are summarized in Tables 4, 5 and 6. As can be seen in Table 4, one quarter of the households used a secondary draught arrangement or type of traction in 1983. There were no significant differences in the proportions using a second traction or access arrangement by village, primary type of traction used, or gender of household head.

TABLE 4: USED A SECOND TRACTION OR ACCESS ARRANGEMENT

	# HH/a	% USE		# HH	% USE
PRIMARY ACCESS:			PRIMARY TRACTION:		
Own	43	27	Donkeys	40	20
Borrow/Manage	9	0	Cattle	36	25
Co-Own	13	33	Tractors	28	29
Hire	30	27			
Cooperate	9	11	HOUSEHOLD HEAD:		
			Male	64	25
VILLAGE:			Female	40	23
Shoshong	59	25	CATTLE ASSETS:		
Makwate	45	22	0-15	51	14
ALL	104	24	> 15	53	34

Source: Crop Management Survey

a. Number of households which ploughed during 1982-83 season.

There were significant differences in use of a second traction or access arrangement by wealth and primary access arrangement. In both cases, this seems to reflect a greater degree of flexibility. For example, several households which used owned animals had the money to supplement with hired tractor, while several who hired had the money to hire multiple types of traction (Table 6). Households which primarily used owned traction also were able to supplement their own ploughing providing traction in exchange for additional ploughing labour.

TABLE 5: RELATIONSHIP BETWEEN PRIMARY AND SECONDARY TRACTION

	DONKEYS	CATTLE	TRACTORS
NUMBER OF HH/a	40	36	28
	(Percent Also Using)		
DONKEYS	8/b	9	7
CATTLE	10	5/b	18
TRACTORS	3	11	4/b
NO OTHER	80	75	71

Source: Crop Management Survey

a. Primary was determined on the basis of the greatest amount of area ploughed.

b. Same type traction, second arrangement.

TABLE 6: RELATIONSHIP BETWEEN PRIMARY AND SECONDARY ARRANGEMENT

	OWN	CO-OWN	MANAGE	HIRE	COOP
NUMBER OF HH	43	9	13	30	9
	(Percent Also Using)				
OWN	2/a*	0	0	0	0
CO-OWN	2	8/a	0	7	0
OWN - GET LABOUR/b	9	8	0	3	0
BORROW/MANAGE	2	0	0	7	0
HIRE	11	8	0	10/a	0
COOPERATIVE	0	8	0	0	11/a
NO OTHER	73	67	100	73	89

Source: Crop Management Survey

a. Same type of arrangement, different traction.

b. Used owned traction but obtained labour through a cooperative arrangement.

Relatively few households which primarily gained access through borrowing or cooperating used a second access arrangement. This is because most of these households had no traction to offer, already had used their labour to gain initial access, and had little money to hire. Most of the second access arrangements used by co-owning households were nothing more than slight variations of cooperative and hiring arrangements used to supplement the initial co-owning.

Fewer donkey-using households used any other type of traction than was true

of either cattle or tractor-using households. This reflects the dominance of donkeys in Makwate and the fact that access to donkeys was so much less expensive than either cattle or tractors. Several cattle using-households had the money to supplement with tractors, while most donkey-using households were poor and just had to plough more often if they wanted more area ploughed.

3. PROFILES OF HOUSEHOLDS USING DIFFERENT ARRANGEMENTS

This section explores correlations between draught access arrangements and various household characteristics. Two issues are addressed. The first is whether there are notable differences in the resource bases of households using different draught access arrangements. Such differences might explain in part why different access arrangements are observed. The second is whether different access arrangements are correlated with the amount and timing of ploughing or the use of different tillage/planting practices. The second issue pertains to the impact of draught access on cropping systems performance, as was mentioned in the introduction.

3.1 HOUSEHOLD CIRCUMSTANCES

In order to identify relationships between draught access and household resources, selected data on household demographic features, income sources, and farm productive capital are presented for households in different draught access categories in Tables 7, 8, and 9. The numbers of households in each category were given in Table 3. There were relatively few borrowing and cooperating households (nine in each category) and this should be remembered when findings are discussed.

TABLE 7: HOUSEHOLD DEMOGRAPHIC STRUCTURE

	BORROW/ OWN/a				
	MANAGE	CO-OWN	HIRE	COOP	
HOUSEHOLD SIZE:					
# < 16	4.7	3.8	3.9	3.5	6.3
# > 15	5.1	4.1	4.2	4.4	5.7
HOUSEHOLD HEAD:					
% Male	81	67	31	40	78
% Resident	98	100	70	97	78
Average Age	60	63	51	59	58
ACTIVE IN GROWING CROPS:					
% With 1-2	40	33	54	57	33
% With 3-4	42	56	23	23	22
% With > 4	19	11	23	20	44
WAGE EMPLOYEES:					
% With 0	23	56	15	20	44
% With 1	37	22	46	50	33
% With 2	19	22	39	23	22
% With > 2	21	0	0	7	0

Source: Crop Management Survey
a. See notes a-d for Table 2.

Household demographic structures are characterized in Table 7. The table

shows that cooperating and owning households had more potential and actual labour resources devoted to cropping activities than did households in the other categories. This is reflected in the number of resident adult members and in the proportions of households having more than two members involved in cropping activities. Hiring and co-owning households had slightly more resident adults, but devoted fewer of those labour resources to crop production. Inadequate labour resources might have been a major reason households turned to hiring or combining traction teams. In contrast, a surplus of labour in conjunction with inadequate traction resources would have been a major incentive for entering a cooperative arrangement.

There were clear differences across categories in the characteristics of household heads, particularly for the co-owning category. Co-owning households tended to be headed by younger individuals, and a majority were female headed. A majority of hiring households also were headed by females. On the other hand, four of five owning household were headed by resident males. With the exception of co-owning households, there was no apparent relationship between age of household head and draught access.

Owning, co-owning and hiring households generally had more members with wage employment than did borrowing and cooperating households. Nearly ninety percent of the borrowing and three-quarters of cooperating households had fewer than two members with wage employment. This might have been why these households borrowed or cooperated; they lacked the traction to plough on their own and lacked the money to hire.

TABLE 8: SOURCES OF CASH INCOME

	BORROW/ MANAGE				
	OWN	CO-OWN	HIRE	COOP	
	(Percent of Households/a)				
NO. OF INCOME SOURCES:					
1 or 2	49	33	23	23	33
3	28	67	54	50	67
> 3	23	0	23	27	0
PRIMARY SOURCE:					
Sell Cattle	56	33	23	27	22
Sell Beer	9	44	31	27	22
Remittances	9	11	39	30	22
Wage Labour	21	11	8	13	22
Sell Other HH Prod.	0	0	0	3	11
Sell Crops	2	0	0	0	0

Source: Crop Management Survey

a. Based on number of households shown in Table 3.

The importance of access to cash resources is substantiated in Table 8. All borrowing and cooperating households had three or fewer cash income sources. Moreover, selling beer or other household products -- both of which generate small amounts of cash income -- were the primary cash income source for at least a third of the households in both categories. In contrast, 60 to 75 percent of the households in the other draught access categories had three or more income sources. Owning households undoubtedly were the best off with respect to cash income since nearly 80 percent considered selling cattle or wage labour to be their primary source of cash income. Both

sources tend to be substantial, at least relative to beer brewing or remittances. Remittances can be large and play a major role in providing the cash necessary to hiring traction, but often are irregular.

TABLE 9: FARM PRODUCTIVE CAPITAL

	OWN/a	BORROW/ MANAGE	CO-OWN	HIRE	COOP
NO. OF CATTLE:					
% With 0	9	22	54	37	56
% With 1-15	21	56	8	17	22
% With 16-35	30	22	15	23	0
% With 36-70	21	11	15	20	0
% With > 70	19	0	8	3	22
NO. AGR. IMPLEMENTS:					
% With 0	7	22	69	43	56
% With 1	51	56	23	40	22
% With > 1	42	33	8	17	33
FIELD:					
Years Cultivated	20	15	19	23	22
% Years Plant All	55	52	60	49	16
Destumping:					
% Complete	45	22	46	40	33
% Partial	43	0	31	50	56
% Little or None	10	78	23	10	11
Field Fencing:					
% None	26	78	17	32	67
% Bush	14	11	33	29	22
% Wire	61	11	50	39	11

Source: Crop Management Survey

a. Number of households per category shown in Table 3.

The relative income positions suggested in Table 8 show up with respect to cattle wealth in Table 9. Borrowing and cooperating households tended to have the fewest cattle. Co-owning and hiring households were somewhat better off. Owning households clearly were the richest. Between hiring and co-owning households, those hiring tended to be richer as is indicated by equipment ownership as well as the proportion with more than 16 cattle.

Owning households again were the best off category with respect to implements and field resources, followed by co-owning and hiring households. While borrowing and cooperating households were in the worst situation, their circumstances with respect to implements ownership and field resources (as well the human resources pointed out above) were quite distinct. More borrowing households had implements and more planted all of their lands each season - reflecting a greater ability to plough the land which was available. Cooperating households fully used their land resources less than did households in any other category, undoubtedly reflecting draught access constraints. Both borrowing and cooperating households had less developed land resources with reference to fencing and destumping than did any other draught access category.

In summary, there were clear differences in the resources available to households in the different draught access categories. Owning households had the most resources and the greatest number of incomes sources. Hiring households tended to be richer than households in the remaining categories, but often lacked labour or equipment for ploughing. At least some hiring households chose to hire even though they had their own traction animals. Borrowing and cooperating households tended to be poorest.

One might hypothesize based on the above results that using owned traction would be the first preference of most households. Hiring appeared to be a second best choice for households having access to cash income. Co-owning households had resources which were quite similar to hiring households and perhaps chose to not hire in order to save cash. Borrowing and cooperating were the arrangements used by households having the fewest resources. Cooperating households cooperated because they had the labour to do so, while borrowing households were lucky enough to have relatives or friends from whom they could borrow.

3.2 TIMING AND AMOUNT OF PLOUGHING

In the introduction it was postulated that the relative control of draught resources implicit in different draught access arrangements should impact on the timing and amount of ploughing, and therefore on cropping outcomes. This section confirms that in 1983 there were significant relationships between the timing and amount of ploughing and draught access arrangements. The second relationship -- that between the timing and amount of ploughing and cropping outcomes -- could not be confirmed in 1983 because little was harvested due to drought. However, this second relationship was confirmed in plot monitoring in both the 1983-84 and 1984-85 seasons [ATIP, 1986].

Relationships between the timing of ploughing and draught access categories are characterized in Table 10. The control over timing by owning households is apparent. Seventy percent started ploughing before December and only two owning households failed to start until January.

TABLE 10: MONTHS PLOUGHING STARTED AND ENDED, 1982-83

	OWN	BORROW/ MANAGE	CO-OWN	HIRE	COOP
	(Percent of Households/a)				
PLOUGHING STARTED:					
Before November	30	55	31	13	11
November	40	0	31	13	44
December	26	11	23	43	11
After December	4	33	15	30	11
PLOUGHING ENDED:					
Before December	?	0	23	10	33
December	47	22	46	45	11
January	40	44	31	34	22
After January	9	22	0	10	22

Source: Crop Management Survey

a. Based on number of households given in Table 3. Note that percentages for borrowing and coop based on only 9 hhs per category.

More than half the borrowing, co-owning and cooperating households also started before December, but there still may have been timing problems. For example, one-third of the borrowing households did not start until after January. More than twenty percent of the borrowing and cooperating households continued ploughing past January, even though the probability of success substantially drops off for February and March plantings [ATIP, 1986a]. A large share of both co-owning and cooperating households did not, on the other hand, do any ploughing after November -- even though some the best rains fell in December. Ploughing undoubtedly would have been done if traction and labour resources had been available.

The worst draught access category with respect to timing clearly was hiring. Nearly three of four hiring households were unable to start ploughing until December or later. Moreover, eighty percent of the hiring households which started before January also ended before January. Similarly, most of the households which started in January also ended in January. This suggests quite clearly that hiring households had a small window in which most ploughing was done. This substantially increases the risk inherent in growing crops in an erratic rainfall environment.

The potential vulnerability of hiring households is further illustrated in Table 11, which shows the days of ploughing in the 1982-83 season. Hiring households did their ploughing on an average of just over two days during the season. Most of this ploughing was done by tractors and the average area ploughed per day was quite substantial (relative to the amount ploughed per day by households in other draught access categories).

TABLE 11: DAYS OF PLOUGHING, 1982-83

MEANS:				
PRIMARY ACCESS:		TRACTION USED:		
Own	7.7	Donkeys	6.1	
Borrow/Manage	11.4	Cattle	6.0	
Co-Own	4.7	Tractors	3.8	
Hire	2.1	Tractors & Animals	4.4	
Cooperate	3.2	Cattle & Donkeys	6.5	
VILLAGE:		CATTLE ASSETS:		
Sheshong	4.4	0-15	4.6	
Makwate	6.1	> 15	5.6	
HOUSEHOLD HEAD:		ALL	5.1	
Male	6.1			
Female	3.7			
REGRESSION:	B	STD ERR	T/a	VARIABLE
	8.0			Constant
Adj R-sq:	-2.1	.89	-2.4 *	0,1 if Tractor Used
.40	2.7	1.34	2.0 *	0,1 if Borrow
F(5,95):	-3.2	1.19	-2.7 **	0,1 if Co-Own
14.2	-4.7	.97	-4.8 **	0,1 if Hire
	-4.1	1.34	-3.1 **	0,1 if Coop

Source: Crop Management Survey; HHS which ploughed
 a. Significance level: * = >.95; ** = >.99.

The number of ploughing days by hiring households can be compared to averages of nearly eight days for owning households and over eleven days for borrowing households. As will be argued below, owning and borrowing households have the greatest control over the timing and amount of ploughing. (The reason why owning households ploughed fewer days than borrowing households is that several had the money to supplement their own ploughing with hired tractor ploughing, and therefore ploughed on fewer days.)

Table 11 also shows how many days were spent ploughing according to village, gender of household head, traction type and wealth. This shows the indirect impacts of draught access. For example, relatively more Makwate, male-headed, and animal-using households gained access through owning than through hiring or cooperating. Correspondingly, these households tended to plough on more days during the season than did Shoshong, female-headed and tractor-using households, respectively.

The regression results presented in Table 11 stem from an attempt to isolate the relative importance of different factors in influencing the number of days ploughed. An initial regression equation included 0,1 indicator variables for village, gender of household head, types of traction, cattle assets and draught access categories. After backwards elimination, four of the five remaining significant variables related to draught access categories. The base for the regression presented in Table 11 is owned animal draught. The coefficients show significant differences regardless of village location, gender of head or cattle assets. The regression reflects the pattern shown in the first part of Table 11 and confirms that draught access is the most important factor affecting the number of ploughing days.

There were relatively smaller differences in the amount of area ploughed across access categories than in the timing and days of ploughing, as can be seen in Table 12. Nevertheless, owning and borrowing households each ploughed around 50 percent more area than did co-owning, hiring and cooperating households. Since most Batswana farmers try to plough as large of an area as possible, this difference undoubtedly reflects greater control over ploughing resources.

Makwate households did not plough as much area as did Shoshong households, despite there being relatively more owning households, because of reliance on donkeys rather than cattle and tractors. Donkeys plough slower. Thus, the amount ploughed is a function of the type of traction used as well as control over the timing and days of ploughing.

Table 12 also presents the results of a regression analysis of the amount of area ploughed. As with the days regression analysis described above, an initial regression included a number of village and household variables. After backwards elimination, only three access and one household variable were significant. The regression coefficients for the access variables reflect the means presented in the first part of the table and, overall, the regression analysis confirms that draught access arrangement was more significant than village, gender of head or type, or traction used in determining how much area was ploughed in the 1982-83 season.

TABLE 12: HECTARES PLOUGHED, 1982-83

MEANS:/a

PRIMARY ACCESS:		PRIMARY TRACTION USED:	
Own	3.6	Donkeys	2.5
Borrow/Manage	3.3	Cattle	2.7
Co-Own	2.2	Tractors	3.4
Hire	2.4	HOUSEHOLD HEAD:	
Cooperate	2.2	Male	3.3
VILLAGE:		Female	2.1
Shoshong	3.0	CATTLE ASSETS:	
Makwate	2.4	0-15	2.0
		> 15	3.7
ALL	2.8		

REGRESSION:	B	STD ERR	T/b	VARIABLE
	8.0			Constant
Adj R-sq:	1.2	.31	3.8 **	0,1 if Own >15 Cattle
.22	-1.0	.49	-2.1 *	0,1 if Co-Own
	-1.0	.35	-2.8 **	0,1 if Hire
	-1.0	.56	-1.7 *	0,1 if Coop

Source: Crop Management Survey; HHs which ploughed

a. Traditional acres were converted to hectares using the ratios derived from ATIP plot monitoring data: one donkey-ploughed acre = 0.25 ha; one cattle-ploughed acre = 0.33 ha; one tractor-ploughed acre = 0.40 ha. Conversions were based on the primary traction type used by each household.

b. Significance level: * = >.95; ** = >.99.

3.3 USE OF PROGRESSIVE TILLAGE-PLANTING PRACTICES

In the introduction, it was argued that draught access not only influences cropping outcomes, it affects the ability of households to try multiple tillage-planting operations. This could not be directly tested in 1983 because few households used any type of multiple tillage-planting system, regardless of draught access. However, in the Crop Management Survey, respondents were asked whether anyone in the household had use any of a number of progressive farming practices. Five of the practices were tillage-planting practices (although not necessarily requiring multiple operations). These questions provide an opportunity to analyse associations between draught access arrangements and use of progressive tillage-planting practices. Results are summarized in Table 13.

The differences in Table 13 by draught access arrangement are quite stark. With the exception of the relatively obscure practice of hand furrow planting, more owning households had used the five practices than households in any other category. It is particularly notable that over seventy percent of owning households had early planted. Relatively high proportions of the borrowing households had tried the various practices but few households in the remaining three categories had tried any practice except early planting. The findings in Table 13 suggest there may be substantial differences between owning and borrowing households versus the remaining households when it comes to the possibility of implementing new tillage-planting practices.

TABLE 13: PROGRESSIVE TILLAGE-PLANTING PRACTICES, 1982-83

	OWN	BORROW/ MANAGE			
		CO-OWN	HIRE	COOP	
Early Plant	72	44	31	17	0
Early Plough w/o Plant	19	11	0	0	11
Row Plant	19	11	0	3	0
Harrow	28	22	0	0	0
3rd Furrow Hand Plant	7	11	8	0	0

Source: Crop Management Survey; HHs which ploughed
 a. Households which have ever used the practice. Based on numbers of households given in Table 3.

4. REASONS FOR USING OR NOT USING ARRANGEMENTS

One of the important issues addressed in the Draught Arrangement Survey was why households use or do not use different draught access arrangements. Information on this issue sheds insight into household preferences for different arrangements, perceptions of the advantages of particular arrangements, and constraints on using preferred arrangements. Findings on this issue are summarized in this section.

This section and Section 5 are based on the Draught Arrangements Survey and, therefore, a somewhat different sample from Sections 3 and 4. This was discussed in the introduction and a summary of the sample composition was shown in Table 2. There is no reason to believe that the results discussed for each access arrangement are atypical for households using that arrangement even though the sample composition prevents inference to the population as a whole.

4.1 CURRENT ARRANGEMENTS

The reasons given by respondents for using different primary and secondary arrangements are summarized in Table 14. As of the 1982-83 season, use of owned traction clearly was the preferred draught access arrangement. Ninety percent of the respondents from households which ploughed alone with owned traction felt it was sufficient to say that they did so because there were no resource constraints preventing them from doing so. Conversely, most of the reasons given for the other arrangements suggest some sort of resource constraint.

Table 14 shows that for many households labour was a more important constraint than draught resources. This was particularly true for hiring households and households which used owned traction while cooperating to get additional labour. Lack of draught resources did, however, become a relatively more important constraint than labour shortages during the drought because few traction animals were fit for ploughing.

The primary motive for sharing resources did not always stem from self interest. Several households which cooperated or combined draught resources said they did so in order to help other households, often times members of the extended family. A key issue when monitoring the impact of technologies requiring multiple tillage-planting operations is whether households will be

less willing to help other households once the opportunity cost of doing so is higher.

TABLE 14: REASONS FOR USE OF ARRANGEMENTS

	RANK	REASON	# RESP.
PRIMARY ARRANGEMENTS:			
Own Alone	1.	Have enough traction, labour	19
	2.	Family obligation	2
	3.	Lack money to hire	1
Co Own	1.	To help other co-owner	4
	2.	Lack enough draught	2
	3.	Other owner could not use	1
Borrow/Manage	1.	Lack draught	4
	2.	Better than hiring or coop	2
	3.	Owner could not use	1
Hire	1.	Labour constraint	9
	2.	Lack draught	7
	3.	To supplement own draught	3
Coop-Get Labour	1.	Labour constraint	5
	2.	To help labour provider	2
Coop-Get Draught	1.	Lack draught	10
	2.	Family obligation	1
	2.	Lack money to hire	1
SECONDARY ARRANGEMENTS:			
Co-Own	1.	To supplement draught	2
	2.	To help other person	1
Hire	1.	To supplement draught	11
	2.	Labour shortage	1
Coop-Get Labour	1.	To supplement labour	6
	2.	To help other person	2
Coop-Get Draught	1.	To supplement draught	3
	2.	To help other person	1

Source: Draught Arrangements Survey

Regardless of the primary access arrangement, the most common motive for entering a second arrangement was to secure more resources in order to increase the area ploughed. For example, several households which did most of their ploughing alone with owned animals also cooperated in order to gain access to additional labour and thereby were able to plough more area earlier in the season. Other owners supplemented their own ploughing by hiring a tractor.

4.2 PAST ARRANGEMENTS

A historical perspective on draught access arrangements was obtained by asking which arrangements had ever been used, even if no longer being used. A summary of the different arrangements used by the sampled households at some time is presented in Table 15. In Table 15, owning and co-owning are combined since in both cases these households provided some or all the traction involved.

TABLE 15: HAVE EVER USED DIFFERENT ARRANGEMENTS

MAIN TRACTION 82-83:	OWN OR BORROW/		HIRE	COOPERATE
	CO-OWN	MANAGE		
(Percent HHs Having Ever Used:)				
ALONE:				
Own Draught	73	0	56	8
Borrowed	5	100	11	0
RELATIVES:				
For	30	17	6	8
By	51	50	11	8
HIRE:				
In	32	17	100	31
Out	8	17	0	0
COOPERATE:				
Get Labour	32	0	6	0
Get Draught	5	17	6	100

Source: Draught Arrangements Survey

Table 15 suggests that there had been a shift toward less independence in ploughing during the years preceding the survey. More than half the households which primarily hired in the 1982-83 had formerly ploughed alone with owned traction. Several households which gained access by cooperating also had at one time ploughed alone with owned traction. Nearly a third of the households which primarily used owned traction had hired draught, but many of those households had only hired during the 1982-83 season or the previous season.

More than half the households which used owned or borrowed draught had ploughed for relatives, and these households did so quite regularly. There undoubtedly was a social obligation to help other households if possible. At the same time, relatively few households had ever hired out, even though making resources available on a hire basis clearly could help other households. Apparently, the motive for hiring out was to generate cash income — not to increase access through custom hire operations.

Households which no longer used particular access arrangements were asked why they no longer did so. Findings are summarized in Table 16. There were relatively few responses, so no firm conclusions can be drawn. Nevertheless, the preference for using owned draught, and the previously identified relationships between timeliness, resource constraints and access arrangements are again evident. Most households which no longer ploughed with owned draught had stopped due to draught or labour shortages. On the other side, most households which had stopped cooperating or hiring-in draught had stopped to avoid late planting or because they had obtained their own draught and labour.

TABLE 16: REASONS NO LONGER USE DIFFERENT ARRANGEMENTS

	RANK	REASON	# RESP.
USE OWN:	1.	No longer enough labour	7
	2.	No longer enough animals	5
	3.	To avoid planting late	2
	4.	Not want to use oxen for draught	1
COOPERATE:	1.	To avoid late arrival	3
	1.	Owner stopped	3
	3.	Now have enough draught	2
	4.	Cooperator stopped	1
HIRE-IN:	1.	Started cooperative arrangement	2
	1.	Lack money	2
	3.	Now have enough labour	1
	3.	Owner of draught stopped	1
HIRE-OUT:	1.	No longer enough animals	1
	1.	Not want to use oxen	1
	1.	To avoid late planting	1

Source: Draught Arrangements Survey

4.3 ARRANGEMENTS NEVER USED

Farmers often have an easier time saying why they do not do things than why they do. Therefore, respondents who had never used owned traction, cooperated or hired draught were asked why. Findings are shown in Table 17.

TABLE 17: REASONS NEVER HAVE USED DIFFERENT ARRANGEMENTS

	RANK	REASON	# RESP.
USE OWN:	1.	Lack draught	7
	2.	Labour shortage	5
	3.	Too old	1
COOPERATE:	1.	Not get reliable or timely access	10
	2.	Has enough draught and labour	7
	3.	Too old	5
	4.	Labour shortage	4
	5.	No one asked	2
	6.	Only have time for own ploughing	1
	6.	Doesn't want relative to rely on him	1
6.	Not want oxen to plough so much	1	
HIRE:	1.	Too expensive	15
	2.	Has enough draught and labour	6
	3.	Prefer to be active	5

Source: Draught Arrangements Survey

Although there were again relatively few responses, the table makes it clear that in 1983 farmers did not plough with own traction and labour only because they could not. If they could not plough alone with owned traction, they hired unless they found hiring to be too expensive. Many farmers lacking draught resources avoided cooperative ploughing, in favour of hiring, because they could not ensure reliable or timely access to ploughing resources. The negative consequences of cooperative ploughing for reliable and timely access were perceived by draught owners as well.

4.4 PLOUGHING FOR OTHERS

Since many households lack the labour and/or draught resources to plough on their own, an important draught access question is who ploughs for others, and why. This issue in part determines how widely scarce draught resources are likely to be shared throughout a community.

Nearly half the households which participated in the Draught Arrangements Survey reported that they ploughed for other households during the 1982-83 season. The main factor influencing whether a household ploughed for another household was the primary draught access arrangement. Three out of four owning and co-owning households ploughed for other households, as did two-thirds of borrowing households. Together, these households accounted for 94 percent of the households which ploughed for other households during the season. Around 15 percent of the cooperating households ploughed for others (outside the context of their cooperative arrangement), while none of the households which primarily relied on hiring did any ploughing for other households.

More households in Makwate (60%) ploughed for others than did households in Shoshong (37%), reflecting the fact that more Shoshong households relied on hiring traction and were not in a position to help other households (even though they tended to have more oxen to serve as traction animals). For the same reason, more male-headed households ploughed for others than did female-headed households. In fact, three-quarters of the households which ploughed for other households were headed by males.

Most of the time ploughing was done for other households, it was for immediate family members. Only 17 percent of the households which ploughed for others, ploughed for non-relatives. However, ploughing for relatives was not just done for family help. Overall, 41 percent of the households reported they ploughed for others due to family help while 38 percent said it was due to a cooperative arrangement. Only one in five households which ploughed others said it was due to hiring (some of which was done for relatives).

5. FEATURES OF DIFFERENT ARRANGEMENTS

The distinguishing features of five draught access arrangements are identified in this section. The focus is on factors affecting access to and use of traction resources. The information presented is based on the five supplementary schedules of the Draught Arrangements Survey.

The section begins with a review of management practices for owned traction. This is followed by an assessment of ploughing with and by relatives. While ploughing with, for or by relatives might result from any of several reasons, it is quite a common occurrence in the surveyed villages. An

important issue is whether relatives have special rights which distinguish relative-based access arrangements from other access arrangements. The section ends with a summary of the rights and obligations associated with three of the most important inter-household draught arrangements: hiring, cooperating and borrowing.

5.1 MANAGEMENT OF OWNED TRACTION

The schedule dealing with management of owned traction was administered to thirty households. Of these households, 13 used donkeys, 16 used cattle and one owned a tractor. Seventeen households were from Shoshong East and the rest were from Makwate. Data were collected on several issues, including the following:

- (a).How many animals are used
- (b).How long animals are used
- (c).Whether animals are fit to start ploughing when the rains begin
- (d).The length of time spent training animals
- (e).The number of people involved in ploughing
- (f).Ploughing for others
- (g).Livestock damage to crops
- (h).Options if owned traction was not available

Most of these issues affect the timing and amount of ploughing done by the owning household, and the availability of owned traction for other households.

Half of the households ploughed with six animals, while the rest used four, eight or ten animals. Cattle-using households generally used more animals than did donkey-using households. For example, half of the cattle-using households ploughed with eight or ten animals compared to only two (15%) donkey-using households. Over a third of the households using donkeys used only four animals but no household using cattle ploughed with just four animals.

There was no consensus on how long animals should be used. The most common response for cattle users was three to four years. Cattle users usually took into consideration when animals were the proper age to be sold for beef. Only one of five cattle users said that cattle can be used for ploughing without their price falling. One-third said cattle could be used only for one or two seasons before the price would begin to fall, while three cattle users said they could use their animals for more than four years before the price would fall. Donkey users were not very concerned about the issue since selling donkeys was not anticipated.

As of the 1982-83 season, most respondents said their animals usually were strong enough to begin ploughing in October. Half the respondents, however, qualified their answer by saying it depended on whether rains had been good during the prior season. Recognition of this relationship could eventually form the basis of a campaign to promote forage crops. There is likely to be greater interest in forage crops, or other supplements, than among donkey users. For example, in the 1983 sample, less than 40 percent of donkeys users had ever provided supplemental feed, salt or medicine to their traction animals compared to nearly 90 percent of cattle users (a significant difference at > 0.99 confidence level).

Approximately a third of the respondents said ploughing could begin after no or a single day of training. Another third said only two to three days were required for training. Cattle users generally indicated longer periods were

needed for training than did donkey users. Nevertheless, regardless of type of animal used, training generally did not delay the start of ploughing.

More people were involved in the ploughing operation when cattle were used, 3.6 on average compared to 2.5 when donkeys were used. Tractor use, of course, required the fewest people. An important social obligation on ploughing days was to provide food to those who were working. In most households, preparing food was the responsibility of the wife of the household head. In almost 90 percent of the households the person preparing the food also helped with ploughing.

Just over half the households had ploughed for relatives but only a third had ever hired out traction. Respondents from those households which had not ploughed for relatives generally said their relatives had their own draught or said that they had not been asked to plough for relatives. Only four of those households not ploughing for relatives indicated they would plough even if asked. Of the households which had never ploughed for hire, most respondents said they felt ploughing for hire would not allow them to finish their own fields and six said they had never been asked. The remaining two expressed concern about overworking their animals.

More than two-thirds of the animal-using households reported that their animals had caused damage to the respondent's or other people's fields. Nearly all the households which acknowledged damage said they had made payments for the damage. Despite the potential for damage, 85 percent of donkey users and 44 percent of cattle users kept their traction animals at or near the lands compound after the ploughing period was over.

Nearly half the respondents said their household would turn to cooperative ploughing if there was too little labour or animals to plough on their own. The second most common alternative would have been to hire. Only two respondents said their household would have hire labour, while the respondent for the remaining household said they would manage to continue ploughing on their own by waiting to plough until after school, or by buying a double furrow plough.

5.2 PLOUGHING FOR OR WITH RELATIVES

Social obligations to plough for or with relatives can constrain the freedom of draught-owning households to plough when they want. If the perceived loss of control is significant, fewer owning households might be willing to plough for or with relatives than would otherwise be the case -- thereby reducing the pool of draught resources available to a community.

To examine effects on draught control by owning households, one schedule of the Draught Arrangements Survey addressed ploughing for, with or by relatives. This schedule was administered to 21 households. Of these households, thirteen had ploughed for relatives, seven had ploughed together with relatives and one had had ploughing done by relatives. Nine households were from Shoshong East and twelve were from Makwate. (In presenting findings, results from the household that had had ploughing done by relatives are included with those from households which had ploughed with relatives since in both situations these households were more dependent on relatives than were the households which had ploughed for relatives.)

According to the respondents, ploughing for relatives most often was done in order to help the relatives, while ploughing with relatives always stemmed from some type of cooperative arrangement. In most cases when ploughing was done for relatives, the surveyed household owned both the traction and the

equipment used to plough for relatives. On the other hand, when ploughing was done with relatives, the traction usually was not owned by the respondent. In four cases the respondent did provide some of the equipment used. In twelve cases where ploughing was done with relatives, each household involved provided some of the resources used for ploughing.

There was no clear pattern as to which relatives were involved. Most frequently the relative was a sister but in other cases it was a son or daughter or a parent, uncle or aunt. In nearly all cases, the respondents claimed that ploughing was done for or with relatives as a result of family obligation, even though an outsider would view it as a cooperative arrangement benefiting both households. There was never any gift or payment made to the household providing the traction.

The owner of the traction generally had the dominant say over the schedule for ploughing. However, more than one third of the respondent said that the eldest relative had the final say regardless of who owned the traction. Most of the respondents ploughing for relatives said they decided when there was enough moisture to plough since they provided the traction animals. Those ploughing with relatives (and who generally did not provide animals) usually said the decision over soil moisture was a joint decision.

In just over half the cases, ploughing was not done on both fields. When ploughing was done for the relative only, either three days or a week of ploughing was done for the relative (during the entire season). For the cases where ploughing was done on both fields, two to three days were most commonly spent on one field before shifting to the other field.

In all but one case, the respondents said there would be an obligation to replough if germination failed. Less than half though said there would be an obligation to share the harvest if the field of one relative failed. Another eight households, however, said that the harvest would be shared in case of crop failure on one field if other cropping activities were shared besides ploughing. This was not likely since only one household of the twenty-one shared other activities with their relatives.

Few respondents were concerned about disputes arising among the relatives. Nearly half said they had never had a dispute and several others said they could merely discuss the problem and find a solution. Some said that the traction owner would make a decision any time a dispute came up. In the few cases where the notion of disputes was taken seriously, the respondents said they could turn to hiring draught or would split the traction team and plough alone. Essentially all the respondents expected that ploughing would be done for or with the same relative during the following season.

In summary, ploughing for relatives mainly resulted from a social obligation to help less fortunate family members. When and how much ploughing was done usually was at the discretion of the traction provider. In fact, relatives seemed to have few rights under this arrangement. The control over draught of a traction owner should not have been significantly hindered by the fact that ploughing was done for relatives.

Ploughing with relatives was viewed much more as a normal cooperative ploughing arrangement. Both participating households had obligations and rights. While the traction providing household retained much control over draught, there would have been times when that household would have been obligated to plough at the discretion of the relative. From a crop production standpoint, the rights and obligations associated with ploughing with relatives were little different from cooperative arrangements with non-relatives.

5.3 HIRING TRACTION

The schedule on traction hiring was administered to 39 households which had hired traction and six households which had hired out traction. Sixteen cases were from Makwate, the rest were from Shoshong East. In 12 cases donkeys had been hired. Cattle had been hired in another 12 cases. The remaining 21 cases involved hiring tractors.

Only one-fourth of the respondents from hiring households said they would have wanted to hire a different type of traction than the type they did. Most households were satisfied with the type of traction they hired while the rest felt they had no choice. In fact, there was little choice since, at the time, there were no tractors available in Makwate and very few donkeys were being used in Shoshong East.

When queried as to the advantages and disadvantages of different types of traction, respondents said donkeys were easier to use and had more stamina than cattle. However, donkeys were seen as being too slow and concern was expressed about the ability of donkeys to plough heavy soils. The main advantages of cattle were that they were cheaper than tractors and faster than donkeys. As to disadvantages, cattle were seen as being slow compared to tractors and often were available for hire only late in the ploughing season. Two households pointed out they lacked the labour to use cattle. The single cited advantage of tractors was their speed relative to animal traction and the only complaint was their expense. Tractors were more than double cattle hire rates and three to four times higher than donkey hire rates.

In almost 40 percent of the cases, the people involved in the hiring arrangement were relatives. Nevertheless, hiring a relative did not seem to give the person hiring any additional rights. For example, in all but four cases a complete payment was made at the time of ploughing. In most cases, the person hired provided the plough and the person hiring provided food.

The time of ploughing generally was scheduled by the person who hired. However, ploughing often was not done when scheduled. Reflecting this problem, the most common reason for hiring the person who was hired was that the person was available when needed. If soil moisture seemed to be insufficient, the person hiring did have the right to say that ploughing should be delayed until another rain. This would be a difficult decision for hiring households. Reploughing was rarely done if germination had failed after a first ploughing, but there would also be uncertainty as to whether the tractor driver would actually come on the next rain. Reploughing generally was done only if there was substantial early weed development, demonstrating that the first ploughing had been poorly done.

The most common source of cash used for hiring was remittances. Nine households sold livestock in order to hire draught, eight sold beer or thatching grass, and four relied on monthly wages. In other words, for all households, the cash cost of hiring draught required a transfer of funds from non-cropping activities to subsidize the crop production enterprise.

Most of the households hiring animals said they would have ploughed with their own animals if they had had enough healthy animals. Many of the households hiring tractors lacked labour for ploughing and so half the respondents from those households said they would have continued to hire tractors even if animals had been available.

As was true of arrangements between relatives, people hiring traction were not concerned about disputes. Most felt that any disputes could be discussed and resolved. One common resolution was to do more ploughing or some reploughing. In only two cases was it reported that a dispute had led to a price reduction. Most disputes were avoided by having a senior member of the hiring household present at the time of ploughing.

5.4 COOPERATIVE PLOUGHING

Thirty-two households responded to the schedule dealing with cooperative ploughing, half in Shoshong East and half in Makwate. Twenty households had provided labour or equipment to gain access to traction while 12 had provided animals in exchange for labour. Twelve cases involved donkeys and 17 involved cattle. In three cases, households had provided drivers to gain access to tractors.

Two-thirds of cooperative arrangements were with relatives. In most cases the motivation for the relationship was to gain access to ploughing resources, either labour or traction. In ten cases, however, the motivation was to help friends or relatives. Most of the time, the provider of labour initiated the cooperative arrangement. Nevertheless, most respondents said that both cooperators benefited equally from the arrangement.

Both providers of labour and providers of traction agreed that the household providing traction had the major say over the timing of ploughing, although some households said this was a joint decision. Both partners usually were involved in the decision as to whether soil moisture was adequate on the day ploughing was scheduled.

There generally was a fixed amount of time spent on each field before shifting. Most frequently reported was three days or a week. The main factors considered when determining how much ploughing was done each day were soil moisture, the condition of animals and the starting time. In only four cases was the amount to be ploughed pre-set.

Households engaged in cooperative ploughing had several rights with respect to their partners. For example, all households reported that reploughing would be done if there was poor germination on a field that had been ploughed cooperatively. Essentially all households also reported that if the reciprocal ploughing was not completed in one season due to a lack of rain, the obligation would be carried out the following season.

Most respondents said they were satisfied with their cooperative arrangement. Few reported that their household had ever had a dispute with their partner. Over 80 percent of the respondents said their household would have the same arrangement with the same partner during the following season. Hiring traction or cooperating with another partner were seen as the main alternatives to the existing cooperative arrangement.

5.5 BORROWING TRACTION

Of the entire sample, only seven households had used borrowed or managed traction. The schedule addressing use of borrowed or managed traction was administered to six of these households plus one household which had loaned out animals. Four of the households had used cattle traction, two had used donkeys, and one had used a tractor. Four households were from Shoshong East and three were from Makwate.

Half the loans had been made to relatives but the others had been to neighbours, so loaning was not restricted to family. In only one case was a gift given to or work done for the household which had provided traction. In four cases no time had been specified as to when the animals were to be returned. In the remaining cases, the loans were at least for the entire ploughing period. Five of the six animal borrowing households had borrowed entire traction teams.

In six of seven cases, the borrowing household was free to use that traction for hiring out. The respondents from five of those six households said they would not have given any money to the traction owner if they had hired out. In fact, in only one case did the respondent say that traction owner had retained any say about how the traction was to be used. Even if an animal died while under the control of a borrower, no compensation was due the owner. In most cases, however, the carcass would either have been given to or shared with the owner.

The respondents from two borrowing households said they would turn to cooperative ploughing if they could not have borrowed traction. One said the households would have hired traction. Three respondents could not see any alternative to hiring, except not ploughing.

6. PLOUGHING SITUATIONS SINCE 1982

The analysis in this paper has been based on data collected in two surveys in 1983. That year was the second of a severe five year drought. The information about why certain arrangements were used and about decision making under each access arrangement should not have been affected. However, there certainly have been changes in draught access and traction use patterns during the drought. This section draws on national agricultural statistical data to summarize traction use and draught access trends. Some implications for household control of draught resources are identified.

Trends in traction use and draught access between the 1979-80 season and the 1985-86 season are shown in Tables 18 and 19, respectively. The data refer to Mahalapye East and Mahalapye West Agricultural Districts. More recent national data are not available. Data from the 1981-82 season could not be included since there was an agricultural census in 1982. The summary of census data prepared by the Agricultural Statistics Unit did not give findings on traction use or draught access by district. Moreover, the Agricultural Statistics Survey does not distinguish households which obtain access through cooperative agreements, so this category could not be included in Table 19. Presumably, households which own draught and cooperate to get labour are included in the own category, while households which provide labour to get access to draught are included in the borrow category.

Table 18 shows the dramatic decline in the use of cattle traction during the drought. There was a slight increase in the use of donkey traction but most households shifted to tractors. During the first part of the drought, at least a small share of households continued to do some animal traction ploughing while supplementing with hired tractors, but during the last two seasons 60 to 70 percent of households had shifted exclusively to tractors. The shift to tractor ploughing was greatly stimulated by the various farmer assistance programmes of the Ministry of Agriculture, particularly ARAP.

TABLE 18: TRACTION USED, MAHALAPYE
DISTRICTS, 1980-1986

	CATTLE	DONKEYS	CATTLE & DONKEYS		ANIMALS & TRACTORS	
			TRACTORS	TRACTORS		
	(Percent of Households Using)					
1986	13	16	3	69	<1	
1985	17	18	4	61	1	
1984	40	21	1	30	7	
1983	45	21	3	28	2	
1982/a						
1981	50	16	<1	25	9	
1980	53	11	1	31	4	

Sources: ASU [1981; 1982; 1984; 1985; 1986; 1987]
a. Data not available.

Table 19 shows that there were relatively minor changes in draught access patterns until the 1984-85 season, but then there was a substantial shift from use of owned traction to hiring traction. Again, this reflects the influence of farmer assistance programmes, as well as an inadequate supply of fit traction animals. Both tables together make it clear that there was a major shift away from ploughing with own animals, particularly cattle, to ploughing with hired tractors.

TABLE 19: DRAUGHT ACCESS, MAHALAPYE
DISTRICTS, 1980-1986

	OWN	BORROW/ MANAGE		COMBI- NATIONS	
		HIRE	TRACTORS		
	(Percent of Households Using)				
1986	26	11	62	1	
1985	22	8	63	8	
1984	46	15	32	5	
1983	53	14	28	5	
1982/a					
1981	43	16	36	4	
1980	40	20	37	4	

Sources: ASU [1981; 1982; 1984; 1985; 1986; 1987]
a. Data not available.

ATIP data from Jhoshong and Makwate suggest that the change in traction use and draught access patterns might even have been more dramatic than that is suggested by the district-level data [ATIP, 1986a; Baker, Bock, and Worman, 1988]. For example, ATIP data show an even more substantial increase in the use of donkeys by those households which have continued to use animals. Also, there has been almost a complete abandonment of cooperative ploughing arrangements. This cannot be verified at the district-level using ASU data but is consistent with the findings presented in Sections 4 and 5. Respondents from several owning households expressed concern about the constraints on draught control imposed by cooperative agreements. Owning household could have been expected to (and did in fact) stop cooperating

when ploughing opportunities became limited due to drought. Also, most cooperative arrangements involved animal traction, and relatively few households continued to use animals during the drought.

The combined shift from animals to tractors, and from owning to hiring means that by the end of the drought relatively few households had enough control over draught resource to ensure timely and sufficient ploughing. Because tractor ploughing tends to be concentrated on a few days during the season, the possibility for crop failure increased. In addition, the prospects for widespread adoption of row planting or double ploughing undoubtedly decreased during the drought, even though these have been shown to be appropriate production practices under drought conditions.

The shift to hiring of tractors also suggests that the potential for inequitable development increased. Prior to the drought, many poorer households were able to achieve reasonable cropping outcomes by ploughing on many days with owned donkeys. Households not owning traction often could borrow or at least get some ploughing done through cooperative agreements. Timely access was not always possible through cooperative agreements, but at least cooperators had some rights with respect to reploughing and carrying over of obligations between seasons. With hiring, cash payments are required at the time of ploughing, and this simply is not possible for many households.

If it had not been for ARAP the equity consequences of the drought probably would have been more severe. Mostly richer households would have been able to hire tractors -- as was the case at the start of the drought. Poorer households which owned donkeys would have ploughed only small areas with their weak animals. The poorest households, those with no donkeys or cattle, probably would not have ploughed at all.

A subtle but important impact of the drought has been a shift away from informal resource exchanges and sharing inter-household draught arrangements, to formal exchanges based on cash. In addition, at the beginning of the drought most inter-household arrangements involved relatives while this was not the case with most tractor hiring later in the drought.

Thus, the drought has raise several serious questions relating to draught access and traction use which impact on the future ability of farming households control the timing and amount of ploughing. Three, for example, are as follows:

- (a). To what extent will farmers shift back to animals now that the drought has seemingly ended? Some shift away from tractors certainly will take place, and in fact seemed to be taking place during the 1987-88 season, but the extent of the shift is unknown.
- (b). What will be the relative importance of donkeys versus cattle in the future? Donkeys have several advantages, including being cheaper and easier to control, which might lead to a more equitable pattern of agricultural development.
- (c). To what extent will non-cash resource exchanges again replace cash hiring as the dominant mode of inter-household draught arrangement? To the extent cash hiring continues to be dominant, the gap between richer and poorer households is likely to increase. Even more important, cropping activities will become even more dependent on resource transfers from other household enterprises -- making crop production less attractive than ever.

7. CONCLUDING COMMENTS

Several categories of draught access arrangements were being used by households in Shoshong and Makwate in 1983. There was indeed a complex pattern in which many households at different times both provided and obtained ploughing resources from other households. Households not owning draught animals or a tractor had several options for obtaining access. On the other side, even households which owned ploughing resources often faced constraints on the use of those resources due to arrangements involving other households.

This paper hopefully has made it clear that information about draught access arrangements and, to a lesser extent, types of traction used is important. Household circumstances force households to use different arrangements, and those arrangements each have different rights and obligations affecting decision control over the amount and timing of ploughing. Consequently, access arrangements affect cropping outcomes and the prospects for adopting improve practices requiring multiple tillage-planting operations.

The Draught Arrangements Survey showed that owning was the preferred form of draught access, and why that is so. Households using owned traction had almost complete control over the timing and amount of ploughing, except for those households which also entered cooperative arrangements. Unfortunately, data from the Crop Management Survey showed there was a bias in which households used owned traction. Owning households tended to be male headed, relatively rich, had multiple sources of cash income, and had well developed land resources.

Borrowing would have been the best option for households unable to use their own draught. Borrowers had almost free rights with respect to use of borrowed traction and very few obligations. From a crop production standpoint, people able to borrow traction had essentially the same control over the timing and amount of ploughing as did users of owned traction. Unfortunately, few households were able to borrow animals.

Households hiring traction had the fewest rights with respect to timing decisions and the amount ploughed. However, hiring was attractive to households which lacked labour as well as traction. Hiring tractors was particularly attractive to many survey respondents because ploughing can be done quickly. The biggest drawback from hiring, beside the loss of control over the timing of ploughing, was the cash payments required.

Cooperative ploughing gave rights to both partners, limiting the normal control of traction owners in exchange for access to additional labour. Cooperative ploughing would seem to be a desirable way to share scare resources among the farming community, but is likely to be of declining importance in Botswana.

One of the main challenges facing the Ministry of Agriculture during the coming years of drought recovery will be to help farmers take best advantage of the rapidly changing patterns of traction use and draught access. Although no one knows the extent to which the trends will reverse themselves, it is important to determine which trends should be encouraged and which discouraged. For example, several negative consequences of increased tractor use and decreased use of own traction have been described above. But there might be a positive side. For example, the trend toward tractor hire might provide an opportunity to impact on many farmers by

concentrating on developing appropriate implements and tillage-planting operations for a much smaller number of farmers. Equally important, the control, speed and draught power of tractors create several additional options for field operations such as sub soiling, stubble sweeping, and inter row cultivating.

Meeting the challenge posed by the drought, particularly as it has affected traction use and draught access, will require close communication and collaboration between the Division of Planning and Statistics and the Departments of Agricultural Research and Agricultural Field Services.

APPENDIX: DATA SUMMARY OF DIFFERENT ARRANGEMENTS

A. USE OF OWNED TRACTION

1. If animals were used, how many animals were used?

Type Traction	Number of Households Using:			
	4	6	8	10
Donkey Users	5	6	1	1
Cattle Users	0	3	7	1

2. What equipment was used with traction?

Equipment	# HH *	
Single Mouldboard Plough Only	25	* Number of Households
Single Farrow Mouldboard Plus Planter & Cultivator	1	
Double Farrow Mouldboard Plough	3	
Disc Plough	1	

3. How many people helped with the ploughing?

Type Traction	Average	ALL:	# People	# HH
Donkey Users	2.5		1-2	11
Cattle Users	3.6		3	9
Tractor User	2.0		4	6
ALL	3.1		4	13

4. Who provided food on days of ploughing?

Relation to head of Household	# HH *	
Wife	21	* Sums to more than 30 since 4 households gave 2 responses.
Mother or Aunt	4	
Sister	4	
Daughter	3	
Domestic Employee	2	

5. Did the person providing food also help with ploughing?

Type Traction	% Yes
Donkey Users	85
Cattle Users	88
ALL	87

6. Had ploughing ever been done for relatives?

# HH		Why Not?	# HH
Yes	17	Relatives Have Own Draught	5
No	13	Never Asked	3
		Short Labour/Too Old	2
		Animals Too Weak	1
		Cannot Finish Own Field	1
		No Relatives	1

7. Had ploughing ever been done for hire?

	# HH	Why Not?	# HH
Yes	10	Cannot Finish Our Field	12
No	20	Never Asked	6
		Fear Overworking Animals	2

8. How many years were animals used on average?

	# Donkey Users	# Cattle Users	# All
Years: 1-2	2	3	5
3-4	2	6	8
5 or More	1	3	4
Until Selling Age	0	1	1
Until Younger Ready	0	1	1
Until Too Old	2	0	2

9. What percent of the animals used in 1982-83 were being used for the first time?

Type Traction	% New
Donkey Users	16 *
Cattle Users	42 *
ALL	29

* Significantly different at >.99 confidence level.

10. How many years could they plough with an animal before the price received for it would fall?

	# Donkey Users	# Cattle Users	# All
Years: 1-2	1	5	6
3-4	3	6	9
5 or More	1	3	4
Does Not Fall	2	1	3
Did Not Know	4	1	5

11. Were traction animals usually strong enough in October to begin ploughing?

Type Traction	# Yes	# Yes, If Good Rains	# No
Donkey Users	6	3	4
Cattle Users	5	8	3
ALL	11	11	7

12. How many days at the beginning of each ploughing season were needed to train or retrain traction animals?

	# Donkey Users	# Cattle Users	# All
No Days	2	1	3
Days: 1	5	3	8
2	1	4	5
3	3	2	5
A Week	0	2	2
A Month	1	2	3

13. Had supplemental feed, salt or medicine ever been given to animals that are used for traction?

Type Traction	% Yes
Donkey Users	59 *
Cattle Users	87 *
ALL	54

* Significantly different at >.99 confidence level.

14. Had traction animals ever caused damage to the respondent's or other people's fields?

Type Traction	% Yes
Donkey Users	77
Cattle Users	63
ALL	69

15. If damage had been caused, had the respondent ever had to make a payment because the damage?

Type Traction	% Yes
Donkey Users	90
Cattle Users	80
ALL	85

16. Were traction animals kept at or near the lands compound after the ploughing period was over?

Type Traction	% Yes
Donkey Users	85
Cattle Users	84
ALL	62

17. What would the respondent have done if he/she did not have enough labour to plough with owned traction animals?

Action Would Take	# HH
Begin Co-operative Ploughing	14
Hire In Traction	6
Plough Alone (As at Present)	3
Hire Labour	2
Shift to Double Furrow Plough	2
Plough After School	1

18. How many traction animals died during the 1980-83 period?

# Animals Died	# HH
None	18
1	5
2	6
> 2	0

B. PLOUGHING FOR OR WITH RELATIVES

1. What type of traction was used?

	# For *	# With *
Donkeys	5	5
Cattle	9	3
Tractor	0	0

* Number of households ploughing for relatives and number of households ploughing with relatives

2. Who owned the traction?

	# For	# With
Owned by Respondent *	10	1
Own by the Relative	0	2
Some Owned by Each	1	2
Owned by Parents	2	2

* Includes one household which used managed traction to plough for relatives.

3. Who owned the equipment used?

	# For	# With
Owned by Respondent	11	3
Own by the Relative	1	3
Some Owned by Each	0	1
Owned Together	1	1

NOTE: In eight cases, the respondent household owned both the traction and equipment used to plough for relatives. In one case a relative owned both the traction and animals used to plough for the respondent. In the remaining twelve cases, each household involved provided some of the resources used for ploughing.

4. What relationship to the head of the household was the relative?

	# For	# With
Sister	5	5
Son or Daughter	3	4
Parents/Uncle/Aunt	5	4

5. Why was ploughing done for or with relatives?

	# For	# With
Family obligation	11	6
Access to draught	2	2

6. Was any gift given or payment made to the relative who provided traction?

	# With
Yes *	1
No	20

* A goat was cooked and provided.

7. Who had the major say over the schedule for ploughing?

	# For	# With
Eldest Relative	4	4
Owner of Traction	9	3
Both Equally	0	1

8. Who decided whether there was enough moisture to plough?

	# For	# With
Relative Providing Animals	3	2
Relative Whose Field was Ploughed	1	2
Both Equally	4	4

9. If ploughing was done on both relatives' fields, how many days were spent on one field before going to the other field?

	# For	# With
Not Plough on Both	12	1
Days: 1 to 3	1	4
4 to 5	0	1
Week	0	2

10. If ploughing was done for a relative (but not on both fields), how many days of ploughing were done for the relative?

	# For	# With
Ploughed on Both	1	7
Days: 2	1	0
3	5	1
Week	6	0

11. If germination failed and rains were sufficient, would there be an obligation to replough?

	# With
Yes	20
No	1

12. If ploughing is done on both relative's fields and the harvest of only one field fails, will the relative getting some harvest share part of the harvest?

	# For	# With
Yes	7	2
No	2	2
Only if Cooperate		
On Other Activities	4	4

13. Were other agricultural activities shared with the same set of relatives?

	# HH
Yes	1
No	20

14. How are disputes about the ploughing arrangement settled?

	# HH	% HH
Never Had Dispute	10	48
Depends on Owner's Discretion	3	14
Plough for Complainer First	2	10
Hire-In Brought	2	10
Discuss & Come to Agreement	2	10
Split the Traction Team	1	5
Plough Both Fields Each Day	1	5

15. Do you expect that ploughing will be done for or with the same relative next year?

	# HH
Yes	16
No	1
Don't Know	2

16. If the animals used belong to a common herd, will the traction animals eventually be divided up?

	# HH
Not Share Animals	1
Yes	5
No	1

17. If the animals from a common herd are separated, will ploughing with the relative continue?

	# HH
Yes	4
No	1

C. HIRING TRACTION

1. What type of traction was hired?

Arrangement	# D	# C	# T
Hire-In	8	11	20
Hire-Out	5	1	1

D = Donkey Cases
 # C = Cattle Cases
 # T = Tractor Cases

Village	# D	# C	# T
Shoshong	6	8	21
Makwate	12	5	0

2. If hired in, would the respondent have wanted to hire a different type of traction?

	# D	# C	# T
Yes	6	6	3
No	2	4	15
The only Available Traction Was Used	6	1	2

3. Why would the respondent want (or not want) to hire donkeys?

		# HH *
Why Want To	Only Type Available	7
	Easy to Use	2
	More Stamina than Cattle	1
Why Not Want To	Not Available (Shoshong)	13
	Too Slow	12
	Soils Too Heavy	1

* 6 Hire-Out
3 Missing

4. Why would the respondent want (or not want) to hire cattle?

		# HH *
Why Want To	Cheaper Than Tractors	4
	Faster Than Donkeys	1
Why Not Want To	Slow Compared to Tractor	11
	Not Available (Makwate)	10
	Only Available Late	5
	Short Labour as Well	2

* 6 Hire-Out
6 Missing

5. Why would the respondent want (or not want) to hire tractors?

		# HH *
Why Want To	Faster Than Animals	19
Why Not Want To	Expensive	9
	Not Available (Makwate)	7

* 6 Hire-Out
4 Missing

6. Who did the respondent hire-in or hire-out to?

	# D	# C	# T
Relative	2	8	8
Neighbour	10	4	13

7. How many "acres" were ploughed under the hiring arrangement and how much was paid per acre?

By Traction:	Donkeys	Cattle	Tractors
Number of Acres	3.7	6.9	7.7
Payment per Acre	P2.99	P5.09	P14.91

By Village:	Shoshong	Makwate	All
Number of Acres	7.6	4.3	6.4
Payment per Acre	P12.69	P3.12	P9.21

8. What determined the area which was ploughed?

	# HH *	
Amount of Soil Moisture	16	* 11 Households gave two responses
Price/Availability of Money	13	
Condition of Animals	10	
Paces Set in Advance	7	

9. Was a complete payment made at the time of ploughing?

	# D	# C	# T
Yes	12	11	18
No	0	1	3

10. Was equipment provided by the person hiring-out?

	# D	# C	# T
Yes	12	7	17
No	0	5	4

11. Was the time of ploughing scheduled when the person who hired-in wanted or was it determined the the person who hired-out?

	# D	# C	# T
Person Hiring-In	9	8	15
Person Hiring-Out	3	4	6

12. Was the ploughing done when first scheduled?

	# D	# C	# T
Yes	10	8	16
No	2	4	5

13. Did the person hiring-in provide food?

	# D	# C	# T
Yes	11	12	19
No	1	0	2

14. Where did respondents who hired-in get the money needed to hire?

	# HH *	
Remittances	19	* 6 Hire-out 6 Gave two responses 3 Gave no response
Sold Livestock	9	
Sold Beer	6	
Monthly Wages	4	
Paid In-Kind	2	
Sold Thatch Grass	2	

15. Why did respondents who hire-in hire the person he/she did?

	#	HH	*
Available When Needed	12		
No Particular Reason	11		
Good, Competent	8		
Relative	6		
Neighbour	5		

* 6 Hire-out
3 Gave 2 responses

16. Would a respondent who hired-in have used his/her own animals if she/he had enough healthy animals?

	# D	# C	# T	
Yes	5	8	10	2 Missing
No	2	1	10	6 Hire-out

17. Why did respondents who hired-out hire-out?

	#	HH
To Obtain Cash	3	
Because Asked	2	
To Help Relative	1	

18. How are disputes about the hiring arrangement settled?

	#	HH	*
Discuss But No Action Taken	13		
Plough More or Replough	7		
Discuss and Find Solution	7		
Disputes Avoided by Having Hirer Present at Ploughing	6		
Pay for What Done and Not Rehire	4		
Price is Reduced	2		

* 6 Said could not answer since disputes never arise

19. Who decided whether there was enough moisture to plough?

	# D	# C	# T
Person Hiring-In	3	2	13
Person Hiring-Out	2	3	2
Both Together	7	7	6

20. If germination fails, does the person who hired-out replough for the person who hired-in?

	# D	# C	# T
Never	8	10	21
Sometimes	2	1	0
Often (If Rains)	2	1	0

D. COOPERATIVE PLOUGHING

1. What type of traction was used?

	# PL *	# PT G	
Donkeys	6	6	* Number providing labour or equipment
Cattle	11	6	& Number providing traction
Tractors	3	0	

2. With whom did the respondent cooperate?

	# PL	# PT	# D	# C	# T	
Relative	14	8	8	12	2	D = Donkey users
Neighbour	6	4	4	5	1	C = Cattle users
						T = Tractor users

3. Why did the respondent plough cooperatively?

	# PL	# PT	# D	# C	# T
Get Traction	14	0	4	8	2
Get Labour	0	6	3	3	0
Help Friend	1	4	3	2	0
Old/Sick Relative	3	2	1	3	1
No Money to Hire	1	0	0	1	0

4. Who approached whom to initiate the cooperative arrangement?

	# PL	# PT
Owner of Traction	6	4
Labour/Equipment Provider	13	8
Both Decided in Discussion	1	0

5. Who benefits more from cooperative ploughing?

	# PL	# PT
Traction Provider	3	0
Labour/Equipment Provider	1	0
Benefit Equally	8	11
Depends on the Rains	8	1

6. Who has major say over the timing of ploughing?

	# PL	# PT
Traction Provider	14	11
Labour/Equipment Provider	0	0
Both Equally	6	1

7. How many days of ploughing are usually spent on one farmer's field before going to the other farmer's field?

		# PL	# PT	# S	# M
Days:	1	2	0	2	0
	2	2	4	1	5
	3	7	5	5	5
	4-6	1	1	2	0
Week		3	3	1	5
Depends on the Rains		1	0	1	0
Do Traction Owner's First		3	1	3	1

S = Shoshong
M = Makwate

8. Who decides whether there is enough moisture to plant?

	# PL	# PT	# D	# C	# T
Both Equally	7	5	2	9	1
Either Can Veto	8	4	7	5	0
Owner of Field	3	1	2	2	0

9. Does the owner of the field being ploughed provide food?

	# HH
Yes	31
No	1

10. What determines how much area is ploughed?

	# HH *
Soil Moisture	17
Condition of Animals	15
Starting Time	8
Amount is Pre-Set	4

* 7 gave 2 answers
5 gave 3 answers
5 gave no answer

11. How are disputes about the cooperative arrangement settled?

	# HH
Never Had Dispute Requiring Action	18
Plough Equal Areas Each Day	4
Plough One Field & Share Harvest	2
Let User of Animals Plough His/Her Field on Own	1
Discuss and Come to Agreement	1

12. If there is poor germination on a field that has been ploughed cooperatively, will that field be reploughed (if there are sufficient rains)?

	# HH *
Yes	30

* 2 Missing

13. If the reciprocal ploughing is not completed one season due to a lack of rain, will the obligation be carried out the following season?

	# HH
Yes	29
No	0
Up To Traction Owner	3

14. If the respondent had not entered into a cooperative ploughing arrangement, how would he/she have plough his/her field?

	# HH
Hire Traction	11
Get Help From Someone Else	6
Would Not Plough	4
Plough on Own	2
Plant by Hand	1
Plough after School	1
Borrow Traction	1

15. Was it expected that the respondent would have the same arrangement with the same farmer the next season?

	# HH
Yes	26
No	4
Do Not Know	2

B. BORROWING TRACTION

1. From whom were animals borrowed (or to whom loaned)?

	# HH
Relative	3
Neighbour	4

2. Were any gifts given to or work done for the household which provided traction?

	# HH
Yes	1
No	6

3. When was the traction to have been returned to the owner?

	# HH
No Time Was Specified	4
After Ploughing Finished	2
After the Cropping Season	1

4. Can a person who borrows or manages traction use that traction for hiring out?

	# HH
Yes	6
No	1

5. If hiring-out was done, would any money be given to the owner?

	# HH
Yes	1
No	5

6. Does the owner retain the right to say how the traction can be used?

	# HH
Yes	1
No	6

7. Was a complete team borrowed (loaned)?

	# HH *
Yes	5
No	1

* Does not include tractor borrower

8. What would happen should an animal become die while under the control of a borrower?

	# HH
Give Carcass to Owner	2
Share Carcass With Owner	2
No Action Required	2

9. If unable to borrow traction, what else could be done to gain access to traction?

	# HH
Cooperative Ploughing	2
Hire-In	1
Not Plough	1
Did Not Know	2

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