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SEASON AND STRATEGY:
The Changing Organization of the Rural Water Sector In Botswana

Emery Roe

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SEASON AND STRATEGY:
THE CHANGING ORGANIZATION OF THE RURAL WATER SECTOR IN BOTSWANA

Emery Roe

Louise Fortmann

Rural Development Committee
Center for International Studies
Cornell University

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Dedicated to the memory of

BOTSANG MOSIENYANE

First Woman Head of
the Botswana Animal Production Research Unit

TABLE OF CONTENTS

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Land Board Members and Staff:

Rolong Land Board: B.M. Molelekeng, Senior Administration Officer (Land)
J. Moncho, former Chairman and Land Board Member.

Malete Land Board: C.K. Dinake, Senior Administration Officer (Land)
The Land Board at its meeting of 19th February, 1981.

Ngwaketse Land Board: M. Oabile, Senior Administration Officer (Land)
The Land Board at its meeting of 31st March, 1981.

Kweneng Land Board: M. Ratshosa, Senior Administration Officer (Land)
B.T. Mannathoko, Administration Officer (Land)
A.K. Baikakedi, Member.

Kgatleng Land Board:	M.T. Modibedi, Acting Principal Administration Secretary The Land Board at its meeting of 16th March, 1981.
Ngwato Land Board:	M.G. Maforaga, Principal Administration Officer (Land) P. Mokwate, Assistant Administration Secretary G. Kesiilwa, Land Board Chairman.
Tati Land Board:	R. Tsebe, Senior Administration Officer (Land) Sub-Chief K.P. Ramokate, Chairman of Land Board.
Tawana Land Board:	P.C. Dlodlo, Principal Administration Officer (Land) The Land Board at its meeting of 2nd April, 1981.
Ghanzi Land Board:	W.K. Sennanyana, Principal Administration Officer (Lands)
Chobe Land Board:	G. Opelokgale, Senior Administration Secretary (Land)
Sebina Subordinate Land Board:	G.K. Maano, Assistant Administration Officer (Land)
Palapye Subordinate Land Board:	G. Sentsima, Senior Administrative Assistant (Land) N. Nkwako, T. Molebatsi and M. Dambiza, Members.
Mahalapye Subordinate Land Board:	L.B. Koma, Land Board Clerk The Land Board at its meeting of 9th March, 1981.

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Emery M. Roe
Nairobi, Kenya

Louise P. Fortmann
Gaborone, Botswana

July, 1982

LIST OF TABLES AND FIGURES

APPENDIX TABLES AND FIGURES

GLOSSARY OF TERMS

Batswana, Motswana, Setswana	=	The citizens of Botswana are called Batswana (sing., Motswana), while the language and culture are called Setswana.
Cattlepost	=	The area in which a person grazes or kraals (pens) his/her livestock.
Communal land or area	=	Tribal land (see below) which is considered to be communally-held, since individual tribespeople cannot own such land on a freehold basis. "Communal areas" in eastern Botswana are typically the lands, cattleposts and small villages outside the large "urbanized" villages.
Compound locality	=	Set of localities--village, lands and cattleposts--among which members of a household move according to the agricultural and herding cycle.
Domestic water use and domestic water points	=	For human drinking and household consumption purposes.
Hardveld and sandveld	=	Roughly two-thirds of Botswana is considered sandveld and is known as Kgalagadi sands, or formerly as the Kalahari Desert. The remaining eastern third of the country is collectively described as the hardveld, though it consists of ecologically distinct subzones. Typically, the hardveld has better soils and rainfall and accommodates much of the country's human and livestock populations as well as its major crop production.
Headman or wardhead ("chief")	=	Often the hereditary leader of a small village or head of a ward in a larger village. Traditionally he owes allegiance to the paramount chief of his tribe. Some are presently paid by government, though a number of unofficial headmen exist throughout the country.
kgotla (pl., makgotla)	=	In common usage, a public assembly place for meetings or court proceedings. Typically located in and identified with a village or ward of a village. Also may mean the group of people assembling at such a meeting place. Traditionally, kgotla meetings were open to all villagers and were called by the village headman or paramount chief to assess public opinion on a given matter.
Lands	=	A person's cultivation plot(s) or the area in which people have their arable fields.

Locality	=	An area in which certain production and/or consumption activities as well as temporary and/or permanent residence are centered. Generally referred to as a spatial concept with usually some obvious physical feature distinguishing it from other localities, but the activities associated with it give it significance to people who have rights to use its resources (or who are excluded from it.)
lolwapa (pl., malwapa)	=	A household's homestead; often the enclosed compound with a courtyard and huts where some household members are domiciled.
LSU	=	A livestock unit, roughly equivalent to 450-500 kg in weight.
mafisa	=	A system under which one person manages livestock belonging to another, thereby obtaining benefits such as draft power, milk or calves.
pula, thebe	=	Currency of Botswana. 100 thebe equal one pula. At the time of the Survey P1 = U.S. $1.26 (it is currently = U.S. $1.05).
Syndicates	=	In certain tribal areas, groups which run water points, especially boreholes.
Tribal land	=	Statutorily the land under the allocative and adjudicative control of a district land board which holds tribal land "in trust" for the tribe. Roughly 70 percent of Botswana is tribal land.
Tribes	=	A set of ethnic groupings, many of which (e.g. Bangwaketse, Barolong, Bakgatla) are recognized as "tribes" in the laws of Botswana.
Veld	=	Grassland with scattered shrubs and trees often serving as rangeland.
Village	=	Traditionally where a rural person lives when he or she is not at the lands cultivating or at the cattlepost herding.

The Republic of Botswana, formerly the Bechuanaland Protectorate, became independent of the British in 1966. The nation, having about one million citizens in a country roughly the size of Kenya, is a multi-party state, with a president, parliament, and a ministerial cabinet system. The ruling party is the Botswana Democratic Party, founded and led by Sir Seretse Khama until his death in 1980. The President of Botswana is Dr. Q.K.J. Masire.

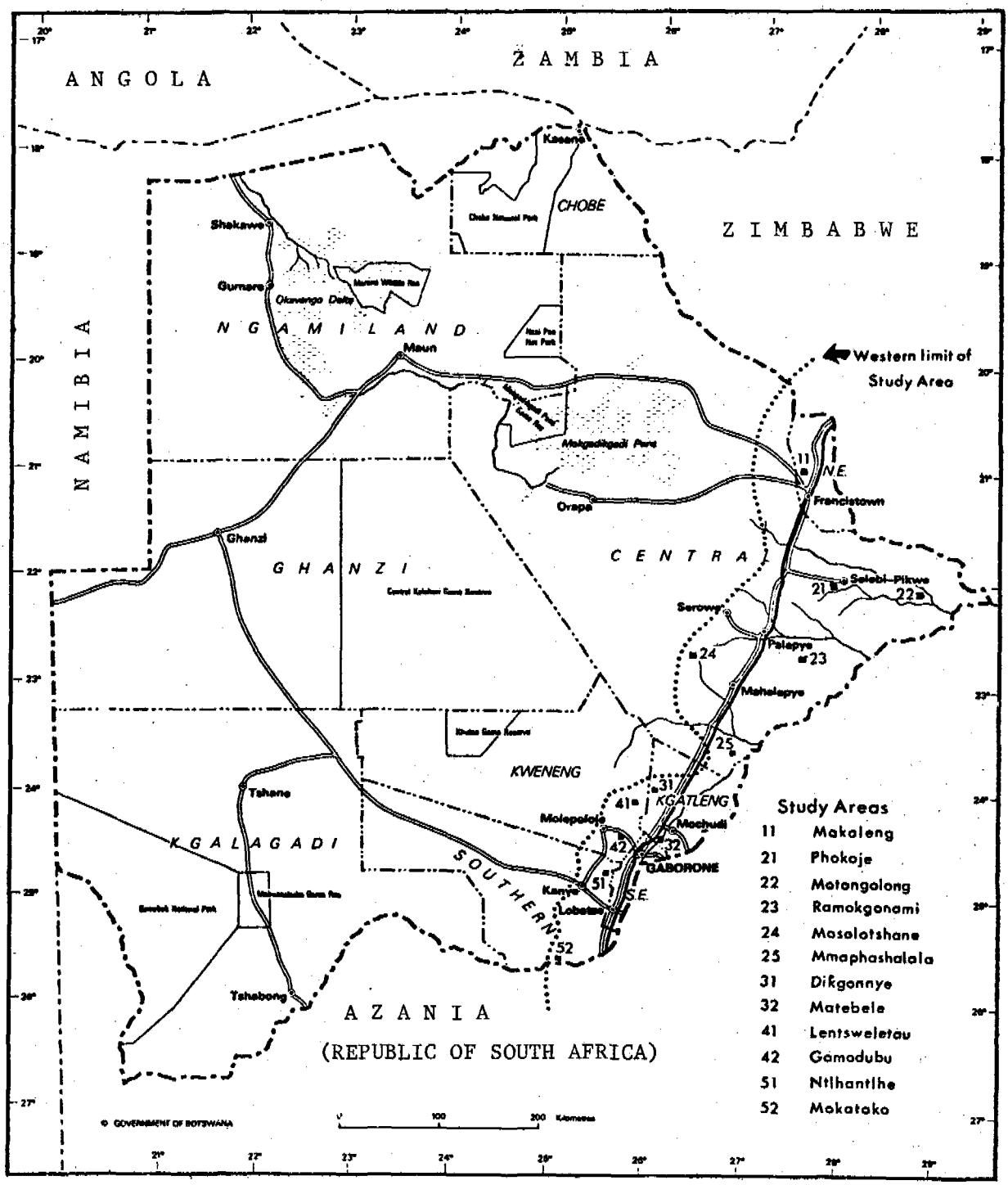


FIGURE I-1 Water Point Survey Study Area

returns from the 1981 Census, Botswana has slightly less than one million resident citizens, at least 75 percent of whom live outside urban areas. The citizens of the country are called Batswana (sing., Motswana).[2] While minerals such as diamonds and copper have recently played an important role in the national economy, cattle and crops remain the principal sources of food, sustenance, prestige and wealth in the rural economy.

There are a number of ways in which land use is commonly described in Botswana and it is not possible for a study of water utilization on that land to avoid using these (often imprecise) distinctions. Phrased in such terms, this monograph studies water use and management in the communal areas of tribal land located in the eastern region of the country which is called the hardveld. Figure I-2 represents these conventional land use divisions.

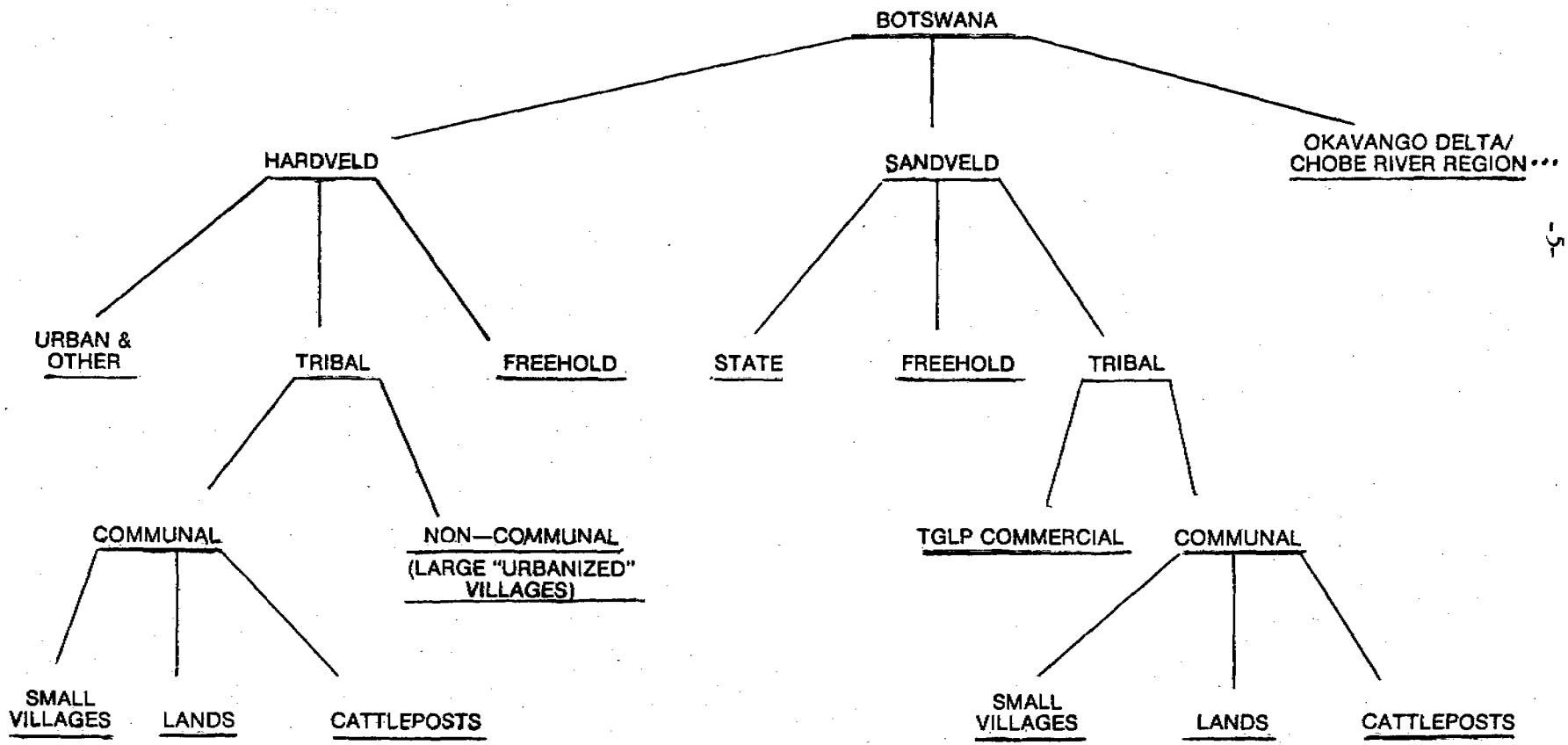
The first-level distinction is a broad ecological one. While there are a number of classification schemes for categorizing Botswana's ecological zones, the most common one is that of the western sandveld and the eastern hardveld, plus the comparatively well-watered Okavango Delta/Chobe River region in the north of the country. It is said that the Okavango Delta covers some 16,000 square kilometers, or approximately three percent of the surface area of the country (Colclough and McCarthy, 1980: 3). Roughly two-thirds of Botswana's land surface is covered by Kgalagadi sand deposits within the area west of the dashed line in Figure I-1. This region is commonly called the "sandveld," or formerly, the Kalahari Desert. Large portions of the sandveld are gently undulating savanna with lower cattle stocking rates and greater wildlife densities than found in much of the "hardveld," the area falling east of the dashed line in Figure I-1.

The sandveld's lower average rainfall levels, combined with its typically poorer soils, have a clear effect on demographic and settlement patterns. It is estimated that some 80 percent of the country's people, 50 percent of its cattle, and much, if not most, of its major crop production are located in the hardveld. Nonetheless, areas of cultivation do exist in the sandveld and there are some areas of very poor soils and vegetation in the hardveld. Given the highly localized nature of rainfall over much of Botswana, it is also possible to find a well-watered locality in the sandveld and a drought-stricken area in the hardveld at the same time.

As of 1980, less than one-tenth of one percent of the country's surface is considered to be urban and mining, 23 percent is state land (mainly national parks and game reserves), six percent freehold, with the remaining 71 percent being tribal land in

[2]Most underlined terms are defined in the Glossary on pages xvii-xviii.

Figure I-2 Conventional Breakdown of Primary Land Categories in Botswana



the rural areas (Bailey, 1982: 84). No precise figures exist on how much of the rural eastern hardveld is tribal land, but it is clearly the majority. Tribal land is statutorily defined as land under the allocative and adjudicative control of various district and sub-district land boards. Even though there may be a legal sense in which tribal land is "owned" by the respective land boards, it is considered to be communally-held since no tribesperson can own such land on a freehold basis.

While tribal land is considered to be communally-held, the term "communal areas" often has a more specific meaning. These areas encompass small villages, cultivated lands (referred to usually simply as "lands") and cattleposts on tribal land, all of which fall outside the areas of large, "urbanized" villages (often the district capitals).[3] The term "lands" denotes both the fields cultivated by farming households and the general area where these fields are found. Similarly, "cattleposts" is commonly taken to mean both where cattle are kraaled (penned) and the grazing area around these kraals (Schapera, 1938: 8). According to one estimate, less than 2.5 percent of the land in Botswana is under "arable use" (Bailey, 1982: 84), while another estimate, based largely on 1970s air photography, regards less than 1.5 percent of the country as tribal land under recent cultivation (Rigby, 1980: 10). Most of the country is available for some kind of grazing should water be available there.

It is very difficult to describe in numbers the study area covered by this monograph, but the following seem reasonable estimates: at the time of the survey the eastern communal areas probably contained 20 percent of the country's land, over 60 percent of its human population and 40 percent of its cattle numbers, along with much of its major crop production during the last half of the 1970s.

The Special Role of Seasonality in Defining Small Villages, Lands and Cattleposts.[4] Understanding the rural household water use system described in Chapter II requires much more detailed consideration of what are the characteristics distinguishing small villages, lands and cattleposts of the eastern communal areas. Each of these communal localities has it own resource base and associated set of socio-economic activities, which are usually highly seasonal in nature. As will be seen, the

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[3]Water use in these few large "agro-towns," as some have called them, is considered to be atypical of that found in the rest of the countryside. It should be noted that the sandveld also has tribal land and communal areas incorporating small villages, lands and cattleposts (Figure I-2). These areas, as well as the Okavango Delta/Chobe River region, fall outside the scope of this study.

[4]Supporting research and survey evidence for the major points made here about the seasonal agricultural calendar in eastern Botswana are detailed in Appendix 1.

conjunction of locality and season determines the agricultural calendar which profoundly affects how a Motswana uses water in the countryside.

It is tempting to describe seasonality solely in terms of wet and dry seasons. Yet there is another type of season which, although related to the wet and dry rainfall cycles, is somewhat different and influences rural behavior directly. This is the shift of household members to the lands for farming purposes during the rains. The cropping season, in fact, spans portions of both the wet and dry seasons, and household members return to the village after harvest, i.e., around the middle of the dry season. We will begin with the start of the wet season, which marks the start of the cropping season, and thereafter, discuss how cropping and residence patterns interact with the rainfall cycle.

Some preliminary observations are in order. The vast majority of rural households --around 75 percent or more--plow in a good rainfall year. Considerably fewer households actually own cattle or have sufficient livestock such as donkeys to have their own draft team of 6 to 8 animals, so hiring or borrowing plow teams is fairly common (Bailey, 1982). Typically, a seed mixture containing mostly sorghum, but including maize, millet, legumes or cucurbits, is broadcast and plowed under using a moldboard plow. Weeding usually takes place once during the cropping season and birdscaring is required where sorghum is grown. Improved cultivation techniques, such as row planting and "autumn" or "spring" plowing (after harvest and before the next rains), although recommended by the Ministry of Agriculture, are rarely practiced.

Average annual rainfall in eastern Botswana ranges between 350-500 mm, though as in most of Botswana, its amount and distribution are highly variable. Long-run averages at selected meteorological stations indicate that most of the rainfall occurs between October and April, such that the rainy season is usually between November and March, a period coinciding with the hot summer months. There is enough variability of rainfall, however, that a crop failure is probable one out of every four or five years in many areas in eastern Botswana (Vierich and Sheppard, 1980: 3; McGowan and Associates, 1979).

Reports from the lands that the first rains have fallen is a signal for villagers to begin moving to their fields. Since it long has been and still often remains the case that a village and its lands are not contiguous (Schapera, 1938: 11), it is common to see ox-drawn carts loaded with people and their chattel slowly making their way to their lands residences during this time.[5] The whole household does not necessarily move, however.

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[5] A number of smaller villages do have lands areas adjacent to them, but even here the distance between the household dwelling in the village and its fields at these lands means for many people more than a day's travel to and back, thereby necessitating a separate dwelling at the lands.

Some children might remain at school in the village, while other family members continue working full-time or on contract in the mines, towns and large farms of Botswana and Azania. On the other hand, an increasing number of households or their members have chosen to live permanently at their lands, often in order to tend their livestock more closely. In fact, many households keep their livestock permanently at the lands rather than take them back to the village after harvest (Bailey, 1980: 9ff). Still, the predominant residential pattern in the eastern communal areas is to have separate lands and village homes, with at least some household members having seasonal residence at the lands.

The start of the wet season and of the cropping season are not identical. A large number of households do not plow with the first rains, but remain in the village a bit longer before moving to the fields. That is, should the rains begin in October or November, one would likely find many households starting to plow only in December or later. A common explanation for "late" plowing is the household's lack of timely access to draft power. While this is indeed a contributing factor, perhaps half or more of those households who do own cattle or have draft animals also plow in December or later.[6] Additional factors which make for late plowing are, inter alia, the fact that many farmers wait to see if the early rains continue; some soils remain hard and difficult to plow even after the first rains, when draft oxen are also typically in poor condition (a factor which may account for some of the large draft teams found in Botswana); and a number of farming households do not want to move to the lands until they are assured of a ready and convenient supply of water there from surface sources for their livestock and domestic purposes.

Convenient, nearby water supplies are in great demand at the beginning of the cropping season since arable agriculture requires substantially greater labor inputs than the herding activities that occur there after harvest and during the rest of the year. Also, livestock work increases in the cropping season not simply because draft teams have to be assembled for plowing purposes, but for a variety of other reasons as well. Animals which are used during the day often have to be left to graze during the night, so herding them together the next day is more difficult. The multiplication of wet season puddles and small ephemeral water sources in this season allows livestock to graze and water in a more dispersed fashion. At all times, growing crops have to be protected from straying livestock. Herding, as with livestock work in general, it should be noted is largely a male occupation.

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[6]Moreover, some of the livestock-holding household members who move early to the lands may be doing so for reasons other than timely plowing, e.g., assisting in calving which peaks in November for a number of eastern communal areas.

For many Batswana, plowing is at the heart of the cropping season; in fact, the Setswana phrase for farming derives from the term "to plow" (Alverson, 1978b: 129). Certainly, the end of the plowing operation signals the end of one major part of the agricultural calendar. Traditionally, adult males have undertaken plowing operations (though not exclusively today).[7] It is still common to find a number of men migrating out of the lands just after plowing, taking up employment in the Azanian mines under contracts typically beginning in January and February (Kerven, 1979b). The next stages in the cropping season include weeding, birdscaring and harvesting which are largely, but not exclusively, female occupations. This period of cultivation is the busiest time of year for most farmers, a fact which is reflected in their increased demand for convenient, nearby water supplies during this time as well.[8]

For some households a contributing factor explaining the demand for more convenient water points at the lands may be that this period before harvest is also likely to include food and nutritional shortfalls. The effects of seasonal hunger and illness, particularly on the availability and productivity of agricultural labor, have not been systematically studied in Botswana and the existing evidence is suggestive at best. One study has stated that diarrhoeal diseases peak during the hot rainy summer months of January and February and that these diseases contribute to dehydration and weight loss in rural areas. Another study found that the number of well-nourished children decreased in the month before harvest time. Perhaps another reason for poor nutrition at the lands is that some, though by no means all, households there cut back domestic maintenance activities in order to meet the additional labor demand of the cropping season.

The food and health plight of households at the lands may be eased somewhat by several factors: (1) since calving peaks in November, milk is more readily available for several months thereafter; (2) gathering wild veld foods increases during the wet season; and (3) one of the benefits of the mixed cropping that the Batswana practice is the early harvesting of maize and cucurbits. Finally, it should be noted that the condition of cattle typically improves by the end of the wet season and the beginning of the dry season. This is in part a function of the reduced demands made on oxen and

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[7] Perhaps a quarter or more of the rural households in Botswana are headed by females (Fortmann, 1981).

[8] Although a number of outside observers have debated whether or not there is a shortage of agricultural labor in the countryside at this time, numerous questionnaire surveys confirm the fact that many farmers perceive such a shortage.

milk cows by that time as well as of the grass growth cycle which peaks in a normal year between February and April. Some herd-holders respond to improved grass conditions by moving their livestock between dry and wet season pastures in different localities. In other cases herds move freely to areas of better grazing within a locality. Both shifts affect demand for livestock water.

The more variable the plowing dates, the greater the spread of harvesting dates. In a poor rainfall year, harvesting if it is done at all may take place as early as April; in an exceptional year, some harvesting may be going on in August or even later. Once harvesting is finished, many household members return to their villages. A major factor contributing to this departure is the drying up of small and large surface water sources at the lands and cattleposts by the time of harvesting and threshing.

There is at least one sense in which the cropping season does not end with the lands harvest and the return to the village. Certain enterprises add value to crops prior to their consumption. In particular, the brewing and sale of sorghum beer increases substantially with harvesting and figures prominently in village life and celebrations thereafter (Roe, forthcoming). Increased demand for water as a result of local beer-making is just one more factor in the seasonal shift of population according to an agricultural calendar which carries with it a shifting demand for water among residences.

In brief, then, the impact of seasonality on water use in communal areas is as follows. The seasonal cycle of rainfall determines <u>which</u> sources (both ephemeral water sources and rechargeable groundwater supplies) contain water. The beginning of cropping activities generally coincides with the first months of the rainy season. This agricultural season, in turn, affects <u>where</u> people are and the <u>nature</u> of their water needs. This is to say that water use in a given locality varies by season because of the change in residence related to the agricultural calendar. This seasonal change in residence also determines <u>who</u> might be expected to use or manage water at a given location. Those who are not at a location clearly will not be involved. Finally, the seasonal availability of pasture affects where cattle can be herded and hence, where there is a demand for livestock water.

One further area of activity must be elaborated in this overview of the seasonal agricultural calendar. Figure I-3 gives the monthly location of members (aged ten years and older) of the households enumerated in the Water Points Survey between November, 1978 and October, 1979. The respondents classified the location of residence as a village, lands, cattlepost, or an area with mixed land uses. This figure shows, for example, the post-harvest shift of population from the lands to the village

and the post-December decrease in the lands population and increase in the "away" population as men migrated out after plowing. More significantly, it underscores the dispersed nature of the rural household and the varied communal localities in which it lives.

The notion of a household as an unified social and economic unit sharing the same dwelling place does not hold for many families in the countryside of eastern Botswana. Members of a family may be split among several different residences in the course of the year. The effect of this is that the unit of production for the family may not be the same as its unit of consumption. Not only may some household members work at the lands only periodically, if ever, but neighbors and relatives are often an important source of labor and other resources to the household during the cropping season. Where a household member works is not necessarily where the whole household is located nor will what is produced by that member necessarily be shared within the household as a whole. It is no longer reasonable to define a household, as Schapera once did, as a "group of people living in the same collection of huts" (1938: 12-13).[9]

The structure of the household and the locality in which it resides are intimately connected. By virtue of different members engaging in different economic and social enterprises in different localities, these localities, in turn, become different from each other. Not only do localities differ in terms of their dominant productive function — as being a lands, village, cattlepost, or some combination of these — but any one locality's social and economic activities change over the course of the agricultural calendar as household members move among them. For example, after harvest a number of lands become grazing areas and villages become places for increased celebrations and social gatherings.

At one level the aggregate population curves in Figure I-3 provide a template against which to classify any communal locality—that is, a locality is what its ownpopulation curve most closely approximates. But at a more decisive level these

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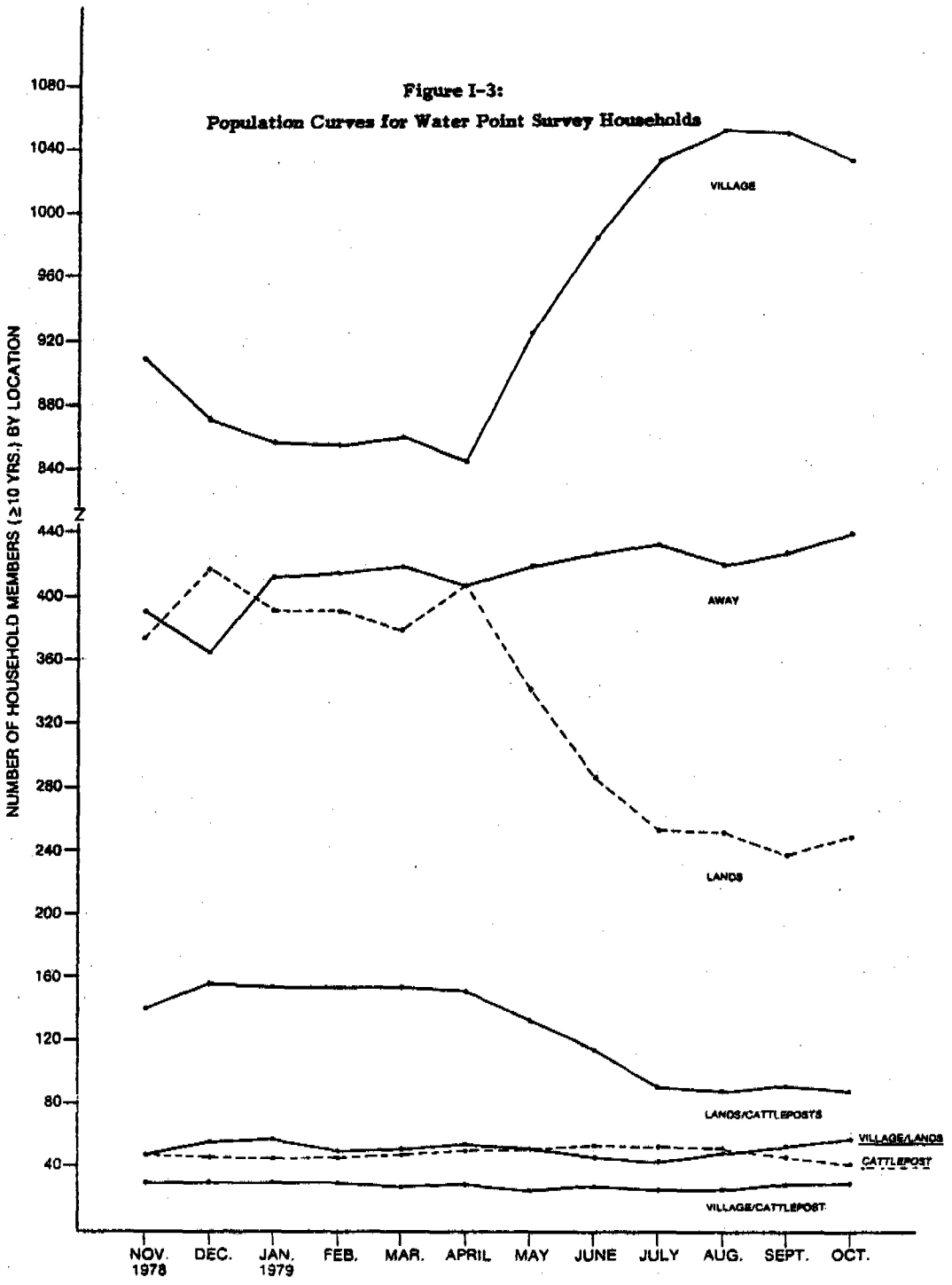
[9]Two additional qualifications affecting household location and activity are in order. First, since localized droughts commonly cause shortfalls in both crop yields and the availability of surface water sources, a household's length of stay at the lands can vary substantially by locality and from year to year. Moreover, eastern Botswana's hardveld is itself a heterogeneous composite of micro-ecologies. For example, the vegetation and forage in the northern hardveld is distinctly different from that found in the central and southern hardvelds. Second, a characteristic of the countryside is the wide variation among localities in the distribution of household livestock holdings. Aggregate statistics, such as the oft-quoted figure that 45 percent of the rural households do not own cattle, mask substantial locality differences (see Bailey, 1982).

Figure I-3:
Population Curves for Water Point Survey Households



curves underline how difficult it is to isolate many communal localities as if they existed independently of each other or existed in an unchanging state over the course of a year. This is not only because many household members in the countryside do not live in isolation from each other or their neighbors. There are other economic, social and political factors at work as well. As shown in Figure I-3, there are a number of communal areas which would be difficult to describe as "villages" if most of their households did not cultivate. Village and lands mirror each other in terms of population shifts, so that a village without lands is at best a different kind of "village." In this sense, it is not the locality, but the compound locality (the village and its lands and cattleposts areas) which is in many cases the appropriate unit of analysis when describing rural land and water use over the course of an entire agricultural calendar.

A locality and compound locality are not only spatial units in which all or some aspects of the economically important seasonal activities relating to agriculture take place. They are also the sites of social and political interactions which influence land and water matters. A complete understanding of water use and management requires a description of these other factors.

Present-Day Institutions and Officials Involved in the Rural Water Sector of Eastern Botswana

Table I-1 lists the major institutions and roles found in the rural water sector. Some of these such as dam groups, the Ministry of Agriculture, and land boards are analyzed in detail in this study, while others are mentioned only in passing. All, however, require comment since they are vital part of the context in which rural activities concerning land and water take place.

The columns in Table I-1 locate each institution and official position in terms of important water activities, namely, (1) developing water resources, (2) managing and/or using these resources, and (3) managing what conflict may arise as a result of water development, management and use. [10] It is important to note that those who develop water resources do not necessarily manage them, though those institutions and roles

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[10] In subsequent chapters, the multiple meanings of "water management" will be increasingly refined. For present purposes, the common-sense notion of management as the exercise of control over water resources is sufficient. "Conflict management" and "conflict settlement" will be used interchangeably. By this latter term, however, we do not mean to imply "conflict resolution"—some conflict over water development and management may be controlled without ever disappearing.

TABLE I-1

Bureaucratic, Political, Social and Economic Units Affecting Water Activities in the Eastern Communal Areas of Botswana*

Locational Level	Developing Water Resources	Managing and Using Water Resources	Managing Conflict Over Water Development, Mngt., and Use	Water Resource Control Areas
National (mostly bureaucratic/ [political])	- Central Government Ministries + Ministry of Agriculture (with BNC) + Ministry of Local Gov't & Lands + Ministry of Min. Res. & Water Affairs - President, cabinet, parliament	- Agricultural Resources Board	- Agricultural Resources Board - MoA - MLGL	
Regional (mostly bureaucratic/ [political])	- Some Regional Agricultural Officers		- Some RAOs	- Zones under Tribal Grazing Land Policy - Some Ministry extension and regional planning areas
District (mostly bureaucratic/ [political] and political/social)	- District Officers (Lands) - Land Use Planning & Advisory Groups - Some District Agricultural Officers - Some paramount chiefs within tribal administration	- Conservation Committee	- District Councils - DAOs - DO(L)s/LUPAGs	- Districts - Tribal areas
	- District Councils - Some main land boards		- Most main land boards - Some paramount chiefs as heads of tribes - Persisting tribal laws and customs governing resource mngt.	
Sub-District (mostly bureaucratic/[political])	- Many DAOs - Some members of parliament		- DAOs - MPs - Some Chief's representatives	- Subordinate Land Board areas - MoA extension areas - Some chief's Rep Areas - Some parliamentary constituencies
			- Subordinate land boards	
Multiple Locality (mostly social/ economic)	- Many agricultural demonstrators - Some District councillors	- Many resource mgnt. groups, initiated by gov't, esp. for dams, bore hole syndicates, farmers committees, livestock, marketing groups, & drift fences	- Some customary courts located in village Kgotla, but trying lands & cattlepost disputes - ADs, district councillors, many groups initiated by gov't	- Villages with their own lands & cattleposts - Villages having mixed/shared lands & cattleposts - Some district council constituencies
	- Some wardheads & headmen for village and associated lands & cattleposts - Some household members, relatives & neighbors	- Some wardheads & headmen for village with associated lands and cattleposts (BADISA) - Some household members, relatives & neighbors		
Locality (mostly political/social and social/ economic	- Some agricultural demonstrators	- Many resource mgnt. groups initiated by gov't	- Some village customary courts - Some VDCs	- District villages, lands, cattlepost, or other semi-autonomous localities such as permanently settled lands - De facto control of grazing around boreholes - Household (units of consumption and production at different compounds)
	- Some, but not all, village development committees - Some village headmen and wardheads - Neighbors & other groups - Household members & some relatives	- Some village headmen and wardheads - Neighbors & other groups - Household members and some relatives		

*Those institutions and positions having a minor or weak part in these activities are underlined. Institutions and positions involved in more than one activity are placed between the row rather than in each row. National political forms of organization are bracketed.

which are involved in direct resource management at times have some involvement in managing actual or potential resource conflict. And in some cases, those who settle such conflict often influence, albeit indirectly, subsequent resource development and direct management. This point will be discussed in more detail later. In addition to classifying institutions and roles according to their water activities, the final column in Table I-1 identifies the important official and unofficial spatial areas in which water resources are controlled in the rural water sector.

Both the column and row variables are, to use the anthropologists' distinction, a combination of emic and etic headings. Terms such as "compound locality" and "resource control area" have no Setswana equivalents. Certainly the row variable identifying the locational level at which each unit of analysis has its locus of control—national through to the locality—does not correspond to the hierarchy of spatial units as traditionally conceived by Batswana, but rather it encompasses categories we have found useful in conceptualizing water issues in eastern Botswana. The locational levels do not represent a continuous, unidimensional variable. Districts are legal entities, while localities are not. Several ministries' administrative sub-districts are larger in surface area than are some districts, and the boundaries of a number of these sub-districts do not coincide within the same district. Moreover, the differences between a locality and a compound locality blur when two adjacent localities, such as a lands and cattlepost, have merged into a shared and mixed lands and cattlepost area (a phenomenon which will be discussed in more detail below).[11]

In the far left column of Table I-1, the institutions and roles listed in each row have been characterized by the kind of organization predominantly found at each locational level, namely, (a) bureaucratic/political, (b) political/social, or (c) social/economic. As the following pages should make clear, there is often no clear-cut distinction between central government bureaucratic and political structures, largely because the former at times allocate resources and set de facto policies independently of the formal political process. Similarly, the traditional political and social roles of chiefs and their subordinates are inextricably bound together and are not solely dependent upon government sanction or role. Moreover, such institutions as the rural household operate both as the means of socialization and social control of its members as well as the unit of economic production to reproduce itself. The bureaucratic,

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[11] Although in the past an area might have within it two or more named localities having different land uses, today they may be indistinguishable in terms of land uses, while still retaining their "locality" names.

political, social and economic dimensions of organization form only a rough continuum, however; for example, a bureaucratic/political creation, such as the Botswana Meat Commission which buys livestock producers' cattle, affects many rural households directly.

Finally, as Table I-1 shows, there are a number of instances where institutions or roles are involved in multiple water activities. For example, it is not uncommon to find the same household involved in some forms of water development, management and related conflict settlement over an extended period of time.[12] For this reason, we have chosen to discuss the importance of each institution and official position not by the types of water activities it is involved in, but by the type of institution or position it is popularly thought to be—namely, one that is "traditional" or "modern." This dichotomy is commonplace in government discussions about rural institutions and is one which the reader must first appreciate in order to understand how it has distorted government perceptions about the rural water sector.

"Modern" institutions are often taken to be those initiated or promoted since Independence, particularly those officially established by government. "Traditional" institutions and roles, on the other hand, are almost always identified with those established prior to Independence under chieftainship. In addition, this distinction is often infused with a sense of some traditional structures persisting in the face of modernity or, conversely, of modern institutions and roles replacing traditional ones.[13] While in certain instances this sense is correct, the "traditional/modern" dichotomy sometimes connotes less a distinction of contrast than of synthesis: as will be seen later, some so-called "modern" institutions act in very "traditional" ways, while other purportedly "traditional" roles have changed considerably since Independence ushered in new and expanded socioeconomic and political pressures at the local level. Thus, this dichotomy is put within quotation marks here to indicate its status as a conventional wisdom. For this and for the other reasons mentioned above, Table I-1 represents only a first approximation for distinguishing the units of analysis relevant for discussing rural water issues in eastern Botswana.

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[12] According to Gulbrandsen (1980), a household can be conceived as having a "life cycle" through which it is involved in a number of socioeconomic activities during different periods of time.

[13] For some officials and politicians, "traditional" and "modern" also act as codewords for "backward" and "advanced."

The Importance of "Modern" Institutions and Officials in Water Resource Development, Management and Conflict Settlement. With Independence came the present two statutory levels of government in Botswana--central and local (i.e., district). Their respective roles in water development, management and conflict settlement are defined by a set of laws and policies concerning the responsibilities of various government authorities. The portfolio responsibilities of the Ministry of Agriculture, for example, include the "siting, construction and maintenance of small dams for agricultural purposes," a subject which is examined in detail in Chapters III and IV. The Ministry of Local Government and Lands has portfolio responsibility for district councils and land boards, both of which have statutory powers affecting water development, management or conflict settlement in their administrative areas. Each district council has locally-elected and Ministry-nominated councillors and, in its capacity as a local government authority, it is responsible for the provision of public water supplies, where "public" has been largely, though not always, taken to mean village water supplies used for domestic (human drinking) purposes only. The district council operation of village water supplies is discussed in the next chapter, while the land board responsibility for water point development, management and conflict settlement is detailed in Chapter V. Suffice it to say that with only a few exceptions, district councils are comparatively more involved in water planning, development, and management, while land boards are much more concerned with water-related dispute settlement. A further ministerial division of responsibility is reflected in the fact that the actual construction of district council water supplies as well as of other government water sources--except those dams built by the Ministry of Agriculture--is undertaken by the Ministry of Mineral Resources and Water Affairs, often assisted by donor financing and personnel.

The field staff of the Ministry of Agriculture, particularly its extension division, are found at all locational levels and have an especially important role in water development in the rural areas. The agricultural demonstrators (ADs) and district agricultural officers (DAOs) are particularly significant in the formation of groups to manage those dams constructed by the Ministry's dam building unit. In addition, the Ministry of Agriculture has projects which provide financial and/or staff assistance to rural people who want to set up and operate livestock marketing cooperatives, farmers committees, fencing groups or other organizations which have a direct or indirect impact on rural water use and management in the areas concerned.

Special mention must be given here to the pricing and throughput policies of the country's only national export abattoir, the Botswana Meat Commission (which has a close association with the Ministry of Agriculture), since these policies have a profound

influence on livestock holders' decisions to develop and invest in livestock improvements, such as stock watering boreholes. In effect, the importance of the Ministry of Agriculture in the eastern rural water sector lies primarily in the area of water point development, rather than direct water management or related conflict settlement. Some extension agents do contribute to dispute settlement and the lessening of tension over water matters in their areas, but this is not the norm. The Agricultural Resources Board with its district conservation committees has the legal ability to recommend destocking orders for areas judged to be overgrazed, but it has so far lacked the political and bureaucratic willingness to do so. Lastly, the Ministry of Agriculture does not retain an effective link with the dam groups once it hands its dams over to them. As will be made clear in Chapter III, the conditions laid out in the Ministry of Agriculture's "lease" of the dam to the group are rarely met by any group in practice.

In addition to district councils and land boards (some of which, in turn, have subordinate land boards), the Ministry of Local Government and Lands is responsible for other departments and administrative units which directly or indirectly affect water use and management, three of which should be noted here:

(1) The Tribal Administration, which has given official status to some but not all traditional positions such as paramount chief, chief's representative and headman, is responsible for presiding over official customary courts (some of which try cases relating to water and land matters). Moreover, the Tribal Administration has been given a role to play in promoting rural development policies by virtue of having positions for chiefs and headmen on various development committees, particularly at the district and village levels.

(2) The Land Use Planning and Advisory Groups (LUPAGs) and the District Officer (lands) operate in each district under a District Commissioner who, although falling under the authority of the Ministry of Local Government and Lands, acts as central government's senior representative to the district. The District Officer (lands) is directly accountable to the District Commissioner and is responsible for coordinating all district land use planning exercises. In particular, the DO(L) is secretary to the LUPAG in the district. This is a technical support group, particularly to land boards, on matters of land and water policy. LUPAGs and DO(L)s have to date been largely involved in water point planning and development and have had almost nothing to do with the actual management of water resources. Only by virtue of their advisory role have they had some small influence in conflict management over water resources.

(3) The policy of the Ministry of Local Government and Lands, with implementation left to the district councils, is to establish locally-elected village development committees in villages throughout the country. These committees are the major local-level institutions for recommending and approving most development projects, such as village water supplies, to be funded through the district council and the Ministry. Some VDCs have been concerned with the Ministry of Agriculture dams, but, on the whole, VDCs today play only a minor role in village water management and conflict settlement. It should be noted that, while the VDC (called by some the "parliament of the village") is a bureaucratic/political creation of government, its actual decision-making and activities are often outside the direct control of government. In fact, some successful VDCs draw their legitimacy solely from having as their leaders village headmen who have influence by virtue of older political and social roles.

Finally, the water-related ministries operate within the political context of a state apparatus headed by a president, cabinet and parliament which, from time to time, promulgate laws and policies concerning land and water matters in rural areas. As noted above, what appears as bureaucratic influence at times derives from political power, making the two difficult to distinguish within the government. For example, while the president and cabinet sanctioned both the Tribal Grazing Land Policy (leading to the establishment of leasehold ranches on tribal land in sandveld areas) and the Agricultural Resources Conservation Act (leading to the establishment of the Agricultural Resources Board and its district conservation committees), both were originally formulated within and strongly advocated by various central government departments and officials. In the same way, even though land boards, in consultation with district councils, retain their legal right to set water policies in their administrative areas, most of the significant government development policies operating today have either originated or been promoted by central government ministries. Perhaps the water resource development process manifests its most political form through a few members of parliament and district councillors who have become advocates of water point construction in their constituencies. This process is probably most bureaucratically directed when central government water development funds are allocated and apportioned to districts on the basis of their population counts.

It should be noted here, however that while government provision of water sources is especially important for villagers, households remain the major source of water point development, management and conflict settlement in many communal areas. This point will be discussed more fully in Chapter II.

The Importance of "Traditional" Institutions and Officials in Water Resource Development, Management and Conflict Settlement.

Mostly About the Past System. There was no uniform system of traditional chiefly authority in Botswana. Moreover, tribes varied in terms of chieftainship hierarchies, laws and customs. To describe "common" traditional institutions which once existed in Botswana requires a degree of generalization and abstraction to which exceptions can easily be found. The intervention of missionaries, traders and eventually the colonial government also had a profound effect on traditional laws and customs, an impact which varied by tribe. Schapera, who chronicled many of these earlier laws and customs, concluded it was not possible to divorce such "outside" influences from local tribal law (1938: 44-45). Nonetheless, the following discussion attempts to generalize about some of the more important tribes' major traditional institutions as they existed in the Protectorate, with European warts and all.

According to Schapera, the traditional "central government" was based on the paramount chief of a tribe and his close advisors (1938: 53). No higher unit of traditional authority existed which bound together the major tribes, whose tribal areas eventually became the basis for many present-day government districts. The administrative system of chieftainship was based on delegated authority, each level of which was ultimately responsible to the chief. In its idealized form, members of a family lived in the same collection of huts, such that the household could be identified with its domicile. These compounds and their families were, in turn, grouped by village ward, each of which had a wardhead. Should the village have more than one ward, then there was a village headman (often the senior wardhead) to whom other wardheads were accountable. In larger tribal areas, these village headmen were themselves responsible to the paramount chief's representatives, who often had authority over a number of village areas. The chief's representatives were directly accountable to the paramount chief (Schapera, 1938: 53-103; Schapera, 1943: 30; Schapera, 1970: 83-84; van Niekerk, 1966). This administrative system from wardheads to chief's representatives was called by Schapera the traditional "local government" of a tribe (1938: 89). Although some of the names for these authority positions varied by tribe, today it is common to speak of each as a "chief."

This political and social system was very important in terms of resource development, management and conflict settlement. The wardheads, village headmen and/or their designates had the right to allocate to a tribesperson land for arable and residential sites. In discharging this traditional role, these people were called in several

tribal areas badisa (sing., modisa), or overseers for the area for which the allocation was being made (Schapera, 1943: 143-144; Wynne, 1981: 39). The modisa for allocating a cattlepost to a household or for granting it permission to use a grazing area might have been the same wardhead who allocated lands areas, though it appears to have been more common to allocate a large grazing area (naga; pl., dinaga) to more than one ward (Schapera, 1943: 224-227).[14] In addition, construction by tribespeople of water points, such as open wells, required prior approval of the appropriate overseer or paramount chief. Whatever the level of overseer, though, the land under their allocative authority was seen, within the traditional system, as having been ultimately allocated to them by the paramount chief (Schapera, 1943: 42). Thus, the administrative hierarchy of local and central government became particularly important for water and land disputes, since in theory a household could appeal the allocation decision of a wardhead to its village headman and, if necessary, all the way to the paramount chief (Schapera, 1943: 42). The kgotla of a ward, village or tribal capital was, in addition to being a public meeting place, the locus for settling water disputes which could not be settled by households, relatives or neighbors directly.

It is not a gross generalization to say that the traditional system of chieftainship incorporated not only the political dimension of traditional Tswana society (its "central" and "local" government), but also that society's social and economic dimensions. For a tribesperson, one's community was the tribe, or, on a smaller scale, his or her ward and village. Willett is surely correct when he states that, even today, many Batswana do not consider a settlement to be a community unless it has a traditional headman and a kgotla (1981: Chapter 26). Moreover, the pattern of seasonal population movements was regulated by the way chiefs stipulated where livestock could be kept, when villagers could leave for the lands to plow and when they were expected to harvest and return to the village (Schapera, 1943: 185ff). Thus, even more so in the past, a village which had no lands, no grazing areas, no seasonal activities, or no regulation of agricultural activities, ceased to represent a community in much of the traditional sense.

There were a number of customs and laws which governed range and water use in Botswana, many of which varied by tribe. Some of these practices were dying out even

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[14] Apparently, badisa for a number of grazing areas were either village headmen or direct personal appointees of the paramount chief (Schapera, 1943: 224-225; van Niekerk, 1966: 40-41).

in the colonial period, e.g., in some tribes the custom of once considering open wells as common property eventually gave way to recognizing that those who constructed the wells could regulate access to their use (Schapera, 1938: 210; Schapera, 1943: 246). Other conventions—particularly that travelers in an area should not be denied water nor should a person be denied emergency domestic water supplies—have persisted up to the present in certain areas.[15]

Mostly About the Present-Day System. Depending on one's theoretical perspective, one can look at Tswana culture and society today as experiencing the breakdown of many traditional patterns and relationships or as demonstrating the persistence of at least some traditional structures and norms in the face of population change and the establishment of modern institutions. Certainly the idealized description of traditional institutions presented in the previous section is no longer a close approximation of the reality in many communal areas. Today, paramount chiefs do not regulate seasonal population movements to and from the lands; they do not solely determine who will get allocated land and water where; they no longer settle all major disputes concerning land and water matters. The laws and policies underlying the creation of the Tribal Administration, land boards, and LUPAGs have led to a steady diminution of the authority and power of many paramount chiefs over water matters.

Yet, as described in Chapter V, some modern institutions, such as land boards, have retained some customary ways of making decisions and settling disputes. For example, one law requires that a land board applicant must first seek approval from a wardhead, even though the same law does not stipulate that these chiefs must be the official ones recognized by the Tribal Administration. Moreover, there are still headmen, some of whom are not paid government officials in the Tribal Administration, who wield considerable authority by virtue of the respect they command from villagers. Villages, in contrast to many lands areas, are still the center for celebrations, schools, churches and social services. On balance, however, it is clear that the political, social, economic and spatial patterns of traditional relationships have indeed changed. To begin understanding the nature of these changes requires first an extended discussion of how localities and compound localities have altered over time as distinct spatial areas for controlling and organizing land and water resources.

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[15]Chapter II examines in greater detail how some of these customary norms have persisted to the present. Chapter III provides details on how one traditional water norm, namely, that surface water sources are often considered to be common property, has affected the use and management of recent government dams.

The Changing Form of Local Resource Control Areas. The development, management and conflict settlement involving land and water resources in the Botswana countryside have been affected by the proliferation of administrative areas, both bureaucratically created and legally mandated, for agricultural and water extension, land use planning, district and sub-district administration and elections. Some of the effects of these various administrative and legal areas will be examined below, but they cannot entirely explain the profound restructuring of localities and what we call compound localities, much of which has taken place since Independence.

For our purposes in this monograph, it is not essential to classify all the different kinds of localities found in the eastern communal aeas, let alone in Botswana. What is important, however, is to understand the forces which have given rise to the creation and multiplication of new types of communal areas and the direction these forces have taken, since they have affected the pattern of water and land operations in eastern Botswana. Each locality can be conceived of as being situated along two dimensions in the eastern communal areas: (1) the degree of seasonal fluctuation in a locality's population, that is, the ratio of seasonal residents to permanent residents in a locality,[16] and (2) the degree to which a locality's resource base and its access to those resources is limited. We have already discussed the nature of seasonal population fluctuations, especially those affecting agriculture. Suffice it to say that they were probably more pronounced in the past, when permanent settlement at the lands and cattleposts was less widespread and the chiefly regulation of seasonal population movements was still in practice.

Describing a traditional locality's resource base is a more difficult exercise, since in the distant past, the locality's resources were more limited in one sense while in another sense, they were less limited than they are today. As noted above, access to lands and grazing localities in many tribes was at one time restricted on a village ward basis: a lands locality might have been assigned only to members of a given ward, while a grazing area may have been assigned to the same ward or shared with members from several other wards. Thus, it appears that access to land for cultivation or herding was once limited according to village ward status. As will be described below, this has

[16]Since it is theoretically possible that the number of permanently settled residents in a locality may equal zero, a "high" seasonal ratio includes an estimate of infinity. However, a number of eastern localities today rarely go to zero population levels for any extended periods during the course of a year, except possibly in times of drought (see Figure I-3). By "permanent resident" is meant the presence of at least one household member in the locality during the course of a year.

changed with increased sharing of localities with other wards and eventually with other villages not originally assigned to them.

On the other hand, in the past, when land was abundant and when livestock and human population densities were low, it was possible to find localities with really no fixed and permanent boundaries, a situation roughly approximating Werbner's contemporary account of a locality in the north-east of the country:

> No single political unit is defined by a locality. Indeed, it covers an overlapping of administrative divisions, and is not a bounded territory. A locality is a named expanse of land near or surrounding a landmark, such as a knoll or kopje, a river or another distinctive feature, a great stand of trees for example. As an area of cultivation and land use, it may overlap two or three wards, without embracing their total territory or even the whole of one ward. (1975: 103)[17]

It is true that attempts were made by various chiefs to use roads, river beds, trees, outcrops, vegetational changes and man-made beacons as boundaries for some lands and grazing areas (Schapera, 1943: 143, 224). Even some of this "demarcation," however, was ad hoc at best, and where formal attempts at demarcation were made, there was no guarantee that these boundaries would be fixed and permanent: the courses of roads and rivers change; stands of trees become firewood, poles and destumped fields; the range becomes overutilized or fired; and all too often man-made beacons disappear. This is not to say that in the past a tribesperson from a locality was never certain if he or she was really in that locality; they knew and continue to know. A locality did not change from year to year as a sand dune does. Rather, in the past, many local perimeters did not matter as much as they do now in many communal areas. Where abundant land and low population densities existed, one did not have to worry about the exact location of an area's borders in order to know that his or her allocation fell within the area. The "boundary" that did matter, particularly to many chiefs, was the separation of lands areas from cattlepost grazing areas, though today the "boundaries"

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[17] The 1971 Census also noted this lack of firm locality boundaries in a number of areas persisting in the early 1970s:

> . . . boundaries were not precisely defined, and it was not necessary that they should be as long as all localities were listed by name and relative position. The people of every place know it by name and are well aware in general terms of its boundaries so that it was not unduly difficult to get answers like, this place is so-and-so; but that, over there, is such-and-such. (Central Statistics Office, 1972: 22)

between some of these areas have disappeared for all practical purposes. Where the boundary between two localities was once informal or even formal, today it can be the subject of conflict and dispute. Where land availability within a locality was once no constraint, today a locality may be perceived as having no more space for any new allocations. Where boundaries were once really never questioned, today new boundaries compete with older ones, as in the case of owners of livestock watering boreholes claiming de facto grazing rights of control around these boreholes.

Schematically, this past situation can be represented as falling on the two continua mentioned above:

Table I-2:

Status of Past Localities as Resource Control Areas

		Locality Boundaries More Limiting: Locality Shared	Locality Boundaries More Limiting: Locality Unshared
Relative Seasonal Population Variation	Low		
	High		$(V:L:CP)_i$

The traditional resource control area is taken to be the compound locality of the village (V) plus its assigned lands (L) and cattleposts (CP), represented in Table I-2 as $(V:L:CP)_i$. This compound locality is characterized by high seasonal fluctuations in population between its localities, each of which is neither shared with other tribespeople ("outsiders") nor characterized by closely defined boundaries. In light of what was discussed above, this traditional compound locality could have been shown on a village ward basis, but for ease of exposition and since it does not affect the conclusions drawn below, what were once ward-identified localities have been grouped into a larger (V-L-CP) compound locality. Moreover, since the land use processes of sharing and mixing described below may have affected localities at differential rates (a cattlepost area may have become shared by outsiders before its associated lands area), the representative compound locality of a village with its lands and cattleposts should be viewed as at best a modal case and at worst an ideal type still popular as conventional wisdom about past land use in Botswana.

Today the distribution of types of localities and compound localities is very different from this hypothesized past one:

Table I-3:

Present-Day Localities as Resource Control Areas

Relative Seasonal Population Variation	Access to Resources: Locality Boundaries More Limiting: Locality Shared	Access to Resources: Locality Boundaries More Limiting: Locality Unshared
Low	Towns	$(L/CP)_{ij}$
	"urbanized" large villages	V_i: $(L:CP)_i$
High		$(V:L:CP)_i$ V_i: $(L/CP)_{ij}$

While there are still some villages and even village wards which more or less have their own lands and cattlepost areas, unimpinged on by growing populations around them, the passage of time has witnessed profound changes in the eastern communal areas:

(1) Even in the 1940s, Schapera found evidence of considerable "intermixing" of members from different wards in lands and grazing localities originally assigned to other wards (1943: 145, 227). In fact, some lands and cattlepost localities have now become effectively shared by residents from other villages, a process assisted by land boards and the Ministry of Agriculture, which, in the face of rising demand for lands and livestock watering points, have often ignored these customary assignments. Thus, what was once a lands area associated with one village (as in Table I-2) has now become a shared lands with more than one village represented as (L_{ij}). Also, it is probably the case that in most instances in eastern Botswana there is no longer an identifiable grazing locality for a village, but rather a shared cattlepost area (CP_{ij}) used throughout the year by a number of villages and settlements.

(2) Population growth—both human and livestock—has been such that some of the traditional compound localities of villages and their lands and cattleposts have expanded out to natural and man-made boundaries such as roads, hills, and rivers (so that the position of $(V:L:CP)_i$ in Table I-3 is to the left of its position in Table I-2). Localities also have pushed up against other localities whose population and demand for land and water have been growing as well. Herders and cultivators have begun to feel hemmed in and increasingly restricted to their localities with fewer options for inter-locality movement. People have begun to search for "vacant" lands, such that boundary disputes have arisen. With the development of livestock watering boreholes in grazing areas, those who own and use such boreholes have claimed rights to the grazing land around them, leading to the creation of new de facto boundaries within and between cattlepost areas. Such a borehole becomes its own kind of "locality."

(3) In addition, with rising livestock numbers and/or hectarage cultivated, communal localities have witnessed increased crop damage due to straying livestock. Residents in some of these localities have responded by constructing long "drift" fences which separate lands from grazing areas (in the above typology $(L:CP)_i$).

(4) Although growing dramatically, particularly in terms of squatters, new towns and townships have developed with comparatively low seasonal population levels and with demarcated "city" limits. In some cases, these towns have drawn people from all over the country. Similarly, attempts have been made by government to define the boundaries of some of the "urbanized" large villages and it is probable that some of these larger villages have a higher proportion of non-seasonal residents (e.g., government employees and traders originally not resident there) than do smaller villages.

(5) Perhaps most important, the population curves in Figure I-3 show that a number of households live in localities with combined land uses, many areas of which these people call the mixed lands and cattleposts (L/CP). Permanently settled lands areas are often really mixed lands and cattlepost localities which are shared by former residents of several villages, but which have become increasingly autonomous and distinct from these villages (in the above typology $(L/CP)_{ij}$). In fact, villages are often in the position today of not only having lands and cattlepost areas shared with other villages, but these localities, in turn, have mixed land use functions (that is, V_i: $(L/CP)_{ij}$).

(6) Underlying all of these changes, as described above, has been the parallel spatial dispersion of many household members among more than one residence at any time of the year, so that the household's unit of production may not have the same location as its unit of consumption.

To summarize: today in eastern Botswana, there are a variety of communal areas which differ from the traditional compound locality of a village with its own lands and cattleposts. The nature of lands and cattlepost localities has changed both in terms of these localities becoming shared with other wards and villages and taking on additional land uses. Thus, while people continue to recognize that a locality is still today associated with a particular ward or village, they might at the same time argue that this association does not entail exclusive village or ward rights to that locality. Such locality changes, in turn, have meant modifications in the status of the traditional compound locality, particularly with the rise of new settlement areas such as permanently settled lands areas (which, in reality, are often mixed lands and cattlepost areas). Boundaries now matter in a way they never did before, where the forces underlying these changes include declining chiefly authority, higher population

densities, rising livestock incomes and private borehole development, decreasing availability of land for arable and livestock agriculture (which is largely practiced extensively rather than intensively), and the establishment of modern institutions which have attempted to supercede traditional ones in land and water matters.

Some of these locality and compound locality changes have had an effect on rural water use and management. Requests to district councils for "village" boreholes in permanently settled lands areas have increased. Moreover, as human and livestock numbers have increased in a locality, so too has the need for inter-locality mobility. That is, heavy grazing, man-made grass fires, and the more rapid utilization of finite surface water sources may have compelled some herders to take their livestock outside the locality for supplementary forage and water. In addition, the private and government development of permanent livestock watering points, particularly in areas once used as wet season pastures, has reduced the effective availability of forage for many herders who traditionally grazed their cattle in these areas during the rainy season. Thus, there appears to be, now more so than in the past, a number of communal areas whose resource base is declining, thereby modifying the customary pattern of seasonal population movements once witnessed in their compound localities. Yet, as pressure for inter-locality mobility increases in the face of expanding population growth within many other localities, rising complaints of "encroachment" occur. Today the land uses within some of these localities are competing ones, as seen from reports of crop damage in the fields near livestock watering points in the mixed lands and cattlepost areas.[18] In other instances, conflict now arises between people over differences as to whether or not a locality is in fact shared, e.g., in defense against charges of "stealing" dam water and associated forage, some large herdowners contend that all grazing areas are "communal," i.e., open access. While Chapter II will show that the customary land use classification of village, lands and cattleposts is still useful

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[18] Two recent articles, published within a month of each other, give an indication of how topical and contentious the issue of boundaries has become in eastern Botswana:

> (a) During the time of Schapera's studies, the kgotla [the ward] probably could maintain a rather clear geographic unity, although even Schapera cites some exceptions to this among the Bakgatla. . . At any rate, today, among the Balete (a major eastern village of Ramotswa), there are numerous exceptions which point to the fallacy of attempting to define the kgotla in geographic terms. . . In the general geographic area of almost every kgotla, various households were pointed out as belonging to other makgotla. "This one is not ours, does not belong to us." . . . In one instance, I was told that a house built among the households of one kgotla was 'a mistake' because the owner was from another kgotla. (Allen, 1982: 119)

for establishing first-order differences between areas in terms of water and range use, in subsequent chapters we will try to identify where changes in this pattern have affected such use and management.

An Alternative Organizational Classification. As the far left column of Table I-1 shows, classifying institutions and roles by locational level provides an alternative to the "traditional/modern" dichotomy used above. Bureaucratic and political forms of organization, along with their resource control areas, dominate strategies for water development, management and conflict settlement at the national and regional levels. Here "bureaucratic/political" is almost entirely associated with the post-Independence state apparatus of a multi-party, ministerial form of government. That this is the case is not surprising since there was no counterpart to the national or regional (trans-tribal) domain within the traditional chieftaincy. Perhaps the best example of a resource control area dominated by bureaucratic and political concerns at these levels is the Tribal Grazing Land Program. TGLP represents a national policy aimed at planning for an inter-district region of the country, namely, the zoning of much of the tribal land in the sandveld for commercial ranching purposes, ostensibly as a means for protecting the districts' fragile sandveld from communal overgrazing.[19]

(b) Farmers at Ditshegwane, about 10 kilometers north of Malolwane in the Kgatleng District, have been facing difficulties of identifying boundaries and plowing area (sic) [at] a meeting of the Mmathubudukwane Subordinate Land Board. . . The farmers complained that an unmarked boundary line which demarcates the areas was confusing them because the tree[s] through which it passes were not marked. They protested that the Land Board was now allocating plowing sites on the grazing grounds, since they could also no longer identify the boundary. The farmers were apprehensive that land allocation was now likely to cause disputes over livestock that could cause crop destruction. . . [On the other hand, the Mmathubudukwane Subordinate Land Board secretary] reported that the boundary, which has long been demarcated. . ., was well known to the people despite the fact that there was no marking of trees. ("Boundary Problems Confront Farmers," Botswana Daily News, March 18, 1982)

[19]In practice, this attempt at regional planning has been stalemated, with bureaucratic and political concerns of central government pitted against, at times, those concerns of local government and the social/economic concerns of the residents in the localities affected by the zoning. In particular, TGLP has been criticized as a central government effort both to coopt local government (district) land use planning initiatives and responsibilities and to privatize for a few what many need as communal land. Whatever the merits of these criticisms, it is not surprising that central government asserted its claim over inter-district planning, given the absence of any traditional authority to make a countervailing regional claim. What is somewhat interesting to note, however, is the central government belief that it could settle resource conflicts regionally through bureaucratic and political means, when many of these conflicts exist at the locality and compound locality levels and are predominantly socioeconomic in nature.

At the district and sub-district levels, the mix of institutional types changes considerably. In the districts, central government political and bureaucratic concerns no longer dominate, but share the arena with the statutory and policy concerns of the local government authorities, namely, district councils and land boards. More important, the anomalous position of paramount chiefs and their representatives is highlighted at these levels as well. Such chiefs still retain considerable political and social powers, but these rarely, if ever, derive from their position within the Tribal Administration for the districts concerned. Their powers come less from government than from their persisting customary political and social roles within the older tribal areas that form the basis of many districts. In Table I-1 the political power that comes by virtue of one's government role alone is starred in order to distinguish it from that sanctioned by the persisting tradition of chieftainship.

At the compound locality and locality levels, social and economic modes of organization dominate the activities of water development, management and conflict settlement. In the case of many villages, the persisting political and social influence of headmen and wardheads remains important in these activities. In some villages, VDCs are also involved in regulating rural water use, though, as will be seen, such VDCs often operate and are organized along political, social and economic lines outside the direct control of local or central government. Most important, at the compound locality and locality levels, it is households, at times in association with relatives, neighbors, or more formally constituted groups, which account for most of the water points developed and managed at these levels.

As will become clear in subsequent chapters, the role of government at the compound locality and locality levels is a fairly circumscribed, if not minor, one when all water-related activities found there are considered. Chapter II shows that the district council provision of village water supplies has indeed played an important role in village water use in the eastern communal areas. Similarly, the Ministry of Agriculture's dam building program has had an impact on water use in some lands and cattleposts. Yet the ability of government to mobilize local resources to develop and manage water points and to settle water-related conflicts at these levels has been virtually nil. The following chapters examine in detail some of the important limitations on government penetration to these levels.

Summary

What started simply as a monograph about rural water use and management in eastern Botswana has turned out to be a more complicated enterprise, largely because

the same term may in reality represent a number of different units of analysis necessary for describing this resource use and management. A "village" can refer to many different realities: a single locality, an integral part of a compound locality, a locus for seasonal activities and social services, and a place in which a headman exerts (some) social control, if not (some) political power. In characterizing rural water development, use and management in eastern Botswana, terms such as household, village, headman and government have no meaning apart from the variety of contexts in which they exist. In this monograph, we have not been able to describe and deal in detail with all these contexts, but we have focused on the ones we find to be crucial to an understanding of the rural water sector as a whole.

Some introductory themes have been set out in this chapter--the overall importance of seasonality in the rural water sector, the spatial configuration of economic and social life in the communal areas, and the different forms of organization found in the rural water sector from the national to the local level. The following chapters develop these themes, giving specific attention to describing the role of government at each of these levels in terms of water development, management and/or conflict settlement. Chapter II begins this examination with an extended description of household strategies for water use over time and place. Considerable attention is given to this topic, since an understanding of the household's decision-making about its water requirements is necessary for understanding how water-related activities at the locality and compound locality levels differ from those found at the district or national levels.

Chapter III presents a case study of the Ministry of Agriculture's policy for group management of dams, illustrating how seasonality and socioeconomic factors operating at the local level profoundly affect the management and use of water points built, but not operated by, government. The bureaucratic and political concerns which dominate the national level's involvement in the rural water sector are discussed in Chapter IV, which sets out the organizational perceptions and biases that have structured Ministry of Agriculture dam building activities since Independence.

Chapter V examines the complex co-existence of "traditional" and "modern" modes of governmental decision-making at the district level of the rural water sector by considering how land boards and subordinate land boards apply a rule for the spacing of livestock watering points in their administrative areas. Each of these case studies is intended to illustrate the major water strategies relating to season, place and organization at the different locational levels. These strategies are brought together and integrated in Chapter VI to give an overall picture of the rural water sector in eastern Botswana.

Chapter I
INTRODUCTION

During the rainy season, it is difficult to think of Botswana in terms of the images associated with its Kalahari Desert. Dry river beds fill and wash with the rush of rainwater, roads which billowed dust and dirt in the dry season turn into thick mud, and sun-hardened soil softens into clods of tan and red earth in the wake of a plow. Some cattle huddle under scattered thorntrees during a light cloudburst, while others continue to graze in the shower. The fence poles around the several huts a family keeps at its plowing fields turn wet-black in the rain, and smoke from the cooking fires within—a sign that people and their herds have once again moved to the fields for the cropping season—scarcely rises above the grass roofs of the mud huts. Even on a sunny day in the wet season you can look to some part of the horizon and likely see a distant shower. Its rain is dark, slanted and moving, as if tracking the orbit of the people, their livestock and crops. In many places, the tradition is still to end a public meeting with a short burst of handclaps and with the valediction "Pula! Pula! (Rain! Rain!)," resonating both the hope that what was agreed upon at the meeting will be carried to fruition and the public desire for more rain and all the blessings it can bring.

For most people in the Botswana countryside, the recurring pattern of wet and dry seasons and of cropping and drought summons a set of variable strategies for water use and management. It is the aim of this monograph to show how season and customary practices have continued to shape rural water sector strategies, even after the advent of active government intervention in this sector. In addition, we will describe how several of these major government interventions have been premised on assumptions and beliefs about the "desert-like" countryside which are at variance with reality. Colonial and post-Independence policies and programs for the development of improved livestock and human water supplies in Botswana have both changed and been adapted to persisting seasonal patterns of water and land utilization. It is the interaction of season, custom, and government institutions, primarily in the relatively heavily populated countryside of eastern Botswana, which is our focus.

Initial Definitions and Descriptions

The most difficult task in describing rural water use and management in Botswana is the identification of the appropriate units of analysis. What at first seems a relatively simple matter of describing how a household uses water in the countryside or how water use varies among groups or rural communities is in fact not simple at all.

It is difficult not so much because water use is complex, but rather because the terms "household," "group" and "community," among others, are not easily defined. An example from the Botswana Water Points Survey fieldwork best illustrates this.[1]

Ministry of Agriculture officials asked us to determine whether or not local-level groups were operating stock watering dams in accordance with the Ministry's stipulations which these groups agreed to prior to the Ministry's handing the dams over to them. The prevailing view of officials was that most of these group-operated dams each year watered numbers of livestock grossly in excess of their stipulated limit. Similarly, dam walls and fences were said to be rarely maintained by groups, and apparently no group collected the stipulated yearly charge per animal watered at a dam. Indeed, our initial field checks confirmed that there was widespread non-observance of Ministry stipulations. It appeared that the presumption in the Ministry was correct—the dam groups were a failure. There were no group meetings, there were seldom any records, there was little evidence of any activity.

Then after several months, things changed dramatically. Suddenly, fences were being repaired, water use was being regulated at the dams, there was activity on every side. Why? Because the rains had stopped. As is made clear in Chapter III, the people in a given locality manage dam water only when they need to, that is, on a seasonal basis as alternative water sources become less available. In this process, the residents of a locality who manage a dam often include more people than just those who are registered by the Ministry of Agriculture as members of the dam group. Only after six months of fieldwork did we realize that the Ministry's definitions of what constituted "management" by a "group" had concealed the reality that water use was in fact at least periodically regulated at many of these dams. Management was occurring, but not the kind of water management which followed Ministry stipulations.

At almost every stage of analysis of rural water use and management we have had to question and define more clearly the conventional terms used to describe such behavior. The following framework for describing and analyzing rural water usage is based on the results of that exercise.

A Short Description of Botswana, Especially the Eastern Communal Areas. Botswana, which is roughly the size of Kenya or Texas, shares borders with, moving clockwise, Zambia, Zimbabwe, Azania (also known as the Republic of South Africa) and Namibia (Figure I-1). The Tropic of Capricorn passes through the south of the country, thus some regions have a tropical or subtropical climate. According to preliminary

[1]The results of the Water Points Survey are discussed in detail in Chapter II.

Chapter II

THE HOUSEHOLD WATER USE SYSTEM

> As water becomes scarcer and grazing poorer, Nuer fall back on permanent water where they make large camps and cattle can graze on marsh plants that abound in numberless depressions and make good milk. In May, when the new rains set in, they are able to return to their villages (Evans-Pritchard, 1940: 61).

This chapter discusses the use of water in the eastern communal areas of Botswana. It examines what sources are used when and where and what factors affect the use of particular sources. The focus will be on household use of water in the various communal localities in which household members reside, as represented by the twelve sites covered by the Water Points Survey.[1]

The Relationship Between Water Point Type and the Household Resource Commitment to Water Point Use[2]

In most basic terms, a "water point" is any natural or man-made structure which yields water. A water point can be classified according to the physical characteristics associated with its structure and according to the management practices which make its water available for use. Five major management types and ten major physical types of water points used in the eastern communal areas of Botswana were identified during the course of the Water Points Survey:

(1) Management Types. Water points can be owned and/or managed:

- by government,
- by private individuals,
- by groups having some corporate identity and whose members use the water in accordance with agreed practices,
- communally by users who are the residents of the area in which the water point is located and who use the water in accordance with some community norms, or
- as open access facilities, particularly natural water points where the ownership and/or management of a water point in no way restricts its use.

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[1] A discussion of the Survey's sampling frame and methods is in Appendix 3.

[2] This section is adapted in large part from Charles Bailey's Keeping Cattle and the Cost of Water in Eastern Botswana (1980).

(2) Physical Types. In addition to rainy season puddles and pits, there are pans, rivers, dams, haffir-dams, haffirs, springs, sand river wells, seep wells, open wells (unequipped or equipped), and boreholes, all of which are considered as water points.[3]

Far fewer combinations of management and physical are found in practice than are possible in theory. For example, there are no "private" rivers. Bailey found 16 physical-management-type combinations used by cattle-holding households in the Survey area, the most important being private open wells, rivers, private seep wells and private boreholes in that order. These four types accounted for 61 percent of the total monthly cattle usage at water points utilized by Survey sample households (Bailey, 1980: 46).

There is no simple relationship between water point type and household water point use. Human drinking or livestock watering is not always associated with certain water point types. One of the characteristics of the household demand for water in the eastern communal areas is that a household can use a given water source in several different ways and for more than one purpose during the course of the year. Nor is there a perfect correlation between a water point's ownership and its management in practice. During the Water Points Survey, privately owned open wells were found which were used as if they were communally held or open access facilities. In other cases, government-owned boreholes, handed over to groups to manage, were in actuality operated as if they were privately owned and managed (that is, one "big man" in the group made all the important operational decisions). Similarly, a communally-held water point may be open-access to all the locality's residents, while at the same time these residents restrict its use by turning away "outsiders." In effect, a water point may be used as if it were an open or restricted access facility, even though it is said to be owned or managed in an altogether different way. The seasonal forces that give rise to a household's demand for convenient, reliable and inexpensive water which, in turn, produces this variable association of management and physical types, are discussed in the following sections of this chapter. What is examined below is the

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[3]The specific structural characteristics of each physical type are described in Appendix 2. This list is not comprehensive, e.g., isolated use of subsurface dams and rainwater catchment tanks (which capture shower runoff from roofs and other surfaces) was also encountered during the course of the Survey. However, these ten physical types reflect what the Water Points Survey found to be the major sources of water for livestock and domestic purposes in the rural areas of eastern Botswana. It should also be noted that, given our definition of a water point, one could conceivably argue that a 200 liter drum filled with water or a standpipe used to reticulate borehole water to different areas of a village or ranch was also a water point. However, unless otherwise stated, physical types of water points discussed in this monograph are those structures from which the water was originally extracted.

extent to which there is a relationship between the physical type of a water point and the resources a household commits to its use.

Classifying a water point by its physical type is a deceptively simple exercise. At one level it is quite clear that the technology associated with a water point influences its use. A haffir-dam with a steeply-sloped reservoir makes it difficult for livestock to water directly from the pit. A deep borehole without an engine or source of power cannot be used. The more important question from the viewpoint of the household is how a water point's physical type affects the level of resources the household must commit in order to use that point. Table II-1 arranges the ten water point physical types in ascending order of household resource commitment:

(1) Springs, pans and rivers, along with rainy season pits and puddles, require very little effort on the part of the household to use. Many people simply ladle or bucket water directly from open puddles near their compounds. While some herders may queue their cattle at a small spring, cattle often find their own way to rivers and pans and water freely there. These water points are largely, but not always, open access ones, both because it is physically difficult to restrict access to some of them (it would be difficult to fence an entire river or every puddle) and because social norms still persist in some places which treat natural watering points, such as rivers and pans, as open to use by all those from the area in which these points are located.

(2) Most of the village boreholes, dams and haffir-dams found in the Water Points Survey area were originally constructed by government at little or no cost to their rural users. Many village boreholes used for "domestic" (human consumption) purposes are also operated at no cost for users by their respective district councils or by central government directly. User costs consist only of herding, transporting the water and/or in maintaining and regulating use at these structures.

(3) Sand river wells, haffirs and seep wells are often privately owned by their users. These users have to pay for their original construction (an annual task for sand river wells) and for their periodic deepening and cleaning. Moreover, additional user effort must almost always be made at seep wells and sand river wells to lift the groundwater up to a level where it can be used at the site or hauled away for use elsewhere. (This sometimes also occurs at dams and haffir-dams with steep reservoirs.) Since these water sources are largely privately owned, permission to use them may be required by their owners.

Table II-1

Household Resources Required for Water Points of Different Physical Types

	I	II	III	IV	V
Water Point Physical Types	Springs, Pans and Rivers	Village Boreholes, Dams, and Haffir-dams	Sand River Wells, Haffirs, and Seep Wells	Open Wells (unequipped)	Livestock Boreholes and Equipped Open Wells
	→ → → Increasing Level of Resource Commitment → → → → → →				
Resources Committed: Labor, Cash, Cattle, Materials, Influence	negligible	1. herding to water 2. thorn bush fencing	1. herding to water 2. thorn bush fencing 3. labor to lift water a short distance to trough 4. construction 5. cleaning and deepening	1. herding to water 2. sometimes thorn bush fencing 3. labor to lift water a long distance to trough 4. construction 5. cleaning and deepening	1. herding to water 2. thorn bush or wire fencing 3. volunteered labor or wages for pumper 4. diesel, oil, and spare parts equipping 5. drilling and equipping 6. structural repairs and rehabilitation

Adapted from Bailey (1980: Table 10, p. 30).

(4) Many open wells have been privately constructed and remain privately owned in eastern Botswana. They require considerably more labor to lift water up to a level where it can be used than do other water sources. In addition, they are much more costly to construct and often more laborious and risky to deepen and clean.

(5) Equipped open wells and livestock watering boreholes often, but not always, demand the most household resources in order to ensure their use. Since these water points require capital-intensive technologies in order to tap often deep groundwater sources, they are much more costly to drill, equip, maintain, repair and operate than most of the other water points mentioned so far (some government dams have also been very costly to construct). Equipped open wells and boreholes are controlled by government, by groups, and by private persons where their access is at times limited to those who can pay to use them.

Table II-1 illustrates that there is indeed a positive association between increasing water point technology and the level of household resources committed in order to use water from such points. But the correlation is by no means perfect. Clearly, group II water points, such as dams and domestic boreholes, can be quite costly to build and/or maintain, but the government subsidization of these costs has greatly reduced the household expenses devoted to their use in many cases. In turn this subsidy has encouraged user perceptions that government water points are meant to be used freely by all who need them. Moreover, there is a panoply of other user perceptions about certain water point types which affect their use in practice, e.g., surface water sources are often considered to be unreliable, natural water points are likely to be treated as open to use by all, and private ownership and management of a water point brings with it special rights of use to its owner or manager (who may or may not exercise that right, however).

The technology of a water point is itself associated with other factors, which depend in part on water point management considerations. For example, whether a water point is a groundwater or surface water source clearly influences the level of technology needed for water extraction. Surface water sources are often less expensive to use than groundwater ones, in many cases simply because the additional resources needed are only those to get the groundwater to a place where it can be used (springs being the exception). Yet, people consider groundwater sources to be more reliable water supplies, and users are likely to be more willing (however reluctantly) to pay for reliable rather than unreliable water supplies. In other words, a household's willingness to pay for the higher unit costs of a livestock borehole is partly explained by the

borehole's reliability. But even here the household's willingness to pay for groundwater is variable, since the household use of any particular water point in the eastern communal areas is highly seasonal in nature. If cheaper, more convenient water is available elsewhere, people may be unwilling to pay the premium required for more reliable water.

Seasonality and the Household Water Use System[4]

Figures II-1 and II-2 show the effect of seasonality on rural water use in eastern Botswana. Figure II-1 shows the percent of cases of use each month accounted for by each physical type.[5] While the rank of each type remains relatively steady, the increased use of boreholes and wells and concomitant decreased use of haffirs during the dry season after May show a seasonal shift. Figure II-2 shows use of each type as a percentage of its maximum use month by month. Dramatic drops appear in the use of pans, haffirs, haffir dams and haffirs during the dry season.

These figures trace the effects of rainfall and shifting residence as part of the agricultural calendar. Part of the drop in use of surface water sources occurs as they go dry causing a shift to groundwater sources. A second reason for change is the related move from the lands to the village. Borehole use rises and haffir use drops as people move from the lands, where the haffir use is greatest, to the village where borehole use predominates. Similarly, haffir use rises as people return to the lands in December. The pattern of shifting use shown in these figures is evidence of a highly adaptive household strategy of water point use.

The Household's Fallback Strategy for Ensuring a Reliable Water Supply

In general, all water points are "at risk," and surface water sources particularly so. The sensible household response to this is a flexible fallback strategy or back-up system of water points. As one water point goes dry or breaks down, the household shifts its use to other, sometimes less convenient, but more stable water points so as

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[4]Because the Water Points Survey was limited to sites in eastern Botswana, it was not possible to gather comparable information on the water use system(s) found in sandveld areas. In the review of the literature on the ecological and seasonal factors important in Botswana's agriculture in Appendix I, the little information there is available relevant for such a comparison is briefly discussed.

[5]"Cases of Use" is the sum of all water points used by all households. If one household used two water points and a second household used three water points, there are five cases of use represented by those two households even if they are using some of the same water points. This measure gives no indication of volume of water used or frequency of use.

Figure II-1 **Percent of Monthly Cases of Use Accounted for by Water Point Physical Types.**

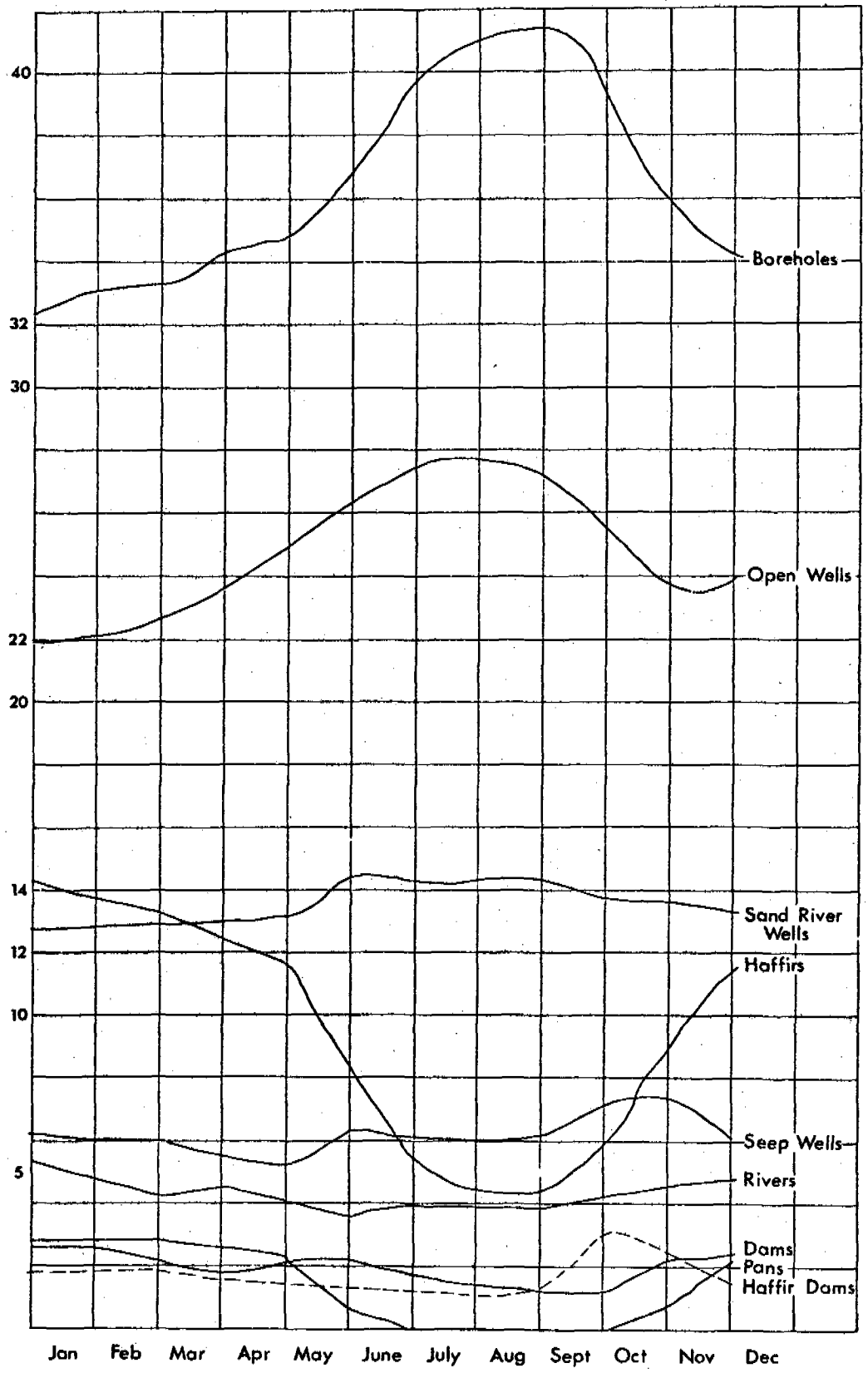
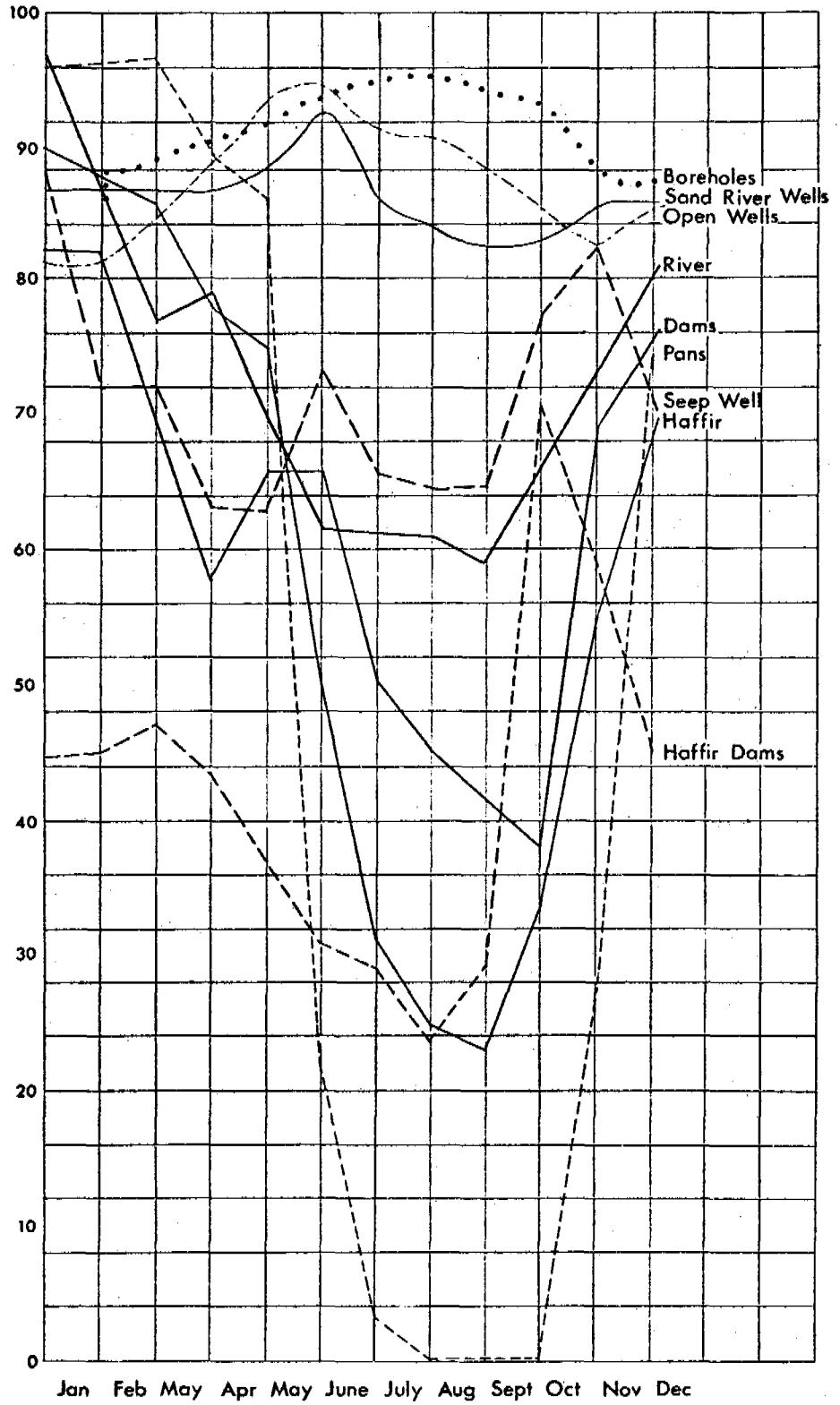


FIGURE II-2 Percent of Potential Use of Water Point Types Each Month.



to maintain a reliable supply of water through more of the year. In its simplest form, a household's fallback water point strategy incorporates shifting from wet season to dry season water sources while at the lands or mixed lands and cattleposts, as well as shifting from such water points to village ones after harvest and before the next rains. However, the configuration of the household fallback system varies from locality to locality, depending on the nature of alternative water sources, and from year to year, depending on the volume and distribution of the rainfall.

Several general principles of household water use strategies can be identified:

1. The household strategy is to obtain water with the least effort at the lowest cost throughout the year.

2. A household's strategy varies by virtue of the use it makes of water. Households may use some water points for domestic purposes only, reserving other water points exclusively for livestock watering purposes.

3. The pattern of use and management of a particular water point may change as part of the fallback strategy. Water points that at other times serve multiple purposes may be restricted at some time to domestic use only in order to preserve nearby domestic sources. In drought, a water point which has been used for only one purpose may be made available for all purposes. This most frequently takes the form of allowing livestock to water at boreholes intended for domestic use only. Similarly, people may reserve lands haffirs for domestic use during the wet season, using them for livestock only when alternative sources dry up.

4. When all else fails, households and their livestock move back to their major village of allegiance which is increasingly likely to have a borehole managed by the district council. In this fashion the village has become the "cattlepost of the last resort." Physically moving the entire household is the final fallback strategy.

In effect, few households are in the enviable position of having year-round free water as near to their dwellings as they would like. The household strategy thus involves trade-offs among three inter-related factors on which the household bases its perceptions of the timeliness and adequacy of potential water sources:

- reliability: is the water available as and when the household needs it? is the water supply a dependable one throughout the year?
- convenience: how much effort (either in the form of walking to the water point or in labor required to get the water) is involved in using the water point?
- cost: how much is the household charged for water?

The relative importance of each fluctuates with the season. For example, Bailey (1980: 21-26) found that the primary reason farmers moved their cattle from one water point to another between January and September is that the first water source went dry. That is, reliability throughout the year is the most important factor. On the other hand, from October to December, convenience was generally the most important factor, with farmers saying that the abandoned water point was too far from grazing or from where the cattle were kept.

The degree to which Survey respondents benefited from reliable, convenient, cost-free water is assessed in the following sections.

Reliability. Of the Survey households, 80 percent used more than one source and 52 percent reported using three or more. This is due in part to the restriction of some water points to a single purpose. Of a total of 485 water points mapped at the twelve Survey sites, 52 percent were single purpose sources. For example, most village boreholes are restricted basically to domestic use except during drought. A second factor is the general unreliability of water sources, which necessitates a back-up point when water ceases to be available at the preferred source. In eastern Botswana reliable sources are usually groundwater sources such as boreholes, open and equipped wells, and sand river wells.[6] People often share the same major fallback water points, such as the village borehole or a river in the mixed lands and cattleposts.

Convenience. Convenience, as measured by the time it takes to make a round trip to a water point from the living compound, is an especially important factor in use. Data on the type of water point use and the distance from a respondent's home are presented in Table II-2. These data show that a higher proportion of sources supplying domestic water are within ten minutes of home. Conversely, few domestic water sources are an hour or more away (36 percent) as compared to livestock water sources (43 to 49 percent). Proximity of a water point to the home may be more important for domestic water than for livestock water because of the labor involved in carrying water for human consumption. Eighty-eight percent of the sample households transported domestic water by headload. In 74 percent of the households only women and girls did this work. Under most circumstances, it is rare that a household's daily supply can be attained in a single trip. If the water point is far from the home, either more time

[6] All dams and pans used by sample households had gone dry at some time in the previous three years; 86 percent of the haffirs and 65 percent of the haffir-dams had done so. In contrast, only 19 percent of the open wells have gone dry. Groundwater sources comprised 87 percent of the fallback sources in the twelve Survey sites. Boreholes and wells were the most important fallback sources.

Table II-2:

Percent of Cases of Use at Water Points a Given Distance from the Respondent's Home*

	Drinking (Percent)	Draft Animals (Percent)	Other Cattle (Percent)	Small Stock (Percent)
Sample Size (N)	(1086)	(401)	(472)	(354)
Ten Minutes	19	9	11	12
Ten to Thirty Minutes	36	30	31	36
Up to Forty-Five Minutes	9	12	11	9
About One Hour	10	8	10	12
Over One Hour	25	40	35	29
Don't Know	1	1	2	2
Total	100	100	100	100

*Includes data from 90 households in 3 sites reported to have water problems.

Note: Both households and water points may be counted more than once in calculating cases of use.

must be spent collecting water or consumption must be reduced.[7] Women in a Mmadinare lands area, who were walking some eight kilometers for water, said their households had reduced consumption to one or two buckets per day. One-third of the respondents who mentioned not using a given water point gave distance as the reason it was not used.

How convenient a water point is to a household is in effect measured by the opportunity costs of the household's time and labor involved in obtaining water from

[7]White et al. (1972: 128-129) found the relationship between distance and per capita water use was curvilinear: "Up to some critical distance--which in most sites appears to be about one mile--there is a tendency to use the same range of water per capita, but beyond that point the tendency is to reduce the range toward whatever is the minimum for the area." Carruthers found that once a source was moved outside a courtyard or house, consumption dropped sharply and that "persons close to water outlets used quantities greatly exceeding more distant consumers" (1973: 28, 35). Warner's Tanzania study showed that six of the eight villages in which accessibility (defined in terms of distance to water) was improved, consumption also increased (1973: 241, 322). In Botswana, SIDA (1973: 44) found no clear relationship between distance and water consumption, though Copperman (1978: 19) found a "slight decline in water consumption as distance increases."

that point. Convenience and cost are closely allied. Nonetheless, this distinction has been kept since it seems to be one that Batswana themselves think important.

Cost. Surface water and water for domestic use have traditionally been free for the asking. However, not all water is free. Costs to the user in the form of contributing labor or an animal or actually paying a cash fee are associated with the use of some water points. These financial costs are discussed here under the catch-all term, fees, and represent the mobilization of various resources in support of the operation of a water point or system of water points.[8]

Table II-3 shows the water points in the twelve Survey areas where fees are charged. Fees were charged at only 20 percent of all man-made water points. Water was free at all dams and sand river wells and at the majority of all man-made water points except boreholes. Fees were charged at 53 percent of the boreholes, 32 percent of the open wells and 21 percent of the haffir-dams.

Table II-3:

Twelve Survey Sites: Mapped Water Points Where Fees are Charged and Where Water is Free*

Type of Water Point	Total Number of Water Points	Fees Charged Percent	Free Water Percent	Total Percent
Dams	15	0	100	100
Haffir-Dams	24	21	79	100
Haffirs	103	7	93	100
Boreholes	40	53	47	100
Wells	74	32	68	100
Sand River Wells	15	0	100	100
Seep Wells	36	14	86	100
Total	307	20	80	100

*Excludes water points for which no information on fees was available.

[8]Part of the cost of consuming water includes factors relating to water purity and hygiene, some aspects of which are raised in Chapter III.

As can be seen in Table II-4, 28 percent of the sample households in the twelve Survey sites said they paid fees. Seventy-five percent of these paying households paid fees at boreholes and 24 percent paid fees at open wells. In four cases, families said they were paying not for using the water but for having it delivered from the source to their home.

Table II-4:

Households Paying Fees in the Twelve Survey Sites

Type of Water Point	Number	Percent of All Households (N = 358 HHs)	Percent of Households Paying Fees[a]
River[b]	1	0.3	1
Haffir Dams	1	0.3	1
Haffirs	9	2	9
Boreholes	75	21	75
Wells	24	6.7	24
Sand River Wells[b]	3	0.8	3
Seep Wells	5	1	5
Total[c]	100	28	

a. Sums to more than one hundred percent due to multiple responses.

b. Indicates households who pay to have water delivered from this source.

c. Total number of households which have paid fees—this is less than the sum of households paying fees for each type because it excludes multiple responses.

Table II-5 shows the ownership of water points where fees were charged. Fees were most commonly charged at private water points. Nearly half of the cases in which fees were charged were at private water points and a fifth were at group or syndicate water points. As Bailey points out (1980: 29-31), group management of a water point can be an especially important means of providing individual members with water. Rather than purchasing water from someone else's water source, members of a group can provide themselves with water directly by sharing the costs of operating a water point.

Table II-5:

Twelve Survey Sites: Ownership of Water Points Where Fees are Charged

	Water Points		Cases of Use[a]	
Owner	Number	Percent	Number	Percent[b]
Council	7	13	25	21
Village Managed	1	2	11	9
Group or Syndicates	6	11	24	20
Private Individual	39	74	58	49
Total	53	100	118	100

a. Both households and water points may be counted more than once in calculating cases of use.

b. Sums to less than 100 percent due to rounding.

Moreover, fees can be seen as a means of purchasing reliability. In 81 percent of the cases in which fees were charged, the water points were said never to go dry. In contrast, only 63 percent of the cases where fees were not charged were at such water points.

In Table II-6 the fees reported by sample households are presented. The vast majority (83 percent) are in the form of cash. If the contribution of diesel which must be purchased is included, cash comprised 88 percent of the cases of fees. As there were charges in only 13 percent of all cases of use, cash fees thus were paid in only 11 percent of the cases of use. While this is a small proportion of all cases of use, it does represent part of what other observers have characterized as the monetarization of the rural water sector.

Table II-6:
Summary of Fees Reported in the Twelve Survey Sites

	Cases of Use	Percent
In-kind - Animals	5	4
Cash per Animal	54	46
Cash per Volume of Water	20	17
Cash - Flat Charge	25	21
Other (including labor)	15	12
Total	119	100

Note: Both households and water points may be counted more than once in calculating cases of use.

Problems of Setting and Collecting Fees

Fees can serve three purposes:

- They can be used to regulate use.
- They can be used to meet operating or capital costs of the water point.
- They can serve the water point's owner or manager as a source of income or as a means of compensation for the bother of operating the water point.

Fees can consist of various types of resources:

- In-kind contributions—cattle, labor, diesel, other livestock, troughs, or other equipment.
- Cash.

Setting Fees Based on Use. Sixty-two percent of the fees were based on some measure of use—either by volume of water or per animal watered. Use at district council- or village-managed sources made up 47 percent of these cases. Roughly 41 percent of the fees at syndicate or privately-owned sources were based on a measure of use.

The problem with fees based on use is that they may be insufficient to recover operating costs, particularly if these costs are unknown. Few owners, whether groups, the government, or private individuals, have any idea of the operating cost of their water point. In a sense, all costs—capital and recurrent—are treated as periodic operating costs to be covered as and when required. Thus, while the technology of a

water point entails costs of operation, there is no guarantee that fees will be set in order to cover these costs and ensure that water point's operation. The state of record keeping (where it exists) is poor. It is not common in any group-run water point for all the relevant records to be kept in the same place or by the same person. Even where there is a single secretary or treasurer and a single set of books for the group, these records tend not to be kept according to standard accounting procedures.[9]

The effect is that fees often do not reflect costs. For example, the fee at the village-run livestock borehole in Makaleng was 60 thebe (see Glossary) per animal per year. (This was in contrast to the standard district council fee of 20 thebe per animal per month.) However, the recurrent costs of the borehole, excluding any repairs, would have required a fee of 90 thebe per animal per year. The response of the borehole committee to this information was to try to enforce a fee of two pula per year for all residents of the village who were not using the borehole, but who might someday in an emergency. This fee was paid by a few public-minded citizens, including a shop owner who clearly knew the value of goodwill. It was not paid by the majority of the residents, including a prominent member of the borehole committee who had no cattle in the village. How long the borehole can continue to run at a deficit remains to be seen. At the time of the Survey, it had been in operation about a year and a half, and had some initial costs covered by what was essentially a grant of diesel from the district council.

Collecting Fees. Setting fees and then collecting them are two different endeavors. A number of factors affect fee collection. Relatives are often charged less or nothing at all. People with connections to prominent families may simply be too powerful to be challenged and they may be served free. We know of no case in which a member of a locality was turned away from a group-run dam for non-payment of fees. We do know, however, of members of other localities who were willing to pay fees but had been turned away from water points. Poorer members of an area may be charged nothing. Only two respondents reported that they did not use a water point because they could not afford the fees. Custom still affects the supply of water, particularly for domestic use. Owners may be afraid to collect fees. One borehole owner alleged that he did not collect fees for domestic use, because the district council would take away his borehole if he did. His strategy for recovering costs was, instead, to try to charge high fees to those few who were willing and able to pay him.

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[9]Both Henderson (undated: 219) and Peters (undated) report that borehole syndicate members were similarly in the dark about their finances.

What is clear is that fees are often not paid. One example is the council stock watering borehole at Lentsweletau. According to district council receipts, this borehole operated every month in 1979. These receipts show the number of cattle watering there ranged from a high of 937 in June in the dry season to a low of 94 in December of the wet season. Our counts of cattle actually watering at the borehole over a two-day period in November 1979, give an average of 296 cattle per day watered there. Yet Council receipts (including late payments made in 1980) show that only 112 cattle were paid for in the month of November. Moreover, the six Survey respondents who said they used the borehole indicated that they used it longer than is shown in the council receipts. It is obvious that substantial numbers of cattle were drinking for free at this borehole. (Nor, it should be added, is there any reason to believe that the discrepancy in this case was due to a dishonest pumper.)

The case of this borehole offers further insight into the setting and collecting of fees. Late payments (that is, payments for watering which had taken place more than a month before) comprised 37 percent of the total receipts. Total 1979 revenue from the borehole came to nearly P1,200 which, compared to available information on the cost of operation, indicated that the borehole was probably covering its costs that year. In April, 1979, the fee was raised from 10t to 20t per animal. Of the 16 receipt holders using the borehole at that time, 14 continued to pay for the same or an increased number of livestock. Moreover, a nearby equipped well charged 40t per beast per month, while at the same time earning, according to owner receipts, some P1,500 during a seven-month period in 1979. Although this information is at best suggestive, it would seem that the district council could have raised its fees above 20t without a real loss in the number of cattle watering at its borehole. Neither council staff nor the well owner had totalled their 1979 receipts in order to assess whether or not their revenue covered costs.

It would appear that many owners rely on a sense of obligation and responsibility among their users for the payment of fees. In some cases, "lax" collection of charges may really reflect a system of neighborly reciprocity which ensures that the water point owner will himself always have some access to another water point in cases of emergencies.

It is probably accurate to say that at the moment in the eastern communal areas, the whole issue of fees is in a stage of transition. Customary obligations and views about the provision of water still have considerable currency. Water is infrequently used solely as a source of income. Such fees as exist are more a means of keeping the water point operational or a means of compensating the owner or manager for the

trouble of providing the water point. The rising costs of drilling, spare parts, and diesel will probably eventually force at least boreholes and equipped wells to be put on a more business-like basis (Peters, undated). Whether the welfare function will continue to be carried out for the poorer segments of the locality remains to be seen.

Patterns of Household Water Use

Physical and Management Type Used.

Village.[10] Eighty-seven percent (313) of the sample households in the twelve Survey sites maintained village residences. The water points used by sample households when they are in residence in the village are presented in Table IIA-1 (page 74). Nearly 72 percent of the water points used were privately-owned. There were more sand river wells used (37 percent) than any other type of water point, though wide village-to-village variation in sand river well usage was found. Private sand river wells and private open wells were the most numerous water points in that order.

The use of water points is presented in Tables IIA-2 and IIA-3 (pages 74-75). In these tables it can be seen that large numbers of any given type of water point do not necessarily mean it will be widely used. The single most important water point in the village is the district council borehole. Council boreholes, which make up only 12 percent of the water points (Table IIA-1), were used by 77 percent of the sample households (Table IIA-3) and accounted for 45 percent of the cases of use (Table IIA-2). The second most important source was the private open well, which was used by 30 percent of the families and accounted for 17 percent of the use. The numerically prevalent sand river well was used by 12 percent of the families and accounted for only 7 percent of the use. Reflecting on the importance of a council borehole, nearly half (49 percent) of the cases of use in villages took place at district council-owned sources. The average council borehole served 21 sample households, compared to five sample households served on the average by all village water points taken as a whole.

[10] Copperman (1978: 22) showed the following breakdown of village water use: cooking 25 percent, bathing 20 percent, beer brewing 20 percent, washing clothes 14 percent, smearing the lolwapa 13 percent, and other 8 percent.

Lands.[11] Sixty-six percent (237) of the sample households in the twelve Survey sites maintained residences at the lands. The water points used by sample households when they are in residence at their lands are presented in Table IIA-4. Privately owned haffirs are the most prevalent water point, followed by privately owned open wells. The majority of water points (70 percent) are privately owned. The average water point at the lands served two sample households (Table IIA-5). Again, it can be seen that numerical frequency does not necessarily mean greater use. Although private open wells are out-numbered by private haffirs (20 percent compared to 27 percent), they account for a greater proportion of the cases of use (25 percent compared to 21 percent) (see Table IIA-5). They are used by a greater proportion of the households (36 percent compared to 30 percent), and support an average of three sample households each, compared to two sample households per private haffir (see Table IIA-5 and IIA-6).

Most dams, haffirs, and haffir-dams built by the Ministry of Agriculture are at the lands or in mixed lands and cattlepost areas. These facilities make up only 12 percent of the water points at the lands. They account for 9 percent of total use. Nearly 13 percent of the households use group-managed haffir-dams, all of which are built by the Ministry of Agriculture. Ministry of Agriculture water sources thus do not play as important a role at the lands as do district council boreholes in the village.

Privately-owned sources provide for the majority of use. The amount of use accounted for by communal water points doubles at the lands, compared to in the village, and use of group-managed water points increases by two and a half times. Group-managed sources are thus much more important at the lands than they are in the village or at the cattlepost.

Cattlepost. Twenty percent (71) of the sample households of the twelve Survey sites maintained cattlepost residences. The water points used by sample households when they are in residence at the cattlepost are presented in Table IIA-7. The average cattlepost water point served one sample household (Table IIA-8). The most prevalent source was the private open well (34 percent), followed by the private borehole (12 percent). Open wells and boreholes accounted for over half the water points in use at the cattlepost. Over three-quarters of the water points were privately owned. Private open wells accounted for a larger proportion of the use than their proportion of the physical points. Almost 42 percent of the total use occurred at

[11] In the following, the "lands" and "cattleposts" refer to the sample households' individual cultivation fields and the sites where they have kept their livestock. Unless otherwise stated, these terms do not idenfity the locality in which lands residences and cattlepost kraals are found. For example, a person's lands may be located in a mixed lands and cattlepost area.

open wells which were used by 47 percent of the households (Tables IIA-8 and IIA-9). Dams, haffir-dams and haffirs (excluding privately owned ones) accounted for 5 percent of the water points and 5 percent of the use. It is important to note that cattleposts maintained by households in the eastern communal areas are probably characterized by a greater variety of water point types than is typically found in more remote sandveld areas.

Convenience. The beneficial effect of a reticulated village water system provided by Council can be seen in the figures on distance presented in Table II-7.

Table II-7:

Twelve Survey Sites:
Percent of Cases of Use at Water Points a Given Distance from the Respondent's Home in the Village, Lands or Cattlepost

Time of Round Trip (Cases of Use)	Village (537)	Lands (372)	Cattlepost (98)
Less than Ten Minutes	25%	16%	12%
Ten to Thirty Minutes	37	43	30
Up to Forty-Five Minutes	8	9	14
About One Hour	12	9	12
Over One Hour	16	22	30
Don't Know	2	1	2
Total*	100%	100%	100%

*May not sum to exactly 100 percent due to rounding error.

Note: Both households and water points may be counted more than once in calculating cases of use.

Government intends there to be a standpipe within 400 meters of every home in villages with a council water system. A quarter of the cases of use were at water points within a ten-minute round trip of the respondent's home in the village, compared to 16 percent and 12 percent at the lands and cattlepost respectively. Sixty-two percent of the cases of use were within a half hour trip, compared to 59 percent at the lands and 42 percent at the cattlepost. Thus there is some evidence that water in the villages tends to be more conveniently located than at the lands or cattlepost.[12] Water at the lands is closer to the home than at the cattlepost, but nearly a third of the cases of use take place at water points an hour or more from the home. Planners have tended to under-

rate the importance of convenience of water supply at the lands, as illustrated in the case study on dam groups (Chapter III). Yet, convenience is especially important to rural households when their labor is either tied up in livestock and cropping activities or weakened by ill-health. Cattlepost water points are farther from the dwelling than water points in any other area. Water points an hour or more away accounted for 42 percent of the cases of use at the cattlepost.

Cost. Fees at council boreholes for domestic water purposes were abolished in 1979. As shown in Table II-8, almost all use (93 percent) in the village was free. People are less likely to pay for water in the village than they are at the lands or at the cattlepost.

Table II-8:

Percent of Cases of Use at the Village, Lands and Cattlepost in the Twelve Survey Areas by Fees Charged

	Village (537)	Lands (369)	Cattlepost (97)
Free Water	93%	81%	80%
Fees Charged	7	19	20
Total	100%	100%	100%

Note: Both households and water points may be counted more than once in calculating caseS of use (shown in parentheses).

The Perceived Need for Additional Water Points.

Respondents were asked if they needed another water source at the village, lands, or cattleposts and why. As many as three reasons could be recorded but most respondents gave only one or two reasons. Unless otherwise stated, the first and second reasons are combined in the following discussion.

Village. The perceived need for additional water sources in the village is presented in Table II-9. In six of the Survey sites, the majority of the respondents said they did not need another water point. In four of the remaining six sites, the first

[12] Eding et al. (1972: 195); Eding (undated: Table 4-2), and Sekgoma and Eding (1972: 81-83) found households lived farther from their primary water point at the lands than in the village in Botswana. Copperman (1978: 45) also estimated that lands water is farther away and takes longer to collect than village water.

reason for wanting another source was to have a nearer, that is, a more convenient, source. This response is typical of a village which has grown beyond the original reticulated system of standpipes. Sweeter water was desired in one village, since water in some village boreholes is slightly salty or has a peculiar taste due to other minerals. In Mmadinare village (the village of allegiance for Phokoje lands area), some people carry water from sand river wells (or hire someone with a donkey and a cart to carry it for them) rather than drink the water from the boreholes. What is demonstrated here is the overall success of the system of district council-provided village water supply. Its only apparent failing (if it can be called that) is that it has created a demand for a standard of supply that is presently beyond the capacity of government to meet in rapidly growing villages.

Lands. The perceived need for additional water points at the lands is presented for each Survey site in Table II-10. In only three sites did the majority of respondents say there was no need for an additional water point at the lands. In Makaleng village, most of the lands are near the village so there is no perceived need for an additional source of domestic water supply. Seep wells and sand river wells provide water for draft animals there. Motongolong is served by a series of open wells. Eight kilometres from the lands area there is a spring with abundant water for livestock. Although no one there responded to the Survey questionnaire with a need for more water points, in kgotla meetings people have expressed the need for hand pumps for their open wells to make them easier to use. Some Ntlhantlhe lands areas are comparatively well served by dams and by sand river wells.

The need for a dry season water source was mentioned by over half the respondents in four of the sites. Half or more mentioned the need for a closer source in five sites. The need for drinking and other domestic water was mentioned in four sites by a fifth or more of the respondents. The need for more water for draft animals was mentioned at half the sites, but only by a small number of respondents. The need for water for non-draft cattle was also mentioned at six sites but again by a small number of respondents.

Table II-9. Respondent's Reasons For Wanting Another Water Point in the Village

Reason	Makaleng		Phokoje		Motongolong		Ramokgonami		Mosolotshane		Mmaphashalala	
	1st	2nd[a]	1st	2nd[a]	1st	2nd[a]	1st	2nd[a]	1st	2nd[a]	1st	2nd[a]
	Percent		Percent		Percent		Percent		Percent		Percent	
Cheaper			7				3	7				
Cleaner	3	7		7			7	3				7
Sweeter			7				3	3				10
Dry Season Source	7	3	3				3			4		
Drought Source		7					3					
Closer	20	10	43	20			14	7	96		47	
Less Work												3
Drinking Water			30	33						19		
Other Domestic										58		3
Smallstock										4		
Brew Beer, Khadi										8		
Grow Vegetables										4	3	7
Housebuilding			7	3								
Village Growing											17	3
Breakdowns												
Cattle												
Don't Need	70		3		100		67		4		33	

Table II-9 (Continued).

Reason	Dikgonnye 1st Percent	Dikgonnye 2nd	Matebele 1st Percent	Matebele 2nd	Lentsweletau 1st Percent	Lentsweletau 2nd	Gamodubu 1st Percent	Gamodubu 2nd[a]	Ntlhantlhe 1st Percent	Ntlhantlhe 2nd[a]	Mokatako 1st Percent	Mokatako 2nd
Cheaper	100											
Cleaner										3		
Sweeter					87							
Dry Season												
Drought								3				
Closer									40		63	
Less Work							3		3		7	
Live Permanently												
Drinking Water											3	
Other Domestic Use												
Smallstock												
Grow Vegetables												
Village Growing											7	
Breakdowns											3	
Cattle			4									
Don't Need			96		13		97		57		17	

(Sample = 30 Households per Village except in Motongolong, 27; Mosolotshane, 26; Dikgonnye, 27; Matebele, 27)

a. May not add to 100 percent since some respondents gave only one reason.

Table II-10. Respondent's Reasons for Wanting Another Water Point at the Lands.

Reason	Makaleng		Phokoje		Motongolong		Ramokgonami		Mosolotshane		Mmaphashalala	
	1st Reason Percent	2nd[a] Reason Percent	1st Reason Percent	2nd[a] Reason Percent	1st Reason Percent	2nd Reason Percent	1st Reason Percent	2nd[a] Reason Percent	1st Reason Percent	2nd[a] Reason Percent	1st Reason Percent	2nd[a] Reason Percent
Cheaper		3						3				
Cleaner							3	3				
Sweeter							7					
Dry Season		3	27	13			60	10	15		40	20
Drought				3			7	3	12	3	3	3
Closer	10		37	20				50	50	4	30	20
Less Work								10			3	
Live Perm.										4		
Drinking Water			23	50			3		8			
Other Domestic Use								3	4	35		7
Draft Animals			3				3	3		8		
Other Cattle			7	3			10	7	4	8		
New Grazing												
Small Stock										4		3
Grow Vegetables										4		
Brickmaking												
No Cattle Water												
Breakdowns												
Current Source Dry												
Not Enough Water Points			3									
Don't Need	87				100		7		7		14	
No Lands	3	3									10	

Table II-10 (Continued).

Reason	Dikgonnye		Matebele		Lentsweletau		Gemodubu		Ntlhantlhe		Mokatako	
	1st	2nd[a]	1st	2nd[a]	1st	2nd[a]	1st	2nd[a]	1st	2nd[a]	1st	2nd[a]
	Percent											
Cheaper	4					3	7	7				
Cleaner							7	13	3			
Sweeter							3	3				
Dry Season	50	7	4		17	7	10	37	13	3		
Drought		7			10			10	7	10	3	
Closer		4	50		20	3	3	7	7	3	60	3
Less Work	26	59			3		57	17	7		3	
Live Permanently	4	4		4								
Drinking Water	4	7		39	7	17						
Other Domestic Use				7								
Draft Animals						3				3	3	3
Able to Plough Earlier						3						3
Other Cattle	4	4			3							7
New Grazing											3	
Smallstock												
Grow Vegetables												
Brickmaking						3						
No Cattle Water					3	7						
Breakdowns							10	3				
Current Source Dry								3				
Not Enough Water Points												
Don't Need	3		39		27		3		53		3	
No Lands	4	4	7	7	10	10			10	10	23	25

Sample = 30 Households per village except Motongolong, 27; Mosolotshane, 26; Dikgonnye, 27; Matebele, 27.

a. May not add to 100 percent as some respondents gave only one reason.

These are important findings, since Ministry of Agriculture personnel treat water for cattle as the pre-eminent water need for agricultural producers at the lands. It is not always easy to convince Ministry of Agriculture staff that their professional concerns are not the major concerns of most people who place a high value on reliable domestic water when at the lands.[13] When these findings were presented to one agricultural demonstrator's monthly meeting, the ADs nevertheless insisted that the problem was water for cattle. This meeting was followed by two large kgotla meetings, one with an attendance of about 100 and the other with an attendance of about 50. At both meetings, the people insisted that water for human consumption was the greater problem.

The picture at the lands, then, is one of a need in a majority of localities for drinking water to carry people through the dry season and for water sources which either are closer or in some cases require less labor to use. The latter can be particularly important as there is often a perceived labor constraint during certain periods of the agricultural calendar, especially for women. Thus, convenience of water points may still be an important factor to households even in the wet season, when surface water sources are physically nearer the dwelling. Water for draft animals is a problem but less of a hindrance than the lack of drinking water.

Cattlepost. The data on perceived need for water at the cattlepost are presented in Table II-11. As noted above, the majority of respondents at all sites did not have a cattlepost. Most of those who did felt their water supply was adequate. This is to be expected, since presumably a household would not set up a cattlepost in the absence of adequate water. The very small percentage who felt a need for an additional water point most frequently mentioned the need for a closer source and for a dry season supply, again pointing to the importance that water point convenience has for a number of rural households in eastern Botswana.

The Effect of Specific Factors on Household Use of and Access to Water Points

The Effect of Fees. Poorer households might be expected to be adversely affected by fees charged at water points. However, less than a third of the sample

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[13] In this regard, it is interesting to note that when a rural sociologist from Reading University asked people around Tutume, where dams were being built in 1970, what they would like to see in terms of development, the most usual answer was schools. Dams came quite low down on the list. In a recent interview he noted "It wasn't clear that they were very worried about water at all." Interview with Peter Rawlings, 2 December, 1981.

Table II-11. Respondent's Reasons for Wanting Another Water Point at the Cattlepost.

Reason	Makaleng		Phokoje		Montongolong		Ramokgonami		Mosolotshane		Mmaphashala	
	1st	2nd	1st	2nd[a]	1st	2nd	1st	2nd[a]	1st	2nd	1st	2nd
	Percent											
Cheaper Water				3								
Cleaner												
Sweeter							3					
Dry Season Source			3	3			7	3	4			
Drought Source							3	3	4			
Closer			7	3			3	7			3	
Less Work								3				
Live Permanently												
Drinking Water				7								
Other Domestic										4		
Other Cattle			23				7	7	4	8		
Breakdowns												
Don't Need	47		10		29		27				40	
No Cattle Post												
Post	53		57		71		50		88		57	

Table II-11 (Continued).

Reason	Dikgonnye 1st Percent	Dikgonnye 2nd[a] Percent	Matebele 1st Percent	Matebele 2nd[a] Percent	Lentsweletau 1st Percent	Lentsweletau 2nd Percent	Gamodubu 1st[b] Percent	Gamodubu 2nd[a] Percent	Ntlhantlhe 1st Percent	Ntlhantlhe 2nd Percent	Mokatako 1st Percent	Mokatako 2nd Percent
Cheaper Water							3	3				
Cleaner							3					
Sweeter												
Dry Season Source	4								3			
Drought Source												
Closer			4									
Less Work	4											
Live Permanently		4										
Drinking Water		4		4								
Other Domestic Use												
Other Cattle									3			
Breakdowns							3					
Don't Need	30		25		17				40			
No Cattle Post	62		71		83		90		54	53	100	

Sample 30 Households in all villages except Motongolong N = 27, Mosolotshane 26, Dikgonnye N = 27, Matebele N = 28.

a May not add to 100 percent because some respondents gave only one reason

b Does not add to 100 percent due to rounding error

households said they paid fees (including contributing labor) for water. Only two respondents said that fees kept them from using a water point. While the need for cheaper water was mentioned by all respondents in Dikgonnye and a few respondents mentioned cheaper water in each of five Survey sites, in six sites no one felt the need for cheaper water (Tables II-9, II-10, II-11).

Domestic water remains freely available through the district council borehole systems in many villages. Natural sources remain open access. While fees for water have the potential of becoming a problem, at the moment, the poor appear not to be greatly oppressed by fees in most of rural eastern Botswana. This stands in sharp contrast to the situation in the sandveld where a number of poor households are dependent upon boreholes owned by a few wealthy households (see Hitchcock, 1978; and Kramer and Odell, 1979).

The Effect of Private Ownership of Water Points. Water development by some households may work to the detriment of others. Hitchcock found that water sources in the sandveld of Botswana "are increasingly being concentrated in the hands of fewer and wealthier individuals" with the very real possibility of a "loss of water rights on the part of a substantial number of people" (1979: 192, 399).

Owners of private water points do have the general right to turn others away from their water points. In eight percent of the cases in which a water point was not used, the cause was owner restrictions. This affected only four percent of the respondents. Owner restrictions have been found to cause hardship to the poor in some areas (Peters, undated) and certainly have the potential to be a problem elsewhere. In the sites studied in this Survey, they did not appear to work undue hardship at the time of the Survey.

The Effect of Wealth. A Guttman scale of possession was constructed to provide an index of relative wealth (Appendix 3). The scale was collapsed into four categories: poorest, scale step 0; moderately poor, scale steps 1-4; moderately rich, scale steps 5-9; and richest, scale steps 10-11. The use of each water point physical type by households of varying relative wealth was compared. The differences in use of dams, haffir-dams, pans and seep wells were found not to be statistically significant.

Those which were found to be significantly different are presented in Table II-12. For the purposes of this table, the four categories have been combined into dichotomous categories. The poorest and the moderately poor are significantly more likely to use sand river wells and haffirs. Each of these is a small source, which a family can provide for itself typically by committing its own resources.

Table II-12:

Comparison of Relative Wealth and Use of Selected Water Point Physical Types[a]

(in percent)

Water Point		Poorer	Richer	Chi Square Test
		0 - 4	5 - 11	
		Sample = 264	Sample = 96[b]	
Haffirs	Use	42	26	Significant at
	Do Not Use	58	74	.01 Level
		0 - 4	5 - 11	
		Sample = 97	Sample = 72	
Rivers	Use	16	33	Significant at
	Do Not Use	84	67	.01 Level
		0	1 - 9	
		Sample = 21	Sample = 418	
Boreholes	Use	62	73	Not Significant
	Do Not Use	38	27	
		1 - 4	5 - 11	
		Sample = 317	Sample = 110	
Boreholes	Use	68	81	Significant at
	Do Not Use	32	19	.001 Level
		0	1 - 11	
		Sample = 21	Sample = 397	
Open Wells	Use	19	58	Significant at
	Do Not Use	81	42	.001 Level
		0	1 - 11	
		Sample = 13	Sample = 195	
Sand River	Use	85	49	Significant at
Well	Do Not Use	15	51	.05 Level

a. Scale steps used to define richer and poor categories vary according to differences found in the preliminary 4-step analysis.

b. Sample varies from type to type because villages which did not have a given physical type were excluded from the analysis for that type.

There is no significant difference in the use of boreholes by the poorest compared to the moderately poor and moderately rich. This undoubtedly reflects the use of district council boreholes and provides an example of water development which is beneficial to the poor. However, the richest and the moderately rich, compared to the moderately poor, were significantly more likely to use boreholes. This would suggest that the rich are probably the primary users of boreholes other than the "free" village boreholes. This is consistent with necessary cash outlay either in the form of fees or capital to drill, equip, and operate one's own borehole.[14]

The poorest were significantly less likely to use open wells. The poorest and the moderately poor were significantly less likely to use rivers, possibly in part due to many rivers being used for watering cattle. The poorest are less likely to own cattle and hence might be expected to use such sources less.[15]

In sum, those water points clearly requiring capital outlay were less likely to be used by the poorer households. Where labor could be substituted for capital, use by poorer households predominated. Where a water source was free and open to all, with the exception of rivers, no difference in use could be attributed to differences in wealth.

The Effect of Holding Cattle. Table II-13 compares households which do and do not hold cattle.[16] Cattle holders were significantly more likely to use dams, rivers and wells. This is consistent with the findings above that the richest and moderately rich, who are also more likely to hold cattle, are more likely to use rivers and wells.

While publicly-provided domestic water points have been shown to serve the poor, it is not at all clear that publicly-provided cattle water sources equally serve the poorer cattle holder. Households keeping cattle were divided according to their score on the Guttman scale of relative wealth. The water points they used for watering cattle were classed as private, communal, and publicly-provided sources. For this purpose,

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[14]Boreholes constructed between Independence and the late 1970s "represent the single largest productive investment related to the agricultural sector during this period--apart from the natural growth of the cattle herd" (Colclough and McCarthy, 1980: 236). These authors also estimate that perhaps only 5 percent of Batswana farmers can afford their own borehole (Ibid: 115).

[15]The percent of households holding at least some cattle in each category is: poorest 65 percent; moderately poor 73 percent; moderately rich and richest 75 percent.

[16]Holding cattle includes both ownership and holding the cattle of others through the Mafisa system. See T. Hertel, 1977.

Table II-13:

Comparison of the Use of Physical Types by Households Which Do or Do Not Keep Cattle (in percent)

		Keep Cattle	Do Not Keep Cattle	Chi Square Test
		N = 203*	N = 94	
Dams	Use	13	2	Significant at 0.01 Level
	Do Not Use	87	98	
		N = 158	N = 80	
Haffir Dams	Use	16	14	Not Significant
	Do Not Use	84	86	
		N = 260	N = 98	
Haffirs	Use	39	33	Not Significant
	Do Not Use	61	67	
		N = 187	N = 81	
Rivers	Use	24	11	Significant at 0.02 Level
	Do Not Use	76	89	
		N = 85	N = 33	
Pans	Use	21	9	Not Significant
	Do Not Use	79	91	
		N = 326	N = 118	
Boreholes	Use	73	72	Not Significant
	Do Not Use	27	28	
		N = 317	N = 97	
Wells	Use	59	46	Significant at 0.05 Level
	Do Not Use	41	54	
		N = 147	N = 61	
Sand River	Use	41	30	Not Significant
Wells	Do Not Use	59	70	
		N = 130	N = 48	
Seep Wells	Use	40	27	Not Significant
	Do Not Use	60	73	

*N varies from type to type because villages which did not have a given type were excluded from the analysis for that type.

privately initiated group were defined as private, while those sources built by the government and turned over to groups were defined as publicly-provided.

The use of each kind of source by each category of cattle holders is presented in Table II-14. The data in this table show that the very poorest cattle holders do use publicly-provided sources to a greater extent than do other groups, though the samples for each extreme category (poorest and richest) is very small—eight households in both cases. In more general terms, communal water points accounted for 41 percent of cases of use by both categories of poorer cattle holders and 50 percent of the cases of use by both categories of richer cattle owners. If only public and private water sources are considered, there is evidence that, while some poorer cattle holders benefit from public sources, the wealthier cattle holders benefit more (Table II-15). Admittedly, this measure is crude. It is not known how many head of livestock each group waters at such sources or how crucial these sources are considered. Nonetheless, it does appear to indicate that some factor (perhaps location) makes these sources more useful to the rich than to the poor.

Some Lessons

The Push-Pull Dynamic. There is an underlying tension in a household's water use strategy which may be missed by an overly deterministic reading of the description of the household "falling back" through a set of water points of seasonal changes to move from water point to water point with little choice in the matter. Rather, there are likely to be reasons for staying at a water point as well as reasons for leaving it. The decision to stay or leave often involves a number of "push" and "pull" factors associated with each water point and the locality in question. For example, Bailey found in the Water Points Survey that, of all the reasons given by cattle-holders for leaving a water point, 32 percent were related to the water point going dry, while 24 percent were concerned with the greater convenience afforded by another water source (1980: 22). The fallback strategy is not just one of the household using an increasingly restricted set of water sources in the dry season, but also one of "falling back" to a much expanded set of options with the advent of the wet season and the cropping season.

If the village is taken as the point of departure in describing rural water use, rather than the lands at the start of the cropping season, a recurring geographical pattern of advance and retreat is apparent in household water use with the passing of each agricultural season as household members move from the village to the lands and cattleposts and back again. This pattern of advance and retreat in houshold migration is, in turn, dependent on other push and pull factors in addition to those

Table II-14:

Comparison of Use for Livestock Water of Private, Communal, and Publicly Provided Water Points by Relative Wealth of Cattle Holders

	Relative Wealth Score			
	0 (8 Owners)	1 - 4 (164 Owners)	5 - 9 (69 Owners)	10 - 11 (8 Owners)
Cases of Use (Percent) at Private Sources	6 (35%)	148 (44%)	39 (30%)	3 (33%)
Cases of Use (Percent) at Communal Sources	4 (24%)	139 (42%)	66 (50%)	4 (44%)
Cases of Use (Percent) at Publicly-Provided Sources	7 (41%)	47 (14%)	26 (20%)	2 (22%)

Note: Both households and water points may be counted more than once calculating cases of use.

Table II-15:

Comparison of Use for Livestock Water of Public and Private Sources by Richer and Poorer Cattle Holders

	Poorer 0 - 4	Richer 5 - 10
Total Cases of Use	208	70
Private Sources	74%	60%
Public Sources	26	40

Chi Square Significant at .05 level

Note: Both households and water points may be counted more than once in calculating cases of use.

related to seasonal water availability.[17] For example, the village provides a pull away from the lands and cattleposts in the form of social activities, greater alternative

[17]For more details on this topic, the reader should consult Fortmann and Roe (1982).

economic opportunities, and other amenities, such as a district council-operated village water scheme. This pull may be strong enough to overcome the attraction of even the most convenient and reliable water supply at the lands or cattlepost. Moreover, for a segment of the population meeting their most basic problem, access to the means of production, may make farming or settlement at the lands or cattleposts not even feasible. For them, the economic opportunities elsewhere provide an irresistible pull. There is also the push from the lands into the village that comes after harvest, when the supply of water becomes increasingly inconvenient and unreliable at the lands during the dry season.

The push-pull dynamic also operates to encourage lands and cattlepost activities. There is a push out of the village toward the lands and cattleposts to the extent there is insufficient land for grazing around a village along with insufficient household labor and too many expenses involved for maintaining a separate village residence. For some, the lands or cattleposts provide a strong pull in the form of productive opportunities when few are available in the village. In fact, this pull may overcome even the most inconvenient water supply at the lands, as in many cases when households decide to settle permanently at their lands area.

Thus, there are likely to be a number of push and pull factors associated with deciding to stay or to leave a residence or water point. Moreover, such decision-making is also affected by considerations of risk and uncertainty.

Protecting the Water Rights of the Poor. The rights of the poor to domestic water in the village seem to be fairly well assured. It is at the lands and cattleposts where their rights, particularly to water for livestock, are most threatened, especially in the form of de facto and de jure moves toward individual land tenure.[18] Individual tenure provides no assurance that a poor household could develop a reliable water source on his/her property or that this person will be able to take his/her animals to a fallback source should the need arise. Fencing in fallback sources of water or placing a fence across the line of trek to a fallback point could spell disaster for small farmers. The very nature of the present water system, however, is probably the best protection of the water rights of the poor. The fallback system with a combination of natural and man-made water points scattered over communal land offers many options to the poorer livestock owner. Physical effort gains access to water points such as haffirs and sand rivers. Nonetheless, it must be constantly kept in mind that a water system which

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[18]Individual land tenure arrangements, both in the hardveld and in the sandveld, are discussed in Chapters IV through VI.

largely operates as a communal unit can only exist in conjunction with a surrounding agricultural and residential land base which is also held communally.

The Evolving Nature of Water Rights. The present system of water use and associated water rights has its roots in a traditional system of water use norms which, in turn, is similar to the systems in many neighboring countries with similar environments. The present system can be seen to have evolved from an earlier, primarily communal system of rights.

Communal Rights. When discussing the right to use water, the general right to get water and the right to use a specific water point must be distinguished. For example, the Karamojong speak of the "theft of a water hole" rather than of the water supply itself (Dyson-Hudson, 1966: 219-220). The right to water, as distinct from the right to use a specific water point, tended to be recognized as a universal right in most eastern and southern African societies.[19] This was most clearly so in the case of drinking water, particularly for emergencies, and also in the generally recognized right for anyone to use water from natural sources. Schapera documented these rights among the Tswana:

> In tribal law, the open waters of a river or pan close to which a village is settled can be used freely by anybody for drawing domestic supplies, washing clothes, bathing, or watering stock.
>
> . . . Tswana formerly regarded all surface waters as common property which any member of the tribe could use freely. The only qualification was that the water supplies in a grazing district were reserved for the people keeping cattle there.
>
> In all tribes, however, it is the general rule that travellers passing a well are entitled to free water for themselves and for their cattle. (1943: 243-249)

The logic of such communal rights to natural water is fairly obvious. First, it must be remembered that in most societies with such norms, land was often held by the tribe. Hence, even where usufructuary rights were granted to individuals, the land base around any water point was essentially communal. In legal systems with private water rights to natural water sources, such rights usually depend in large part on control of

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[19] See for example: Mukwaya, 1953: 14 (Uganda); USAID, 1979: Annex 9 P.4 (Somalia); Colson, 1959: 120 (Zambia); Gulliver, 1955: 37 and Malcolm, 1953: 32 (Tanzania); and Lambert, 1956: 142 (Kenya). See also Caponera, 1979.

adjacent or nearby land.[20] In other words, the ability to acquire natural water points generally depends on the ability to control access to the adjacent land.

In a pastoral society under semi-arid conditions, there are very good reasons for not acquiring exclusive rights to any particular piece of land. Seasonal variations in the amount of rainfall and the location of water and forage make the ability to move to resources essential for survival. This applies to the person who needs to leave a spot when it lacks resources as well as to one who may need to come to it when it is flush with water or grass.

If all resources are held in common, then everyone has the possibility of moving to and using those resources. Privatization of land or water limits the number of options available to the community as a whole. Hence maintaining communal rights to natural sources is part of a strategy for maximizing the number of options open to the community in times of stress. The generally recognized right to drinking water had a similar basis. Because in extremis no one wished to be turned away from water, this was granted as a right to everyone. One's responsibility to a traveler or a neighbor would assure one's own right in a similar situation.

Many things have changed in Botswana since Schapera's time, but the desire to maintain options through general water rights remains a strong feature of present rural society in Botswana.

> It remains a respected convention, essential for survival, that people and their cattle deprived of water should be permitted the use of a water source normally used and even managed and maintained by others. Kin or close neighbors are turned to first, but even outside this network the convention holds. . . Socially, many farmers explained, others in need of water for their cattle cannot be turned down. (Willett, 1981: Chapter 14)

Even the wealthy try to keep diverse options open. In some areas, borehole syndicate members maintain good relations with owners of nearby wells in order to have a back-up source should their borehole break down (Peters, undated: 27; Henderson, undated: 216).

Communal Obligations. Keeping options open sometimes required periodic maintenance of a water point. Hence it was not uncommon to find attached to the

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[20] For a more detailed discussion, see Bernhardt (1975).

right to use a water point, the responsibility, indeed the obligation, to maintain it. Communal labor and collective responsibility seem to have been particularly prevalent in connection with village water supplies.[21] In Botswana some of this work was done by age regiments, groups of men of a similar age who could be called upon by the chief to do work for the community (or for himself).

> During the rule of Sekgoma II, the tribe needed a dam for watering their cattle and a site was chosen at the bottom of Swaneng Hill. The Masokola regiment was called forth to build it. We closed the stream running beneath the hill, dug a foundation and filled it with sacks of manure and river sand. We built the wall up with sacks of sand and covered it all with soil. (Head, 1981: 90)

Again, times have changed. Community work by regiments has decreased drastically since Independence. Some collective responsibility is still attached to the use of open access and communally-held water points. Groups of neighbors can be expected to assist in the deepening of a seep well or the repair of an open well from which they regularly get water. In 1979, a broken dam wall in Makaleng was repaired by hundreds of local residents who turned out for two days of voluntary labor. (Such stories do not always have happy endings. The dam filled with water and was duly admired by a visiting Minister. Then the biggest rainstorm in a twenty-four hour period in the last twenty years occurred, and the new dam wall washed out in a spectacular flood. It remained in disrepair for two years until it was rebuilt by the Ministry of Agriculture in 1981.)

Private Rights. Communal rights and communal obligations are still the means by which survival is ensured through the maximization and maintenance of options in the form of alternative water sources. But as the community has come to mean less and the individual and locality more, there has been a shift toward private rights to water.[22]

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[21] See for example: Mukwaya, 1953: 55 (Uganda); Cory, 1954: 72, 81 and Malcolm, 1953: 32 (Tanzania); and Lewis, 1961: 234 (Somalia).

[22] The shift from communities to localities and individuals in eastern Botswana is discussed in Chapter VI.

existed in Botswana for at least some fifty years. Schapera (1943: 246-249) wrote as follows on the establishment and maintenance of private water rights.

> In general, Chiefs have willingly allowed and even encouraged people to sink wells, so that the country might be developed and pressure upon other water supplies be diminished. However, should a man make a well without permission, he may be forced to abandon it, even if he has already struck water.
>
> The people who sink a well are entitled to the sole use of its water and to protection against trespass, but they often allow others to water cattle there too. In some tribes. . . they occasionally demand and receive payment from men wishing to share regularly in the use of the well. Among the Ngwato, on the other hand, Kgama ordered that water must never be sold; it should either be given freely or not given at all.
>
> In the Kgatla Reserve, some of the boreholes put down by the Administration in and since 1934 were paid for either by individuals. . . or by small groups of men, locally known as "syndicates" who are also responsible for maintaining them. As with wells and private dams, the owners are entitled to the sole use of the water, but to this right was attached the special condition that they might no longer share the boreholes that are common tribal property.

The shift toward private rights accruing from the investment of individual labor and capital can be seen to result from two factors. Individuals or families may have desired to secure more reliable groundwater sources than they could get from communal sources in which less investment had been made. The shift toward privatization likely received its impetus with the introduction of the borehole which required considerable capital to drill and then to equip with an engine. Since boreholes can also have substantial running costs, a borehole owner might be understandably loathe to provide water free to all comers. In other cases (such as privately owned wells), freely available water might be exhausted sooner than if only the owner(s) were to use it. Yet another factor which might have encouraged restrictions of use to small groups is that it is often easier to exercise social sanctions on such groups than on the community as a whole.

Thus the development of private rights can be seen as one step in the search for more reliable water supplies, an effort which was profoundly affected by the introduction of a new, capital-intensive drilling technology. A controlled source, such as the borehole, was more likely to be reliable. A source paid for (with either sweat or cash) also fostered a desire for control and led to a belief that exclusive control was justified.

The Private/Communal Balance. It is interesting that the trend toward private rights has by no means led to the abandonment of communal rights. Private rights apply to man-made sources only. Natural sources remain open access with rare exceptions usually based on the control of the surrounding land. Attempts to establish exclusive private rights to a communal source are likely to cause considerable outrage. But even in the case of a man-made source, there are some communal aspects to private rights. Indeed, the two systems of right--communal and private--can be seen as interdependent.

First, the right of poorer locality members to use open-access sources reduces pressure on private water point owners to share their water. The private owner, on the other hand, must often rely on his/her own communal water rights since the private water point may prove to be unreliable. It may go dry. If it is mechanized, the machinery may break down, or the oil or fuel may run out. Further, a private water point is immobile. If grazing runs out around it, the reliable supply of water is of limited value to the owner. The private owner, then, also has reason to appreciate the system of communal rights which allows him to move his herd elsewhere, for it is this system which guarantees the flexibility still critical to survival in an agro-pastoral society. Of course, if the owner wishes to share communal water points or even use those points primarily serving poorer neighbors, their right to ask for the use of the private water point is increased. Thus the old system of reciprocity to a large extent survives. There are, of course, points of tension: some owners charge high fees for water; outsiders may abuse their right to use communal sources, ruining the grazing and water for locality residents; and certain people refuse to pay reasonable fees or use illegal means to get water from private sources.

The continuing existence of the two systems leads to a certain blurring of definitions. Government may consider a source to be private, but if the community considers it a communal source, it is likely to be used communally. (This we shall see, was a major stumbling block in the Ministry of Agriculture small dam program.) One should not expect to see the disappearance of the communal system. It protects the poor and it is an essential part of their strategy of survival. At the same time, it also serves the interests of the rich. The continuation of the communal system inevitably sets limits to the degree of privatization which can be expected. On the other hand, privatization can be expected to expand. It is tied to a technology--boreholes--which is widely viewed as essential to the provision of reliable water. For the richer cattle

producer, it provides added control over the production system. Thus it can be expected that the two systems will continue, perhaps in changing balance, to provide each other support and aggravation.

Summary

The data presented in this chapter have shown the response of people to the seasonal availability of water and the resources to which that water gives access--the associated grazing and arable land. People have been shown using water as it is seasonally available in different places, returning ultimately every year to the village where government investment has provided water which is cheaper, more convenient, and most important, more reliable than at the lands or the cattlepost. It has been shown that what water points are used depends on the time of year, the place, the primary production activities and to some extent the socio-economic status of the user.

Rather than emphasize the system of physical facilities, a water use system has been detailed. It would be an error to consider all the water points in a geographical area as colllectively comprising primarily a physical system. Rather the focus must be a system of use, assessing the available physical structures within their social context and the effects of seasonality. (Indeed, the management of many natural resources can only be understood in the context of such a system of use.) In the end, it is seasonality which plays the predominant but not the only role in determining the nature of the system. We turn now to a case study of how this system of use can also affect local-level water point management.

TABLE IIA-1 Twelve Survey Sites: Water Points Used by Households When They are in Residence in the Village

Type of Water Point	Council Owned Water Points		Privately Owned Water Points		Public or Community Water Points		Group Owned or Managed Water Points		Total[a]	
	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points
Dam	-	-	1	1.0	3	2.9	-	-	4	3.9
Haffir Dam	1	1.0	-	-	-	-	2	1.9	3	2.9
Haffir	-	-	6	5.9	1	1.0	-	-	7	6.9
River	-	-	-	-	1	1.0	-	-	1	1.0
Pan	-	-	-	-	-	-	-	-	-	-
Borehole	12	11.7	3	2.9	-	-	-	-	15	14.7
Open Well	-	-	17	16.7	-	-	1	1.0	18	17.6
Sand River Well	-	-	33	32.3	5	4.9	-	-	38	37.2
Sandriver Extractor	1	1.0	-	-	-	-	-	-	1	1.0
Seep Well	-	-	13	12.7	1	1.0	1	1.0	15	14.7
Total	14	13.7	73	71.5	11	10.8	4	3.9	102	100

TABLE IIA-2 Twelve Survey Sites: Average Number of Households per Water Point Type and Percent of Use at Each Type When Households are in Residence in the Village

Type of Water Point	Council Owned Water Points		Privately Owned Water Points		Public or Community Water Points		Group Owned or Managed Water Points		Total	
	Average Number of Households per Water Point	Percent of Total Use[a]	Average Number of Households per Water Point	Percent of Total Use[a]	Average Number of Households per Water Point	Percent of Total Use[a]	Average Number of Households per Water Point	Percent of Total Use[a]	Average Number of Households per Water Point	Percent of Total Use[a]
Dam	-	-	1	0.2	3	1.6	-	-	3	1.8
Haffir Dam	2	0.4	-	-	-	-	9	3.1	6	3.5
Haffir	-	-	3	2.9	1	0.2	-	-	2	3.1
River	-	-	-	-	5	0.9	-	-	5	0.9
Pan	-	-	-	-	-	-	-	-	-	-
Borehole	21	45.3	5	2.7	-	-	-	-	18	48.0
Open Well	-	-	6	17.2	-	-	1	0.2	5	17.3
Sand River Well	-	-	1	7.3	5	4.9	-	-	2	12.2
Sand River Extractor	20	3.6	-	-	-	-	-	-	20	3.7
Seep Well	-	-	4	8.8	3	0.6	1	0.2	3	9.5
Total	19	49.3	3	39.1	4	8.2	5	3.5	5	100

NOTE: Total "Use" is defined as the sum of the number of times each water point was used for at least one month by the sample households. A household or water point may be counted more than once in calculating "total use".

a May not add to 100 percent due to rounding errors.

TABLE IIA-3 Twelve Survey Sites: Percent of Households Using Water Point Types When They are in Residence in the Village

Type of Water Points	Council Owned Water Points		Privately Owned Water Points		Public or Community Water Points		Group Owned or Managed Water Points	
	Number of Households	Percent of Households	Number of Households	Percent of Households	Number of Households	Percent of Households	Number of Households	Percent of Households
Dam	-	-	1	0.3	10	3.2	-	-
Haffir Dam	2	0.6	-	-	-	-	17	5.4
Haffir	-	-	15	4.8	1	0.3	-	-
River	-	-	-	-	6	1.9	-	-
Pan	-	-	-	-	-	-	-	-
Borehole	240	76.7	13	4.2	-	-	-	-
Open Well	-	-	93	29.7	-	-	1	0.3
Sand River Well	-	-	37	11.8	28	8.9	-	-
Sand River Extractor	20	6.4	-	-	-	-	-	-
Seep Well	-	-	37	11.8	3	0.9	1	0.3

Sample = 313 Households who maintain a village residence.

Adds to more than 100 percent since households use more than one water point.

TABLE IIA-4 Twelve Survey Sites: Water Points Used by Households When They are in Residence at the Lands

Type of Water Point	Council Owned Water Points		Privately Owned Water Points		Public or Community Water Points		Group Owned or Managed Water Points		Total[a]	
	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points
Dam	3	1.8	1	0.6	3	1.8	-	-	7	4.3
Haffir Dam	5	3.1	-	-	1	0.6	3	1.8	9	5.6
Haffir	-	-	43	26.5	3	1.8	2	1.2	48	29.6
River	-	-	-	-	6	3.7	-	-	6	3.7
Pan	-	-	1	0.6	10	6.2	-	-	11	6.8
Borehole	5	3.1	4	2.5	-	-	7	4.3	16	9.9
Open Well	-	-	32	19.7	-	-	-	-	32	19.7
Sand River Well	-	-	16	9.9	1	0.6	-	-	17	10.5
Seep Well	-	-	16	9.9	-	-	-	-	16	9.9
Total	13	8.0	113	69.7	24	14.8	12	7.4	162	100

TABLE IIA-5 Twelve Survey Sites: Average Number of Households per Water Point Type and Percent of Use at Each Type When Households are in Residence at the Lands

Type of Water Point	Council Owned Water Points		Privately Owned Water Points		Public or Community Water Points		Group Owned or Managed Water Points		Total	
	Average Number of Households per Water Point	Percent of[a] Total Use	Average Number of Households per Water Point	Percent of[a] Total Use	Average Number of Households per Water Point	Percent of[a] Total Use	Average Number of Households per Water Point	Percent of[a] Total Use	Average Number of Households per Water Point	Percent of[a] Total Use
Dam	2	1.7	1	0.3	3	2.5	-	-	2	4.4
Haffir Dam	2	2.5	-	-	1	0.3	1	0.8	1	3.6
Haffir	-	-	2	21.0	1	1.1	1	0.5	2	22.7
River	-	-	-	-	5	8.3	-	-	5	8.3
Pan	-	-	2	0.5	2	5.5	-	-	2	6.0
Borehole	4	5.2	2	2.5	-	-	5	8.8	4	16.6
Open Well	-	-	3	24.9	-	-	-		3	24.9
Sand River Well	-	-	1	4.7	2	0.5	-	-	1	5.2
Seep Well	-	-	2	8.3	-	-	-	-	2	8.3
Total	3	9.4	2	62.2	3	18.2	3	10.2	2	100

NOTE: Total "Use" is defined as the sum of the number of times each water point was used for at least one month by the sample households. A household or water point may be counted more than once in calculating "total use".

a May not add to 100 percent due to rounding errors.

TABLE IIA-6 Twelve Survey Sites: Percent of Households Using Water Point Types When They are in Residence at the Lands

Type of Water Points	Council Owned Water Points		Privately Owned Water Points		Public or Community Water Points		Group Owned or Managed Water Points	
	Number of Households	Percent of Households	Number of Households	Percent of Households	Number of Households	Percent of Households	Number of Households	Percent of Households
Dam	6	2.5	1	0.4	10	4.2	-	-
Haffir Dam	8	3.4	-	-	1	0.4	3	12.7
Haffir	-	-	70	29.5	4	1.7	2	0.8
River	-	-	-	-	25	10.6	-	-
Pan	-	-	2	0.8	18	7.6	-	-
Borehole	20	8.4	9	3.8	-	-	30	12.7
Open Well	-	-	86	36.3	-	-	-	-
Sand River Well	-	-	17	7.2	2	0.8	-	-
Seep Wells	-	-	33	13.9	-	-	-	-

Sample = 237 Households who maintain a residence at the Lands.

Sums to more than 100 percent since households use more than one water point.

TABLE IIA-7 Twelve Survey Sites: Water Points Used by Households When They are in Residence at the Cattlepost

Type of Water Point	Council Owned Water Points		Privately Owned Water Points		Public or Community Water Points		Group Owned or Managed Water Points		Total[a]	
	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points	Number of Water Points	Percent of Water Points
Dam	1	1.4	1	1.4	1	1.4	-	-	3	4.1
Haffir Dam	1	1.4	-	-	1	1.4	-	-	2	2.7
Haffir	-	-	7	9.6	-	-	-	-	7	9.6
River	-	-	-	-	5	6.8	-	-	5	6.8
Pan	-	-	-	-	-	-	-	-	-	-
Borehole	5	6.8	9	12.3	-	-	2	2.7	16	21.9
Open Well	-	-	25	34.3	-	-	-	-	25	34.3
Sand River Well	-	-	8	10.9	1	1.4	-	-	9	12.3
Seep Well	-	-	6	8.2	-	-	-	-	6	8.2
Total[a]	7	9.6	56	76.7	8	10.9	2	2.7	73	100

a May not add to 100 percent due to rounding errors.

TABLE IIA-8 Twelve Survey Sites: Average Number of Households per Water Point Type and Percent of Use[a] at Each Type When Households are in Residence at the Cattlepost

Type of Water Point	Council Owned Water Points		Privately Owned Water Points		Public or Community Water Points		Group Owned or Managed Water Points		Total	
	Average Number of Households per Water Point	Percent of Total Use[a]	Average Number of Households per Water Point	Percent of Total Use[a]	Average Number of Households per Water Point	Percent of Total Use[a]	Average Number of Households per Water Point	Percent of Total Use[a]	Average Number of Households per Water Point	Percent of Total Use[a]
Dam	2	2.0	1	1.0	1	1.0	-	-	1	4.1
Haffir Dam	1	1.0	-	-	1	1.0	-	-	1	2.0
Haffir	-	-	1	9.2	-	-	-	-	1	9.2
River	-	-	-	-	1	6.1	-	-	1	6.1
Pan	-	-	-	-	-	-	-	-	-	-
Borehole	2	8.2	1	9.2	-	-	2	3.1	1	20.4
Open Well	-	-	2	41.8	-	-	-	-	2	41.8
Sand River Well	-	-	1	8.2	1	1.0	-	-	1	9.2
Seep Well	-	-	1	7.1	-	-	-	-	1	7.1
Total[a]	2	11.2	1	76.5	1	9.2	2	3.1	1	100

NOTE: Total "Use is defined as the sum of the number of times each water point was used for at least one month by the sample households. A household or water point may be counted more than once in calculating "total use".

a May not add to 100 percent due to rounding errors.

TABLE IIA-9 Twelve Survey Sites: Percent of Households Using Water Point Types When They are in Residence at the Cattlepost

Type of Water Points	Council Owned Water Points		Privately Owned Water Points		Public or Community Water Points		Group Owned or Managed Water Points	
	Number of Households	Percent of Households	Number of Households	Percent of Households	Number of Households	Percent of Households	Number of Households	Percent of Households
Dam	2	2.8	1	1.4	1	1.4	-	-
Haffir Dam	1	1.4	-	-	1	1.4	-	-
Haffir	-	-	9	12.7	-	-	-	-
River	-	-	-	-	6	8.5	-	-
Dam	-	-	-	-	-	-	-	-
Borehole	9	12.7	10	14.1	-	-	2	2.8
Open Well	-	-	33	46.5	-	-	-	-
Sand River Well	-	-	8	11.3	1	1.4	-	-
Seep Well	-	-	5	7.0	-	-	-	-

Sample = 71 Households who maintain a residence at a cattlepost.

Sums to more than 100 percent because households use more than one water point.

Chapter III

PARTICIPATION IN THE MANAGEMENT OF WATER: A CASE STUDY OF DAM GROUPS

> With the practice of many years they came to realize that in order to properly manage and utilize the Meich'uan Reservoir (in China) and the numerous small reservoirs and ponds, it is necessary to exercise unified management and unified arrangement. Isolated ponds and reservoirs had become no longer consonant with the development of the situation. The reservoirs, canals, ponds and dams of the entire district had to be linked together to form a complete system. (Nickum, 1977: 27-28)

Water management is often viewed as carrying out a series of specific technical tasks. The attempts of the Botswana government to encourage water management have tended to reflect this view. Water management has a technical component, but the social setting is of equal importance. Again and again, experience has made clear that local social structure and norms generally have more effect on the behavior of water point users than do government institutions, expectations and regulations. Recognition of this has led to attempts in Botswana to utilize local institutions and people in the development and management of water points. The results of this have been mixed. This chapter considers the experience with government-initiated dam groups and derives some lessons for planning and encouragement of local involvement in water point management.

The Road to Participation in Dam Management

There is a long history of community effort in the initiation, construction and management of dams and related structures in Botswana.[1] In 1905 a group of Bakhurutshe are reported to have constructed a weir which is still standing on the Shashe River near Kalakamate. In the early 1910s, members of the Bangwaketse tribe constructed a dam just outside their capital to provide water for its cattle (Schapera, 1947: 30, 70). In 1932 some Bakhurutshe constructed a dam near Makaleng similar to those observed on white freehold farms. In 1937 this dam was expanded with technical advice from a Boer farmer and was used until the wall collapsed during extraordinary rainfall in 1977.[2]

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[1] A detailed history of post-Independence dam building activities by the Government of Botswana up to 1974 is provided in Fortmann and Roe (1981).

[2] Information on Bakhurutshe history from Sub-Chief K.P. Ramokate.

As the colonial government became involved in the construction of dams, it came to recognize the importance of local involvement. In 1965 the Director of Agriculture wrote:

> The concurrence of the Tribal Authority [Paramount Chief] and the local people is essential in the siting of dams so that they will accept responsibility for maintenance. . . The Tribal Authority [is] to be made responsible for maintenance of the water supply and fencing and for the discipline of offenders. (1965: 2)

A later memorandum for a new government dam building unit stated:

> The project previously financed by OXFAM has been extremely popular and well-supported by the public and the object of the new project is to set up a small dam unit to continue and expand the concept of building, improving and repairing small stock watering dams in co-operation with communities...[T]he fact that local people are helping to provide their own wants will ensure that they are closely associated with any dams that are built and will, therefore, make certain that these dams are properly looked after. (Republic of Botswana, 1968(?): 1)

Good intentions were not enough, as the Chief Conservation Officer subsequently wrote near the start of the 1970s:

> To date the dam construction unit has been operating on a Government directive that dams should be built. The program was started with insufficient preparation by establishing contact with the people from the area concerned...What is really lacking is the means of establishing certain assurances namely that the people's full participation is guaranteed and that the requirements of the government are met. The participation of the people should include some form of contribution to the physical operation [of the dam]... (Youthed, undated: 2-3)

These concerns about local involvement resulted in part from criticisms of Ministry of Agriculture dam building programs, such as that by a Reading University agricultural economist:

> . . . the construction of these dams was clearly ahead of the detailed planning work, and, possibly, even at some variance with the real needs of that particular area. . . [There] was not at this time any organized approach to the use to be made of these dams and the

> controls that might be necessary: and many of the families in the area seemed quite indifferent to the construction of the dams. (Gardiner, 1968: 3)

The 1974 Dam and Haffir Building Policy

The eventual outcome of the discussions on local participation in the management of dams was a 1974 Ministry of Agriculture policy statement on haffirs and dams which was still in effect in 1982. The dams, haffir-dams, and haffirs discussed in this chapter were some of the estimated 99 constructed under this policy from 1974 to 1980 in the eastern communal areas by the Ministry's Small Dam Unit (SDU).

According to the policy statement, these dams are to be "primarily" for stock watering purposes in the lands and cattleposts; they are not intended to serve as domestic (human drinking) water supplies for villages. They are to be large enough to ensure that, given normal rainfall, they can water up to 400 adult cattle year round. In practice, capacity varies from dam to dam.

Central government undertakes to pay the full construction costs of these small stock dams, which are to be "built for agreed groups by building them and handing them over to District Councils free of charge." The policy gives a council two options in dam management:

> . . . the first option is for District Councils to take complete administrative control of the dams; to appoint a person to look after the dams, to maintain the fence around the dam, the watering point below it if there is one, to keep stock off the dam wall, to keep the wall grassed, and to collect watering fees. . . A second option would be for the Council to hand over complete responsibility for maintenance to an established group of farmers using the dam [and] allow them to collect the watering fees and the money in a fund for maintenance of the dam. (Ministry of Agriculture, 1974)

In practice, no council has chosen the first option: dam groups have overwhelmingly assumed direct management responsibilities, even though formal handovers by councils to groups have been rare.

Under the policy, a dam group is meant to consist of approximately 15 members, each of them owning an average of fewer than 20 adult cattle. (Users are expected to increase their herds over time.) No single person should be allowed to water more than 50 head. Each group should be formed before the dam is constructed and should consist of farmers who want the dam and are "willing to control their grazing." The Ministry of Agriculture extension staff is expected "to take the initiative in organizing groups who want dams." Prior to dam construction each group should sign a standard form, "Terms

of Agreement" (see Appendix 4), as a precondition to the dam's handover. The three major conditions to be accepted by the group in this formal agreement are:

1) The group members will maintain and repair the dam.
2) Each member will pay 72 thebe per adult animal per year, the revenue from which will be used for dam maintenance and repair.
3) The group agrees to allow no more than 400 adult cattle (or their equivalent) to water at the dam.

The name of each group member is to be written in the Agreement. It is unclear in what sense the Terms of Agreement constitutes a binding legal document. It contains, for example, no clause stipulating that each member of the group is jointly or separately liable for shortfalls in, say, fee collection. No penalties for non-payment of fees are specified, though the Agreement includes a clause to the effect that the local government authorities can take unspecified "appropriate action" if the conditions of the Terms are not fulfilled by the group. Nonetheless, under the Water Act of 1967, water rights have been issued to a number of these groups since 1976, giving them exclusive legal right of use to the water in the dams, though not to the land around and under them.

The 1974 dam policy sought to achieve a number of objectives. First and foremost, it meant to institute group management of the dams. Such management was to center around members' payment of set fees; observance of standard stock limitations; and agreement to undertake routine maintenance and repair. Through acceptance of these conditions, stock and grazing control around the dams would be established. Moreover, the dams were to be designed so that they could not water more than 400 adult cattle on a year-round basis. Underlying these objectives were both political pressures and lessons learned from earlier dam building programs, not least of which was the view that livestock watering points built by the Ministry of Agriculture should not result in overgrazing and range degradation.

What Dam Groups Do

Since what people are supposed to do often differs from what they actually do, it is not surprising that dam groups have not followed the Terms of Agreement to the letter.[3] In Table III-1 , information on the dams observed in the course the Water Points Survey is summarized. There are 24 dams, 21 of which have some sort of group management, described in the table.

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[3] A. B. J. Willett's massive study (1981) on groups in Botswana also provides much useful information on the operation of individual dam groups.

TABLE III-1 Management of SDU Dams

Dam Name and Code Number	Group	Use[a]	Maintenance	Regulation	Fees[b]	Average Daily Counts* (LSU/Domestic) Users	Condition of Fence	Comments
Makaleng Haffir Dam 11201	VDC	L D	None	Gate is locked when village cattle watering borehole is operating	None	289/0 (Dry Season)	Good	
Mambo Haffir Dam 11204	None	L	None	Occasional exhortation by headman	None	-	Knocked down in places	
Sechele Haffir	VDC	L	Fence reinforced with thorns	Locked until Sechele Haffir Dam goes dry	None	-	Good reinforced	
Sechele Haffir Dam	VDC	L	None	See Sechele Haffir above	None	-	-	
Toteng Haffir 11302	Toteng Ward	D	None	Domestic only	None		Good	
Bosudi Haffir 11303	None	L D	None	Occasional exhortation by Chief	None	148/1 (Jan, 1980) 237/4 (April-July 1980)	Gate knocked down	A group has been formed but was told by MOA that they must wait until the dam has been handed over to Council
Lekurwana Haffir Dam 23201	Dam Group	L D	Fence reinforced with thorns	Non members excluded	None	41/2 (Wet season) 60/0 (Dry Season)	Good reinforced with thorns	Hand pump does not work charge for not working on maintenance
Mmadithota 23202	Dam Group	L D		Non members intended to be excluded	None	99/7 (Wet Season) 86/14 (Dry Season)	Thorns only	Cannot exclude community members from use
Dinokaneng 23203	Dam Group	L D	Fence reinforced with thorns	Non members domestic use only	Members - none Non-members domestic use only 25t/drum (limit one drum per day)50t/ month(buckets only 1 - not collected regularly	94/4 (Wet Season) 28/1 (Dry Season)	Good	Hand pump not used some have paid fine for not working on maintenance

TABLE III-1 (continued)

Dam Name and Code Number	Group	Use[a]	Maintenance	Regulation	Fees[b]	Average Daily Counts* (LSU/Domestic) Users	Condition of Fence	Comments
Sekerepa 23204	Dam Group	L D	Fence reinforced and thorns built fence as a group	If dam going dry, tell non-members not to come	Said to be members Domestic P1.20/ household/year; cattle 72t/beast Non members: Domestic P2.00/ household/year Smallstock 1t/4 head/ day cattle 1t/beast/ day - not collected regularly		-	Hand pump not used Have collected fines for not working on maintenance
Belabela Haffir Dam 32201	Dam Group	L D		No non-members said to use haffir-dam	P6.00 membership fee	0/0 (Wet season) 0/4 (Dry season)	Good	Apparently little used
Segomotlhaba Haffir Dam 41200	Dam Group	Primarily D	None	Livestock excluded often because of lack of sufficient dam water	None	4/13 (Wet season) 0/19 (Dry season)	Good	Hand pump not on order
Galetlhokwane Haffir Dam 41201	Dam Group	L D (Primarily L)	None	Used for domestic only when dam water is low; some non-members use dam	None	218/0 (Wet season) 375/1 (Dry season)	Good	Hand pump not working; major lands cattle watering source
Letswatswe Haffir dam 41202	None	D			None		Good	Rarely used because of poor water holding capacity
Ngotshwale Haffir Dam 41205	Dam Group	Primarily D & SS	Users have placed metal trough outside fence for calf watering	Galetlhokwane non-community members excluded	None		Good	Proximity of village cattle watering bore-holes allows group to restrict dam to domestic only
Mannyelanong Haffir dam 41206	Dam Group	D		Gate locked to stop livestock water, water rationed primarily for domestic use only	None	14/10 (May 1980)	Good	Said to be seepage and poor holding capacity

TABLE III-1 (continued)

Dam Name and Code Number	Group	Use[a]	Maintenance	Regulation	Fees[b]	Average Daily Counts* (LSU/Domestic) Users	Condition of Fence	Comments
Kgope 41207	Dam group	D		Gate often locked to prohibit livestock watering; scarcity of water led to rationing for domestic use only	None	7/28 (May 1980)	Good	Reports of people "forcing" their way into dam for livestock watering have been made recently
Mmanoko Haffir Dam 42200	Dam group (said do be associated with Mmakanke VDC)	D L	Bush fencing within dam area and reservoir pit to exclude livestock walking into water	Caretaker hired. Users have placed a metal trough for watering outside pit; users form "bucket brigade" from pit to trough when watering cattle	Varies: 10t/beast/dry season(1980); P1.00/year 1978/79)	601/1 (June 1980)	Good	Used by and restricted to residents around dam
Motloletsetshega Haffir dam 42201	Sub committee of Mmakanke VDC	D L	Caretaker maintains fence; however, cattle enter dam & trample spillway as outside hand pump not working	Caretakers hired; users have placed a metal trough outside reservoir pit for watering; herders bucket water to trough; rationed for domestic water only in dry season	Varies:10t/beast/dry season(1980); P100/hh/yr (1978). In past, fees were self-help levies on residents of area. P67 collected since 1977	2/1 (Wet Season) 240/16 (Dry Season)	Good	Hand pump not working; VDC complaining of people failing to make contributions. Fees collected go into general VDC treasury
Mmamohiko Haffir Dam 42202	"Dam Group"/ Communal	D L	Volunteer caretaker once said to maintain dam, but no longer; new caretaker said to be identified (5/80)	Users have placed water trough outside reservoir pit, with herders bucketing water to trough	Said to be 10t/beast/dry season, but apparently no one paid as of 10/80	4/4 (Wet Season) 36/9 (Dry Season)	Good	When Chairman of original dam group died, group effectively disbanded; hand pump not working
Rapalana Haffir Dam 42203	Dam Group(said to be associated with Mmakanke VDC)	D L	Caretaker herding activities away from dam fencing	Have used outside hand pump and trough in past to ensure no pollution of water for domestic use; caretaker said to be hired	10t/beast/dry season, but varies from time to time	485/21 (June 1980)	Good	Hand pump recently was working; history of disputes with Mmakanke VDC
Mohane Haffir Dam 51200	Dam Group	D L	None	Gate once said to be locked, excluding Chairman of Dam Group from using it. (Vice chairman had key)	None	7/0 (Wet Season) 105/1 (Dry Season)	Good	Serious disagreements between Dam Group Chairman and Vice Chairman, both of whom are from different communities but farm the same lands area around dam

TABLE III-1 (continued)

Dam Name and Code Number	Group	Use[a]	Maintenance	Regulation	Fees[b]	Average Daily Counts* (LSU/Domestic) Users	Condition of Fence	Comments
Mmamonkge Haffir Dam 51201	Dam Group	D L	Considerable bush fencing for goat-proofing, cow dung collected for grassing of wall around rill erosion areas	Have bye-laws for members and non-members, meetings held; gate often locked, said to have rationed water in dry season for ss purposes; caretaker said to have volunteered at one time.	50t/hh/dry season (covers D & L Uses); said to have collected P150 so far; fees vary yearly for members and non-members	9/0 (Wet Season) 108/0 (Dry Season)	Good	Group has had fund raising parties and projects for dam
Magolthwane Haffir-Dam 51202	Dam Group	Primarily L (Late 1980)	None	Has not been managed or used since just after construction to mid 1980; availability of domestic village borehole and nearby river has lessened need for dam	Inconsistent reports on fee collections; some P6 - P11 collected in the past	12/0 (Wet Season) 139/0 (Dry Season)	Good	Hand pump does not work; people want Government to fix pump
24 Dams	21 Groups	83% dams used for domestic water. 25% dams used for domestic only	48% of the groups do some maintenance	All the groups try to regulate the use of their dams	43 percent of the groups say they charge fees			

* 1979/80 Counts from Water Points Diaries; see Chapter Four for more details

a. D = Domestic, L = Livestock, SS = smallstock

b. hh = household

Maintenance Functions. Maintenance involves keeping the physical structure in proper repair and working order. One of the appealing features of dams is that there is no technically complicated maintenance associated with them unless the wall actually collapses or the dam silts up, both reasonably infrequent events in Botswana. Maintenance is largely preventive and its absence is not immediately apparent.

About half the groups do some sort of maintenance. We found no dam group which adhered fully to the stipulated maintenance activities. No group has planted grass on the dam walls, although in some cases natural growth has occurred. The Mmamonkge dam group in Southern District has been reported to have put cattle manure on the rills of the dam wall in preparation for seeding. The Ministry of Agriculture has provided some, though not all, of the dams with drinking troughs and hand pumps outside the wall and reservoir area. Many of these do not work at all. Others are not used only because they lack a pump handle.

The predominant maintenance activity is maintaining the fence which encloses the dam wall and reservoir. In contrast to older Ministry of Agriculture dams, many SDU dams still have their original fences in reasonably good repair. In some cases, groups have even improved the original fences—adding strainers or piling thorn bushes around the wire to keep out smallstock. Two groups have hired caretakers whose duties included keeping cattle away from the fence; another two groups are said to have had caretakers in the past. It appears that fences are maintained less for the Ministry's reason of lengthening the life of the dam than because they are an essential tool for regulation which is the most common management activity.

Regulatory Functions. All groups attempted to regulate the use of their dams. In addition, at two dams without groups, the chief or the headman occasionally exhorted the people to use the dam properly. As the alternative ephemeral sources start drying up, the use of dams begins to be restricted in many areas. Again, the regulations may not necessarily take the form laid down by the Ministry of Agriculture (we know of no SDU dam group, for example, which deliberately limits the number of stock as prescribed) but they do assist in a rational strategy of overall water management.

Four kinds of regulation are common:

(a) The numbers of users may be limited. This appears to be accomplished more by turning away outsiders even when they are willing to pay fees than by turning away non-paying members in the group or in the same locality.

(b) The types of use may be restricted. Six dams are limited to domestic use, either permanently or seasonally as other sources start to go dry. (Sometimes watering of calves and smallstock is allowed

at "domestic" water points.) Cattle drink such large amounts of water that, rather than try to ration use by cattle, the group simply excludes them completely in order to ensure a convenient domestic water supply. The success of such an ordering of priorities ultimately depends on the availability of alternative and fallback water points, both for domestic and livestock purposes.

(c) The manner of use may also be controlled. This strategy tends to be associated with a priority for domestic use, in part for reasons of hygiene. Dams used for domestic purposes are more likely to have a limitation on the access of cattle to the reservoir. The only workable hand pump known to us is at Rapalana dam in Kweneng District, where the water is used for domestic as well as livestock purposes. Where the water is used for both cattle and domestic purposes, the cattle are allowed near the reservoir but are typically kept out of the water (being watered instead from troughs). Ironically, the exclusion of cattle from the reservoir, an important maintenance activity in the eyes of the government, occurs mainly in conjunction with the use of the water by humans, a use for which these dams were never primarily intended.

(d) The time of use may be regulated. Some dams are closed completely at certain seasons. This usually occurs for one of two reasons. In some cases, dams are used as fallback points for other water points which are subject to breakdowns, such as boreholes. Such dams are kept closed (by the simple expedient of locking the gate) and opened only when the primary water point is not functioning. Makaleng haffir-dam in North-East District is controlled in this way. Other dams are part of the sequential system of fallback points. The water source most likely to go dry is used first, followed by the other, more reliable sources. In Sechele village (North-East District), one haffir-dam is used first, while a second, deeper haffir is kept locked. When the first goes dry, the second is unlocked. When that is finished, the herds are taken to "the cattle post of last resort", the village, and watered for a fee at the district council borehole, which was originally intended only for human consumption.

In general then, it appears that regulatory activities take place in an attempt to preserve water quantity and quality over time as the more plentiful and convenient rainy season water supply diminishes. In more specific terms, the demand on these dams for domestic water partly explains why considerably more livestock do not water at some of them. Of the 129 daily counts of total livestock watering at 15 SDU associated haffirs and haffir-dams between November, 1979 and July, 1980, only 15 of these counts (12 percent) recorded over 400 livestock units (LSU), eight of which were at a single haffir in the North-East District.[4] The average daily count for all SDU

[4]Willett provides further examples of SDU dams watering over 400 head (1981: Chapter 14).

constructed or contracted haffir-dams monitored during this period was approximately 100 livestock units. Thus, although most farmers do not speak of limiting the number of livestock using dams, in fact many SDU dams are used in such a way that the numbers are limited.

Revenue Generating Activities. Because there are few, if any, operating costs for dams, users are less likely to perceive a need for fees than they are in the case of water points equipped with pumps and engines. As noted above, the Ministry recommends a water fee for SDU dams of 72 thebe per animal per year. Nine groups said they charged some kind of fee, but we know of no dam where the recommended fee is collected. Revenue is generated, however, in response to specific needs often in the form of a contribution, e.g., paying a caretaker. Some users appear to pay an initial membership fee out of a general sense of obligation, thereafter treating this payment as a license fee entitling them to take water indefinitely. Groups may have a membership fee or a requirement for contributing labor and a penalty for non-compliance but such penalties are rarely enforced.

Under these circumstances it is not surprising to find that record-keeping is rarely practiced by the groups. If records are kept, they are unlikely to be sufficient to determine either total revenue or total costs within a given period. It is understandable if users are reluctant to pay fees in the circumstances where they consider there to be a complete lack of financial control and accountability. Making contributions for a specific purpose or emergency seems to many a more acceptable way of raising revenue. In this fashion, people are not made to feel that they are paying for water or, in the absence of trust, "throwing their money away," but that they are chipping in to keep the effort going--rather in the nature of a self-help contribution.

According to their books and recollections of members, no group seems to be collecting more than a small fraction of what the government recommendations envisaged. For example, the Sekerepa Dam group in Central District had collected between twelve and thirteen pula as of January, 1980. (The dam group chairman could not say precisely what had been collected.) Had the group collected the fees at the government rate, they would have collected over P125. On the other hand, few groups seem inhibited by want of funds from taking essential action for essential purposes. It appears that government overestimated the real costs of dam management, or that only in the longer term will these costs emerge. "Essential action" for the users does not include saving to deal with long-term costs.

Why People Do What They Do

Why People Follow Management Procedures Laid Down by Government. Dams serve a useful purpose. Rural water users value reliable and convenient supplies--every hour not spent carrying water can be spent doing something else, including resting. Hence, it is worthwhile to protect and preserve a nearby supply. Fences are maintained because people can see them working as a management tool. When the water in a dam comes under stress within a fallback system, its supply is regulated.

Why People Do Not Follow Management Procedures Laid Down by Government. Two sets of factors seem to encourage groups to depart from the Terms of Agreement, one set technical and the other social organizational.

(a) Technical Factors

The Small Capacity of the Dams. Dams are intended to hold water through the dry season, but there must be adequate rainfall--preferably in the form of quick heavy showers for this to happen. No rainfall is reliable in Botswana, let alone a specific amount and type of rainfall. Even given sufficient rain, many small dams do not hold water throughout the dry season. In some cases this is due to the pressure of an excessive number of stock. If a dam is perceived by its user as likely to go dry (see below), it makes sense to "mine" the water while it is there, especially if there are other water points to fall back to. Some dams go dry because, as recognized by SDU personnel, they have not been properly sited. Siting of most SDU dams was based on a short visual inspection of a site selected by the dam group, without the aid of technical tools such as soil tests and aerial photography.

Dams as Low Maintenance Facilities. Many people favor dams precisely because they do not have to worry about their maintenance. Where maintenance requirements are perceived to be low, there is even less incentive to pay fees.

The Role of Seasonality and the Position of Dams in the Fallback System. The seasonal use of dams is significantly affected by the water fallback system. Dams hold the greatest amount of water when they are least needed--during the rainy season. At that time there is little incentive to pay attention to them. Moreover, many dams extend the rainy season supply through only part of the dry season, although this varies from year to year. While choosing Survey sites in August/September 1979, we found only three dams in the areas we checked (including, but not limited to, the twelve Survey sites) still holding water. However, in 1980, late heavy rains resulted in 73 percent of the SDU dams containing water at the time they were monitored, compared to 29 percent of all man-made surface water sources.[5] On

[5]Willett found a comparable 75 percent of the 82 SDU dams he surveyed had water in mid-1980 (1981: Chapter 14).

the whole, though, dams in general have a reputation for going dry before the end of most dry seasons.

Thus, during the rainy season when water is plentiful and often during the late dry season, there is little payoff for labor devoted to dams. The payoff comes when the dam begins to be used as a fallback point or needs repair. Management occurs, but it is management under stress at that time of year when use of the dam is critical. If fees are collected, it is typically at this time.

Dams as Multiple-Purpose Water Points. If fencing and deep reservoirs successfully restrict direct livestock access to dam water, users are more likely to use this water for other purposes--especially in many mixed lands and cattlepost areas where convenient domestic water supplies are at a premium at the start of the dry season during cropping time. Twenty of the twenty four dams were used for domestic water. The management arrangements associated with a dam used for both domestic and livestock watering purposes can be different from those followed in managing it as a livestock watering source only. For example, calculation of fee payments on the basis of use can become more complicated when a dam is managed for multiple purposes. In particular, domestic water charges are looked upon with even less favor than are livestock watering fees by the households, since domestic water is supplied free of charge in most major villages.

(b) Social Organization Factors

Shortage of Labor. Use of the SDU dams in the mixed lands and cattlepost areas where many of them are sited is affected by a perceived shortage of labor for agricultural work, especially for cattle-herding. Of the Survey respondents who said they live permanently at the lands, 67 percent said they did so for reasons relating to managing their livestock. Those who have traditionally cared for livestock, young men and boys, are now occupied in the wage sector or at school. This means that adult owners, truant children, or low-paid hired herders take care of the cattle. Livestock watering dams are appealing to such herders because cattle can simply water themselves at those single-purpose dams without deep reservoirs and locked gates. Herders would much rather open a gate and allow cattle to water freely than spend their time and energy using a hand pump.

The perceived labor constraint makes itself felt in other ways as well. The Motloletsetshega dam group in Kweneng District could not ration its dam water for domestic purposes until after harvest, when field labor became available to herd the cattle to more distant water points. Similarly, many people leave the lands when the

harvest is over, an event which clearly affects the availability of group members for various management activities at that time (Willett, 1981: Chapter 14 also notes this problem). Thus, labor-intensive dam maintenance tasks may not be done for lack of labor. Moreover, the very lack of fences and deep reservoirs may increase the value of the dams to labor-short stock holders who use the dams for livestock watering purposes only. In other words, individual cattle-owners may have a vested interest in minimizing their own costs by ensuring that some small dams are not managed and controlled as intended by the government.

Local-level Perceptions Affecting Dam Use. Water points which have been established by private individuals are commonly maintained by them (privately owned, open-access sources are not unknown, however). Government dams are generally considered to be government property, the local perception sometimes being that government will take care of them as it does its other property. Although the government policy of consultation and agreement before a dam is built is meant to create a sense of local ownership, this does not always result.

Because of traditional norms of free access to many surface water sources, a SDU dam is commonly perceived as belonging either to government or to the locality in which it is situated; rarely is it seen by residents as belonging exclusively to a small group of people in that area, even if they have been registered by the government.

Dam Groups as a Creation of the Government. Dam groups often have no life of their own. The members are 15 to 20 people who have signed up with the agricultural demonstrator to get a dam. They are not particularly deserving of a dam. They were simply in the right place at the right time. It is for this reason that government and local perceptions can run afoul of each other.

The government is concerned that there be a group which has expressed sufficient interest to assure that building a dam responds to a local need. What locality the group represents does not concern the government, as long as the group agrees to manage the dam. From the viewpoint of the government, the group has been given the right to use the dam and the corresponding responsibility to manage it properly. But other residents of a locality may not be prepared to accept the group's exclusive right to the water. The communal land on which the dam is built "belongs" to all residents, including the neighbors of group members. The dam itself is constructed by the government at no cost to the group. The water is rain water. This distinguishes the dam groups from private individuals whose right to their wells or dams comes from the labor or capital they have invested in their development. There is a noticeable lack of any equity (including sweat equity) in the case of most dam groups.

Groups which try to exclude neighbors from using the dam or try to collect fees, therefore, may find themselves on rather tenuous ground. They have no local basis of legitimacy, government statements notwithstanding. There are few, if any, traditional norms on which they can draw to support their claims. As long as there is mutual assistance among neighbors, dam group members may hesitate to turn away people who might help them in other circumstances. Thus groups may have to sacrifice the provisions of formal dam management as stipulated in the Terms of Agreement to preserve their standing in other social networks of the locality. One can find would-be fee-paying outsiders turned away in favor of "free-riding" residents of an area.

Finally, dam groups arise in response to a government offer. The government initiates the suggestion that a group be formed. Once the new members say yes, they have no involvement in the process of dam building until the dam is turned over to them for management. Because the dam building unit is administratively separate from the extension unit responsible for group formation, although both are in the Ministry of Agriculture, the time between agreement and getting the dam can be from two to six years.[6] This is no basis for building a cohesive group which might try to enforce unpopular water use regulations. Since groups typically have committed no resources to the dam, and since the group itself is not particularly strong, its members have no reason to exert themselves.

Lack of Consultation. The government sometimes acts alone, leaving the farmers behind. During the course of the Survey, the North-East District Council fenced five dams as the first step in turning them over to the villages. The entire fencing effort took place on council's initiative without informing the people. To the dismay of the council employees, the fences at all five sites were either cut by villagers or demolished by cattle within a few weeks. Council viewed the villagers as irresponsible and destructive. Villagers viewed the fences not as management tools, but as devices for preventing use of the dam water. Consultation might have prevented distress on both sides.

The Declining State of Self-Help. Self-help activities are generally in disarray in many rural areas. The absence of community sanctions against those who do not support the management of a dam may indicate the low priority that all self-help activities receive in an area. The complaints of some dam group members about people who do not contribute to the management of a dam occur in the context of an

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[6] At least 232 dam groups were said to exist in all of Botswana as of mid-1980. Of these, Willett found 124 (54 percent) were "groups waiting for dams to be built by the Small Dam Unit." (1981: Chapter 14)

increasing lack of trust and cooperation in some localities. In this sense, extension efforts based on locally-initiated efforts by those dam groups which want to improve their revenue collection are more likely to be successful.

Alternatives

The alternatives to group management are not necessarily better. District councils could run the dams as they do with village water supplies. Even if they could afford the wages for some 100 or more caretakers, there is no guarantee that such control would assure that fees were collected or stock numbers limited.

Dams could be sold to private individuals on the condition that they follow government maintenance regulations, including stock limitations.

Yet private leasing of state and tribal grazing land has not secured improved management of the range anywhere in Botswana. Privatizing dams would certainly disrupt many areas' fallback systems to the detriment of the poor smallholder and domestic user.

Finally, privatizing a water point may raise the cost of water to the consumer. For example, in the Mokatako/Ditlharapa Survey area, water, and particularly domestic water, is sold commercially, and in those localities where there is no alternative to these few available private sources, the cost of water tends to be comparatively high.

Groups, Management and Participation: Some Lessons

The Intermittent Nature of Dam Groups. Dam groups do not perform as the government might wish. On the other hand, the condition of SDU dams is not as bad as that of their predecessors after a comparable period of use. The most visible sign is the number of fences still standing upright and intact. Management occurs when it is needed, especially where dams serve both a critical livestock and domestic function, particularly during the early dry season. In most cases, groups act when a clear need for labor or money arises.

The claim that group-controlled dams are mismanaged because the government-designed Terms of Agreement are not followed is too narrow a view. It rests on preconceived notions of what groups are, what are dam management costs, and how fees fit into management. The dam groups monitored by the Water Points Survey might best be characterized as ad hoc working parties, seasonal in nature and locally-based. They regulate water use; they occasionally maintain the dams by contributing time, labor and, in some cases, cash. Their sole purpose is to facilitate timely access to a convenient, but not wholly reliable, water point.

To expect such working groups to behave as if they were formal committees, with an on-going basis for operation is unrealistic. The drying up of many dams and the post-harvest out-migration of people to their villages is bound to subvert the possibilities for year-round, group management of dams in communal areas. (A number of farmers may be too busy during the agricultural season to attend regular meetings even then.) Finally, in many instances the failure to obey stock limitations is balanced by the fact that grazing pressure on the area around the dam is rarely sustained the entire year.

Water Management Is Based on a Water Use System. Some of the better managed dams are part of a system of multiple water points managed by the same group. Exclusion from a single water point is accepted by users when the water point has a clear place in an orderly system of fallback points. Emphasis on management of single water points is inconsistent with the adaptive behavior necessary for survival in an area which has great variation in division of labor between sexes and with prevailing forms whereby households manage their water supplies. Thus, government efforts to ensure or improve the widespread participation of the residents of a locality in the management of a single water point are likely to be frustrated in most eastern communal areas of Botswana. Planning local-level management for a water supply there requires careful consideration of the nature of both the water use system and the agricultural system, and of the related management practices for both.

One must relate decisions on investment to the fallback system of water points, both man-made and natural, which are used at different points in time and across space. This complicates the question of promoting local-level participation at any one stage in the development of a specific water point, since at any particular time, the attention and energies of the people may be focused on another water point, more critical to them at that time and in that locality. Farmers and villagers are interested in the system as a whole. But this assessment of the system will vary somewhat from household to household, depending on the preferences of each for cheaper, more reliable or more conveniently located water. Seasonal variations in water supply, in household residence and in water demand all affect the operation of water points in the eastern communal areas. At any given time, a certain water point may receive no attention because people do not need it; there is no grazing around it; because they have better things to do with their time; because they simply are not there; or because the water point has no water.

Group Water Management Improves When It Takes Into Account a Community of Users. Groups seem to be most effective in two situations. If there are enough water points in an area, they can avoid conflicts with each other and regulate their own dams.

When demand exceeds supply, which is more often the case, groups are in potential conflict with other would-be users.

The second situation in which groups seem to be effective is when they draw their legitimacy from a large number of neighbors and residents of the locality as a whole and can depend, therefore, on wider norms and sanctions for their actions than the members alone can provide. Groups with such broad support often arise in areas with strong leaders or in highly homogeneous communities. Socially, separated dam groups are not particularly viable. Those linked to existing institutions with some wider legitimation are generally more effective and stable. The link may be with a respected village development committee, an active farmer's committee, a drift fence group or a kgotla. Such linkage is particularly important if the wait from signing the Agreement to receiving the dam is a long one.

Participation in Management and Participation in Use Are a Continuum. The government focus on man-made water points has tended to restrict the definition of water management in eastern Botswana. Operating such water points, particularly the mechanized ones, has specific requirements: repair, replacing parts, running the engine, and so on. But not all management is so formal. Indeed, for some water points, management cannot be isolated from use. That is, the manner of use of a water point is essentially the same thing as its management. In such cases, each user is a manager. In effect, the participation of residents of a locality in the operation of a water point falls somewhere on a continuum from pure management (management separated from use), through management as use and through pure use (use separated from any management) to use in opposition to management. Moreover, as shown in Table III-2, this participation may vary among the management functions of maintenance, regulation and revenue collection described earlier. Users might, for example, not pay stipulated fees and yet scrupulously abide by the regulations to maintain some or all of the equipment associated with the water point.

Pure management exists when people who do not use the water point themselves decide what constitutes appropriate water point management, plan the necessary activities and see that they are implemented. These activities undertaken by such managers may be in one or more of the three management functions. Activities at this more formal level of management are (or have been) undertaken by people other than the present water point users. Regulations, for example, may have been established by the previous generation or by the government. Enforcement may be the domain of the chief's kgotla or of a government officer. Thus, pure management may often (but not always) be found in the bureaucratic/political sector associated with formally defined government positions.

TABLE III-2 Types of Participation in Water Point Operation

Participant is	Maintenance	Regulation	Revenue Collection
Manager Only	Sets rules for maintenance Decides what is to be done Organizes the maintenance Enforces participation in maintenance and ensures its completion	Sets regulations for use Publicizes regulations Organizes enforcement	Sets fees Organizes collection of fees Enforces fee payments
Manager/User	May contribute labor and/or cash to some maintenance	May help with enforcement of some regulations Manages water point by using water only in certain ways	May help with collection May pay all or some fees, often on an ad hoc basis
User Only	Is not obligated to undertake maintenance of the water point (Maybe no maintenance needs)	Uses water without regulating water point	Pays no fees
Opponent of Management	Increases maintenance needs (e.g., cuts fences)	Refuses to obey regulations when using water	Refuses to pay fees for using water

However, water point use and management become difficult to distinguish when the users themselves are undertaking to manage the water point. Here community norms and sanctions act as the basis for the peoples' desire to use water "in an appropriate manner." Regulations are obeyed because users share the perception that water must be used responsibly. A woman fetching household water from a dam will close the gate behind her not because the government has a rule, but because one does not leave surface domestic water sources open to potential pollution by livestock. After filling their buckets, most people close the taps on a village borehole's standpipes because they perceive this to be the proper way to use village water; few adults need to be told to do so by a formal authority. Similarly, water is rarely taken from another's sand river well without the owner's permission. Although permission will likely be granted, the request for permission is customary. In these instances, how one utilizes a water point is part of how that water point is managed.

Government dams may offer the clearest case of management as use. Households use many of these dams at certain times of the year, for specific purposes, or in a given manner, so the pattern of use becomes the pattern of management. Management is in this sense, the way people use the dam. Thus, the boundary between use and management throughout the system, but particularly at this point, can be seen as often rather artificial. Management as use occurs particularly in localities where the bureaucratic/political involvement of government in the rural water sector is minimal and where socioeconomic forms of locality or compound locality organization still dominate.

The physical type of a water point partly determines its management needs. Some water points need not be managed, puddles for example. The sensible thing to do with a puddle is simply to use it, while it lasts. Such water points account for some cases of pure use. In other cases, all the management functions may be located outside the community of users. This often is the case with government boreholes for livestock watering; government personnel exclusively maintain these boreholes, collect fees (if at all), and regulate time of operation and manner of use.

Use in active opposition to water management is typically the result of two situations. A water point may be used by someone who is not a resident of the community of users and who is not sanctioned by them. Such a person uses others' water profligately and with impunity. These outside users are often influential people such as large cattle-owners, politicians, and civil servants. A second problem is conflict over the ownership of a water point. One or both parties to the conflict may ignore or try to undo measures undertaken by the other to exclude him or her from use

of the water point. For example, fences may be cut. A variant of this occurs when the users recognize the ownership of the water point, but reject the owner's claim to the right of excluding them from use. A water management system may or may not have a means of handling conflicts such as these and it is often here that rural water management in Botswana runs into difficulty.

Recognizing that management and use are a continuum allows planners to look in a more realistic fashion at the participation of a locality's residents in the operation of a water point. It is clear that while a concept of pure management is sometimes appropriate, it can at other times be too narrow and deceptive. Conceiving management only in a formal way misses the simple and essential act of a woman closing a gate or replacing the thorn tree in a bush fence. Moreover, this kind of approach skews attention toward those activities more often undertaken by government officials or formally constituted bodies. The weakness of such an approach becomes evident in the case of active opposition to management. Government institutions and national laws exist to protect residents of a locality against the predatory use of their water by outsiders, yet these laws and institutions rarely operate so as to provide such protection. Instead, people must (and do) protect themselves by taking action at the local level. This is an important reminder that most management remains a local activity undertaken by local residents, especially if the government's capacity for carrying out supervisory activity is limited, as it is in most LDCs.

Summary

In many respects people's participation in the management of a water point is not only feasible, but inevitable since management and use usually are so intimately interconnected. Errors in trying to institute participatory management arise from any misperception of the needs and behavior of the local people. Planners need to remember that management is both more and less than they think it is. It takes place on a system-wide basis and it includes a multitude of small acts which collectively have a large effect.

Chapter IV

CENTRAL GOVERNMENT PERCEPTIONS OF RESOURCE MANAGEMENT IN COMMUNAL AREAS: A CASE STUDY OF THE MINISTRY OF AGRICULTURE

While it has been shown that many dam groups have managed Ministry of Agriculture dams in a fashion not inconsistent with government objectives to prevent overstocking, the prevailing view in the Ministry has tended to be that these groups have been an unmitigated disaster. This chapter examines the organizational underpinnings of this exaggerated view. First the explanations propounded by various government officials over time for the shortcomings in dam management are discussed. Most of these explanations indeed identify very real difficulties encountered in the management of government dams. Our task here, however, is to understand officials' misplaced conviction that there is poor dam management. The second section, therefore, identifies the perceptions held by a number of government officials which support this too narrow view and which are profoundly at variance with those held by many rural Batswana. Finally, the roots of these bureaucratic perceptions (and misperceptions) are examined.

We need to proceed with an understanding of the important factors at work in the evolution of the Ministry of Agriculture's dam policy since Independence. It is also necessary to appreciate how this dam policy affected and has been affected over time by government efforts to devise broader water development and grazing management strategies for livestock. Thus, when the term "dam policy" is used below, it means not only the 1974 dam policy but also the longer process of evolving a set of government objectives concerning dam building which dates from after Independence through the 1974 policy statement and up to the recommendations of the Water Points Survey in 1981. In addition, the government's strategy for improving grazing and livestock management through the better use and placement of major types of water points has developed over a comparable period of time, including not only the 1974 directive but also the promulgation of various laws and other policies (particularly the Tribal Grazing Land Policy) to deal with such issues. In short, this chapter attempts to explain the relevant parts of the national political and bureaucratic context which shaped the goals of the government's dam building activities over time.

The discussion may seem to reify a series of discrete actors and events into "the Ministry," "the policy," and "the official view." Since turnover in government staff has always been high in Botswana, there has never been a shortage of variant views and

opinions concerning existing policies. Not all perceptions and explanations identified here are still expressed in government today, it should be added.

Bureaucratic Explanations For The Lack Of Management At Government Dams

Officials have typically explained poor management of government-built dam by reference to one or more of the following factors:

"There is a need for more planning and consultation. . .". Since the beginning of the Ministry of Agriculture's post-Independence dam construction activities, its various dam units have been criticized for a lack of proper planning and consultation, which, it was said, discouraged active community involvement in dam use and management. Gardiner's 1968 criticism (cited in Chapter III) that the Ministry's dam building unit planned its construction program without sufficient regard for the desires of the residents in the areas of construction is one example. While no one would argue today that dam building is ahead of planning, concern has even recently been expressed that the Ministry's planning process still rarely considers an area's water requirements or social organization before construction of a dam (Willett, 1981: Chapter 14; Levine, 1980:7). Similarly, the preceding chapter refers to instances where the lack of government consultation caused problems in dam management for some localities.

"The need is for more community participation. . .". Some have argued that, even under the best of circumstances, improved planning and consultation are not enough for ensuring proper dam management—what was and continues to be needed is not better top-down planning so much as increased local-level participation of dam users in the development and operation of these structures (Youthed, cited in Chapter III). Even though this concern for more local participation resulted in the 1974 emphasis on group management of dams, a lack of community participation remains evident in some of the recent Ministry of Agriculture dam building activities. This matter is much more than simply "a lack of consultation." When asked during the Water Points Survey who built the dam in his area, the chairman of one dam group answered "batswakwa," politely put, "foreigners." To some observers, the lack of community participation in the development of these dams and the subsequent noncompliance by groups with the formal Terms of Agreement are two sides of the same coin.

Lack of Proper Design and Site Evaluation. Gardiner criticized the capacity of early Ministry dams as being "grossly in excess of any likely use that could be made of them" (1970: 3). In contrast, recent Ministry of Agriculture dams have been criticized

for being too small. Large dams are seen as encouraging overstocking, small dams as discouraging active and continuous maintenance.

The siting of dams has also been problematic. Thirty minute "ocular" siting inspections by Ministry staff have resulted in many dams either having high seepage or literally never holding water. Gardiner (1968, 1970) and Levine (1980) have seen the lack of specialist advice (soil surveyor, hydrologist, rural sociologist) as contributing to such poor siting.

Inadequate Extension Efforts. Since agricultural demonstrators (ADs) have the duty of organizing dam groups under the 1974 policy, some of the blame for allegedly poor dam management has been laid at their door. It has happened that the transfer or resignation of an AD took place while a group was being established or before the dam was built. This has naturally led to delays and misunderstandings among group members. Some areas have no AD at all; others are too large to be covered adequately by one AD. In some cases, groups appear to have been misinformed by poorly-briefed extension staff about the government conditions for use of dams.

The Lack of an Effective Legal and Tenure Framework for Dam Management. Some policy-makers attribute poor dam management to "legal" problems associated with the dam and its resources. Three inter-related problems have often been mentioned by officials:

(a) It has sometimes been argued that what was needed to correct poor dam management was an enforceable lease, stipulating strict stock limitations at the dam (Mettrick and Thomson, 1970: 5, 8).

(b) Others claimed that overstocking around dams was part of a larger problem which demanded national legislation to prevent overstocking at all water points. The chairman of the central government's Natural Resources Technical Committee, discussing the reasons underlying cabinet curtailment of the early Ministry of Agriculture dam building activities in 1970, commented:

> . . . a lesson should be taken from this tragedy (sic): the bottleneck in these areas was grazing rather than water availability and the building of dams had preceded any effective organization to control overgrazing...[The] heart of the problem lay in the need for legislation to control grazing. . . (NRTC, 1970: 2)

In fact, the overgrazing said to have been "caused" by these early Ministry of Agriculture dam building activities was a major justification given by many

central government officials for national legislation on stock controls, subsequently enacted as the Agricultural Resources Conservation Act of 1974.

(c) Other policy-makers have long felt that calls for more effective leases and legislation for stock control were at best palliatives which dealt with symptoms--overstocking and overgrazing--rather than with what they perceived to be their cause, namely, the practice of communal grazing on land under the traditional land tenure system. Until the land tenure system was changed, pressure for mismanagement of individual water points would continue to exist. The common (often expatriate) prescription for correcting the situation has been a series of recommendations for allowing owners of watering points exclusive grazing rights around these private watering sources (e.g., Ministry of Agriculture, 1971: 5). By individualizing communal tenure of grazing land in the eastern lands and cattleposts, it was said, farmers would see that the only alternative was to manage their finite grazing and associated resources better (see Gulbrandsen, 1980: 235ff).

Poor Leadership. Many active, well-organized dam groups either have a strong group chairman or have been supported by an active headman, councillor or other village and government notables. Some observers have concluded that poor management arises from the lack of such leaders (see Willett, 1981: Chapters 1 and 3).

Differing Perceptions

To some extent, the government perception of "poor" dam management is a function of its definition of management. Since the Terms of Agreement have probably nowhere been followed in their entirety, many officials consider this failure to be sufficient evidence of mismanagement in itself. Yet the matter is subtler than this. Some officials claim they have seen widespread overgrazing and overstocking; yet as Chapter III indicates, overall stocking rates at a number of dams have been consistent with the yearly level recommended in the Terms of Agreement. And some group members argue that the membership and stock-holding requirements laid down in the Terms of Agreement are not just a different way of managing livestock water--they make no sense. At issue here are not simply differing definitions of management, but fundamentally different perceptions about what constitutes dam management in the general context of communal water and associated grazing utilization. These differing sets of perceptions held by a number of government officials and rural Batswana concerning water and range activities in the countryside are discussed below.

Perceptions of Dams and Reliability

While some officials have thought of government dams as reliable sources of water, only a few have glimpsed the reality. For example, discussions which led to the 1974 dam policy speak in terms of the Ministry of Agriculture building dams of "greater reliability," each offering "a dependable year-round source of water" (Mettrick and Thomson, 1970: 6). The 1974 policy directive states: "The dams will be large enough to ensure that they can water about 400 [adult livestock] for the whole year" (Ministry of Agriculture, 1974: 1). Yet, as Chapter III shows, it is common local knowledge in many areas that government dams are often unreliable livestock water sources for use throughout the year.

There is little chance of agreement between officials and dam users when they have such differing perceptions of reality. On one hand there is the Ministry official who makes a tour of government dams, probably in the dry season when the roads are passable, and sees congestion around some of them. He extrapolates the stocking rate he sees to a seasonal or yearly one; and when he returns to his office he argues forcefully against building any more dams in these areas. At the same time, village development committees or farmers committees in some of these areas might well be requesting more dams. They may perceive a need to even out and extend livestock watering through the dry season by using a set of dams, one after the other, in a fallback system —even though in some years none of these dams may hold enough water (thereby creating a vicious cycle of reinforcing the locally perceived need for more dams. . .).

Perceptions of Water: Is Dam Water A Common Property or Scarce Resource?

A Difference in Kind. The following excerpts incorporate two rather distinct views about the nature of the surface water in some Botswana dams:

> . . . Tswana formerly regarded all surface waters as common property, which any member of the tribe could use freely. . . Since the Europeans introduced better methods of tapping and conserving water, new communal supplies have been provided in the form of wells, boreholes, and dams. Dams are also used freely, except in one instance among the Ngwaketse, where special regulations were made by the Chiefs. . . [Boreholes and some wells are] not 'common property' in the same way as rivers, pans and some dams. (Schapera, Native Land Tenure in the Bechuanaland Protectorate, 1943, p. 249)

> The objectives of the [small dam] pricing policy are:
> (a) to enable Government to recoup all or part of the cost of constructing dams,

(b) to impress upon people the value of water as one of the country's scarce resources and,
(c) to assist in the conservation of the grazing area around each dam by discouraging overstocking. . . (Mettrick and Thomson, "Small Dam Construction Pricing Policy", 1970, p. 1)

It is perhaps here that differences in perceptions between rural water users and government policy makers are their most striking. While the common property aspect of tribal grazing land in Botswana has been widely acknowledged, government officials appear not to have recognized that dams--especially those built by government--are also perceived by many of their users as common property. Government has at times unwittingly reinforced this perception. Some officials doubted the feasibility of requiring people to pay for water at new dams when fee collection at pre-1974 dams was not enforced. Nor have fees at a government dam been justified by officials in terms of providing funds for the replacement of a dam at the end of its useful life. Rather the expectation persists in government that such dams will be provided as a public sector responsibility.

Given the rural perception of government dams as common property, the lengthy pre-1974 meetings and discussions in the capital seeking to fix fee payments for dam water must have had an air of unreality about them. By always assuming that the water in these dams was a scarce resource, central government in its own way set neoclassical economics on its head. Officials argued that water prices were necessary in part to impress on dam users that water was scarce--a scarcity which, if it had been the only factor operating, should have generated the water prices in the first place. Ministry officials essentially proposed the rationing of water through the price system, even though the Ministry knew from its own surveys that rural Batswana did not want rationing by explicit price (Sekgoma and Eding, 1971). Even today, if water has to be rationed out, it is allocated by customary means without recourse to set prices. Dams are utilized by households who evaluate their opportunity costs of collecting water at a particular dam in light of the alternative water sources available. The fee of 72 thebe/animal/year in no way reflects such opportunity costs.

A Difference in Degree.

> Nothing is more useful than water; but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other good may frequently be had in exchange for it. (Adam Smith, An Inquiry into the Nature and Causes of the Wealth of Nations, Chapter IV.)

One of the explanations as to why dams are managed the way they are in Botswana--itself perceived to be a desert country, rich in diamonds and lacking in water--lies in the answer commonly given today to the paradox of value posed by Smith: the more there is of a good, the less the relative value of its additional unit, even though its total utility increases as we get more and more of it. Notwithstanding the conventional view of Botswana as a "water-short" country, in a good wet season there are a great number of water points in eastern Botswana, particularly ephemeral ones. Only when these points dry up does dam water become used and managed in the process of being used. Thus, trying to classify dams and the water in them as either common property or scarce resource misses a major point: it is the scarcity of water at other sources at a certain point in time which leads to the relevance and operation of a particular dam as a common property resource. Common property is not always synonymous with unrestricted and uncontrolled access. In a sense, dams become common property when their use and consequent management occurs, since during the rest of the year the dam and its water are ignored by the majority of users. Water is scarce, but not throughout the year at individual water points within the fallback system, so the Ministry's perception of water scarcity is only partly correct. Accordingly, the view that communally-held water sources are unmanaged, open-access facilities is also incorrect for some weeks or months at a time in eastern Botswana.

Perceptions of Grazing Around Water Points: Is Grazing Land A Limiting Factor or A Renewable Resource?

Although keeping livestock plays an important part in the rural economy and society, there has been no systematic, country-wide investigation of rural people's attitudes and beliefs about rangeland and its associated livestock grazing since Schapera's land tenure study of some of the major tribes in the country published in the 1940s. Still, there is evidence that government officials and Batswana livestock holders do not see eye to eye on the matter of livestock grazing around water points.[1]

In the past, colonial officials commonly argued that the limiting factor in livestock production was ultimately the availability and rechargeability of groundwater sources (see Roe, 1980: 25). More recently, some officials, particularly in the technical cadres of the Ministry of Agriculture, have held that the first limiting factor in livestock production in tribal areas is forage, not water. In their view, livestock deaths like those in the drought of the early 1960s, were caused less by lack of water than by

[1] See Bailey (1982) and Willett (1981: Chapter 11) for a more complete summary of available data on rural attitudes about grazing and stocking conditions.

lack of grazing due to excessive stocking around the water supplies (Campbell, 1979: 104, 248). In the words of the Chief Land Utilization Officer, stock watering boreholes, small dams and haffirs have "become nuclei for the onset of desertification because livestock owners are unwilling to control the size of local herds or their access to the pastures surrounding the watering points" (Alidi, 1979: 264).

Since from this perspective overgrazing is seen to follow from uncontrolled access of livestock to these watering points, it is understandable that the notion of making water development conditional on stock limitation might appeal to a large number of government officials. The Ministry of Agriculture's dam building program has been justified by its technical cadre as a "lever" for obtaining better grazing control (Mettrick and Thomson, 1970: 5), both through constructing new dams in a more dispersed fashion as a means of encouraging better distribution of livestock and through stock control measures such as those in the Terms of Agreement for the 1974 policy.

In contrast, our field observations and discussions lead us to speculate that a number of rural livestock holders see grazing land more as a renewable resource, seasonally depleted and replenished, than as a limiting factor, a point also made by Devitt (1981: 10). While the availability of grazing, even in the wet season, is already a problem for some areas of Botswana, the "average" wet season still provides reasonable water and forage availability for a number of rural livestock-holding households. As Bailey has put it: ". . . the typical cattle holder considers rainfall much more of a constraint than local cattle numbers on the opportunity his or her cattle have for good grazing" (1982: 113). Where overstocking is perceived, it is seen by some as the concentration of livestock around a few reliable dry season water points and this can be solved by the next good rains.[2] As both Bailey and Willett (1981: Chapter 11) point out, rural Batswana as a rule do not attribute overgrazing, in whole or in part, to overstocking. Again, in such a view, it is rainfall which is the critical factor in renewing the grass and water resources.

Where Batswana have agreed that lack of man-made watering points has restricted access to new grazing areas, their notion that this is a limiting factor is subtly different from the view held by colonial officials. In the latter view (one still expressed by some Ministry of Agriculture staff), the development of livestock watering points in a "virgin" grazing area, which was formerly underutilized by livestock due to lack of

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[2]Water Points Survey evidence supports this view to the extent that livestock numbers were found to diminish significantly at a number of man-made water points in the wet season, only to reappear in the dry season as the surface water sources increasingly went dry. This, however, says nothing about the quality and quantity of pasture as a result of this stocking pattern around water sources in an area.

nearby water, increases that area's effective carrying capacity (Roe, 1980). On the other hand, a number of Batswana livestock holders see the opening of new grazing areas through water development as means of providing a relatively cheaper substitute for the grazing resource which has become depleted in those areas already well-served or "crowded" with livestock watering points (see Willett, 1981: Chapter 11; for a related irrigation parallel, see Levine, 1980b). New water point development in underutilized grazing areas may be perceived as the cheaper way of providing forage to livestock holders when compared to the more "costly" methods of improving grazing supplies within existing grazing areas, particularly because livestock water development of underutilized areas has been subsidized throughout the history of the country (Roe, 1980). The availability of "frontier" grazing and water sources has probably militated against making more efficient use of those resources in the older established areas, thus, ironically, working against the stated government intention of treating water and grazing as "scarce" resources.

Differing Perceptions of the Commons: The Flaw in the Tragedy

> . . . under our communal grazing system it is in no one individual's interest to limit the number of his animals. If one man takes his cattle off, someone else moves his own cattle in. Unless livestock numbers are somehow tied to specific grazing areas no one has an incentive to control grazing. . . . (Government of Botswana, White Paper No. 2 of 1975: National Policy on the Tribal Grazing Land; quoted in Devitt, 1981)

One of the major factors affecting the direction of government land and water policies since Independence has been the operating assumption made by many politicians and bureaucrats alike that the overstocking and overgrazing found around dams and other large livestock watering points ultimately arises because of Botswana's land tenure system. The view that this traditional land tenure system of communal grazing on tribal land led to a "tragedy of commons" has been enshrined in recent national policy. Paralleling the logic laid out originally by Garret Hardin, it is widely believed in government that no Motswana livestock holder sees it as in his benefit (whether economic, social or both) to try to limit his herd's size under a system where rangeland is open to all, since this stock holder receives all the benefit from adding animals to the veld, while the cost of his increase in terms of overgrazing is borne by all herders. Since all stockholders come to this same conclusion, so the argument runs, the aggregate stocking rate of herders will eventually exceed the range's carrying capacity.

The perverse situation will arise where each stockholder sees it as in his own interest to overstock, because he cannot prevent his neighbors from doing the same thing (see also Gilles and Jamtgaard, 1980: 2). In this anarchical system there is allegedly no incentive to limit livestock numbers at water points. The solution, as embodied in the Tribal Grazing Land Policy, has been to alienate tribal land grazing areas by granting exclusive rights to private users. Under this new system, each rights holder, it is argued, will see it to his own best interest to manage his holding properly.

A number of researchers have criticized or provided evidence which contradicts this view of the causes of overgrazing in Botswana. This criticism and evidence is complex and can only be schematically treated here. Suffice it to say that at least three of the underlying assumptions of this "tragedy of the commons" view have been called into question.[3]

Communal Grazing Land Is Not Open To All.

> Until recently it has been widely assumed in Government circles that 'communal grazing rights' means that everybody has a right to graze as many livestock as he wishes on any communal grazing area in Botswana. Traditionally, and within living memory, this was not so. (Devitt, 1981: 24).

Studies done by Schapera (1943), van Niekerk (1966), Gulbrandsen (1980), Wynne (1981) and Hitchcock (forthcoming) provide evidence that in the past, access to and use of grazing areas in some parts of the country were regulated by chiefs. As pointed out in Chapter I, it was common for some of these chiefs to assign overseers to be responsible for approving and/or siting individual cattleposts within grazing localities of the chief's tribal territory. Gulbrandsen, for example, described the former grazing regulation among the Bangwaketse as follows:

> The modisa's [overseer's] primary duty was to control the construction of wells and dams to prevent too high a concentration of livestock which would damage the range. He also carefully controlled the number of cattle and the distribution of cattleposts in his area. Thus, people intending to establish a cattlepost first had to get his approval. If an area was too overstocked, the overseer had to report this to the kgosi [chief]. The matter was discussed in the tribe, and the kgosi then decided whether to move some of the cattleposts to another area, or to close it to new ones. (1980: 193-194)

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[3] A discussion of the definitional and methodological problems associated with identifying the "carrying capacity" of an area is deferred until Chapter V.

While this system has generally lapsed in recent years, its existence shows that the commons was not opened to all and was, in fact, managed and its use regulated to some degree.[4]

Even today, access to communal grazing areas is restricted both de jure and de facto. The Tribal Land Act of 1968 gives each land board the right to restrict access by non-tribesmen to the grazing land falling within the legal borders of its jurisdiction. Similarly, other laws limit access to grazing, e.g., in mining areas. Moreover, the control of water points has long limited livestock holder access to grazing areas. Part of the rationale for the Tribal Grazing Land Policy was that the uncontrolled drilling of boreholes gave borehole owners de facto control of the grazing around these watering points (Colclough and McCarthy, 1980: 117). And as noted in Chapter III, some localities in eastern Botswana restrict "outsiders'" access to communally-held water points and thereby de facto prevent their use of the forage around the points.

Batswana Had Traditional Methods For Preserving Or Restoring The Range. Neither the badisa system nor the motley set of de jure and de facto restrictions on grazing utilization addresses the central issue in the "tragedy of commons" argument, however: the system of communal grazing is said to militate against measures to conserve or rehabilitate grassland, once the stocking rate exceeds the "carrying capacity" of the range. In fact, Gulbrandsen points out that one of the reasons why the badisa system worked in the past among the Bangwaketse was that the stocking rate was low relative to the available grazing land (1980: 194). What practices, then, have Batswana used that preserved grazing or restored it in an area already heavily stocked?

We have already explained how households in a number of localities in eastern Botswana use a set of livestock watering points in what can be best characterized as a fallback system, which has the effect of achieving, intentionally or not, a form of deferred grazing. Almagor (1980) describes the ohambo grazing system of some Mbanderu of Ngamiland who still practice a crude rotation of herding their livestock between wet and dry season pastures. Willett (1981: Chapter 9) describes present day efforts by residents in some mixed lands and cattlepost areas to establish a deferred rotational grazing system through constructing long drift fences separating wide tracts

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[4]The introduction of land boards which have replaced the chiefly right to allocate land, the declining association of dinaga (grazing areas) with certain communities, and increased demographic pressure for more extensive livestock and arable land uses have been used to explain the passing away of the badisa system (see Devitt, 1981: 24). The practice of appointing lands and grazing badisa is not completely moribund, however: the minutes of the Kweneng Land Board show that an overseer had been appointed to a lands area as late as 1980 (minutes dated August 26, 1980).

of lands areas from cattlepost areas, where the lands are opened for grazing purposes after harvest.

Perhaps the best example of a practice used traditionally to improve range condition in already-stocked areas was that of veld-burning. It is generally recognized today that the judicious use of fire can play an important part in improving range condition (Funes, 1975). Batswana had long seen the benefits of burning off dead grass, particularly in terms of encouraging new and more succulent grasslands after the first rains:

> In all tribes chiefs also made laws to regulate the practice of veld-burning. It was formerly the custom to burn off the withered grass in pastoral areas at the time when the first rains were due (September and October); this, it was held, promoted rapid growth of new grass and also helped to destroy ticks. A man might burn only where his own cattle grazed, and had to keep the fire under control lest it sweep the countryside. It was an offense to burn during the dry winter season, when grazing was scarce and fires could also spread more easily. (Schapera, 1970: 104-105)

While extensive areas of the country are burned every year (Alidi, 1979: 267), to our knowledge veld-burning as a means of improving livestock grazing conditions seems to be rarely practiced today in the eastern communal areas. However, we speculate that the decline in use of this range management practice had little to do with growing denudation in grasscover due to overstocking. Rather it appears to be a classic example of how freehold (largely white) farmers and colonial government interests worked together in an effort to quash a traditional practice which was perceived as a threat to the property of the white farming communities adjacent to tribal areas. For example, in March 1912, Chief Seepapitso of the Bangwaketse made the following announcement to his tribe:

> The first matter is a message from the white people which you have already heard before, to say that the veld should no longer be burned, especially by you people in the east. The white people complain that when those of you living near the boundary burn your veld, your fire spreads and burns their land as well. Whoever burns the veld will be fined £100, or imprisoned for six months. The fine of £100 may on occasion be accompanied by 24 lashes, or the latter may be the only penalty. (Schapera, 1947: 48-49)

Schapera commented on Chief Seepapitso's statement:

> . . . [Veld-burning] might spread on to the lands of neighboring European farmers and do considerable damage. There had been complaints in 1911 about the negligence of the Ngwaketse, and on 1 March 1912 the Secretary of the Lobatsi [freehold] Farms Association wrote to the chief asking that veld-burning should be suppressed. Seepapitso replied on 14 March that the request would be 'carefully attended to, but some of my people near the border say that some of the fires were caused...in your farms.' However, the occasion apparently led to the promulgation of the following tribal law, which is included in [Seepapitso's] code of 1913: 'Grazing veld must be burned in our country only, and then only after the people have come home from the fields'...The penalties mentioned by the chief are those specified in the Cape Colony 'Forest and Herbage Preservation Act, 1859' (as amended), which was also applicable in the [Bechuanaland Protectorate]. It was not until 1919 that the Protectorate Government made its own law against veld-burning. (1947: 49).

Schapera concludes this story of the decline of a traditional range management practice as follows:

> The complaints continued, nevertheless. In 1927, following upon the representations from the European Advisory Council, the Resident Commissioner warned the Chiefs that he would recommend the promulgation of a law against veld burning, unless they took active steps to see that all fires started close to European areas were kept under control and prevented from spreading over the border. During the next few years the matter was repeatedly pressed upon the people, both in kgotla and at meetings of the Native Advisory Council. As a result, the Chiefs one by one issued orders making it an offense to burn the veld at any time, and insisting on prompt suppression of all fires. . . As far as I could ascertain, [these orders] have been generally enforced, and the records of the various Chief's Tribunals contain several instances of people being punished for ignoring them. (Schapera, 1943: 233)

Much more information is needed on traditional methods of assessing overgrazing and overstocking, along with those practices traditionally used to try to improve and ameliorate these conditions. For example, Chief Seepapitso is recorded as instructing his tribe to eradicate burweed which Schapera describes as a noxious weed "whose rapid growth and spread was a menace to grazing facilities" (1947: 77). Traditional management of communal resources, both past and present, has yet to be systematically detailed or examined in Botswana.

Privatizing the Commons Need Not Guarantee Better Grazing Management. While in theory it may sound reasonable to expect land to be better managed when it is owned privately than when it is communally-held, in practice it may be quite a

different matter. Granting exclusive leasehold rights in formerly communal grazing areas has been justified on the grounds that it is necessary if the rights holder is to adopt the improved system of fenced rotational grazing and watering livestock recommended by the Ministry of Agriculture for increasing livestock productivity (TGLP White Paper, 1975, quoted in Devitt, 1981). Nonetheless, overstocking and overgrazing has been observed on some leasehold fenced ranches under Botswana's First Livestock Development Project (Odell, 1980b). In addition, roughly fifteen years of government grazing trials undertaken periodically from the 1950s through 1970s show no significant difference in range conditions between those found under various fenced rotational systems and that observed under continuous, "single paddock" grazing (see Roe and Fortmann, 1981: 71; APRU, 1980: 85-86). The evidence is far from conclusive that privatization of the Botswana commons increases the likelihood of improving range conditions there.

Reasons for Official Perceptions: Five Institutional Biases

The simplest explanation for the difference between these local-level and official perceptions is to take the view that expatriate technical cadre in the Ministry of Agriculture are woefully ignorant of Tswana social reality. The matter is much more complex. Batswana traditional attitudes toward water and grazing have been a matter of record since publication of Schapera's Native Land Tenure in the Bechuanaland Protectorate, a work undertaken for the colonial government. Memoranda and minutes of meetings leading to the 1974 dam policy also show that several highly placed expatriate officers were aware of the traditional badisa management system and were sensitive to local perceptions concerning dam reliability and to the importance of alternative water points in affecting the use of any one water source (Ministry of Agriculture, 1971: 5; Youthed, undated: 4; Fortmann and Roe, 1981: 375-390).

Moreover, some Batswana politicians and civil servants held the same views about the causes of overgrazing as the expatriate technical cadre within the Ministry of Agriculture. They, too, believed that overgrazing was accelerating at an alarming rate during the early 1970s and that it had to be stopped. In 1972 the then-Minister of Agriculture said:

> The agricultural industry of Botswana is in danger of collapsing because of appalling overgrazing. . . In many areas of this country we are approaching a threshold and once we have crossed it recovery will be virtually impossible. (Dambe, quoted in Zumer-Linder, 1976: 180)

Behind some of these expressions of alarm may have been the political desire to secure donor development funds for various livestock projects in the country (Fortmann and Roe, 1981: 383). In the case of TGLP, a number of civil servants and politicians who pushed for the policy certainly saw some potential for private gain from a program designed to allocate ranches to livestock holders such as themselves (Picard, 1980). But even after taking into account self-interest, there was still genuine concern on the part of the political and bureaucratic elite about overgrazing. A series of politically unpopular actions--the cabinet curtailment of Ministry of Agriculture dam building activities in 1970; the Parliamentary passage of destocking legislation in 1974; and the Ngwaketse Land Board's initiation of a fenced ranching project on tribal land prior to TGLP--were moves to counter what was perceived as an ever-worsening "tragedy of the commons" in the country.

To understand how these official perceptions were sustained, we need to appreciate the set of institutional biases,[5] both political and bureaucratic, which operated largely within the Ministry of Agriculture as organizational goals, as policy constraints on bureaucratic behavior, or as conventional wisdom in the bureaucracy.

Anti-Overstocking Bias. Officials in the Ministry of Agriculture have always been acutely sensitive to charges that the dam building program encouraged overgrazing and overstocking. Their response to such criticisms was to try to ensure in the 1974 policy that there would be stock limitation at the new dams--both through compliance with the stock restrictions set out in the Terms of Agreement and as a result of designing smaller dams for watering considerably fewer livestock than had been provided for at earlier government dams. By opting for smaller dams, however, the Ministry reduced their reliability as year-round livestock watering sources and thus reduced the chance of their operation by farmers according to the Terms of Agreement. Sacrificing water reliability in the interests of stock limitation can only be understood as reflecting the thinking of an institution which was bent upon avoiding charges of designing projects that could lead to overstocking and overgrazing. In addition, within the Ministry of Agriculture the widely-held bureaucratic perceptions of the need to conserve water as a scarce resource and to regard grazing as the major limiting factor, coupled with a perception that communal grazing leads to devastation of the range, have served as a kind of organizational ideology with which to counter outside charges that Ministry officials develop livestock projects which lead to overutilization of the range and water.

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[5]This approach, as well as several of the "biases" discussed, finds its origin in Robert Chambers (1978).

The Numbers Game. Until concern was once again expressed about the possibility of overgrazing around Ministry dams, the number of dams constructed and of groups formed was treated by officials as the yardstick of effective implementation of Ministry policy. Becoming an end in themselves, these dams and groups were regarded as empirical proof to donors, politicians, other bureaucrats and the rural populace at large that development was happening.[6] The Ministry's general organizational objective of promoting better range management and its organizational commitment to local consultation and participation in dam management were transformed in the 1974 policy into a two-page set of conditions for dam group formation and management. This policy statement, in turn, became a departmental mandate for the extension and dam building units within the Ministry to maximize the number of dams and their associated groups. In short, "improved range management" was transformed into a directive to build as many livestock watering dams for 400 livestock units each as quickly as possible over the widest area. Getting "better community participation and consultation" was translated into the goal of forming as many groups as possible within each extension area. In the process of trying to meet targets of constructing a given number of dams, each having signed Terms of Agreement, some of the original policy objectives were lost from sight, i.e., we have seen that a group might reduce the overstocking potential around its dam without following the Terms of Agreement. Emphasis on numbers has in part been reinforced by the institutional bias against overstocking. Since overgrazing in an area is typically concentrated, if not localized, around several of that area's dry season livestock watering points, concern about dams as individual facilities to be better managed seemed to make a great deal of sense.

Sandveld Bias. It seems fair to say that, at least since the 1950s, extending livestock water development into the Kgalagadi has been a major objective of government policy (see Odell, 1980b: 12ff; Campbell, 1979). Discussions of isolated sandveld boreholes operating far away from alternative water sources fill volumes of government correspondence. The operating assumption has been that reliable livestock water sources are few and far between over most of the country. This, however, is not the case for many areas in eastern Botswana, where seasonal and groundwater sources are often spaced more densely, a point discussed more fully in the next chapter. In eastern Botswana a household may be able to maintain a reliable water

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[6] Willett (1981: Chapter 1) has also found a similar Ministry of Agriculture preoccupation on numbers in its group development program.

supply through the year by using a number of water points seasonally. Often it does not need to rely year-round on one water point such as a borehole as most people do in the sandveld. There has been an institutional tendency to view the hardveld in sandveld terms.

Reliability Bias. Households, when choosing a water point, consider not only reliability but also matters of water point convenience and cost, including water quality. As noted in Chapter III, some Ministry of Agriculture dams, intended primarily for livestock watering, have been used and managed primarily as convenient domestic water sources, reflecting the fact that reliability of livestock water supply is not the only factor operating in household decision-making. Yet, the institutional bias of the Ministry of Agriculture has led to an assumption that livestock water reliability is the single most important factor motivating rural water demand. This assumption, in turn, has been reinforced by the sandveld and numbers game biases which assume that there are few water point alternatives, that drought and the desert are ubiquitous, and that the maintenance of a reliable household water supply is equivalent to construction of a reliable water point. Much of the "poor dam management" seen by the Ministry of Agriculture officials stems from these institutional misconceptions about rural water use in the eastern communal areas of Botswana.

Groups Bias. The Ministry of Agriculture's first dams were built with little or no provision for their local-level management. In the face of growing criticism over the lack of local consultation, it was proposed in 1967 that "Advisory Councils and Local Committees" be established "to assist the acceptance of development schemes [including dam management] by the local communities and to ensure that full and proper attention is paid to the local communities' experiences and wishes" (Gardiner, 1968: 8). The head of the dam building unit wrote in more specific terms to agricultural staff that "working committees" of "the people" in a locality were to be formed, "through which you can negotiate and plan the work schedule" for dam construction (Youthed, 1968: 1). By 1970, Ministry officials had evolved a more detailed notion of local management and were writing that a "principle which to us seems clear is that control of each dam should be local," each dam having a "local committee," each member of which should "have a voice in its affairs proportional to the number of livestock units he is licensed to carry at the dam" (Mettrick and Thomson, 1970: 7-8). By 1974, the Ministry dropped any lingering euphemisms about committees representative of the broad local opinion of an area and spoke of "organizing groups who want dams and who are willing to control their grazing" (Ministry of Agriculture, 1974: 2).

We can only speculate as to why this shift from community to group management of dams occurred. Perhaps the most important factor was the political and bureaucratic climate existing in the early 1970s. Groups of dam users doubtless seemed the "natural" choice to some Ministry officials in an environment where (1) their "best" policy choice--privatizing the dams and the land around them--was not politically acceptable, (2) direct government operation of all such water points was not practical, (3) group-managed water points had long been in operation in certain parts of the country,[7] and (4) Ministry officials had been roundly criticized for lack of community consultation in their earlier dam building activities. Forming groups, in effect, became the Ministry's compromise way of consulting with communities in a politically acceptable fashion.

This reliance of the Ministry of Agriculture on groups, however, was characterized by two very mistaken views of dam group management:

(1) Groups were expected to be formal and permanent associations and to meet regularly. In fact, they are likely to exist and function only intermittently.

(2) As pointed out in the last chapter, some broader-based institutions such as village development committees and the kgotla have had success in dam management. This is particularly so where residents of a locality recognize that these institutions seek to manage dams in the interests of the wider community within a fallback water point system, as part of the network of water supplies upon which all the people of the area depend. While there may be questions about how representative a VDC or kgotla is, in most areas they will have greater support than do dam groups of some 15 members.

Finally, the at times half-hearted Ministry bias for groups really represents a rather ingenious sleight of hand. By constructing dams for groups rather than individuals, Ministry officials maintain the fiction that there is a distinction between group-managed water points and individually-owned ones. The fact of the matter, though, is that there are some groups which treat tribal grazing land around "their" water points as if it were their own private property, while private owners of livestock watering sources who grossly overstock and overgraze are well known.[8]

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[7]The Bakgatla also had had group management of boreholes in the form of "syndicates" since the 1930s (see Peters, undated).

[8]This point we owe to Pauline Peters.

Summary

While there are undoubtedly other factors which influenced Ministry views about the causes of poor dam management, the five institutional biases just discussed explain much of the divergence between government and local-level perceptions. These organizational biases have underpinned the beliefs of many officials to the effect that water and grazing are scarce resources, often abused, and that putatively reliable water points, such as dams, can be effectively used as a means of reducing overgrazing on the commons. These biases reflect an organizational environment which encourages its water development personnel to perceive their primary aim as that of providing safe and reliable livestock watering points to a constantly water-short population, even though many rural Batswana in eastern Botswana have as their water priority the provision of convenient domestic water in their agricultural areas. It is true that where poor dam management really does exist, it often stems from such factors as inadequate Ministry planning, consultation, community participation, design, and/or leadership. Yet, the almost exclusive official focus on poor management of dams—even when their actual operation has often been consistent with the Ministry's original broad policy objectives—must be credited to these special biases within the Ministry bureaucracy.

This distortion of understanding and prescription may work at an even more subtle level. What is striking about the common explanations given by officials for poor dam management is how taken together they make mismanagement seem inevitable, e.g., if there were no lack of community participation, then something else, such as the communal land tenure, would work against effective management. Not only is this in character with post hoc rationalizing, but more important, the "inevitability" of poor dam management arises from the reinforcing nature of some of the institutional biases described above. For example, a program for group management of individual water points might be justified as follows: in light of the "fact" that the Ministry's dam would be a major (reliable) livestock watering point in an area, each member of the dam group should see it in his or her "rational" interest to ensure that the other members were not watering more livestock than they were entitled to under the Terms of Agreement. To do otherwise would mean less water available to this member should other members' "overutilization" deplete the dam water before the next rains. Since each member of the group would make this same judgment, group "pressure" should reduce the potential for overstocking around the dam. Because overstocking is taking place around such dams (or so Ministry officials believe), it "follows" that this is likely due in part to some inadequacy in group management. What may be needed, so the

argument concludes, are new land tenure arrangements. Unfortunately, such reasoning reflects the cumulative effect of these institutional biases and perceptions: bureaucratic thinking has virtually homogenized the physical and climatic environment of the Batswana and erased from such thinking any trace of the seasonality which Batswana face in rural water use. But it is exactly these substantial differences in season and in location which frame the nature of water use and management in Botswana.

Chapter V

RANGE AND WATER MANAGEMENT AT THE DISTRICT LEVEL: A CASE STUDY OF LAND BOARDS

In the preceding two chapters, the Botswana government's policy for building and managing dams has been used to illustrate and extend one of the major points raised in Chapter I: in the locality and compound locality, water development, use, management and conflict settlement still largely revolve around the seasonally-shaped socio-economic concerns of communal area residents. Central government has sought to penetrate to the local level through a series of bureaucratic and political interventions, which oftentimes have not worked out as originally planned. As we have seen, part of this failure is accounted for by the fact that many of these interventions by government officials have been predicated on a belief that central government was or could thereby become the prime mover of the rural water sector. This belief, like the original conception of primum mobile, lies on rather faulty perceptions of how "remote" things really do work. This contrast between the national and local levels in terms of official and rural perceptions about, orientation to and involvement in the rural water sector is fairly clear-cut, though shared concerns do obviously exist.

Considerably less well-defined, however, are the forms of organization in the rural water sector at the district level. As noted in Chapter I, the district is an amalgam of the older, pre-Independence institutions along side the more recent Government of Botswana ones. The interaction of seasonality, customary water norms and bureaucratic concerns becomes much more complex when the unit of analysis is district-level water development, management and conflict settlement. It is here where contradiction between and fusion of "traditional" and "modern" has heightened emphasis. This chapter presents a case study which illustrates this complexity by examining the difficulties district land boards have had in applying a spacing rule for locating each new livestock watering point eight kilometers apart from other livestock watering sources so as not to cause overgrazing around them.

It will be shown that some of the same factors which made the Ministry of Agriculture's dam policy difficult to realize in practice also affect land board efforts to space water sources in their tribal areas. In particular, attempts to site water points at uniform distances run counter to the existing pattern of rural water use in many communal areas. Land boards also have organizational concerns similar to the Ministry of Agriculture which affect their judgments about land and water matters. Land boards as district institutions, however, are conditioned by season and customary practices in

ways that the Ministry of Agriculture based in the capital is not. As will be discussed below, part of the "success" of land boards stems from the same forces that support communal land tenure. In addition, some land boards have reproduced the decision-making processes, land use rules and conflicts found in the traditional institutions formerly responsible for tribal land and water matters. Rather than conceiving land boards solely as modernizing institutions, it is argued here that they are better understood as hybrids manifesting the influence of a persisting seasonality and custom.

Land Boards in Rural Water Management

The Tribal Land Act of 1968 (TLA) established land boards as the land allocation and adjudication authorities in each district "for the benefit and advantage of the tribes[people] of that area and for the purpose of promoting the economic and social development of all the peoples of Botswana" (section 10(1)). The provisions of the Act did not commence until 1970 and since then, it has been amended, particularly for the establishment of new land boards. Several of the twelve main land boards have a series of subordinate land boards for a total of 35 land boards in the country. A major responsibility of a land board is to issue "grants of customary land rights" for tribal land to tribespeople in each of the land board administrative districts. From the date of commencement of the TLA, the residents of each district have been expected to make any new applications for plowing fields, residential plots and sites for water point development to the appropriate land board. The TLA, however, did not invalidate land grants "lawfully" made prior to its enactment under the then-existing customary tenure system of chiefs and wardheads. Also, each land board is obligated by the Act to "consult the District Council in the formulation of policy" (section 11(1)) concerning any water and land development matters, though the law is unclear about what is and is not "policy." Primarily as a result of their statutory obligation to consult district councils, land boards have sometimes been considered to be essentially sub-committees of councils (see APRU, 1980: 5; Picard, 1980: 325). But in law and in practice they act largely independently of the council committee structure.[1] More information will be provided below on how the past and present systems of land allocation have operated with respect to water supplies.

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[1]Recently the Interministerial Committee Report on Land Board Operations (Ministry of Local Government and Lands, 1978) and the Report of the Presidential Commission on Local Government Structure in Botswana (Republic of Botswana, 1979) have recommended a closer relationship between the two bodies. In fact, the membership and responsibilities of land boards remain very much a topic of debate within Botswana government circles at the time of this writing.

Some preliminary explanation should be offered of the motivation behind the enactment of the TLA and its amendments. The Act, along with a series of other laws instituted after Independence, represents in part an attempt by the ruling Botswana Democratic Party to break the power of chieftainship in the countryside (Colclough and McCarthy, 1980; see also Werbner, 1980; Comaroff, 1980; Gulbrandsen, 1980; Silitshena, 1979). The TLA transferred to the land boards "All the right and title of the Chief and tribe to the land in each tribal area" and "All the powers vested in a Chief under customary law in relation to land" (sections 10(1) and 13(1)) in order to curb "the whim of a chief whose decisions on land matters may be affected by all kinds of considerations which have nothing to do with the interests of the farmer or the nation" (Masire, quoted in Werbner, 1980). In particular, Dr. Masire, now President of Botswana, originally justified the TLA as a means of "increasing popular control" over land matters (quoted in Werbner, 1980). Inclusion of district councillors in land board membership and the establishment of subordinate land boards can be interpreted as a reflection of this intention to increase local participation in land allocation and adjudication matters. This intention, however, has only partly been fulfilled, as illustrated by the land boards' application of a spacing policy for livestock watering points.

Background Information on the Eight Kilometer Rule for Spacing of Livestock Watering Points

A Short History and the Official Justification of the Eight Kilometer Rule. The rule of thumb that livestock watering points should be spaced eight kilometers apart from each other has been known about for years in Botswana. However, neither from departmental and archival files nor from interviews with knowledgeable Batswana and expatriates were we able to determine its precise origin.

In Botswana, the rule goes back at least to the early 1950s. In 1952, Chief Bathoen of the Bangwaketse was writing about the need for "good boreholes at least five miles apart so that local stock could water at one borehole while the other remains unused and the veldt thereby given a rest." As more and more colonial development funds became available for borehole and dam development after 1950 (see Roe, 1980), appeals to this rule of thumb increased with rising colonial concern over the seeming reluctance of many chiefs to institute other forms of grazing control around these watering points. The rule was said to have been applied to both new boreholes and dams, though it appears not to have been an official colonial policy to do so. Correspondence shows that many local officials treated the rule not as a regulation, but as a guideline. They seemed as likely to argue that new livestock watering points

should have different spacings. For example, the Director of Geological Survey recommended a spacing of closer than eight kilometers in the eastern hardveld for a 1956 Bakwena water development scheme (which also considered using new boreholes to rotate grazing). Moreover, officials commonly associated the eight kilometer rule with a stock watering point serving approximately 400 head, so that if there were fewer livestock watering at a point, the water points could be closer—given other "proper grazing controls."

Between 1969 and 1971, an exercise was undertaken largely within the Ministry of Agriculture to determine the optimal spacing of livestock watering points.[2] Some argued for a 6.5 kilometer (4 mile) spacing, based on personal observations inside and outside Botswana that grazing cattle have "an optimum walking distance of 1 1/2 to 2 miles from the watering point." In addition, they felt young herders were often reluctant to herd cattle daily up to four kilometers from a watering source. Under these circumstances, an eight-kilometer spacing implied either underutilized grazing or sub-optimal livestock performance. Others argued that a 6.5 kilometer spacing was unrealistic. In the first place, they felt that limiting cattle numbers to the level this spacing implied would be difficult and unworkable. Assuming a carrying capacity of one livestock unit (LSU) per ten hectares (25 LSU per square mile), and assuming that cattle graze radially around a water point, a 6.5 kilometer spacing meant that only approximately 320 head should be allowed to water in the area around each water source. In their view, stocking rates of 500 LSU around each point were much more likely, which implied an eight-kilometer spacing under the above assumptions. Other officials argued that the limiting factor was not the trekking distance of the livestock, but the likely range degradation immediately around the watering point, which meant that, even with a stocking rate of 320 LSU at each source, a spacing of more than 6.5 kilometers would be necessary to make up for such lost grazing.

In late 1971, the secretary of the Natural Resources Technical Committee summarized the debate on optimal spacing of livestock watering points and concluded:

> The five mile rule which has been used as a basis for borehole location serves as an indication of the stocking rate that is expected around one borehole. From the recent papers and general thinking this figure does not appear to be far wrong. Until adequate research on the effects of distance between watering point and grazing on cattle performance have been investigated it would not appear that one is justified in altering this existing rule of thumb.

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[2]The following quotes have been taken from S. Youthed and W. Halkon (undated); H. Mettrick and B. Thomson (1970); and M. Beresford's paper to the Natural Resources Technical Committee reviewing the borehole spacing issue (1971).

The outcome of this discussion was to reinforce Ministry support for the eight kilometer spacing of livestock watering points as a means to reduce the potential for overgrazing between them. Additional support came with the Tribal Grazing Land Policy (TGLP) in 1975, since many of the commercial ranches demarcated under TGLP have each been an eight-kilometer square, with the ideal location of each ranch's borehole in the very center of the grid (see Hendzel, 1981). As we shall see, the eight kilometer rule has been used to justify both a grid and diameter spacing around centered water points.

We have found no record of a post-Independence government official arguing that the eight kilometer rule should be applied to the spacing of all water points. Rather, the presumption, especially during the debate within the Ministry, was that this rule was appropriate for spacing permanent livestock watering points, particularly boreholes and large dams, each of which could water between 300 and 500 head of cattle typically grazing radially around the point, where such a stocking rate would not exceed the carrying capacity of the rangeland.

Perceptions That the Rule is Being Applied. To our knowledge (based both on interviews and reading through files), there does not exist today nor has there been any official government policy, statute, or regulation stipulating that livestock watering points be spaced at least eight kilometers from each other in the communal areas of eastern Botswana.[3] Yet there is a widespread impression, both inside and outside government, that land boards, if not "government" in general, do in fact follow such a rule as a matter of policy. For example, a recent consultant to the Ministry of Agriculture's Arable Lands Development Program noted that a "constraint" on the more intensive use of open wells in eastern communal areas was the "ruling by Land Boards that wells may not be spaced closer than 8 km" (Classen, 1980: 9). Similarly, Werbner writes from his research on several eastern villages that "regulations aimed at pasture control require a five mile distance between wells" (1977: 31). Willett gives a case where farmers of an eastern locality "thought it was a Land Board ruling of 5 miles between water sources which limited their quota" to four Ministry of Agriculture dams (1981: Chapter 14). One of the Government of Botswana publications on the Tribal Grazing Land Policy notes that in past borehole drilling, the "only requirement was that boreholes were placed eight kilometers apart" (1976?: 15). In fact, some land boards couch their acceptance or rejection of a customary grant application for a water point

[3] An earlier government evaluation of borehole spacing also came to this conclusion: "The five-mile distance between boreholes has been used as a rule of thumb for several years, but this has not been written into official policy" (Beresford, 1971).

in terms of whether the proposed site was the "recommended" eight kilometers from another livestock watering source (e.g., the minutes of the Ngwaketse Land Board dated 21-22 November, 1978). We found more officials and land board members who spoke in terms of a putative eight-kilometer ruling than who were aware that, in fact, there is no official policy which stipulates optimal spacing distances (Roe and Fortmann, 1981: 48-51).

As will be described below, land boards have not uniformly or consistently applied the spacing rule in practice. However, on the basis of our interviews and on a reading of land board minutes, we conclude that there have been few, if any, instances of a land board justifying a spacing which was closer than eight kilometers on the grounds that government policy did not officially require such a spacing. While a number of people, particularly those associated with government, recognize that the eight-kilometer spacing rule is not exactly legally mandated regulation, they see it as something considerably more than just another government recommendation. In effect, some land boards and other government officials have treated this spacing rule as one approximating at least an unofficial government policy.[4] The rest of this chapter will be devoted to explaining why land boards have persisted in appealing to the spacing rule, even though as described in the next section, these same land boards have not applied it in all cases. In raising these issues we will see how land boards have performed very much in the manner of the chiefs they were meant to replace.

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[4]We have found only one case of a land board consulting its district council as to whether or not it should adopt a water point spacing policy. In October, 1971, the Tawana Land Board proposed to the North-West District Council that its policy should be "Boreholes to be spaced a minimum of five miles apart." In January the next year, Council responded by rejecting such a policy on the grounds that it was "legislative." The Tawana Land Board, however, continued often to site and approve water points eight kilometers apart, in effect acting as if that indeed was the policy.

Application By Land Boards of the Eight Kilometer Spacing Rule[5]

Two kinds of evidence are examined below to ascertain the extent to which land boards consider the issue of spacing livestock watering points eight kilometers apart. First we will describe what a number of land boards say is their spacing policy. Thereafter, land board records and minutes, particularly with respect to disputes, are summarized in an effort to see how important such spacing considerations are in the formal meetings of land boards.

Present Land Board Water Point Spacing and Allocation Policies. While a number of government officials, including land board members and staff, give the impression that the de facto policy is to space stock watering points eight kilometers apart from each other as a means of reducing the overgrazing potential between them, on closer questioning they will admit several "exceptions" to this rule. Table V-2 (placed at the end of this chapter, pages 151-163) summarizes the statements of various land board officials as to what their policies are said to be in practice and shows that the application of the eight kilometer rule is ad hoc, varying substantially from land board to land board, particularly with respect to its application in the communal lands and mixed lands and cattleposts areas. Of the twelve land boards and subordinate land boards actually visited, only the Tawana and the Tati Land Boards have explicit policies of spacing lands boreholes and open wells eight kilometers from other livestock watering sources, such as rivers. The Malete Land Board has a policy of approving a five-kilometer spacing between dams built by the Ministry of Agriculture and other stock watering points. The Ngwato, Kweneng and Kgatleng MLBs, along with SLBs at Sebina, Palapye and Mahalapye, try to control livestock watering numbers in lands areas either by setting a limit on the number of stock to be watered at the proposed borehole or by siting the borehole within the owner's plowed field. Although the Tati Land Board has an eight-kilometer spacing rule, people are said rarely to apply for water points there, relying on water from sand rivers instead. The Ngwaketse MLB says its

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[5]Much of the information in this section comes from Roe and Fortmann (1981). Interviews with land board staff and/or land board members were made at seven main land boards (MLB) and three subordinate land boards (SLB) whose administrative areas fell in whole or in part in the hardveld: Rolong, Malete, Ngwaketse, Kweneng, Ngwato, Tati, Kgatleng; Sebina, Mahalapye, and Palapye. In addition, comparative information was obtained from interviews, reading of files and/or site visits on the spacing and allocation practices of land boards whose tribal land jurisdiction, although west of the hardveld line in Figure I-1, includes communal areas where people farm and herd their livestock: Tawana, Kgalagadi, Chobe and Ghanzi. It was not possible to confirm on the ground if applications for water points approved by land boards on the condition of an eight kilometer spacing were in fact spaced at that distance once constructed. As will become clear, the actual distance is a secondary issue.

communal lands water point policy is to "treat each case on its own merits," while the Rolong Land Board has no policy whatsoever. Since lands typically follow water points in the sandveld Ghanzi and Kgalagadi districts, village and settlement water points there often serve as ones for the lands as well. A number of land boards have policies for either consulting residents of an area before approving an application for a borehole in the lands area, or encouraging residents to form a "syndicate" as a way of providing a mechanism for group pressure to control overgrazing and crop damage associated with livestock watering.

In contrast to water point spacing in the communal lands and mixed lands areas, the Ngwato, Tawana, Ghanzi, Ngwaketse, Kgalagadi and Kweneng land boards, along with the Mahalapye SLB, have a policy of spacing livestock boreholes at least eight kilometers apart in the grazing areas of the hardveld or sandveld and/or in sandveld TGLP commercial areas. All MLBs visited felt it was easier to space livestock watering points eight kilometers apart in these commercial sandveld areas than in the more crowded communal areas, particularly in eastern Botswana.

No land board interviewed has a policy of insisting that water points used primarily for human drinking purposes should be eight kilometers from each other and it is accepted almost without exception that these water points should be close to the dwelling. For MLBs such as Ngwaketse, Tawana and Kweneng, approval of a borehole "for domestic purposes only" can include provision of water for draft oxen, some milk cows, calves and smallstock. A number of land boards consider seep wells, sand river wells and haffirs to be small, temporary water sources, for which no tribesperson need apply. Rules governing the distance persons are allowed to re-drill boreholes from their original sites (should the first borehole prove unsuccessful or dry up) vary from land board to land board, e.g., the Tawana and Ngwato MLBs stipulate drilling within a 100 meter radius of the original site, while the Kweneng Land Board is said to allow a one kilometer radius and the Ngwaketse Land Board up to a two kilometer radius. Several MLBs already allow their SLBs to site arable water points once the MLBs have given their approval to do so.

Finally, it is interesting to note that even some of the Ministry of Agriculture's livestock watering points are spaced closer than eight kilometers from other stock watering sources. During the course of the Water Points Survey, all dams built by the Ministry's Small Dam Unit at the twelve Survey sites were mapped. Not only are these dams often closer to a number of other water points, but there are instances where these structures are spaced less than eight kilometers <u>from each other</u>, as was found in four Survey sites.

In brief, while a number of land boards can and do honestly claim to have an eight kilometer spacing rule for livestock watering points, it is clear that the rule does not apply to all such points nor to all areas of many districts. In fact, under closer questioning, many land board members and staff admit they have explicit policies to do otherwise, even for major livestock watering boreholes and dams, in the more heavily populated lands and cattleposts areas of eastern Botswana.

The Role of Spacing Factors in Land Board Consideration of Disputes and Applications. The information in Table V-2 represents largely verbal descriptions of spacing policies, or in some cases, the lack of policies, for various land boards. An additional source of information on how important spacing considerations actually are in land board matters are the boards' written minutes and reports concerning rejections of water point applications and settlement of water-related disputes.[6]

First, a listing of disputes and rejections related solely to the spacing of water points was made for the Ngwaketse, Rolong, Kweneng and Tawana MLBs. Taking into account the variable quality in minute taking, three factors deserve special mention:

(1) At least one land board took the eight-kilometer rule to mean at times a grazing area with an eight-kilometer diameter around a water point and at other times an eight kilometer by eight kilometer grid of grazing land around a centered point. In other cases, the terms used to describe spacing considerations did not at all quantify distance and livestock watering numbers. A land board may have described an area as "already crowded," "congested," "heavily overgrazed," or just "too small" for another livestock watering point. The use of such imprecise terms makes it all the more difficult to establish precedent in dispute settlement. From our reading of recent files, it appears that there have been only a few cases of land boards settling a spacing dispute by appeal to a similar case adjudicated in the past.

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[6]The land board records of disputes and rejections are not as complete as might be hoped. It has long been recognized that some minutes do not accurately reflect the substance of the discussion they were meant to record. In addition, disputes and applications may appear in the minutes of one meeting only never to be heard of again. This is due both to minutes missing from the files and to inadequate minute taking. Whatever the cause, the disputes and rejections discussed here certainly do not represent all that took place. They represent what were in the files (roughly covering the period 1977-1981) and what we could determine from questioning land board members and staff. Each land board is obligated to record its resolutions over such matters, along with "the substance of such resolution," in the form of minutes under section 7(1) of the TLA. The disputes examined concerned both communal and TGLP commercial areas in tribal areas.

(2) Some land boards, particularly the Ngwaketse and Kweneng, have been concerned not only with the spacing between livestock watering points, but also the spacing of such water points from plowed fields. As noted in Chapter I, crop damage caused by livestock watering is a growing issue in a number of communal areas in eastern Botswana.

(3) There may be competing claims or other allocation practices which a land board might feel override the eight-kilometer rule. Since this is a major point in our discussion of the institutional reasons why land boards find it difficult to apply this spacing rule uniformly, below are verbatim extracts from the minutes of one land board which illustrate the consideration of competing decision rules with respect to the allocation and use of livestock watering points.[7]

The Case of M. Motse versus S. Kgamane

"Mr. Motse had complained to the Board against the drilling of a borehole at Pikwe by Mr. Kgamane, that the borehole had been drilled too close to his well. When asked how long the well had been out of use, said the well had not been used since 1958.

S. Kgamane said he had applied for a borehole to the Board in 1970, and on the 23rd September 1970 he was granted the site. He produced the [land board] certificate of the site.

Points raised: (i) That the well had been abandoned for 18 years from 1958 to 1976. (ii) That, according to section 15 (a) and (e) of the Act,[8] he no longer had water rights over the well. (iii) That Mr. Motse had taken a long time after the allocation of the borehole in 1970 to complain.

Resolved: That S. Kgamane should go ahead to use the borehole as it was granted legally."

The Case of T. Tlale versus H. Pitso

"T. Tlale said he had lodged a complaint with the Board on account that he owned an open well at Macheng. That he had already registered water rights with the Water Apportionment Board with the

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[7] All names have been changed.

[8] The relevant sections of the TLA read as follows:
"15. The grounds upon which a grant of land may be cancelled, whether or not such a grant was made before or after the coming into operation of this act shall be—
(a) that the holder of the grant is no longer eligible to hold land under the provision of this part;....
(e) in the case of agricultural land, that for a period of five consecutive years the land has not been cultivated and that there is no sufficient excuse for this. . ."

authority of the Land Board. But later noticed that Mr. Pitso had the intention to equip the borehole at Phate which was less than five miles radius recommended.

H. Pitso said it had come to his notice that the borehole at Phate belonged to Council and he applied for the use of the borehole to Council and his application was approved.
There was evidence that Council granted Mr. Pitso permission to use the borehole.

Mr. Tlale had liked the Board to prevent Mr. Pitso from equiping the borehole and that the borehole be removed. The matter was discussed at length and the Board came up with the following points: (i) That water rights were granted for the use of the well at Macheng and did not mean exclusive grazing rights. (ii) That the borehole was drilled and Tshidi people did not object. (iii) That the borehole was drilled to relieve drought in the area. (iv) That the Board does not have a way of removing the borehole, and that it was drilled for the public interest. (v) That use of water-points will be determined by carrying capacity of the area.

Resolved: That the borehole stands that Mr. Pitso should go ahead and equip it."

In both cases, the land board considered the traditional right of "beneficial tenure" superceded spacing considerations—that is, land should be in productive use rather than left "unnecessarily" idle because of some other tenure arrangement (see Werbner, 1980 and Comaroff, 1980). Moreover, in the first dispute the five-year rule was also (perhaps unlawfully) appealed to as reason for cancellation of a person's former land rights, while in the latter case, the land board added that the "carrying capacity" of the area in question permitted a spacing closer than eight kilometers. We will return to these issues below.

A complete listing of all water-related disputes and rejections for the Tati, Palapye, Mahalapye, Ngwato and Kgatleng land boards was also made. Variable quality in minute-taking and imprecision in terms were noted in these land board records. However, they do give a rough idea of the frequency of different kinds of disputes, including those related to water point spacing:

(1) There were 21 disputes extracted from these minutes. Many of the cases involved more than one issue. The number of disputes involving crop damage is probably underestimated since often these are taken to customary court:

Issue	Number of Cases
Spacing	7
Consultation	6
Right of Use	5
Ownership	6
Too Many Cattle	4
Crop Damage	2

Right of use and ownership are related issues and, when combined, are raised in over a third of the cases. Spacing of a water point close to another is the second most frequent issue. Half of the cases involving complaints about consultation included a complaint about water point spacing. What is particularly interesting is that only twenty-one water disputes reached these land boards over the period studied.

(2) There were 13 rejections of water point applications recorded. Eight of these (including the TGLP rejections) were related to the problems of water point distance or overcrowding:

Reason	Number of Cases
Self Allocation	2
TGLP Freeze	3
Spacing	3
Overcrowding	2
Change in Use	1
Group Problems	2
Prevent the Start of a Village	1

This also demonstrates how rare is a rejection of a water point application.

Thus, although few land boards were found to be using an explicit eight-kilometer rule to reject water point applications and settle disputes, considerations of water point distance and proximity in more general terms were still very important factors, particularly for the spacing of livestock watering boreholes, wells and dams. In some cases, other considerations may be just as important or more so in land board decision-making, but these two listings support the impression given in Table V-2 that the spacing of livestock watering points, especially large-capacity ones such as boreholes, remains an important factor to be taken into account when allocating such water sources—even though land boards have found a uniform spacing rule difficult to

follow in communal areas. The reasons why such concerns remain salient for land boards are discussed in the next section.

Why Land Boards Find It Difficult To Apply The Eight Kilometer Rule Uniformly: Technical and Organizational Problems

The issue before us is twofold: to identify and discuss a set of factors which not only have made it difficult for land boards in practice to space stock watering sources at uniform distances, but also explain why land boards continue to maintain that water point spacing in general and the eight-kilometer rule in particular are taken into account in their decision-making. The technical and organizational problems accounting for spacing difficulties are fairly easy to identify and are discussed briefly below. As we will try to show, however, the variability in application of the eight kilometer spacing rule comes less from technical and organizational problems which are encountered particularly in the siting of water points, than from the structure and dynamics of land board decision-making which underlie its judgment as to whether or not the eight-kilometer rule actually applies in each case before it.

Frequent Technical Problems

The Existing Distribution of Water Points in Many Eastern Communal Areas. There are many localities in the communal areas of eastern Botswana where it is simply no longer possible to find a site for a new livestock watering point eight kilometers away from others. The figures in Table V-1 from the Water Points Survey estimate the number of water points, including boreholes, open wells and haffir-dams, within an eight kilometer radius of 29 permanent water points serving areas that are the lands and mixed lands and cattleposts.[9] Of these 29 sources, 26 (90 percent) are said to include livestock watering purposes and it is probable that those listed as having a domestic purpose only also supply livestock water during emergencies. The approximate number of water points within an eight-kilometer radius ranges roughly from a low of seven to a high of 75. The estimated number of water points within eight kilometers of a permanent water point averages 28 (or 24 if the extreme case of Ntlhantlhe is excluded). It should be noted that almost all of these water points were found to be well within this radius. Only a few were actually on the perimeter and, hence, could be said to be in accordance with the eight-kilometer rule.

Not only are there large numbers of water points within eight kilometers of permanent sources serving the lands, but many of these are also permanent sources.

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[9]Bailey found that the majority of herds held by households sampled in the Water Points Survey were kept at the lands and mixed lands and cattleposts (1980: Table 3).

TABLE V-1: Number of Water Points Within Eight Kilometers of Permanent Water Points at Twelve Sites in the Eastern Communal Areas

Site	Water Point		16 Kilometer Circle[1]			
			Number of Water Points	Including the Following Number of		
	Type	Use[2]		Boreholes	Haffir-Dams	Open Wells
Mokatako	Borehole	L/D	11	2	0	0
	Borehole	L/D	23	4	2	1
	Borehole	L/D	28	6	3	3
Ntlhantlhe	Borehole	D	68+	1	1	0
	Borehole	D	75	1	1	0
Gamodubu	Borehole	L/D	46	0	3	12
Lentsweletau	Borehole	L	38	2	4	11
	Borehole	L/D	38	2	4	11
	Open Well	L/D	31+	2	4	9+
Matebele	Borehole	L/D	12	1	0	0
	Borehole	L	12	1	0	0
Dikgonnye	Borehole	L/D	19	0	0	6
	Borehole	L/D	7	2	0	1
	Borehole	L/D	11	2	0	1
	Borehole	L/D	7	2	0	1
Mmaphashalala	Borehole	L/D	32	5	0	20
	Borehole	L/D	31	4	0	7
	Borehole	L/D	41	4	0	7

1. In most cases it was not possible to draw a complete circle of a 16 kilometer diameter around the site's Survey area. These figures are indicative only and are not based on a comprehensive ground check of each site.

2. L = Livestock
   D = Domestic

TABLE V-1: Number of Water Points Within Eight Kilometers of Permanent Water Points at Twelve Sites in the Eastern Communal Areas

Site	Water Point		16 kilometer Circle[1]			
			Number of Water Points	Including the Following Number of		
	Type	Use		Boreholes	Haffir-Dams	Open Wells
Mosolotshane	Borehole	L/D	26	0	0	2
Ramokgonami	Haffir-Dam	L/D	18	5	3	0
	Haffir-Dam	L/D	12	4	4	0
	Borehole	L/D	30	4	2	0
	Borehole	D	32	3	2	0
Motongolong	Borehole	L/D	15	0	0	9
Phokoje	Open Well	L/D	37	0	0	8
	Open Well	L/D	41	0	0	9
	Equipped Well	L/D	34	0	0	3
Makaleng	Borehole	L	15	0	3[a]	0
	Borehole	L	9	1	3[a]	0

a. Includes 2 large haffirs

The average permanent water point had roughly two boreholes within this radius, with as many as six in one case. There was an average of about one haffir-dam within eight kilometers, the range going as high as four. Open wells were even more numerous. There was an average of some four wells around a permanent water point, with perhaps an estimated twenty wells occurring in one case.

We thus see that there are a number of communal areas in eastern Botswana which already have livestock watering points serving lands and mixed lands, much more densely located than would have been permitted had the eight-kilometer rule been applied in all cases. Yet, as Chapter II shows, there are still a number of households in such areas which continue to seek--for reasons of convenience, cost or reliability--new stock watering sources in such areas.

The Present Use of Different Types of Watering Points. While much of the concern over water point spacing has been with respect to livestock boreholes, Bailey (1980) has calculated that they accounted for only 26 percent of the total twelve-month water point usage of cattle, estimated on the basis of cattle numbers watered by livestock holders sampled in the Water Points Survey. Rivers and the wells in them accounted for 22 percent. In fact, open access (natural) and communally-held water sources in the eastern communal areas accounted for over a third (34 percent) of this total twelve-month cattle usage of water points. It would be very difficult, indeed, to control human and livestock access to natural water points, such as rivers, in an effort to ensure an ideal spacing of eight kilometers among these livestock watering points in eastern Botswana.

Ambiguities in the Underlying Assumptions of the Eight-Kilometer Rule. As originally justified, the eight-kilometer rule applies to the spacing of permanent water points, particularly boreholes and large dams, each of which could water up to 500 head of adult cattle (or their equivalent), grazing around the water point in an area where this stocking rate would not exceed the carrying capacity of the rangeland. Phrased in this fashion, a number of definitional and empirical problems become evident:

(a) ". . . the carrying capacity of the rangeland". According to D. Field's "Potential Carrying Capacity of Rangeland in Botswana" (1978), there are some areas of the country which can carry a livestock unit on less than ten hectares of land. Using the same assumptions given in the section above on the original justifications of the eight kilometer rule, this would imply that in these areas, water points serving 500 head could be sited more closely than eight kilometers, other things being equal. Yet, there is evidence from a variety of sources suggesting there are serious problems with such an

estimation of carrying capacity in Botswana. Only a few of these problems are mentioned here.

One difficulty is that Field's estimation procedure assumes a strong negative relationship exists between carrying capacity and the numbers of trees and shrubs present in the rangeland, that is, the less there is of bush encroachment, the substantially better are the grazing conditions. Yet it is well known in Botswana that livestock not only browse on trees and shrubs in certain areas of the country, but that such browsing contributes a substantial portion of the diet to livestock in these areas (DHV, 1979: 28).

Moreover, according to one researcher (Hendzel, 1981: 14-15), none of the range transects where Field and his colleagues did empirical work are in the "overused" communal areas. If this is correct, it raises the question of how appropriate to these areas, where much of the livestock is herded, are those functional relationships largely derived elsewhere, upon which the estimation procedure is based. A different problem is that studies in Botswana suggest grass crude protein, and not energy, may be the first limiting factor in growth of beef cattle (Pratchett et al., 1977: 445). If so, the weight gain desired by a livestock producer may not be achievable on a year-round basis by merely increasing the volume of grass available for grazing, that is, by simply reducing the stocking rate or increasing the distance between stock watering points. Such weight gains might require, if not feed supplements, then a change in the composition of the species typically grazed.

Finally, carrying capacity figures have been expressed in terms of hectarage needed for one livestock unit equivalent to 450-500 kg (APRU, 1980: 81; Field, 1978). However, data on the weight of cattle marketed by livestock cooperatives, shown in Table A-2 (Appendix I, page 000) suggest that the average size (weight) of animals in the communal areas is considerably less than the weight figure used to estimate carrying capacity. This helps explain why one finds communal areas in Botswana which, according to Field's criterion, are said to be up to twelve times "overstocked" but where, nevertheless, there are few, if any, cattle deaths due to range degradation (Government of Botswana, 1976?; Sandford, 1980: 12). This reflects what has been known for years: many Batswana try to optimize the number of cattle held rather than the weight of each animal held. In 1978 the Employment Development Advisor to the Government of Botswana, Michael Lipton, went so far as to recommend that researchers there "should abandon the concept of 'carrying capacity' which is defined in a way that lacks economic meaning, especially for a small grazier on tribal land" (1978: Vol. I, page 90). In short, there is in Botswana presently no compelling procedure for

estimating carrying capacities which the land boards can rely on for the better siting of livestock watering points.

(b) ". . . grazing radially around the water point". Air photos taken over sparsely populated sandveld areas provide example after example of the radial grazing pattern around isolated livestock watering points, giving the appearance of a rangeland being potmarked by a set of defoliating bombs. In view of this and the fact that much of the Ministry of Agriculture's grazing research has been in such sandveld areas, it is not surprising to find the "typical" water point grazing pattern almost always depicted as an ever-widening set of concentric circles, each wider circle having better grazing that the one nearer the source of the water (Hendzel, 1981; APRU, 1980). There are, however, several factors which constrain the radial grazing configuration throughout the hardveld. Since one often finds livestock watering points nearer than eight kilometers to each other in many eastern communal areas, one cannot presume that the farther away one moves from a borehole the better the grazing. Moreover, natural obstructions to radial grazing such as rivers, gullies and hills occur in the hardveld with much greater frequency than the sandveld, while the encroachment of plowing lands and settlements into grazing areas around boreholes is also becoming more and more common. In these areas, the configuration of grazing and lands areas in adjacent localities simply may not allow a uniform spacing of water points, let alone at eight kilometers apart.

(c) ". . . a permanent watering point with a stocking rate of 300 to 500 head of cattle". Something which seems as simple to define as a water point stocking rate can be, on further examination, very difficult to assess. Since in eastern Botswana herds water and graze in a fallback system, the stocking rates at most man-made livestock watering points will usually vary seasonally. Even a borehole or an open well which is a "permanent" water point still may not be used on a permanent basis, i.e., throughout the year. This raises the question of how to compare two watering points having numerically equivalent stocking rates, but which water cattle at different seasons of the year. How to estimate stocking rate equivalancies when forage conditions are seasonally variable has not yet been addressed for eastern Botswana to any real extent.[10]

(d) ". . . an 8 km spacing". Implicit in an eight-kilometer spacing rule is the possibility of an animal trekking a total of some eight kilometers or more a day as it

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[10] An additional complication comes in cases where there is considerable overlap in the grazing areas and where it cannot be assumed that stopping the supply of water at one point will necessarily result in resting of the grazing area around that point.

grazes and waters. Yet walking such distances is not advised for certain types of animals at certain times of the year, particularly, cows during calving and lactation or oxen during the plowing season. Moreover, and most obvious of all, hydrological and topographical conditions affect the probability of siting eight kilometers apart water points which are meant to provide adequate water supplies for some 500 head of cattle.

Such "technical" factors constraining the uniform application of the eight kilometer spacing rule are not as important or as complicated, however, as some of the institutional difficulties land boards face in applying this rule. Before discussing the major institutional factors which account for these difficulties, several secondary factors deserve brief mention.

Organizational Problems

There are some organizational reasons why some land boards occasionally find themselves unable to apply the eight kilometer rule in an uniform and consistent way:

(1) Insufficient land board personnel and transport not only can delay or suspend carrying out the spacing exercise on the ground, but it can cause errors in the actual distances measured out. We were told of one case where the distance was measured by means of riding a horse!

(2) Some land board members and staff share the sandveld and numbers game biases discussed in Chapter IV. They too have kept their eyes turned west to the seemingly underpopulated sandveld areas ripe for exploitation by those--such as themselves--who have the resources to drill, equip or maintain a borehole. As noted above, land boards also believe it is easier to space livestock watering points eight kilometers apart there than in many of the overstocked eastern communal areas. In many districts, borehole water development in the sandveld has monopolized not only land board time spent on water allocations, but also its conception of what "real" water development is (Willett, 1981: Chapter 26). Given this land board preoccupation with sandveld matters, it is not surprising that the eight kilometer rule may <u>seem</u> district-wide in application when in fact it has not been.

(3) Finally, no other organizational alternative to the selective application by the land board of the eight-kilometer rule has yet been proposed for communal areas that is acceptable to the land boards or the wider rural population. Destocking areas by increasing offtake is anathema and the TGLP White Paper itself recognized that the fencing and exclusive rights proposed for the sandveld could not be applied <u>in toto</u> to the communal areas (Devitt, 1981).

There is a recent example of just how far some of the central government recommendations on water point distribution are removed from the lives of most rural

Batswana. In a 1981 Ministry of Agriculture publication, "Traditional Versus Commercial Agriculture in Botswana," Litschauer and Kelly concluded that if the optimal distance between water points in tribal areas were based on the amount of land found to be available per water point on commercial farms, then "the minimum allowable distance between boreholes/permanent waterpoints would be 3.9 and 6.6 kilometers in the hardveld and sandveld areas, respectively" (1981b: 40). The implications of using such a criterion for water point distribution in the eastern communal areas are appalling. There is no land board in Botswana which would agree, let alone seriously consider, managing its communal areas as if they were one big paddocked ranch.[11]

These organizational factors, along with the technical ones mentioned above, provide land boards with a ready rationale to justify their practice of selective application of the eight-kilometer rule. However, these factors do not fully account for this selective application. In order to explain such land board behavior, we must better define the land board as an institution within the context of the political and socioeconomic values operating in past and present Tswana society as they affect land and water matters.

Why Land Boards Find it Difficult to Apply the Eight Kilometer Rule Uniformly: Institutional Decision-Making Dynamics

Studies by Comaroff and Roberts on the Barolong and the Bakgatla provide a framework for evaluating land board use of various rules governing land and water allocations. Comaroff (1978) found that in the past there were several rules for determining who was a chief and who was a regent among the Barolong, each rule of which in turn became a resource for those who were able to control its use:

> In the most general sense, the manipulability of the rules itself equips politicians with a means both for asserting their own legitimacy and for validating their actions. But there is another, more specific, aspect to the properties of rules as resources. Because of the nature

[11] There are a number of other problems associated with the Litschauer and Kelly analysis. They assume essentially a homogeneously flat rangeland for water point distribution in the hardveld and that "the majority of commercial cattle farmers are utilizing their rangeland to capacity without excessive overgrazing" (1981b: 38). The former assumption is a good illustration of the sandveld bias at work and the latter assumption is certainly open to question (see Chapter IV). The fact that some commercial ranches may have water points spaced closer than four kilometers is more a cause of concern about possible overgrazing there than it is a basis for optimism. The authors also focus on boreholes, even though Bailey has shown that these water points probably account for only some quarter of monthly water point use made by cattle in eastern communal areas (1980: 44).

> of the set, there are always a number of alternative ways in which a candidate may justify his claim to office. The latter, or his sponsors, are compelled to select between them. (1978: 15)

As Comaroff describes, one of the problems faced was to settle what rule applied. Deciding whether a person was really a chief or only a regent depended not simply on ascertaining what were the facts in the case, but also on how persuasive were the arguments made for deciding the issue one way or another. In short, the facts, rules and norms in a case could become the subject of dispute. In an earlier article, Comaroff and Roberts elaborate at length on how such dispute settlement has customarily proceeded in a number of instances:

> . . . in presenting a case, Tswana disputants construct and rely upon a "paradigm of argument": that is, they attempt to convey a coherent picture of relevant events and actions in terms of one or more (implicit or explicit) normative referents. Any such "paradigm of argument" is sited in the requirements of a particular case, and is not fixed or pre-determined. Its degree of elaboration and integration depends upon several factors, such as the oratorical ability of the disputant, his expectations concerning the strategies of his opponent and his own strategic intentions. Moreover, the construction of the paradigm may vary over a number of hearings of the same dispute before different agencies, since the perceptions, expectations and strategies of the opposing parties may change or become progressively refined. The important point to note is that the complainant, who speaks first, establishes such a paradigm by ordering facts around normative referents which may or may not be made explicit. The defendant, in replying, may accept these normative referents, and hence the paradigm itself; under these circumstances he will argue over the facts within the paradigm. Alternatively, he may assert a competing paradigm by introducing different normative referents, in which case he may not contest the facts at all. At the higher levels, where the mode of settlement becomes one of adjudication, the third party responsible for adjudication (a headman or the chief) may order his decision within the agreed paradigm, choose between competing paradigms, or impose a fresh paradigm upon the issues under dispute. (1977: 86-87)

Under such circumstances, it is not surprising to find that a process of dispute settlement, which traditionally often seemed to treat a case "on its own merits," was also one substantially without a concise body of legal precedent. Schapera highlights this in his 1957 study of the legal foundations of Tswana customary courts:

> Since, in every individual case, the judge's decision is shaped at least partly by the opinions of the people present, it is unlikely that judicial precedents can be as significant as is sometimes asserted of

> similar systems. Whether or not a precedent exists depends in fact merely upon whether someone present has seen or heard of a similar case before. . . . In the circumstances, and considering the inevitable limitations of personal experience, the tendency will be for judgments to be based more upon recognized general principles than upon specific decisions of the past. . . . This in turn means that the law is not rigid but flexible, and can be readily adapted to meet new situations or, if need be, to reject customary norms that are now obsolete. (1957: 161; our emphasis)

This is not to say that the outcome of any dispute was unpredictable in traditional society. Most villagers knew what were the operating traditional rules and norms governing action and they behaved with the expectation that these would probably be used in judging the appropriateness of that behavior, if called to account by other tribespeople. The point made here is that complete certainty about how these rules and norms would be applied in all cases was not guaranteed in traditional Tswana dispute settlement. Flexibility in applying the law entailed probable, not certain, outcomes. With this background information, we can usefully re-interpret land board use of land and water allocation rules.

Land Board Use of Rules as a Means for Establishing Their Legitimacy. The preeminent problem faced by many land boards in roughly this first decade of their operation has been to establish the legitimacy of their authority over land and water allocations and adjudications in their respective tribal areas. The TLA gave land boards their statutory authority, but the president, cabinet and parliament have to a large extent left it up to the land boards to establish the legitimacy of the exercise of that authority. Moreover, land board members do not have the popular support of any local constituency which comes by virtue of having been directly elected to office.

Part of the legitimacy problem land boards have faced reflects their continuing difficulties in replacing the chiefly system of traditional land distribution and management. For example, the Interministerial Committee Report on Land Board Operations (ILBR) identified one of the causes of defiance of land board procedures as "tribal authorities continuing to allocate land" (1978: 1-2). Similarly, the ruling party's original effort to use land boards as a means of undermining chieftainship tended to set the two institutions in adversary roles. Yet as Comaroff notes for the Rolong Land Board and Werbner for the Tati Land Board, some chiefly factions were able to consolidate and enhance their power under the TLA by virtue of membership on the land boards (Comaroff, 1980; Werbner, 1980).

A related, but much more intractable, problem in establishing institutional legitimacy has been the land board's effort to establish its right over interpretation of

"customary law" on land and water matters. The ILBR is full of land board complaints about tribespeople making "self-allocations" of land without prior formal land board approval, e.g., "unauthorized plot extension," "unauthorized settlement outside a village boundary," "unauthorized extension of plowed area," and "unauthorized clearing in anticipation of plowing" (1978: 1-1, 1-2). Yet as Werbner shows in his case study of the Tati Land Board, some of what today is defined as self-allocation was once traditionally a matter of neighborly negotiation at the local level (1980: 143-147). In particular, both Werbner (1980) and Sutherland found that use by the Tati and Tawana Land Boards of the five-year rule on leaving land fallow clearly ran counter to traditional practices in the localities they studied:

> It is said that the [Tawana] Land Board may recognize titles to land without regard for other claims to title, once the land has been left uncultivated for at least 5 years. Such allocation, people say, is clearly unfair, because cultivation sites are temporary: from 1 to 3 years of cultivation is the usual limit for a main grain crop, and then a fallow period of from 10 to 20 years is necessary before recultivation. The 5-year rule, appealed to in disregard of both neighborliness and the recognized facts of the agricultural cycle, is seen to be a threat to the security of tenure and locally held views of social justice. (Sutherland, 1980: 76)

Similarly, a few land boards claim that construction of small water improvements such as haffirs at people's lands must be approved by the boards (see Table V-2), even though such improvements were considered by some chiefs to be a traditional right that came with having plowing lands (Schapera, 1943: 175).

Thus, the major problem of the land board as an institution has been establishing the pre-eminence of its claims in regulating the use to which tribal land can be put. For land boards, the eight-kilometer rule represents a resource which can be manipulated to assert the land board's claim on the regulation of use of the site being applied for or in dispute. What appears at first sight to be the land board "breaking" its own rule by allowing a spacing closer than eight kilometers is often done within the context of appealing to other rules which the land board claims it has equal authority to apply in governing land and water use. In the two cases quoted specifically above, we saw the land board settling the priority of what rules apply in the matters before them. To use Comaroff and Roberts' terminology, these cases represent a land board's attempt to adjudicate between competing paradigms by determining what are the salient facts and rules for each.

In using the land and water allocation rules given to it by virtue of the TLA and bureaucratic practice, land boards try to lay claim to being able to decide a

number of different land and water matters in a number of different ways. In particular, the more imprecise in expression these rules are, the greater the number of options the land board faces in settling a case.[12] The land board's claim of having the option to regulate land and water matters can be interpreted in part as an appeal for support from various factions which might not be as forthcoming were the land board "straight-jacketed" into uniformly following a single set of precisely-defined rules. Moreover, that this is the mode for land boards to acquire legitimacy has less to do with the "force of modernity and breakdown in traditional society" than with the fact that while some allocation practices are indeed different than they were in the past, the rule-manipulation governing these practices is structurally similar to what often occurred under traditional chiefly resource allocation and dispute management.

Thus, land boards only seem to be facing a dilemma. On one hand, the worst thing a land board could do, in terms of building political support, aggrandizing its members or enhancing its legitimacy, would be to apply the eight-kilometer rule uniformly and consistently, especially when other rules governing such water and land use also exist, not only in law and in custom, but also within a cultural context where it is accepted that no one rule automatically has precedence over another. On the other hand, land boards are embedded in a larger bureaucratic setting which seeks to set resource allocation on a sound, "rational" footing, as evidenced by the Ministry of Local Government and Lands' creation of the District Officer (Lands) cadre and the LUPAGs to advise land boards. This "dilemma," though, perhaps more than any other factor, explains why the eight-kilometer rule has persisted in the rhetoric of some land boards, i.e., the rule as formulated sets out an "objective" criterion for protecting pastures, while at the same time its application frequently has to be modified simply on technical grounds. In effect, appeals to the eight-kilometer rule allow land boards the opportunity to sound "modern" but be "traditional" at the same time.

Why Are Land Boards Seeking To Establish Such Claims? The motivation behind land board efforts to establish claims on the regulation of land use are complex and not all that accessible to expatriate researchers. Some factors are clear, though. Comaroff (1980) provides an excellent case study of how commercial farming interests, assisted by a new chief, coopted the Rolong Land Board for advancement of their own interests. Werbner (1980) sketches the rise of a chiefly faction through land board membership in

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[12] In this sense, a land board's appeal to the eight-kilometer rule and its judgment about whether or not an area is "too crowded" or "too congested" for water point development do not stand in contrast to each other as much as they reflect alternative formulations of a persisting concern about water point distance and proximity.

the Tati. In other cases, such as the Ngwaketse Land Board in the early 1970s, certain ruling party members on or associated with the land board deliberately attempted to erode the residual land and water allocation powers of the chief and his relatives who were allied with one of the opposition parties. Moreover, almost since their inception, land boards have been under criticism from an alliance of disgruntled applicants, government politicians, civil servants and a bewildering array of consultants, so that some members and staff have quite reasonably felt compelled to defend the legitimacy of their actions. In this same vein, some land board members have a clear vested interest in defending specifically the legitimacy of the eight-kilometer spacing rule, since they can appeal to this legitimacy as justification for their claims to de facto control of grazing around their own private boreholes.[13]

Ironically, one of the primary reasons accounting for land boards' persisting in making claims to regulate land use lies in the fact that land boards too are just one of several competing claimants to the land regulation "pie." First there are the traditional claims of localities, households, and neighbors over land. As Werbner wrote of one area in the mid and late 1960s with regard to any specific territorial title:

> . . . there is almost always someone in the locality who regards it as qualified, in some respects even dubious; and all deny that unencumbered land can now be found. (1975:114)[14]

Of course, there exist also the remaining powers and influence of some tribal authorities, particularly wardheads and headmen, as recognized in the ILBR. Beyond this, the claims of other groups on land use have been burgeoning, especially after Independence established a new state apparatus:

(1) Private borehole drilling, particularly in the sandveld and some of it illegal, accelerated after Independence and, as noted above, was perceived to give borehole

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[13]For the private borehole owner, in general, the appeal of the eight kilometer rule is enormous, but perhaps not for reasons commonly supposed. We know of few Batswana livestock holders who have argued that an eight kilometer spacing is necessary because they have herds of certain sizes which require just that amount of grazing land demarcated by such a spacing between livestock watering points. Rather, by appealing to the eight-kilometer rule, the private borehole owner in one stroke sets boundaries and defines rights of access to grazing around his source in an environment where, as discussed in Chapter I, he has witnessed increasing pressure to share grazing areas and to disregard traditional "boundaries."

[14]For variants of this same point from other areas of Botswana, see Volume 24 (No. 1) of the Journal of African Law devoted to land matters in Botswana.

owners de facto control over tribal grazing land around these boreholes. In effect, a land grab was taking place and one which was not sanctioned by many land boards.

(2) If a history were to be written on the events leading up to the formulation and enactment of the Agricultural Resources Conservation Act of 1974, it would show a concerted attempt by expatriate technical staff, largely within the Ministry of Agriculture, to gain regulatory control over the stocking rates on tribal land in the name of "improved range management" via advising the Minister of Agriculture on such matters.

(3) Picard (1980) has argued that pressure to enact the TGLP--which has subsequently altered land board allocation practices--came from a civil service elite who helped to formulate the policy and whose personal interests could be advanced with the policy's sanctioning commercial ranching on tribal land.

(4) Moreover, other interventions, such as the Ministry of Agriculture's dam policy and subsidies for drift fencing separating lands from grazing areas, can be seen as adding to or legitimizing claims of some groups to control the use of the land around the dams and drift fences.

The net effect of these various claims to regulate land use has been to motivate renewed land board efforts to lay claim to and control as many land and water allocation rules as it can. In this sense, land board's exertions to establish their legitimacy has been a continuing effort to define the organizational limits of responsibility and authority in a highly ambiguous legal, social and institutional environment.[15] Unfortunately, one of the consequences of increased efforts to establish legitimate claims on land use regulation has been growing suspicions among the rural population that land boards and government in general are capricious or self-serving in their decision-making about land and water resources in tribal areas.

Land Boards and the Problem of Community Control of Land and Water Resources

In one sense it is true that land boards need better water point spacing guidelines that are based on technically sounder criteria and are more consistent with prevailing livestock watering conditions in commercial areas than is the eight-kilometer rule. Yet, enabling land boards to use better spacing guidelines will serve only to reinforce

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[15]The variation in land board spacing policies suggests that land boards differ in terms of both the manner in which they have tried to establish their legitimacy and the underlying reasons for doing so. To do justice to this topic would require a thorough review and analysis of the whole range of land board practices, a subject which falls outside the scope of this monograph.

land board efforts to displace the traditional local control over land and water matters. Thus, what seems to be at first an issue of devising better spacing guidelines is really an issue that strikes more fundamentally at the heart of local-level control over resources. As shown above, the claims of government to control the regulation of land use have increased, in part through a displacement, if not erosion, of traditional local control and custom, as represented by the land and water allocation practices of neighbors and chiefs within a given community at the compound locality level.[16]

Yet it would be a mistake to leave the impression that this series of government and private interventions has alone weakened local control over communal land and water resources. The cause-effect relationship is much more complex. First, some of these interventions have been predicated on and enhanced by the variability or absence of effective community control which pre-dated these interventions. Second, land boards and other government agencies have had only variable success in penetrating to the local level in their efforts to undermine the older system of chiefly resource regulation, such that they cannot alone account for this weakened local control. It is argued below that the veritable ease with which post-Independence government claims have been made on communal land use regulation stems largely from the fact that in many areas there is no longer an effective countervailing community regulation of these same resources.

Chapter I described the accelerated decline after Independence in the chiefly system of community control at the compound locality and tribal levels. Suffice it to say that this decline has been reflected in both the proliferation of new types of localities, such as permanently settled areas with mixed and shared land uses having no headmen or makgotla, and the related weakening of the traditional compound locality in many areas with its set of political and social connections operating through the village headman, wardheads and neighbors. Not only have the socioeconomic activities of households become more locality-specific, but individual efforts to privatize communal land and water resources also have been on the increase, as witnessed by private

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[16] While it would require much more research than can be brought to bear here, it is speculated that the periods when local control over land and water resources, either by subordinate traditional authorities or by neighbors, has been the greatest, have also been the times when government has been weakest in asserting its claims on land use. For example, the rise of permanent settlement at the lands in Kweneng District accelerated during a period (1961-1970) when Kwena paramount chieftainship was weak, when colonial government was transferring its power, and when there existed no main and subordinate land boards in the district (see Vengroff, 1977: 55-58; Silitshena, undated).

borehole owners laying claim to the grazing land around their watering points. While, as described in Chapter II, the balance of private and communal water rights persists, the weight of each has shifted and will likely continue to do so over time in the communal areas.

The present pattern of inter-locality mobility shows that there are still strong socioeconomic and spatial links at the compound locality level in a number of areas, particularly in terms of seasonal movements during the agricultural calendar, even though the nature of each of the localities in the compound locality may well have changed over time. Moreover, the pressure for inter-locality mobility still exists, not merely because people continue to farm and need emergency grazing and water, but also because the declining resource base in some localities makes inter-locality movements probable, e.g., as "encroachment." This pattern and changing quality of inter-locality mobility is emphasized here, since it reinforces the rural dwellers' need for communal land tenure.

In the past, communal land tenure could be conceived as the pattern of chiefly resource control and management combined with the recognized claims of tribespeople to use and keep land in a way that permitted inter-locality mobility to be maintained. Certainly part of the legitimacy that some headmen and wardheads continue to retain comes from the fact that they or their families have been physically resident in a locality and are familiar with the persisting land rights in the compound locality, even though the holders of these rights are often moving in and out of the area. Today the household desire for communal land tenure in general, and of many of the traditional land and water practices in general (such as wardhead approval of land board applications) should themselves be seen as adaptive strategies on the part of people to a still largely persisting set of population movements and periodic activities. For example, as noted in Chapter II, a fallback water point system exists only in conjunction with communal land tenure, such that efforts to privatize these water points or the land around them are like to be increasingly resisted by the growing number of rural dwellers who want to maintain seasonal agricultural practices. What is different between the communal land tenure of today and that of the past are those profound changes which have occurred in the nature of both the control over and claims to land and water resources discussed in Chapter I and above.

It is tempting to attribute the acceleration in recent land use disputes to communal land tenure; to paraphrase the old range management admonition "Where no one owns the land, anyone can claim it." Certainly this rationalization has served well those who claim the right to graze their herds anywhere in the tribal area for which

they are tribespeople. It is our belief, however, that the increased government effort to lay claim to land use regulation stems less directly from communal land tenure than is commonly supposed. Rather these claims have flourished in an environment characterized by tribal areas now having a wide range of different types of localities and compound localities

The local pattern of resource control and management has become much more variable than in the past. It is onto this pattern of variability that land boards have felt themselves encouraged to assert their claims to regulate land use. To label this variable pattern as "communal land tenure" profoundly distorts the fact that communal land tenure is itself changing, and it is this change which land boards have sought to exploit. Land boards have thrived on this lack of an effective countervailing local control in some areas.[17] As for the persisting claims on locality land use which households and neighbors have, land boards have tried to invert these customary rights into a land board "policy" of "consulting" with neighbors before allocating a nearby site in the locality to another person. Such a policy, which is essentially an attempt to establish the land boards' priority in conferring land use rights at the local level, is just one more example of land boards trying to create bureaucratically what they have not been given politically or socially—legitimacy. Thus, it is not surprising that land boards, having no real legitimacy of their own, still find their greatest threat to be both "self-allocations" by individuals and the persistence of the chiefly system of resource allocation and dispute settlement.

In effect, the decline in chiefly authority and the proliferation of new kinds of localities created a vacuum at the compound locality level, particularly in terms of settling disputes and conflicts relating to the use and management of land and water resources that involved several, perhaps not even adjacent, localities. But such political and social vacuums do not exist for long. They exert their own kind of pressure to be filled, as land boards attempted to do when taking the opportunity to lay claim to the regulation of a resource base, the management of which was, and is, in some areas no longer pre-empted by other means of control or pre-existing claims. Land boards have become virtually the only agency which deals with matters affecting

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[17] Hitchcock (1978: Vol. 1, p. 6) points out that one of the major assumptions of TGLP, later proved to be incorrect, was that large portions of the sandveld were "unused" and deserted, having no local tenure encumbrances preventing the zoning of this tribal land for leasehold commercial purposes. Our analysis suggests that one reason why some land boards believed that this land was vacant is that such a belief fitted quite nicely with their effort to claim rights to regulate tribal land in general. Where better to assert such a claim to control than in an area perceived to have neither pre-existing claims nor countervailing local regulation of resources?

inter-locality boundaries and disputes in the absence of the older, traditional land institutions and in the presence of the continued, albeit changing, need for inter-locality mobility. In such an environment, half the problem of how to divide and conquer in order to establish their priority has already been solved for land boards.

It is important to understand that land boards have taken advantage of a situation which they have only in part created. As described in Chapter I, land boards have aided those forces which have encouraged post-Independence land use changes, but in no way do land boards account entirely for these forces, which include rising population densities, increased income from livestock production, and the declining availability of land for extensively-practiced arable and livestock agriculture. As Comaroff and Roberts have noted (Roberts, 1980), there has been a tendency to credit too many of the recent land and water changes in rural areas to land board intervention. In fact, as is argued in the next chapter, land boards have been notable for their lack of effective penetration at the compound locality and locality levels, particularly in the area of conflict management involving land and water resources there.

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Tati				
A.S., Files	2 since June, 1980	Sand river wells, Small haffirs	- 8 km from other water points including rivers and open wells.	- Water points are rarely applied for as water is so readily available in the sand rivers of the district. - Wants help from MoA in determining carrying capacity. - Decisions on applications for water point allocations are not always included in the minutes.

a. These are the sources of information for each land board:

A.S. - Administrative Secretary
D.O.(L.)- District Officer (Lands)
LB - Land Board
MLB - Main Land Board
SLB - Subordinate Land Board
P.A.O. - Principal Administrative Officer of land board
D.A.S. - District Agricultural Supervisor in Ministry of Agriculture (MoA)
N/A - Not Computed

b. It was not always possible to tell whether or not an application was for a lands water point. Those applications which were specified as lands water points are noted. Unless otherwise stated twelve month period covers February/March, 1980 to February/March, 1981.

This information has been confirmed by land board staff or D.O.(L.)s.

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Ngwato				
A.S., P.A.O., LB Chairman, former SLB A.S., Files	120 boreholes plus 15 specified as within crop field boundaries, 4 dams, 1 specified as within field boundaries; 5 open wells (from certificates of land board grants 2/23/80 - 3/31/81)	Sand river wells, small haffirs, other temporary sources	- Arable water points must be within a plowed field. - Neighbors must be consulted. - Lands water points should be for household consumption only ("domestic"). - Borehole applications from groups are given preference over individual applications. - Grazing potential should be evaluated. - 8 km rule said to apply in TGLP commercial but not communal zones. - 100 meter radius redrill policy as long as proposed water point use remains the same. - SLB sites water points and recommends to MLB for approval.	- LB has approved water point application over objections of a headman. - D.O.(L.) said rarely to monitor communal borehole applications in some SLB areas because of the size and workload of the district. - 8 km rule may not be applied to crop field boreholes depending on their use. However, boreholes should be 8 km from other water points, where possible.

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Sebina Subordinate Land Board				
SLB, A.S.	16 boreholes (1978) 2 boreholes (1979) 3 boreholes (1981)	Sand river wells, Small haffirs	- Boreholes and open wells sited within crop fields. - Domestic use only. - 100 meter radius redrill policy. - SLB recommends; MLB allocates.	- SLB has recommended the rejection of a water point application because it would have permitted people to start a new village.
Palapye Subordinate Land Board				
A.S., SLB members, Files	10 dams, 15 boreholes (one specified as lands) (Applications November 1979 to September 1980)	Small haffirs	- Boreholes and open wells within a plowed field. - Dams must not interfere with other people's land or property. - Individual boreholes to be used for domestic consumption. - Group applications for boreholes given preference over those from individuals. - 100 meter radius redrill policy. - Abandoned water points may not be redrilled or redug without LB consultation. - SLB recommends and allocates with MLB approval.	- If a group applies for a borehole or dam and the land board finds there is a need for domestic water in the area, it would be allocated even if located outside a field.

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Mahalapye Subordinate Land Board				
A.S., SLB Members, Files	3 (during 1980)		- Inside plowed field. - Consult neighbors. - Boreholes for human consumption and small stock. - No rule about distance at the lands; 8 km for boreholes in the grazing areas. - SLB recommends and allocates with MLB approval.	- LB feels the lack of enforcement officers makes it difficult to deal with disputes and and self-allocations.
Kgatleng Land Board				
D.O.(L.), A.S., D.A.S., LB members, Files	1	Small haffirs, Water points within yard	- Inside fenced and plowed field. - Used for crops, draft animals and domestic purpose only. - May not sell water. - Consult neighbors. - Must provide neighbors with domestic water on request. - Boreholes monitored by D.O.(L.). - Group applications for boreholes receive preference over individual applications.	- District council has taken responsibility for provision of domestic water at the lands. - LB perceives the district to be already heavily populated. - MoA should cooperate in coordinating with LB in construction of dams and boreholes.

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Kweneng				
D.O.(L.), A.S., Files	From Minutes 2/26-29/80 - 1/26-28/81: 22 boreholes 7 haffirs and dams 1 reservoir 30 customary grant applications approved	Policy against self-allocation of boreholes said to be enforced: of 3 boreholes self-allocated, "two were taken away" between 1975 and 1978	- D.O.(L.) has monitored applications for communal livestock water boreholes; however, has not assisted in siting of MoA dams in mixed lands and cattleposts. - No policy of spacing domestic water points in communal arable areas: "provision of water for people at lands and in the village is the responsibility of council". - In communal arable areas, lands borehole owner allowed only to water 40 head; LB has rejected at least one livestock borehole application because "the applied area is Lands Area" (8/26/80). LB favors individual borehole in lands areas rather than group ones, in an effort to control grazing pressure; however, LB still encourages large	- All lands areas are zoned communal arable. - Tribeperson must "reapply" if wishes to construct haffir in already located plowing lands. - Minutes of LB meetings show that there are a number of applications for domestic water points at lands. - Minutes record several complaints of fields being allocated too close to livestock water points. - Some badisa still operate for mixed grazing and lands areas but effectiveness said to vary with how crowded the areas are. - "the main problem of allocating water points at the lands is not to make them cattleposts".

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Kweneng, cont.			private livestock borehole owners to move out of communal areas into TGLP commercial areas. - In communal grazing areas, LB tries to site boreholes 8 km away from other boreholes as well as up to 20 km away from villages and lands. Exceptions exist, especially where "people can manage better" their livestock. - In communal grazing areas, syndicates allowed to water up to 600 LSU. - 1 km redrill policy in communal grazing areas. - SLB recommends, but MLB sites and allocates.	
Malete				
LB members, A.S.	Rare: said to be only one application (for a dam) approved in last year	Temporary, small sources such as sand river wells and lands haffirs	- Minimum 5 km spacing for MoA dams. - Has policy for syndicating water points.	- Livestock watering point applications almost exclusively limited to syndicated dams; LB says it has never allocated a livestock borehole.

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Malete, cont.				- LB approved some past MoA dam applications without physically siting them.
Ghanzi				
D.O.(L.), A.S.	Difficult to assess because 1975 TGLP borehole freeze has left some applications "outstanding" for years. LB has approved one communal borehole in 2 years	"Few, if any" in communal areas	- Follows policy for D.O.(L.) monitoring communal area grazing applications; some private borehole applications not approved because of zoning, i.e., proposed site was in a "wildlife management area". - D.O.(L.) considers 8 km spacing "a bit too close" and has recommended 10-16 km apart for some borehole sites. - Borehole applicants "who are part of a large group (more than 10) are usually given preference in communal grazing areas".	- Since lands are typically near villages or small settlements, people continue to use village boreholes as and when farming.

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Ngwaketse				
LB, A.S., Files	3-4 boreholes 2 "dams" (haffirs) 1 "pit" 9-10 customary grant applications (1/29-31/80 - 1/27-29/81)	Lands haffirs, Sand river wells	- D.O.(L.) has monitored a number of borehole applications for the LB in the communal mixed lands and cattleposts. - 8 km rule said to apply in TGLP commercial, but not communal areas. No policy about spacing of water points in lands areas: "we treat each case on its own merits". Domestic water points at the lands can be nearer than 8 km. - LB has rejected livestock borehole applications for the following reasons related to water point spacing: (a) area was "already crowded" with boreholes (b) "area referred to was heavily overgrazed" (c) "The site was too small to accommodate a borehole." - LB has policy of preferring syndicated	- Numerous complaints to land board over plowing fields and livestock watering points too close together. - Need not apply to LB to construct a haffir on already allocated lands. Apply to LB only for a borehole, open well, or dam. - 12 certificates of grants for water points were issued between September 1979 and September 1980: 11 boreholes in commercial areas and 1 dam site in a communal area. The particulars of this dam application are as follows: Customary Grant Application: date stamped 9/13/79. Approved by MLB: 1/29-31/80 (Minutes) Allocated: 3/18/80 Certificate of Grant Issued: 8/1/80. Although this grant was for domestic purposes only, the certificate of grant does not show it; the original application was found in the wrong file.

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Ngwaketse, cont.			watering points in communal areas, with a limit of 100 LSU per member "as long as the total herd does not exceed the carrying capacity of the area". - SLB recommends, but MLB sites and allocates. - Up to 2 km redrill drill policy in communal areas, though LB favors redrilling nearer abandoned water points in lands areas.	
Rolong				
D.O.(L.), A.S., Files, LB members	Impossible to determine; Minutes record only total number of customary grant applications approved and do not break them down into separate categories. Original applications are mixed in with other files	Some lands haffirs and sand river wells	- No real policy about spacing water points, either in the communal grazing or lands areas. LB does not worry about distance if water point is used largely for domestic purposes or is a lands haffir. However, it has rejected at least one water point application because it was "too close" to a livestock watering	- Over 90% of the Barolong Farms is zoned communal. - Only a few water point applications for customary grants' certificate of grants given by LB were found in the files. - If a haffir is to be constructed inside one's lands area, that person need not apply to the LB; if it is to be outside the field, then an application is necessary.

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Rolong, cont.	and it is not always possible to find the original application for each certificate of grant.		borehole. When allocating a borehole, the LB "just gauges the distance" from the nearest one, rather than physically measuring distances. - LB has rejected at least one livestock borehole application in a lands area on the advice of the D.O.(L.) who argued that LB approval would lead to crop damage there. - LB has rejected borehole applications where members feel the applicant would sell water for domestic or livestock purposes. Selling water may not only lead to overgrazing and crop damage under these circumstances, but many Barolong object to the high fees charged by these private owners.	

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Chobe				
A.S., former D.O.(L.)	N/A	Seep wells, haffirs	- Water point should be within plowing lands. No other policy for spacing of water points in lands areas. Spacing is irrelevant where lands are along the rivers, when lands are in the floodplain, and when seep wells and pits have been located in places where they are less likely to be flooded out. "It's almost a customary right to have your own water point at the lands." - Livestock watering bore-holes are rare, but should be 8 km apart.	- The district is comparatively water abundant with less cattle pressure than in many other areas of Botswana. Said to be few, if any, water point applications in lands area or certificates of grant issued by LB.
Kgalagadi				
D.O.(L.)	N/A	N/A	- No real need yet for a spacing policy of lands water points. Lands typically follow water points in the Kgalagadi, with lands close to village water sources. There is some "spacing" of the wells near	- Council is said to encourage syndication of livestock water points.

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Kgalagadi, cont.			settled pans according to clustering of wells together by ethnic groupings. - 1 km redrill policy. - 8 km rule is said to be applied to livestock boreholes in grazing areas.	
Tawana				
D.O.(L.), A.S.	20 borehole/ open well customary grant applications approved within 1980-81	Haffirs, seep wells, dams, river pits. Those who wish to construct open wells along a river for domestic use need not apply to LB but must obtain permission in writing from the SLB.	- Minutes show 8 km rule often applied to livestock boreholes, open wells and equipped wells in communal grazing areas. In communal lands areas, livestock water points often approved for 8 km apart also. However, boreholes/wells used for watering draft oxen, milk cows and smallstock are approved with spacings for less than 8 km: "it is not fair for draft oxen to walk 8 km during plowing season".	- Applications for dams are rare, i.e. "no dam applications were ever received". - Policy is to issue a certificate of grant for a "borehole", even though water point constructed may be an equipped or unequipped open well. - All water disputes settled by SLB unless appeals are made to the MLB. - Said to be no serious shortage of reliable water at the lands during the cropping season, especially along the rivers (though arable/grazing conflict can arise where cattle trek to river water through these lands).

TABLE V-2 Allocation of Water Points with Special Reference to Land Areas

Land Board Sources of Information[a]	Applications (12 months)[b]	Permitted types of Water Point Self-Allocations	Policy	Other Considerations
Tawana, cont.			- Minutes and certificates of grant specify distance of borehole/well site from nearest existing borehole and/or previously allocated borehole site. In some cases, 8 km is measured from a river when it serves as the major livestock watering source in the area. - One case of siting a private borehole within the owner's fields. LB is said, however, to favor group water points in the lands area, though individuals and groups rarely apply for the same site. - SLB recommends and sites with MLB approval. Only in disputed cases will MLB do siting itself. - D.O.(L.) is asked his opinion only rarely in water point applications. - 100 meter redrill policy.	

Chapter VI
THE RURAL WATER SECTOR IN PERSPECTIVE

In each of the preceding chapters, some portion of rural water use and management has been described, both in terms of its important characteristics and in terms of the significant factors which affect and are affected by that use and management. Households' attitudes toward and demand for land and water have been described as interacting with a series of government interventions in the rural water sector, namely, the district council provision of village water supplies, the dam building program in the Ministry of Agriculture, and the land board policies for spacing livestock watering points. By no means has the entirety of rural water strategies been canvassed. Nonetheless, the broad outlines of the organization and operation of the rural water sector in eastern Botswana have been presented. Prior chapters have attempted to show how a number of major government interventions into this sector have failed to take into account three critical factors: the overall importance of seasonality, the spatial hierarchy of local-level water use and management systems, and the changing organizational base of the rural water sector. We will summarize here the principal elements in each which will affect the content and feasibility of any effort to improve activities in that sector.

The Overall Importance of Seasonality

Seasonality in rainfall and agriculture provides the point of departure for understanding water use and management in the eastern communal areas of Botswana. The cycle of wet season followed by dry season (or, occasionally, by drought) affects water point location and the type of water source available for use. Both users and managers of water sources take this cycle into account. For example, the same factors are considered by a borehole owner when deciding whether or not to purchase diesel to keep the borehole operating in the wet season as are considered by a household when deciding whether or not to pay to use that borehole then. Both know there are likely to be cheaper ephemeral sources nearby. The seasonality in rainfall also affects the timing of the agricultural cycle, and thereby the residential location of most household members and their herds throughout the year. The agricultural cycle also influences who will be available and at what time to draw water and herd the livestock. In short, seasonality in rainfall and agriculture affects the location and supply of water points, the location and level of demand for water, and the type and availability of labor to extract that water. This seasonal shift in water use, both from wet season (largely ephemeral) sources to dry season (often groundwater) points and from water points at

the lands to village water sources, we have termed the household's fallback system for using water points sequentially and in combination. No rural water use or management system can be understood without a thorough consideration of such seasonality.

The Spatial Hierarchy of Local-Level Rural Water Use and Management

To focus on seasonality alone leads to an incomplete picture of the rural water sector. As with communal land use in general, different units of analysis must be considered in order to understand rural water operations. Rural water use and management do not exist independently of households, villages and communities and the meanings of these latter terms will vary with the contexts in which they are used. In order to analyze the rural water sector, one must begin with the most spatially specific unit, the water point itself, and then proceed upward and outward taking into account larger spatial units according to various forms of social, political and economic organization. Following the scheme outlined in Table I-1, a framework for analyzing the rural water sector should reflect the multiple stratifications of location and institution.

A way of proceeding in this direction is to recognize that such concepts as the fallback system and the convenience, cost and reliability of water supplies, represent quite different levels of analysis of the rural water sector. Table VI-1 groups the unique factors which characterize and define primary water point operations along two dimensions: (1) factors important in the development and management of a water point and in the use of its water; and (2) the location of those activities and factors—at the source, in the locality, or within the compound locality. In addition, the primary linkage between managing and using a water point has been identified for each locational level. Although primarily representing a spatial hierarchy of water use and management, these levels include temporal considerations as well. The compound locality incorporates water-related behavior over the rainfall and agricultural cycles, particularly shifting residential demand for water. The locality is the site of more short-term considerations in water use and management that are specific to that part of the agricultural and rainfall cycles associated with residence in a single place. Also, the water point as a facility has characteristics, primarily technological, which are important regardless of where it is located. The resulting typology summarizes our previous observations as follows.

TABLE VI-1 The Spatial Hierarchy of Local Level Water Use and Management in Rural Eastern Botswana

Locational Level	Factors Affecting Development and Management of the Water Point	Primary Factor Linking Management and Use	Factors Affecting Use of the Point's Water
At the Water Point	- localized overgrazing around the point - physical type - management type	- function/purpose of water source	- user perception of water point type - history of water point development and use - norms and perceptions about range and water use - convenience, cost and reliability of water supply
In the Locality (Village, Lands or Cattleposts)	- area topography, hydro-geology, and existing wp placement - locality land use determining need for new water point - seasonally changing function of water point	- availability of alternative water points, especially as it affects management/use continuum	- major water use of locality - availability of labor to draw water and/or herd livestock - use of water point versus management of a household water supply
Within the Compound Locality (Village With Lands and/or Cattleposts)	- changing management because of shift in residence - changing management because of change in land use of that locality	- fallback water point system, especially push and pull factors affecting the rural water sector	- changing user demand for convenient, cheap and reliable water supplies - changing availability of labor to extract water

At the Water Point Site

Developing and Managing the Water Point. Since the most overgrazed areas are typically found around individual livestock watering points, government efforts to control overstocking have generally focused on trying to find the combination of water point physical type and management practices which can assure a safe stocking rate around each water source. For example, some government officials believe that, in the absence of private ownership of livestock water points and the grazing land associated with them, the next best alternative is to ensure that only small-capacity water sources are constructed.

Treating the water point as a facility to be operated at a site highlights the various management functions needed to keep it in operation—its maintenance requirements, regulation of use, and collection of charges to finance these operations. The technology associated with the water point's physical type is an especially important consideration in its management, e.g., boreholes require pumpers. The physical type of a water point determines to some degree the kind of maintenance necessary, the kind of regulation which is possible or practiced, and the necessity of cash or in-kind fees needed for the water point's operation. Water point use may be ultimately contingent on whether or not management can keep that point's supply available.

Using the Water Point. Users typically share a set of perceptions about the advantages and disadvantages associated with certain types of water points. We have already mentioned the common perception of dams as water sources which are not reliable year-round but which have low maintenance requirements. Similarly, it is often believed that borehole water is of better quality than dam or river water and that open wells are particularly laborious to operate. Whether or not the water point has been developed though public or private means also affects perceptions of its availability for use, e.g., it is difficult to prevent people from using water sources constructed by government. These perceptions are, in turn, reflected in people's preferences for new water point development—very few rural dwellers, for example, request more open wells in their areas, while a number of people still request government dams because of the reduced amount of labor they require.

In this same vein, communal norms still govern how a water point is used in many areas. Pans and rivers are held to be natural water points, their use often open to all. Similarly, the majority of Batswana continue to believe that just because a water point is privately owned does not mean its owner has the right to deny outsiders its use for their emergency domestic purposes. Also important are the norms governing the traditional roles of drawers of water, namely, females draw domestic water supplies while males typically herd livestock to their water sources.

Finally, every user wants the most convenient, reliable and least-cost water possible. Since this is rarely attainable, each water point used represents some kind of water shortage to its users, e.g., the cheapest and most convenient water sources in Botswana-rainy season ephemeral sources—are not as reliable as are the often inconveniently located boreholes.

The Link Between Water Point Management and Use. A water point is operated to supply water to its users for a certain purpose, such that different uses entail different management strategies (and vice versa). For example, since livestock watering points are meant to provide access to both water and grazing land, severe range degradation around the point may eventually lead to neither management nor use. Typically a multiple-function water source is used and managed differently from a single-function one. It is more difficult to collect fees at a point which, although originally intended for livestock water purposes, is also used for domestic purposes. Similarly, maintaining a dam's steep reservoir pit (e.g., by desilting or grassing the walls) encourages domestic use of that water, since livestock are not able to enter and leave such a pit easily.

At the Locality Level

Developing and Managing the Water Point. The topography and hydrogeology of an area have a considerable effect on the development and management of water points, particularly in eastern Botswana. A dam constructed at the best possible site in that locality's catchment area may be abysmally located from other perspectives. For example, crop damage and disputes may arise from the placement of a government stock watering dam in the midst of low-lying areas which are used for crop cultivation or which already have open-access stock watering sources such as rivers and pans. On the other hand, a dam not sited correctly in the catchment area runs the risk of holding little or no water at all, thereby making any kind of use or management unlikely. The hydrological and hydrogeological variability in eastern Botswana militates against the successful implementation of "optimal" placement strategies for uniform distances between livestock water points, particularly in localities where access to rivers is physically impossible to control. Similarly, the variability in location of existing livestock watering points and the recent incursion of lands areas into traditional grazing areas has meant an uneven and haphazard configuration in grazing patterns which stands in sharp contrast to the symmetrical pattern of radial grazing around livestock watering sources in the sandveld. Thus, it becomes more difficult to predict the intensity of overgrazing, if any, around a hardveld water point when one only knows its stocking rate.

In many areas of the sandveld, the availability of water determines the land use. Sink a borehole, it is said, and what was formerly virgin savanna, becomes ideal for such grazing. It was this belief which provided the rationale for government proposals to use the spacing of livestock watering points as a means of controlling the distribution of stocking pressure. The assumption that water point type determines land use cannot be made, however, for a number of eastern communal areas. Quite the opposite can be assumed in some cases: it is the land use of a locality which determines whether or not any new water point is needed. For example, many Batswana consider a locality to be overstocked precisely because livestock cannot be dispersed to better grazing simply by the introduction of a new livestock watering point into the area.

One of the characteristics of a large village in eastern Botswana is the absence of daily herd watering in the midst of these settlements: for reasons of health and congestion, villagers are expected to herd and water their cattle in adjacent or nearby grazing areas, save in cases of drought when the village becomes the cattlepost of last resort.[1] In addition, many Batswana are quite explicit about the special circumstances under which they consider the introduction of a new livestock watering point as likely to have a substantial impact on communal land use, namely, in the mixed lands and cattleposts. In areas with competing land uses, a new livestock borehole might well encourage turning the area into a cattlepost entirely, e.g., by increasing crop damage and thereby discouraging further cultivation there.

The effect of a locality's land use on individual water point management can be quite direct at times, particularly in cultivation areas during the agricultural season. Households who want to remain at the lands through harvest require a post-rainy season supply of convenient domestic water. Several dam groups ration their dam water for domestic use, even though the dams were intended for livestock watering purposes only. But, at least one dam group in a permanently settled area was unable to ration water for household drinking purposes until after harvest when labor was freed up to herd livestock to more distant sources. Thus, as ephemeral water sources in a locality change, the major activities of water users there may be such that their management of certain individual water points may also change in an effort to sustain these productive and/or social activities.

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[1] As shown in Table V-1, permanent water sources within or near communal area settlements often have a large number of other water sources nearby as well. This simply illustrates that one of the reasons why there is dense spacing of water sources in the many communal areas is the fact that water point development not only leads to settlement, it follows settlement as well. For example, people who originally settled around a river may, after time, have constructed haffirs near their individual dwellings. Later, as the settlement grew, a stockwatering dam might have been constructed outside the settlement. Even later come the village borehole and its standpipes.

Using the Water Point. As already noted, the household allocation of its water use across different types of watering points will vary according to locality, the obvious example being the livestock watering source as the modal water point in cattlepost areas in contrast to the domestic water source in villages. In particular, we have seen that the district council borehole in the village, the communally-held and group-run water points at the lands, and the privately-owned water sources at the cattleposts account for significant portions of household water use in these localities.

While the norm is that females should draw domestic water supplies and males herd animals to livestock watering supplies, labor availability varies by locality. Children who remain in a village school during the cropping season are not available to draw water at the lands then. In the end, some males draw domestic water, while girl herders are not unknown. The sexual division of labor for drawing of water remains intact, but it is not rigid in each locality.

It is at the locality level where it is first apparent that a person's use of a water point is part of a broader strategy to manage his or her water supply for the household. Since each water point used represents some kind of water shortage in terms of convenience, cost and/or reliability, members of a household might use several water points within a locality as a means of providing them with a "better" supply of water than could be got from any one source there. A household uses a specific water point in order to insure its overall water supply.

The Link Between Water Point Management and Use. The availability of alternative water points for the purpose desired has a profound effect on how any one water point is used and managed in a locality. This availability of alternatives often defines the role any water point has in an area, regardless of its physical type or management type. In effect, any one water point is managed and used because more accessible water points are not available at that time. In one Survey site, a small spring served as the major water source for hundreds of livestock which had no other place to water. In another site, a privately-owned open well was allowed to fall into disrepair and/or disuse by its owner since a nearby river had perennially flowing water. In another Survey area, district council operation of a livestock watering borehole made it easier for a nearby group to manage its Ministry of Agriculture dam for domestic purposes. Thus, the search for the ideal water point with certain physical and management attributes which would insure low stocking rates is illusory in most communal areas. Some privately-owned water sources are managed as if they were open access facilities, as in the case of a borehole owner who felt he could not refuse requests for water because of his status in the locality. In addition to springs, a few

seep wells and even an occasional sand river well can water large numbers of livestock in the absence of alternatives in the dry season. Thus, the technology of a water point type is not the only factor that determines management. And it is not always possible to control these other factors in order to manage a given water point's use, particularly where the alternative water sources are long, winding sand rivers.

Finally, it is the changing availability of water point alternatives which provides the basis for the continuum between management and use. As seasonally available water sources diminish, government dams become used and managed as a common property resource by residents in their localities. It is ultimately because users perceive there to be insufficient dry season alternatives that are cheaper, more convenient and/or reliable than those ones they are "forced" to use which explains why some people have managed a water point by using it in ways which extended its supply over time.

At the Compound Locality Level

Developing and Managing the Water Point. Processes first noticed at the locality level which result from rainfall change within the span of a cropping season at the lands become more pronounced at the compound locality level. The pattern of shifting residence affects the demand for water which, in turn, affects the management of any individual water point. "Mining" surface water sources, rather than rationing and conserving the water in them, becomes a management strategy for those users who know that by the late dry season they or their herds will have to be using different water sources, often in different localities, anyway.

The management of an individual water point may vary within a given period of time as a consequence of that locality's major land use during that period, as in the case of water from a dam at the lands being rationed for domestic use before harvest. At the compound locality level, there is the added phenomenon of the locality's land use changing seasonally, which influences the management of water points in the locality concerned. After harvest a lands area becomes grazing land for livestock, so the demand for domestic water supplies lessens considerably with the out-migration of household members to the villages. Groundwater sources increase in importance with the drying up of many larger surface water points by the end of harvest. Under these circumstances, management of dams, even in terms of making repairs to fences and hand pumps in preparation for future use, grinds to a halt and is suspended often until the beginning of a new cycle of management at the end of the next rains.

Using the Water Point. The inter-locality mobility of households and herds means not only a shift in water demand for different purposes when residence is changed, as with the increased use of water for beer-making after harvest in the villages. There is also a shift in emphasis among convenience, cost and reliability. As noted before, many cattle-holding households place a premium on the availability of convenient water supplies, particularly at the beginning of the cropping season, with the desire for reliable watering sources increasing thereafter. Similarly, the demand for convenient domestic water supplies is probably better satisfied after harvest when household members return to the village, since (1) a number of villages have district council water systems with reticulated standpipes and (2) often more labor is available to draw domestic water at that time in the village than was available at the lands.

The Link Between Water Point Management and Use. The seasonal availability of alternative ephemeral water sources affects the use and management of any one water point in a lands area or mixed lands and cattlepost locality. When this process is extended to the compound locality level, the fallback water point system(s) of the users becomes evident. At the beginning of the cropping season, many households are found letting their livestock water at the dispersed puddles at the lands, while they obtain domestic water supplies from nearby pits, puddles or their own lands haffirs. As the pits and puddles dry up, the lands haffirs might be used and managed for cattle as well as for domestic purposes. Later people and their herds begin to rely more on larger surface water sources such as dams and rivers, the latter being especially important, since in many cases, sand river wells can be dug to extend river use possibly throughout the dry season. By mid-dry season, the lack of reliable and convenient water sources becomes much more of a problem at the lands, solved in part by the peoples' return to the village after harvest and in part by the watering of livestock at groundwater sources such as boreholes and open wells. Once in the village, people will not return to the lands until the next rains and often not until they can be assured that there are convenient domestic and livestock water sources at the lands again.

This falling back from lands sources to village sources represents, when viewed from the perspective of the village, a process of advancing into the lands with the rains and retreating to the village with the harvest in the dry season. At work in this process is a set of "push" and "pull" factors relating to the demand and availability of water and socioeconomic opportunities in each of the localities in the compound locality. People are pulled to the lands with the rains and encouraged to leave when their surface water sources dry up. Moreover, the availability of much more convenient and reliable water supplies in the village as well as of social activities and economic opportunities

encourages them to return there in the dry season. This advance and retreat is at times risky and full of uncertainty for the household, however.

At the locality level, it is difficult to predict the level of grazing pressure for a certain stocking rate, because of uneven water point spacing and configuration in available grazing land. At the compound locality level, the very computation of the water point stocking rate becomes problematic. It is difficult to compare two stocking rates which are numerically equivalent, but which are computed on the basis of different durations of use for different times of the year at different water points in the fallback system. Given the way livestock watering points are actually managed and used, stocking rates and carrying capacities need to be computed on a system-wide basis. This kind of analysis is made difficult not only because of methodological problems in estimating carrying capacities and stocking rates within a system, but also because fallback systems overlap at the compound locality level where different villages share the same lands and cattlepost areas. At the compound locality level of analysis, the use and management of any one water point must be seen as depending not only on its specific functions and purpose or on the availability of alternative water points in the same locality. Water point use and management also depend on its position within a sequence of user fallback systems.

The Organizational Base of the Rural Water Sector

The picture of the rural water sector would still remain incomplete if it were left solely in terms of being a seasonally-driven, spatially-stratified system of water use and management at the local level. What is missing is a more detailed discussion of the changing organizational linkages in the rural water sector, particularly those which connect the various locational levels to one another as well as connect together individuals within each location-specific, water-related activity.

The individual is often seen in the rural water sector only as a drawer and manager of water at a water point. But even then his or her behavior will reflect various forms of socioeconomic organization. That is, some modes of "group" organization and mutual assistance continue to persist and provide the context for much of the rural water sector. For example, since the technology of a water point brings with it costs of operation, the availability of groups which the manager or user can rely on for assistance—particularly, the household, relatives or neighbors—will help determine whether or not and to what extent it is feasible to share the costs of developing and managing a water point rather than purchase water as the means of providing the household water supply desired (see Bailey, 1980). Nonetheless, the composition of these groupings can be variable. The individuals who coalesce around a

water point often change over time and in some cases may only have this single water source in common. Organized behavior around at water point is as likely to be ad hoc, with weak vertical and horizontal links to other forms of organization, as to have stability and strength over time.

The organizational base of the rural water sector definitely has been and is changing. As in the past, the locus of most activity concerning water operations remains the locality level. There the greatest number of water points are developed, used and managed privately by individuals and households often in association with relatives, neighbors, or at times more formally constituted groups. However, the nature of the locality is changing in many areas. Just as there are different physical and management types of water points, so too there are different types of localities and compound localities today.

One can no longer assume that a community is coterminous with a compound locality; that the compound locality consists of a village with its own lands and cattleposts; that each locality has a single, distinct land use, undisputed boundaries, and a highly seasonal population; or that this population represents all the members of the households identified with that locality. A narrative about water operations occurred historically in a compound locality consisting of a village with its lands and cattleposts would no longer describe all or even most of the important cases. In particular, the rise of localities with mixed and/or shared lands and cattleposts—a phenomenon which began before Independence, but has accelerated since—reflects an expansion of competing land and water point uses.

What such changes reflect is the fragmentation of the compound locality into increasingly autonomous localities, such as permanently settled lands areas, or, more important, into what could be termed "truncated" compound localities, such as the village which shares a mixed lands and cattlepost area with other villages, but which also exhibits strong seasonal population movements over the agricultural calendar. However, while the compound locality has become increasingly locality-specific in terms of its social and economic organization, other forms of organization have moved in different directions. The establishment of the post-Independence government and the associated breakdown of the chieftaincy has meant that some political/bureaucratic organization and authority has moved upwards to the national level.

Nonetheless, it is argued here that, as a general rule, this national political and bureaucratic organization has had only tangential effect on the local level. Where present-day government institutions have penetrated to these locality and compound locality levels, it has typically been in the form of provision of services, including the stationing of personnel. The primary example of this in the rural water sector is the

district council provision of village water supplies. It is quite clear that councils have met a felt need by providing many villages water in a fairly reliable and convenient fashion and probably with fewer problems to these users than are faced by people who attempt to get water from group-operated boreholes. In effect, the district council provision of village water supplies represents a case where government has probably provided a better service than could have been provided locally in many areas.

This, though, is of little moment in the overall functioning of the rural water sector at the locality and compound locality levels, especially if one shifts attention from the village to water activities at the lands and cattleposts. Government accounts for only a small portion of all rural water activities, most of which are still largely undertaken by people, singly or in groups. In fact, present-day government institutions, such as district councils, land boards and the Ministry of Agriculture, have been notably unable to mobilize local resources at the locality and compound locality levels for water development, management, and conflict settlement there. As noted above, where government has been successful in penetrating to the local level, its role has been almost exclusively one of provision and enablement. Government has created and, at times, financed, locality-based organizations, such as village development committees and dam groups, but has not been able to exert effective control over their resource and conflict management. Since these government-initiated, locality-based organizations are in themselves really responses to government initiatives, they frequently do not function in the manner the government would like.

This lack of effective control is explained only in part by the growth of dispersed human settlements more remote from the district centers than was the case before Independence. A number of main land boards, which by law and practice, have close links with the central government in the capital, act at times in ways not only similar to those of the traditional institutions they were meant to supercede, but also in direct contravention of central government policy.[2] Similarly, disputants may not abide by a

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[2]It should be clear by now that the problems associated with the establishment of post-Independence government institutions and those associated with the breakdown of older, chiefly ones are not reducible to a conflict of "modern" versus "traditional" institutions. As we have seen, custom persists in Botswana's water use and management. It exists in the form of many, though not all, older norms and shared perceptions which continue to govern much water-related behavior in the eastern communal areas. It exists in the modern guise of land board decision-making. The "traditional" vs. "modern" dichotomy remains empty for agriculture as well; "subsistence" arable production has long relied on outside wage remittances of family members and it is well known that some customary herds are managed much better than some so-called modern commercial ones. In Botswana, a rural/urban or center/periphery distinction may be more apposite than a traditional/modern one, since as we argue in this section, it is likely that tradition remains important because government institutions have yet to penetrate effectively to the local level.

main land board ruling, even though the dispute is located in or near the district center. To explain the lack of government penetration at the local level requires recourse to factors in addition to the problems of government accessibility to physically remote areas.[3] Analysis suggests four problem areas which account for the limits of bureaucratic/political penetration at the locality and compound locality levels.

The Central Problem of Managing Conflict Over Water and Land Resources in the Communal Areas. The lack of government presence at the locality and compound locality levels is most evident in the area of water conflict management. Yet, if one starts with what rural Batswana consider to be their major water problem in the communal areas, it is the difficulties they face not so much in developing or managing water resources as in managing this conflict caused by differential access to and control over these activities and resources. People complain about their neighbors being uncooperative in contributing assistance for the operation of a water point. Or others complain about the marauding "outsiders" and about how difficult it is to get compensation for crop damage, etc. At all levels there is a conflict over the use and management of tribal land and water resources in many areas of eastern Botswana.

A significant portion of this confict can be credited to population increase in the midst of the accelerated fragmentation of the political and social links that connected localities within the traditional compound locality centered around a village. While the pressure to maintain a balance between private and communal water rights has expanded along with this population growth, the customary means for maintaining such a balance has increasingly become subject to change. Today, as in the past, the forum of first resort for most water disputes remains the informal social arbitration among members of the households involved, their neighbors, and/or relatives. However, in the past if such negotiations had failed, the dispute would have moved upward (and outward, if it were a lands or cattlepost dispute) to the village wardhead, headman and, if necessary, to the paramount chief.

While headmen and wardheads often retain considerable influence in their villages, their customary control over political, social and economic events in the villages' "associated" lands and cattleposts is no longer evident in a number of areas. Today, disputants living in areas having mixed and shared land uses may no longer have a traditional authority in common. Moreover, not only are there more rural people now competing for finite land and water resources, but, at every turn, rural dwellers are faced with an expanding battery of government agencies and wealthier farmers making new land use claims to areas where older customary rights often already exist.

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[3]Other observers have noted a similar lack of government penetration. See, for example, Zufferey (1981) and Grant (1982).

The declining resource base within many localities has also increased the probability of inter-locality encroachment and "raiding" of another locality's water and land resources. The forces of seasonal mobility, still strong in eastern Botswana, not only cause conflict (as in the case of the predatory use by outsiders of a locality's water supply), but also make it difficult to settle such conflict (i.e., the offenders who do not reside in the locality may not attend customary court or land board meetings because of "late notice" or "unavoidable delays"). Social norms governing land and water use, which are still quite vital in a number of areas, have often become divorced from the older political, social, economic and spatial context which served as their original rationale.

Similarly, a number of rural households are no longer the cohesive socioeconomic units their predecessors were. In short, while there remains a structure of social control over water conflict at the local level in the form of households and a persisting set of shared norms and perceptions governing water use and management, this structure has become less effective in handling many of the broader water and land conflicts which are part of current spatial and economic organization of many localities, particularly where the older means of political and social control over resource conflict have declined at the compound locality and locality levels.

While some government officials have glimpsed the reality of this, as it were, "hollow middle" in the locality and compound locality, government attempts to intervene in this area of conflict settlement have been few, haphazard, and largely unhelpful. For example, the Terms of Agreement for dam groups are meaningless not just because some of its conditions are irrelevant, but because there is a total absence of conditions most salient to group management of water resources in eastern Botswana: a procedure for settling disputes among group members and between members and non-members. The all-too-frequent government response has been to proceed as if conflict could be minimized either by designing groups in such a way that members have common, "unarguable" interests or by demanding sanctions to discourage any conflict from arising. This approach has been reinforced by government's preoccupation with the development and management of individual water points, even though water use, management and conflict in eastern communal areas typically arise within a system of water points. For example, the unapproved use by outsiders of a locality's dam is not just a problem associated with the management of that dam per se, but more important it increases the difficulty for each locality resident who uses the dam in order to achieve a reliable household water supply while residing in the locality.

It is true that some land boards have played a useful role in dispute settlement involving land and water matters in some areas, but on the whole their jurisdiction is limited, their proceedings often slow, their ability (and even willingness) to enforce their rulings practically non-existent in some cases, and since they are located in the district and sub-district centers, they are not readily accessible to residents of many small villages, lands and cattleposts. More important, land boards have been notably unable to deal with inter-locality disputes that result from the introduction of a new land use or outsiders into a locality. Land boards (through their members) also have the well-earned reputation of being disputants in, rather than arbitrators of, such inter-locality conflicts.

This last point underscores the very difficult problem government agencies in general have in perceiving the true nature of water and land conflict in eastern Botswana. Land board minutes contain a large number of land and water disputes involving tribespeople which the land board has been asked to adjudicate. The evidence suggests that such disputes are rarely, if ever, just between individuals. A customary court case at kgotla over a cultivator's complaint about crop damage to his or her field caused by a cattle owner's herd can and often does represent at the same time three levels of conflict: a conflict between individuals; a conflict over competing land uses within a locality; and a conflict resulting from inter-locality population movements (or lack thereof in the case of permanently settled lands residents).

In the lands and cattlepost areas of eastern Botswana, a resource dispute or conflict almost automatically has more than one location, both because a field and a herd have their economic and social roles defined in terms of the locality or compound locality and because the social and political modes of dispute settlement—the family, neighbors, relatives, village kgotla or land board—typically operate, if at all now, at the locality or compound locality level.[4] Yet a number of government officials seem intent on reducing water resource disputes solely to the individual disputant level, thereby drastically simplifying the spatial hierarchy of local-level water use and management evident in the rural water sector.

Unfortunately, this government distortion is often extended to all major rural water activities. Where government sees individuals—individual water points, individual herders in a tragedy of the commons, individual members of groups, individual disputants—rural dwellers only see a system of use at water points, herders often

[4]Even in the case of a crop damage dispute between two permanently settled lands residents in the same locality, the fact that there is rarely a traditional village headman to settle such a dispute and this makes appeals to the land boards more probable, confirms the dispute's compound locality context.

sharing common resource norms and perceptions, group members who have variable social and economic links with other locality residents, and resource conflict so pervasive that settling a dispute between individuals really solves only part of the problem. That such government distortions have caused their own resource conflict is hardly surprising.

The Problem of Institutional Biases. The absence of effective government involvement in the area of resource conflict management is but one example of how government's profound misunderstanding of the rural water sector has gone hand-in-hand with its ineffectiveness in mobilizing local-level resources in that sector. There are other examples which deserve comment. The tendency of some government officials to seek to reduce the water sector to a simple summing of its hypothesized individual components is probably motivated by the very goals of their organizations. Organizations as diverse as district land boards and the Ministry of Agriculture have translated their goals and objectives into a set of conventional wisdoms, constraints on bureaucratic behavior, and organizational procedures which have biased officials' perceptions about the rural water sector and militated against their more effective involvement there. These institutional biases not only reinforce the conventional wisdom of atomized rural water use and management, but also work to isolate the organization from the real operations of the sector and at the same time insulate it from criticisms for not being more involved. As a consequence, selective inattention, distortion, and biased feedback are the hallmark of much government intervention in and perception of the rural water sector.

Some institutional biases directly reinforce the tendency of some government organizations to reduce discussions of rural water operations to the use and management of individual water points. A particularly widespread conventional wisdom in government circles (and one certainly not limited to the Ministries of Agriculture and of Local Government and Lands) is the practice of viewing hardveld water needs within a sandveld frame of reference. In this view, water point alternatives are few and far between in the countryside, as the provision of a reliable household water supply is equated with the provision of a reliable water point. The conclusion—that more reliable water points are needed and should be constructed by government—entirely ignores the fallback water point strategy of households and the important role of rainy season water supplies for rural dwellers, particularly during the cropping season in eastern Botswana. To hold this conventional wisdom is to see rural Batswana imprisoned like flies in the amber of an endless dry season relieved only by the occasional shower.

Other institutional biases work in more complex ways. The panoply of organizational goals, constraints and conventional wisdom is used by officials to justify organizational claims to part of the rural water sector and to defend their subsequent behavior there. Comprehending and assisting a system of rural water use and management can be quite remote from the minds of such officials. For example, the division of responsibility between the Ministry of Agriculture, which sees its major water mandate as the provision of stockwatering sources, and the Ministry of Local Government and Lands, which sees itself as not having sufficient resources to develop and maintain even domestic village water supplies, has created a blind spot in government perceptions of rural water needs. Few officials in either Ministry see their mandate as the provision of reliable domestic water supplies in agricultural areas. As a result, the majority of rural dwellers go without government assistance in meeting what they increasingly feel to be a major water need.

As noted in Chapter IV, the Ministry of Agriculture is acutely sensitive to charges that its projects have led to overstocking and overgrazing. In fact, one of its ostensible goals is to reverse such perceived overutilization in communal areas. In an effort to protect themselves against such charges, it is not surprising that some Ministry officials have been willing to question the dam building program and believe the worst about it, at times only on the basis of extrapolating to all Ministry dams occasional reports of dry-season overstocking at some dams. Certainly a good number of these dams are being used and managed in a fashion consistent with original government objectives.

Land boards, in turn, have also periodically been under considerable central government pressure to ensure that their water point allocations do not lead to overstocking and overgrazing of the tribal land they are statutorily responsible to safeguard. As a result, when actually charged with contributing to such overutilization, land boards are quick to appeal to technical factors, such as an area's carrying capacity, which is said to permit a spacing of watering points closer than eight kilometers in some areas. All the while, what the land board is really doing is making communal land and water claims on tribal land which many rural dwellers still believe does not "belong" to the land board in the first place.

It should be noted that in theory no government organization at any locational level is immune from developing such biases. The literature on organizations is full of cases of institutions and officials seeking to ensure their own survival and continuance, regardless of whether or not the original organizational mission has been fulfilled. In practice, however, government-initiated organizations operating at the locality and compound locality levels much less frequently exhibit such biases. Such local-level

organizations as dam groups and village development committees often have such a seasonal, if not even more intermittent, existence and membership so that it is difficult to speak of institutionalizing anything. Moreover, as noted above, such locality-based groups often act more as local-level responses to government initiatives than as direct appendages of a large bureaucratic/political structure. This raises the question as to what extent, if at all, any bureaucratic/political concerns manifested at the national and district government levels are reproduced in the socioeconomic and political structure of interests at the local level, a point to which we now turn.

The Narrow Limits of Government Intervention. It is common to hear talk in Botswana about how the interests of the larger cattleholder and wealthier farmer dominate decision-making not only in the bureaucratic and political structure of government, but also in many local organizations operating in the rural water sector.[5] That this should be the case is not surprising given that rural Botswana is largely a livestock-based economy having a highly skewed distribution of cattle holdings. According to several large-scale surveys in the country, some 35 to 45 percent of the rural households do not own or hold cattle, while, of those who do, some 10 percent account for 40 to 50 percent of the national herd (Bailey, 1982: 72-75). Thus, according to one view, the lack of a more pervasive government penetration into local-level livestock water management and conflict settlement derives less from a government inability to penetrate than from its seeing no need to intervene where the interests of the larger cattle holders and farmers already are served without too much difficulty.[6] In such a view, the government role becomes limited to ensuring that services are provided locally which advance these class interests (e.g., bank loans to borehole owners) and that when there is a dispute between one or more of the large holders and poorer households in the area, this conflict is settled in favor of the former's interests (as land boards have increasingly been accused of doing when "protecting" the grazing rights of large holders against "encroachment" by smallholders and cultivators).

This last comment raises an even more obvious, yet telling, point about the existing limits of government intervention in the rural water sector. As noted above,

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[5]For more details, see Picard (1980) on the formulation of TGLP; Comaroff (1980) on the operation of the Rolong Land Board; Peters (undated) on the membership and activities of borehole syndicates in Kgatleng District; and Willett (1981) on the membership and activities of some livestock management groups.

[6]It should also be noted that the recent mineral-led nature of Botswana's national economy has reduced bureaucratic reliance on local-level individual production to a minimum. This, in turn, reduced the immediate need for government penetration to the local level.

land board dispute settlements are often not comprehensive enough to deal with the larger locality and compound locality land use questions which set the context in which individual disputes occur in the rural water sector. Land board dispute settlements, in other words, often do not really work: a land board ruling in favor of the richer disputant does not solve the land and water pressures that forced the poorer disputants into conflict. A land board ruling in favor of the poorer party will likely be undermined by the persisting economic power of the richer disputant. It is sometimes said that this problem really reflects the land board's lack of ability and/or willingness to enforce its rulings, and, indeed, recommendations for increasing land board enforcement powers are common. Yet more effective enforcement of land board rulings will only really "settle" these disputes when the rulings directly ameliorate the structural causes of the conflict at the locality and/or compound locality level.

Moreover, some land board settlements now have the quality of taking from one party in order to give something to the other party in a dispute. More and more, extensively practiced arable and livestock production are perceived to be in conflict with each other, so that a land board ruling can actually exacerbate the broader locality and compound locality land use conflicts, e.g., as when a land board permits private borehole drilling in an area which serves as wet season pasture for smallholders. Thus, and this is the most important point, even if land boards ceased to deal with water disputes on an individual level, but rather would see them within the broader framework of the spatial hierarchy of use and management, they still might be unable to provide solutions to these broader land use issues. Land boards do not have the statutory power to undertake programs, say, for the intensification of livestock production or the creation of new off-farm employment. In addition, such programs are most difficult to undertake in rural areas, whatever their implementation agency. And even if such programs could be implemented, there is no surety that the same class interests leading to the land use conflicts would not be reproduced in these new productive activities, thereby solving nothing.

Some government officials think they have solutions, though. In fact, the audacity of some of these officers who believe that they can erase years of socioeconomic acculturation by mere bureaucratic fiat and project investment is truly astonishing at times. As seen from the discussion of the Ministry of Agriculture's dam building program, it is precisely the fact that it was government, and not a private individual, which built these dams that ensures the restrictive membership clause in the Terms of Agreement will <u>not</u> be followed. No piece of paper can cancel out the norm that government dams are communal water sources. Ironically, government may be in

the worst position to ensure that its water points are managed in a certain fashion, simply because it is the developer of the water source in question. This inability to over-ride persisting traditional beliefs is just one more indication of government's overall ineffectiveness in mobilizing local-level resources.

Defining Participation

We have described the many ways people are involved in the rural water sector—as users, as managers, as members of government institutions and so on. It would not be unreasonable to describe these activities as "participation in the water sector" as indeed they are. But unfortunately the tendency has been to use "participation" as a word stripped of half its meaning. From the viewpoint of government, participation is usually taken to mean the concurrence of local people in some government action or their agreement to undertake some task which the government deems necessary. Rarely from the viewpoint of higher authority does participation include the participants' option to say "no." That is, participation is seen as a means of getting done what higher authority wishes. Yet, participants who are actors rather than tools show a rather disconcerting tendency to say "no" and to attempt to maintain for themselves control over the resource or program in question. Further, when participants from different sectors or places are involved, there is no particular reason to assume there will be harmony of interests across institutions or localities. Hence, participatory strategies are likely to be affected by conflicts in expectations and interests.

The case studies above have shown that all manner of people are very active participants in the rural water sector. They have also shown that when participation has taken a form which runs contrary to government dicta, the tendency has been for government to define such actions as non-participation. We hope the lesson learned from these studies is what such "negative participation" is often rational and that any strategy of resource management involving local participation must accept the full spectrum of participatory actions.

The Special Problem of Accountability. So far we have discussed government penetration in the local-level rural water sector in terms of water development, management and conflict settlement. The form of these activities deserves special comment as well: the government policy is to consult with local residents, especially when the issue concerns the development in their area of water services and facilities.

Kgosi ke kgosi ka batho ("the chief is the chief by the people"). This oft-quoted Tswana proverb embodies the Batswana ideal that their chiefs should consult with tribespeople on important matters affecting the tribe, and decisions on these matters

should reflect a consensus of the people. Chiefly behavior often fell far short of this ideal, but it did legitimize the people's right to call chiefs to account for their actions on important matters.

The present government has carried on this tradition of local consultation through addressing kgotla meetings. The Daily News is full of reports of central and local government politicians and officials addressing such meetings about development issues.[7] While some meetings serve no purpose other than publicizing the ruling party's record, much government consultation is motivated by a genuine official concern to ascertain local opinion and identify local needs. There is the awareness in the local government bureaucracy and the Ministry of Agriculture that if their officials do not consult with the locality's residents about the construction and placement of a government water point, these officials are subject to legitimate criticism.

What is striking, however, about much of this consultation between government and local residents is that it largely occurs when government wants it. Most officials perceive themselves as not being directly accountable to the local level and therefore feel little or no obligation to accommodate local-level concerns unless directed to do so by their superiors in government. This lack of a sense of accountability and advocacy is no better expressed than by the number of locally-elected district councillors and members of parliament who only periodically, if ever, attempt to consult with their constituents. At times one has the impression that the bureaucracy is expected to consult the public on behalf of elected politicians (another reason why bureaucratic and political actors are so closely aligned at times). In a number of areas, the political parties have penetrated to the local level even less than the bureaucracy; where party affiliation does appear there, it is not uncommon to find it projected along older tribal and sub-tribal lines.

This lack of effective accountability by officials and politicians to the local level really poses a set of different problems. In the first place, the preoccupation of consultation in the past has been with the development of infrastructure projects which everybody seemed to want (or, in some cases, no one seemed to be against), i.e., more reliable domestic and livestock watering supplies. Once this infrastructure has been provided (and partly as a consequence), the broader land use issues become more salient, but these are much less tractable to solution, as noted above. To consult on problems which have no ready bureaucratic/political answers is understandably a practice politicians and officials are reluctant to undertake. In addition, there are

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[7] Although recently the President denied any obligation to account to the people for his actions. See Daily News, March 1982.

some localities in which residents will not seek a change in land use until government takes the lead in intervening to establish this change.

This last point brings us back to kgosi ke kgosi ka batho, the achievement of which in present day is at the heart of the accountability problem in many rural areas. The search for the ideal "kgosi" motivates a number of Ministry training courses and seminars at the local level. If only government could identify or train group chairpersons or headmen to have these exemplary leadership qualities—a commitment to consult, to act as a catalyst for local-level aspirations and to mobilize resources to meet these needs, to be an effective liaison between the local level and government—if only. . . The evidence suggests that rather than search solely for this sensitive "kgosi," government would do better to begin by identifying just who and where the "batho" are today. The fragmentation of the compound locality has meant that there may no longer be followers for a leader to mobilize. This is not just because household activities have become more locality-specific. The role that people once had of being led by and in turn, leading their chief is no longer salient to many of their lives. Today there are no "people" tied together by a pattern of political, social, economic and spatial relationships which could legitimate leadership, government or traditional, at the compound locality level in a number of eastern communal areas. Today, there is no center to hold.

Thus, efforts to increase government accountability to the local level must rest on a conception of both how that local is organized and how it ought to be organized. Ironically, making government more relevant to the needs and desires of the people may mean nothing less than the present government facilitating the creation of communities out of localities for the regulation of their land and water resources. Government becomes more accountable by virtue of the local level becoming more the basis for governing. There are various programs which might improve the local management of water and land resources. We have discussed a number of these in Appendix 5 (pages 000-000). None, however, may be as important as the need to negotiate a new level and scale of government in the countryside. Whether or not this challenge will be recognized and if so, who will organize to meet it, remains very much an open question.

As we have said, natural resource management in a setting like Botswana's is and will remain to a major extent, local management, through some combination of individual and collective effort, formal and/or informal, voluntary and/or sanctioned. The major concern which emerges from our analysis is whether institutional chemicals can be created, preserved or adapted in the midst of changing ecological and

demographic pressures to give rural Batswana as well as their national leaders a capacity to balance private and group interests over both the short-run and long-term. Devising and utilizing such institutions at the local level, with complementary national institutions, will require considerable departure from present understandings and attitudes.

EPILOGUE

Mma Tiro rises early in the morning to fetch water from the sand river well. Her feet, with soles as thick as moccasins, don't feel the burrs along the winding dirt path to the river. Some distant clouds, but no wind today.

She removes a few of the encircling thornbushes put to protect the shallow well from livestock. She has to deepen the pit this morning to get the water to filter through the damp sand. The rains have been scattered poorly across the area of the river this year and, indeed, she will have to deepen the pit many more times before leaving the lands. Yet her field is doing well, having gotten what rains there were. There will be at least enough food for those at the lands. The melons would be ready soon.

Because Mma Tiro occasionally needs more water in order to wash or cook or repair the mud wall of the hut, her son bicycles from time to time to a deeper open well where he can fill their plastic container. Some other families are in a better position and can cart drums of water to their dwellings or pay to have this done for them. But things are not easy at the lands. Especially this year. The cattle were already watering at the open wells. The poor rains had all but taken away the grazing.

The people in the area would like more convenient and reliable water sources instead of having to rely just on the river, their haffirs, or the distant open wells for domestic and livestock water. It would be better if government drilled a borehole like the one in the village. The men had once talked of coming together and asking government to build a dam at the lands as big as the one that had been built that side by the late chief. Some money had even been collected, the Agricultural Demonstration had addressed them twice in the village kgotla, but nothing ever came of it. Anyway, it was always more difficult to cooperate at the lands. In good years, people were busy plowing and protecting the crops; in bad years, there were fewer around to work and get things done together.

You can see her there, in the distance, with a bucket of water on her head, walking back to her home. Her figure shimmers in the heat. The sun slips high above a thorntree and scarcely a shadow is cast anywhere.

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The land board chairman looks wearily at the District Officer (Lands). The DO(L), who thought the chairman always looked stoic, presses his point: "Allowing the drilling

of private livestock boreholes in the communal areas will only encourage the larger stockholders to remain there. Who else can afford to drill? Yet central government policy is to get these large cattle owners out and into the commercial areas. Not only that, but the TGLP White Paper goes one step further. Each land board is expected to set limits on the number of livestock which any individual or family can hold in the communal areas so as to ensure that communal land isn't monopolized by a few people. . ." All the while, the land board secretary is trying to translate.

The DO(L) turns to make his case to the other land board members. "I know that setting stocking limits is politically sensitive, especially in a drought year. . ." The land board secretary is finding it increasingly difficult to interpret and keeps interrupting with "What? What?" Finally, the DO(L) gives up and tries to summarize: "Look, it comes down to this. If you don't restrict borehole drilling and set household stock limits, then people are going to continue to overstock. If people overstock, there won't be any good land left. If there isn't any good land left, then you'll be breaking your own law which says you must protect the land for future generations."

After a day-long discussion and debate, the DO(L) leaves the meeting feeling tired but successful. The land board has adopted a new policy. From now on, they won't just space a new water point eight kilometers apart from others, they will also set a limit on the number of cattle the land board would permit at each new point. At least, he thinks the land board has agreed to compromise on the issue.

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"Oh, hell," he sighs, sitting back into his chair. Rubbing the headache just under his forehead, he again props his elbows on the desk and re-reads the stapled set of figures. According to MLGL, drought relief food stores are at their lowest since the last drought. Ministry of Health surveillance of school children indicates widespread malnutrition. His own Ministry's crop production and yield estimates prophesy little or no sorghum harvest for all regions of the country.

Drought. Drought on all sides. And on top of it all, the attached note today from the Perm. Sec. "Want that proj. memo. for livestock relief boreholes now. Cabinet meeting next Monday." And, of course, it is Friday night and, of course, it is still a bloody oven outside and, of course, he has nothing better to do than stay in the office and write. . .

"Due to the widespread incidence of drought, the Ministry of Agriculture requests funds for the urgent drilling of emergency relief boreholes for livestock watering purposes. . ."

. . .and, of course, they don't see that a drought's just what they need to kill off all the excess cattle. . .

"The sinking of 50 new boreholes is proposed, with special emphasis on drilling in the more remote regions of the sandveld. . ."

Sink more boreholes! That way they'll be sure to end up with not a blade of grass anywhere. Just look at the hardveld now. . .

"The National Development Bank will provide subsidized loans to livestock owners, preferably to those applying in groups, who wish to purchase these points after the drought. Purchase, however, will be contingent on the borrowers agreeing to stringent stock controls. . ."

Stock "controls"? That's a laugh. They've never controlled stock numbers before, so why should they begin now?

Outside, the Ministry's guard sits talking with a friend in the dark, just beyond the lone shaft of light streaming from the office window. They pause a moment and look at the strange man working within.

Appendix 1

ECOLOGICAL AND SEASONAL FACTORS IN BOTSWANA AGRICULTURE: A REVIEW OF THE LITERATURE

The Ecological Dimension: Hardveld and Sandveld Ecologies Are Different[1]

Studies which differentiate ecological zones in Botswana generally agree on the distinction between the western (Kgalagadi) sandveld and the eastern hardveld (see Gulbrandsen, 1980: 4-5; McGowan and Associates, 1979; Rigby, 1980). While in a broad sense, rainfall and soil fertility are poorer in the sandveld than in the hardveld, the sandveld is "not a vast, undifferentiated sandy plain covered with low tree and shrub savanna; rather, it is a mosaic of different soil and vegetation types which often vary greatly from place to place" (Hitchcock, 1980: 2). Because of the highly localized nature of rainfall overall of Botswana, it is also possible for a locality in the hardveld to be completely without rainfall in a year while another locality in the sandveld is well watered during the same period.

This broad ecological classification between the hardveld and sandveld does, however, coincide with a demographic one. Approximately 80 percent of the human population and 50 percent of the country's cattle are located in the eastern hardveld (McGowan and Associates, 1979: Vol. II, Annex 2; Colclough and McCarthy, 1980). The hardveld probably accounts for the vast majority of the country's major crop production (see Rigby, 1980: Table 1; Litschauer and Kelly, 1981). In addition, while the sandveld and hardveld apparently have some areas of comparable carrying capacity, stocking rates appear to be much higher in many areas of the hardveld (Field, 1978; McGowan and Associates, 1979: Annex 3).[2] There may be other substantial differences in the distribution of agricultural production between ecological zones, as witnessed by higher average livestock holdings in some sandveld areas (Vierich and Sheppard, 1980).

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[1]The following section is limited only to a comparison of eastern and western areas in Botswana. Because of the lack of comparable data on domestic and livestock water usage, the Okavango/Chobe area of northern Botswana will not be discussed. This northern region probably has no more than 15 percent of the total cattle and agricultural households in the country (McGowan and Associates, 1979: Annex 2; McDonald, undated: 2; Singh and Kelly, undated: Tables 4, 12). Figure I-1 shows roughly the division between the western sandveld and the eastern hardveld.

[2]Forage conditions vary considerably within the hardveld as well; the northern hardveld ("mopane veld") commonly has poorer grass quality than do the south and central hardvelds (McGowan and Associates, 1979; Field, 1978; Fortmann and Roe, 1981: Chapter IV).

It is water point utilization, however, which best illustrates the substantial ecological and economic differences between many areas of the hardveld and the sandveld. While the available information is scant, it suggests three broad differences:

The Importance of Seasonally-Flowing Rivers in the Hardveld. The combination of generally greater rainfall, hillier terrain, more runoff and better groundwater wecharge in eastern Botswana has produced one of the major differences in water use: in contrast to sandveld, a number of seasonally flowing-rivers etch the hardveld and contribute substantially to rural surface and groundwater use there.[3] Roughly 23 percent of the water points used by Water Point Survey sample households at the village, lands and cattleposts are attributed to the surface water and shallow well water of rivers (see Tables in Annex to Chapter II). Rivers and sand river wells accounted for some 10 percent of all the water points mapped in the twelve survey sites. Moreover, 22 percent of the estimated monthly cattle water usage at water sources used by respondents in the twelve Survey sites was at rivers and sand river wells, as compared to 26 percent for boreholes between April, 1979 and March, 1980 (Bailey, 1980: 43ff).[4] While there are some fossil rivers in the sandveld, it is doubtful that, except for a few localities, rivers have as important a role in water use there.[5]

Not only do rainfall, runoff and topography lead to river formation, but when overutilization of the land is added into this equation in the east, a higher incidence of sheet erosion and gully formation becomes another factor affecting water utilization and land use in the hardveld (Rigby, 1980: 23-24). Little research material, however, exists on this important topic.

Sandveld Boreholes Versus Hardveld Water Point Variety. Approximately 15 percent of the water points mapped in the Water Points Survey's twelve eastern sites and 14 percent of those used by the Survey's sample households were boreholes, as compared to roughly 83 percent of the water points mapped in the western sandveld of the Central District (Annex Tables, Chapter II; Hitchcock, 1978: Volume 1, p. 153;

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[3]See Report on Village Studies, 1972: 195; Moshupa Catchment Survey, undated: Table 4.1; Kweneng Resource Survey, 1972: 81; Odell, 1980: 67; and Rural Sociology Unit, 1977, unpublished data. For comparative rainfall, runoff and recharge figures, see: UNDP/FAO, 1972: 1-3; Pike, 1971: 15-25; Jennings, 1974: 65, 125.

[4]See Bailey (1980) for the methodology used in extrapolating monthly cattle usage by water point type on the basis of figures given by Survey sample households of their herd numbers watered at individual water points on a month-by-month basis.

[5]Hitchcock (forthcoming) discusses one sandveld area where a river does have a major role.

Fortmann and Roe, 1981: Appendix B). While comparable figures do not exist for this sandveld area, it is probable that considerably more than 26 percent of its monthly cattle water use there was at boreholes (see the Bailey figures above for the hardveld). Similarly, it appears that many sandveld livestock boreholes water substantially more cattle than the typical livestock borehole in the east. Average counts for daily livestock watering at monitored boreholes in the Water Points Survey were around 170 LSU (livestock units) per day, while in the sandveld figures of 300-500 cattle watering at boreholes are apparently not uncommon (Kramer and Odell, 1979: 12; also Hitchcock, 1978: Volume 1, pp. 276-278).

Although boreholes commonly dominate household domestic and livestock water use in the sandveld, a wide variety of physical and management types of water sources is found in much of the eastern communal area water use, a finding confirmed by a number of past surveys in Botswana.[6] For example, surface water sources such as dams, haffir-dams and haffirs account for some 35 percent of all the water points mapped in the eastern communal areas of Water Points Survey, while Hitchcock, Kramer, and Odell scarcely note any such sources in the sandveld areas they surveyed. Similarly, 20 percent of the water points mapped in the Water Points Survey sites were open wells as compared to 10 percent in Central District's western sandveld (Hitchcock, 1978: Volume 1, p. 153; Attachment Tables, Chapter II; Fortmann and Roe, 1981: Appendix B).

Differences in water point ownership patterns between the hardveld and the sandveld also seem to be present, with the east apparently having a greater percentage of communally-held and natural water points in use and fewer private ones as shown in Table A-1. In fact, slightly over a third of the estimated monthly cattle water usage at points such as those used by respondents in the Water Points Survey was at natural and communally-held water points (Bailey, 1980: 43ff).

Differences in Fallback Systems. In both the hardveld and the sandveld, there is a similar pattern of wet season dispersal and dry season concentration of livestock, along with the more specific drought response of many livestock holders resettling themselves and their livestock at their major village of allegiance (see Vierich, 1979; Gulbrandsen, 1980: 196-197; Willett, 1981: Chapter 14). There are, however, at least three basic

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[6] See Odell, 1980: 67; Opschoor, 1980: 37; Report on Village Studies, 1972: 195; Moshupa Catchment Survey, undated: Table 4-1; Kweneng Resource Survey, 1972: 81-83; Pelotshetlha Survey/Rural Sociology Unit, 1975: 5; unpublished data in the Rural Sociology Unit from surveys at Shoshong, Tlhabala, Tsetsejwe and Losilakgokong.

Table A-1:

Comparison of Sandveld and Hardveld Ownership of Water Points

	Western Sandveld Central District	Water Points Survey 12 Eastern Sites
Private	86%	58%
Council/Government	4	9
Syndicate/Group	2	3
Communal/Natural	2	25
Others/Unknown	6	5
	100%	100%

Source: Based on mapped water points for Hitchcock (1978: Volume 1, 1978, p. 181) and the Water Points Survey (Fortmann and Roe, 1981: Table 13).

differences between hardveld and sandveld fallback systems.[7] In the first place, because of the variety of water points in the east, fallback strategies there appear to include more types of water points than in the sandveld. Second, village settlement is more closely associated with cattle watering boreholes and wells in the sandveld than in many hardveld settlements.

Some of the sandveld literature suggests that people and their cattle move back into their villages to take advantage of the permanent water there during the period between the drying up of ephemeral water sources in the grazing areas and the completion of harvesting their sandveld lands. While such a pattern can be found for hardveld villages and certainly existed in the past, many eastern villages no longer support large cattle watering and grazing populations, except during drought. Third, some hunting and gathering groups in the Kgalagadi effectively reverse the wet season/dry season fallback strategy: they concentrate around several natural watering holes in the wet season and are forced to forage farther outward or migrate to new areas in the dry season (Silberbauer, 1972: 294-304; Tanaka, 1976: 99-116). It should be noted that a household's fallback strategy may incorporate both hardveld and sandveld localities, e.g., Henderson found that some Batswana cattle-holders move from eastern to Kgalagadi grazing areas in the dry season in search of better range (undated, Chapter 8).

[7] Chapter II provides a fuller description of household fallback water point strategies.

The Seasonal Dimension: Cyclical Factors Affecting Production and Settlement in the Eastern Communal Areas

Some Preliminary Qualifications. Much of the information on the socioeconomic activities of rural households in Botswana comes both from point-in-time sample surveys in villages, regions or the country as a whole and from more in-depth—largely anthropological—studies of household activities over time in specific localities.[8] A recurring theme in much of this literature has been the manifold problems of defining just what a household is and what activities it is involved in, particularly when describing crop and livestock production. While the all-too-common reaction has been to raise definitional problems only to drop them in the presentation of survey results, they must come to the fore in a monograph such as this which deals in part with the issue of local-level management of water and land resources. As will be shown below, one of the major reasons why it is difficult to specify what constitutes a household lies in the seasonal and cyclical nature of "its" activities.

Problems of Definition. To some extent the "household" is more a unit of convenience for survey researchers than a persisting, self-contained mode of organization in today's Tswana society and economy. Researchers have often taken separate and distinct living compounds (a set of huts surrounded by a common wall—malwapa, sing. lolwapa) as the basis for distinguishing individual households. In these circumstances members of a household are those who physically live or sleep in the compound on a regular basis. For the Water Points Survey, equating a household with the location of a distinct living compound was useful in describing many spatial differences in domestic and livestock water use patterns over a number of areas.

A problem, however, arises when this identification between household and compound becomes the basis for distinguishing and explaining major differences in agricultural and economic production. As Kerven has put it:

> The danger of mis-use of the term "household" under social and economic conditions such as in Botswana lies in the common assumption made that the [various] social and economic "household" functions are contained within single physical structures (malwapa). Botswana's population is known to move between nucleated permanent villages, lands, cattle posts, towns and mines in South Africa. This actually means that family members of a single lolwapa (the physical structure) may often be away in other places. However, the hidden assumption contained in the common usage of the term "household" is that this is composed of a group of people (family)

[8] Some researchers such as Gulbrandsen (1980) in southeastern Botswana have combined the two techniques to their best advantage.

> sharing the same dwelling space who are the major economic and social unit. In fact, many key members of a lolwapa may be absent for large parts of the year, and many critical social and economic functions necessary to the maintenance of the "household" may be carried out by family members living in other lolwapa, sometimes not even in the same geographical area. To sum up, the term "household" is often inadvertently interpreted as a static unit, tied to a physical place, in the form of a lolwapa. This static concept completely obscures the dynamic operations of familes in Botswana. (cited in Field, 1980: 104)

In addition, it is increasingly recognized that a variety of cropping and herding reciprocities exist among malwapa which require one to distinguish between the household's unit of production and the household's unit of consumption (Cooper, 1980: 61; Gulbrandsen, 1980: 18-19).[9] Those who produce the household's crops and those who consume those crops can include quite different sets of people. The Ministry of Agriculture has been especially plagued by definitional problems associated with enumerating agricultural producers. An increasingly sophisticated set of criteria to distinguish which households were "agricultural holders" and, more recently which were "farms," led to the anomalous situation of the 1980 Botswana Agricultural Statistics providing figures on "traditional chicken farms," when it is very doubtful if anything like this exists in Tswana social reality. Both Kerven and Cooper have described in detail the multiple cash and labor linkages between rural and urban sectors, particularly male labor migrating out of the rural areas and remitting their cash back, so that it is difficult at times to separate the "traditional" and "modern" sectors in Botswana.

Definitional problems arise today even over describing what was once thought to be the most elementary distinction among living sites, dividing them into village, lands and cattleposts in rural Botswana. Reviewing some of the abundant survey literature on rural residential patterns since Independence, Cooper found that households moving among three dwelling places were a definite minority (Cooper, 1980: 14-16; see also Willett, 1981: Chapter 8). Households with only a single dwelling are not unknown and many other families often have only two places of residence—in the village and at the lands—with herds commonly being kept at the lands and mixed lands and cattleposts. Moreover, since permanent settlement of entire households (or some of their members) at the lands appears to be expanding in a number of areas in Botswana, it is increasingly difficult to determine whether a lands settlement is indeed not a small village (see

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[9] Neighbors and relatives often play an important role in contributing labor and other resources to a household when its members need help in plowing, weeding, herding or in undertaking other agricultural tasks (Mahoney, 1977; Almagor, 1980; Bailey, 1982: 287ff).

Fortmann and Roe, 1982). Finally, a number of grazing areas in eastern Botswana are shared and used by different localities, so that it is also very difficult to demarcate "natural" boundaries between such localities (Willett, 1981). These matters are discussed in more detail in Chapter I.[10]

Thus, while such terms as "household," "lands" and various measures of production are used throughout this study, the reader is advised that there are very real terminological and measurement difficulties associated with their usage. Since it is our belief that a number of these difficulties arise because cropping, livestock, and water use are seasonal and periodic, we will offer a reformulation taking these definitional difficulties into account following this section on seasonal factors.

Rainfall's Effect on Crops and Livestock. It is rainfall on which arable and livestock production in Botswana hinge. Surveys have overwhelmingly found the lack of rainfall to be perceived by rural Batswana as the single most important factor limiting crop production (Eding, undated; Litschauer and Kelly, 1981; Bailey, 1982: 284). Droughts--affecting the production of crops, livestock or both--recur with an unrelenting frequency (Roe, 1980; Sandford, 1977). At the time of this study's appearance, Botswana is suffering yet another devastating failure of the rains.

Aggregate agricultural production is roughly correlated with yearly rainfall levels. For example, the Ministry of Agriculture's Agricultural Statistics, 1977 shows that yearly sorghum and maize yields (kg/ha) and the levels of natural increase in the cattle

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[10] It deserves to be noted that there are also severe problems in measuring levels of production and consumption in the various agricultural activities. In terms of yield per unit of land, many studies, particularly point-in-time sample surveys, have relied on interviewee estimates of the number of bags of grain produced and number of hectares cultivated, even though household members may not know or have very different perceptions about what a "hectare" or "90 kg bag" is. Traditional units of plowed area, particularly the "Tswana acre" (ditema; sing. tema), do not readily convert into a standard hectarage unit, e.g., researchers have found that one tema was equivalent to 0.2, 0.25, and 0.4 hectares at various locations (Sheppard, 1979: 8; Vierich, 1979: 48; Field, 1980: 92; see also Lucas, 1979: 4). Even where hectarage plowed and harvested has been independently measured, as in the Ministry of Agriculture's 1980 Botswana Agricultural Statistics, the assignment of specific land areas to specific crops is no simple task, since fields are typically mixed cropped (Singh and Kelly, undated: 4, 68). In addition, many researchers and government officials admit that accurate figures for livestock holdings are difficult to elicit from households, as these holders are purportedly fearful that such figures will be used by tax officials. There may, however, be an independent check on the reliability of aggregate household estimates of cattle numbers. Information provided by Opschoor and others suggests that at the district and national level, calves seem to account for roughly 20 percent of the aggregated herds (Opschoor, 1980: 9-10; Bailey, 1982: 203; Singh and Kelly, undated). Where calves have been accurately measured, a "one-fifth" rule of thumb may be an appropriate basis for computing total herd size.

population rise and fall with annual rainfall levels (1978: 30, 40; see also Lightfoot, 1981: 5). Bailey (1982: 48), however, found no simple correlation between rainfall and aggregate national herd figures. This association becomes even more difficult to establish at the regional level (Jones, 1979). These difficulties not only reflect problems with estimating crop yields and herd numbers, but also illustrate the pre-eminent characteristic of rainfall in Botswana: its incidence is erratic and its distribution localized (McGowan and Associates, 1979: Annex 8; Sims, 1981).

While year-to-year variations are large (Sims, 1981: 6), long-term meteorological records from selected sites in eastern Botswana show the "typical" rainy season to fall between November and March, with maximum daily rainfall usually occurring between December and February (Sims, 1981: 6, 26; Van Der Poel, 1979: Table 2).

Rainfall and the Grass Growth Cycle. Changes in rainfall and forage conditions coincide. Figure A-1 illustrates the grass growth cycle found by the Ministry of Agriculture at one site in eastern Botswana, a curve similar to that found elsewhere as well by the Ministry (Animal Production Research Unit, 1980: 28). Note that grass growth peaks in February through April well after the beginning of a normal rainy season. Needless to say, the stocking rate and the period of sustained grazing will alter the growth curve. It should be noted that one of the apparent effects of the 1978/79 drought was to diminish the quality of grazing over a wide area of eastern Botswana to the extent that there were fewer forage quality differences between various physical and management types of livestock water points than were observed later in the 1979/80 wet season (Fortmann and Roe, 1981).

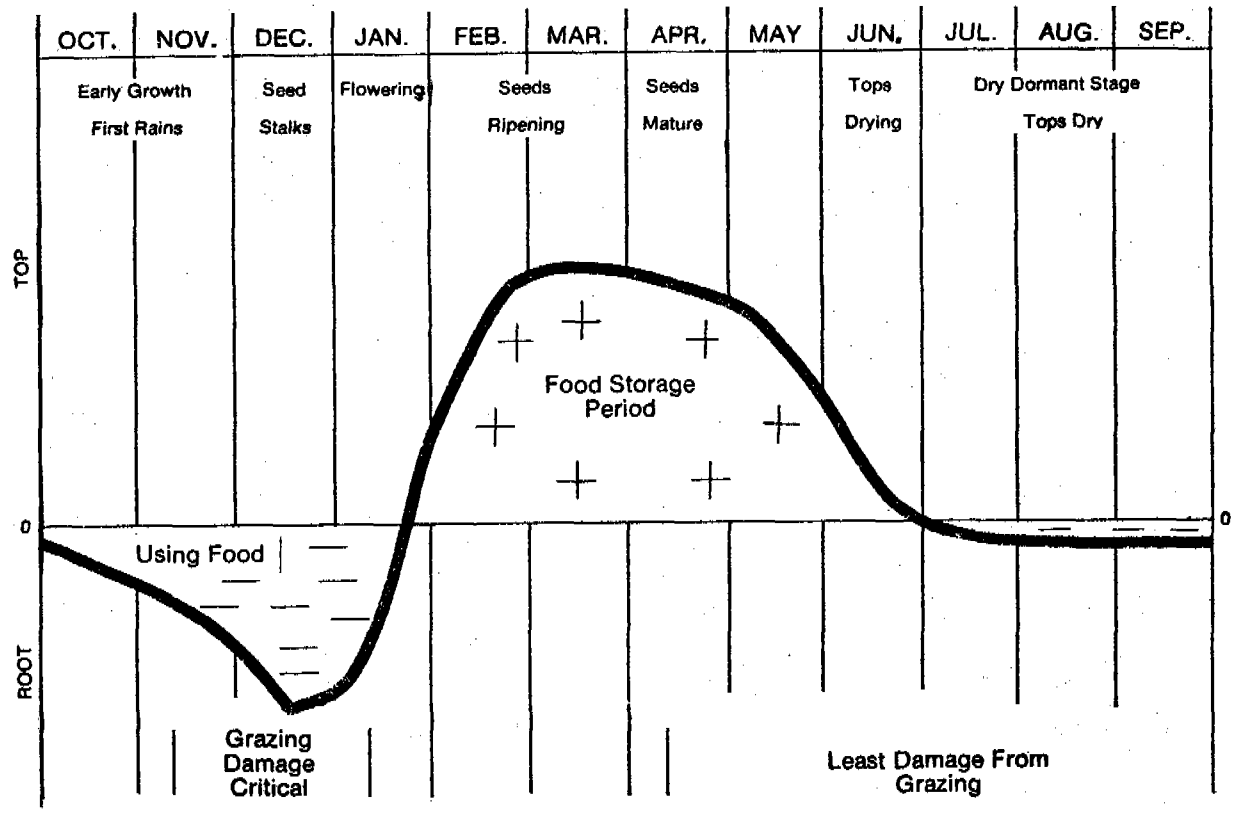
Some livestock owners respond to this change in grassland quality through seasonal herd movements. The Mbanderu of northern Botswana have in the past used wet season pastures and thereby allowed some dry season grazing areas to rest during the most important period of the year for grass growth (Almagor, 1980). In addition Bailey (1980) has detailed herd movements from wet season to dry season water points in eastern Botswana, a topic more fully discussed in Chapter II.

The supply of good grazing is especially important for cows and heifers prior to breeding, since weight gains are said to improve breeding performance (APRU, undated: 20). Similarly, grass deficiencies can be harmful to improved calving, lactation and calf life expectancy (APRU, 1980: 41; Sandford, 1977: B6). It is not known to what extent, if at all, communal-area livestock holders respond to such conditions in their herd management strategies.

Long-term vegetation cycles, which are profoundly affected by the alternation of good and poor rainfall years, are also important in Botswana's rangeland and cropland.

Figure A-1:

Grass Plant Growth Cycle, Gaborone, Botswana[11]



Some researchers have argued that overgrazing has caused a shift in species composition in some of the country's grassland (Zumer-Linder, 1976: 178ff; Alidi, 1979). In addition, Werbner notes that at least until recently some people in northeastern Botswana have associated a cropping field's fallow period with changes in its vegetation:

> Kalanga [an ethnic group] estimate a field's decline and its regeneration largely by vegetation indicators. They consider that it is in decline when it is rank with witch-weed and that it is in regeneration when it is rich in "thatching grass" (various species of Hyparrhenia). (1975: 98)

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[11] Adapted from L. Hendzel, Range Management Handbook for Botswana, Ministry of Agriculture 1981, p. 54, shown with the following proviso: "Very early or very late rains can hasten or postpone start of growth for a month or more" (p.53).

Seasonal and Cyclical Factors in Livestock Production.

(1) Calving. Bailey found that while cows calve throughout the year, "the bulk of the calving takes place during the summer rainy season from late September through mid-March, with the peak occurring in November! (Bailey, 1982: 233). This finding is consistent with other research results from Botswana (APRU, 1980: 41; Central Statistics Office, 1976: 41). Since calving is to a large extent cyclic, so is breeding and weaning (see Bailey, 1982: 236 and APRU, 1980: 39).

(2) Lactation and Milking. Milk is consumed within a number of rural households. A survey in one lands area in southeastern Botswana found that every cattle-owner there kept cows as a source of milk (Rural Sociology Unit, 1977: 10). Fifty-five percent of the 109 rural households sampled in a late 1970s study of two villages in Central District said they consumed milk daily throughout the year (Otzen et al., 1979: 139). Apparently milk is consumed by a number of rural households even during drought (Sheppard, 1979: 38), a finding consistent with there being some calving continuously through the year. However, there are rural localities where milk consumption is negligible (see Syson, 1971: 13).

While differing on the peak month, a number of studies agree that the bulk of milking takes place between January and April, roughly coinciding with the rainy and cropping season (Lipton, 1978: Vol. II, p. 15; Central Statistics Office, 1976: 40-41; APRU, 1980: 40; Willett, 1981: Chapter 12; Turner, undated). In particular, Syson found household milk consumption peaked in February-March during her 1970/71 Shoshong study, a two-month period roughly coinciding with the height of the grass growth cycle (1971: 12-13; see also Figure A-1).

Bailey has found that slightly more than one-fifth of the eastern herds sampled in the Water Points Survey are milk cows, a figure perhaps somewhat less than that of the national herd as a whole (Bailey, 1982: 203; McDonald, undated: 1). In addition, approximately one-fifth of the national and eastern herds are calves (see footnote 10). Thus, lactating cows represent a not inconsiderable grazing requirement.

(3) Cattle Condition. Intuitively, one expects that the condition of cattle would be better in the wet season than in the dry season, other things being equal. However, the effects of lactation on cows and plowing on oxen, along with the fact that the amount of available grass does not really reach a peak until around March in eastern Botswana, combine to produce a lag. Cattle condition is often better in the late wet/early dry season than in the late dry season/early wet season. For example, it has been reported that work done by the Animal Production Research Unit in Botswana on adult animal forage consumption "shows that throughout the year there is quite a

variation in actual dry matter intake, with levels in excess of 13 kg per day being attained in the wet season and down as low as 5.5 kg per day in the late dry season" (McGowan and Associates, 1979: Vol. II, Annex 3). In a year-long study of the Shoshong area in the early 1970s, Syson found that natural deaths of cattle, goats, and sheep there peaked in October and November "when the grazing was at its worst before the rains" (1971: 11). The Water Points Survey found that oxen condition was on average better between April-July, 1980 (that is, at the end of the wet season and beginning of the dry season) than between November, 1979 and March, 1980 (Fortmann and Roe, 1981: 107). A lingering effect of the 1978/79 drought on oxen condition may account for low scores even into March. This is better illustrated in Table A1-2, which shows monthly carcass weight (averaged with and without condemned livestock included) for the livestock marketing cooperatives at four of the Water Point Survey sites over a two-year period. Weights roughly went down after July and began to increase after January, though late wet season weights for Lentsweletau and Ntlhantlhe were lower in 1980 than in 1979.

It is sometimes said that the typically poor condition of livestock at the beginning of the cropping season accounts for the large size of some of the draft teams (at times involving twelve or more animals) used for plowing purposes (Sandford, 1980: 82; Bailey, 1982). However, the relationship of livestock condition to animal productivity, mortality and morbidity in communal areas, remains a largely unstudied topic.

(4) Livestock Sales. A number of commentators have noted the low cattle offtake rate in Botswana, fluctuating between 6 and 14 percent of the national herd over the period 1965-1980 (Bailey, 1982: 38). Yet, while offtake may be low, some studies show that a relatively high proportion of households are involved in periodic cattle sales. For example, the UN/FAO survey of eastern Botswana in the early 1970s found that 40 percent of all households had sold livestock (1974: 51). Such sales seem to be seasonal as well. An analysis of Botswana Meat Commission (BMC) figures for 1976 show that the number of traditional suppliers and their livestock throughput declined after September of that year (McDonald, 1978: 26). This also appears to have been the case over the longer term as well. Figure A-2 shows a dramatic post-August/September decline in the cooperative throughput (which consists largely of traditional herds) to the BMC over a five-year period, four years of which had very good

Table A-2: Monthly Average Carcass Weight (kg) for Selected Cooperatives at the BMC*

1979

		Total Carcass Number	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.
Average C.W. With Condemnations	LLT	521	-	229.5	-	221.7	-	-	208.5	209.2	183.8	172.7	-
	N	608	-	-	197.0	176.2	-	174.2	195.2	144.8	131.5	81.6	-
	Mp.	371	173.7	-	211.5	-	175.7	-	159.7	-	158.2	143.3	-
	Mg.	613	-	200.5	200.8	216.8	194.9	188.8	193.0	-	-	-	161.9
Average C.W. Without Condemnations	LLT	478	-	246.5	-	247.4	-	-	223.8	221.3	220.6	195.0	-
	N	511	-	-	223.9	213.9	-	213.9	201.9	168.0	175.4	163.1	-
	Mp.	324	206.6	-	221.8	-	204.4	-	185.4	-	186.3	173.0	-
	Mg.	538	-	238.7	233.8	238.5	211.2	210.0	213.5	-	-	-	180.4

Lentsweletau - LLT. Ntlhantlhe - N Mmaphashalala - Mp. Makaleng -Mg.

*Sims (1981:182) suggests that an animal averaging 450 kg in liveweight slaughters out to approximately 240 kg (53 percent) in carcass weight at the Botswana Meat Commission.

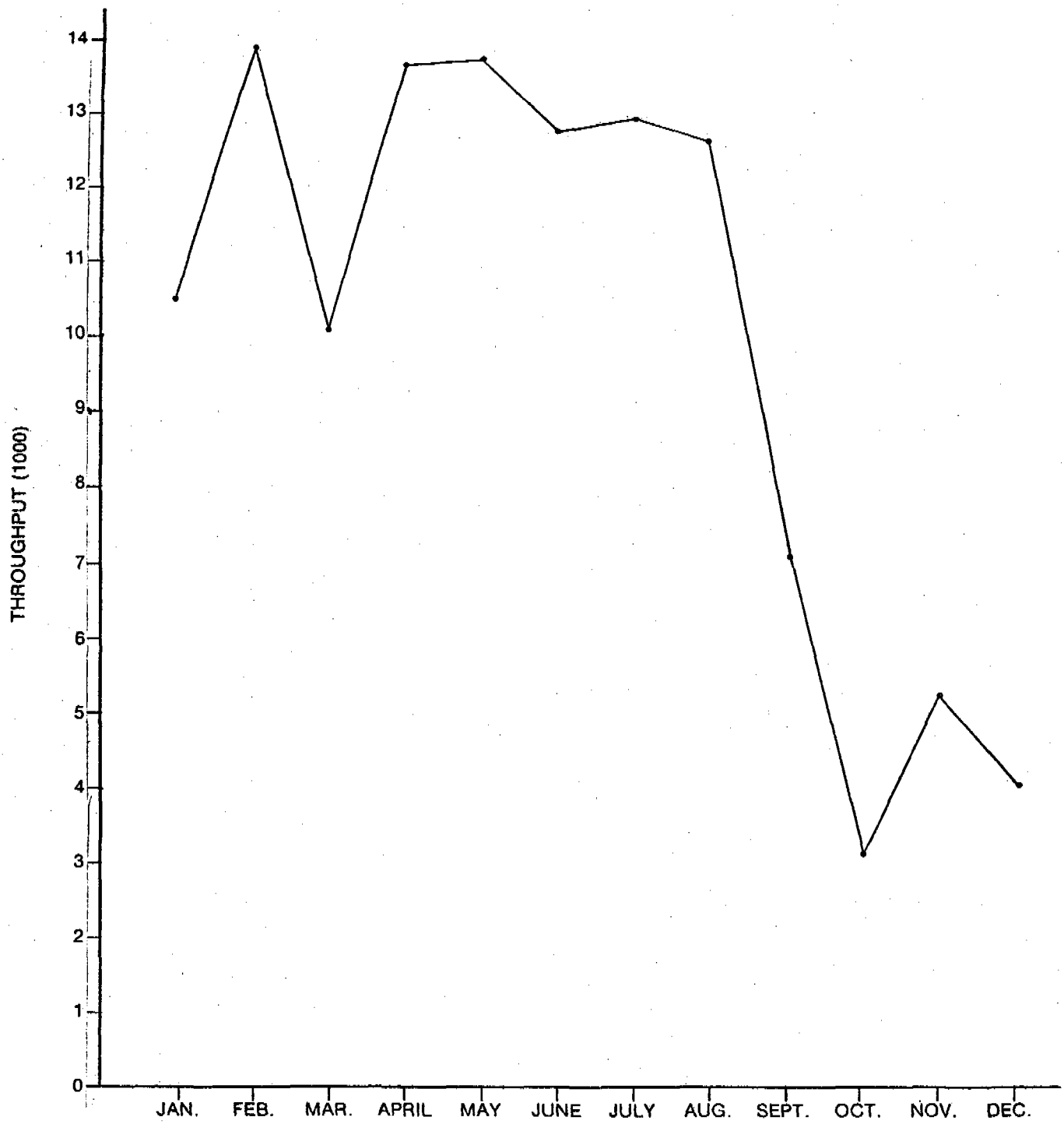
Table A-2 Monthly Average Carcass Weight (kg) for Selected Cooperatives at the BMC (continued)

1980

JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT
215.7	-	210.1	197.9	227.4	228.4	202.7	195.2	188.2	-
153.6	170.4	149.0	163.8	152.7	157.2	167.7	170.0	175.3	-
180.9	-	-	-	-	-	-	-	-	175.5
173.1	165.5	-	-	-	-	-	-	-	-
238.0	-	224.1	220.9	240.8	228.4	228.8	223.1	200.8	-
170.6	192.3	186.3	199.0	193.0	194.9	189.4	177.7	186.3	-
193.3	-	-	-	-	-	-	-	-	204.8
201.2	192.2	-	-	-	-	-	-	-	-

Figure A-2:

1972-1976 Total Monthly Cooperative Throughput at Botswana Meat Commission



Source: Animal Production Division, Botswana: A Handbook of Livestock Statistics.

rains.[12] Such a seasonal decline in livestock sales probably stems partly from the fact that by August and September much, if not all, of the harvesting has been completed and a number of people have returned to their villages away from where livestock are kept.[13] However, this pattern can be reversed in a poor rainfall year. Syson found that Shoshong area cattle sales peaked in September-October when "cash was desperately needed" as a result of two consecutive poor harvests there (1971b: 7).

As one might expect when farmers prefer selling older rather than younger animals for the best possible return, the proportion of older animals sold seems to rise as grazing conditions improve, as shown in Table A-3.

Table A-3:

1976 BMC Quarterly Age Distribution of Oxen Slaughtered

	5 years or less	5 years or more	N
January-March	72%	28%	42,681
April-June	62%	38%	51,618
July-September	65%	35%	30,724
October-December	77%	23%	10,586

Source: McDonald, 1978: 37. Some overlap in age occurred in the original age estimations. Oxen account for the vast majority of BMC throughput.

From the seller's viewpoint, one of the unfortunate consequences of the timing of such a selling strategy is that this period of better grazing also coincides with the gestation period for cows, so that a high percentage of the cows slaughtered in the past at the BMC have been pregnant (Bond, 1975: 11-12, Table 3). APRU has recommended that cows, if in good condition, should be sold in August or September once weaning would have been completed (1980: 147).

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[12] Cole also found that the four-month period between February and May accounted for over 40 percent of the cattle sold in 16 localities in 1968/69, while Opschoor's 1979/80 study of three localities in Kgatleng District found that the bulk of sales "seem to be confined more to the period for 1st January-July/August, 1979" (Cole, 1971: 65; Opschoor, 1980: 15)

[13] There may be other contributing factors to such a decline, e.g., BMC announces its prices every January (Bailey, personal communication).

(5) Time Spent on Work With Livestock and Cattle. Information on household time spent on livestock-related activities is scant in Botswana. Table A-4 includes monthly labor input firgures for livestock work. These figures are based on samples of above-average farmers in Botswana. It is interesting to note that seasonal increases and decreases in labor inputs roughly coincide in the sets of figures. As Fox notes for the 1977/78 and 1980 inputs:

> Labor requirements for livestock production vary seasonally. During the months of March, April and May cattle labor requirements are about double those of August and September...This seasonality is due to the need for more intensive herding to protect the growing and maturing crops. (1981: 10; Fox, undated: 9)

Time actually spent by households on livestock work, while still seasonal, may vary less in some sites than suggested by Table A-4 (Lipton, 1978: Vol. II, p. 15 and Vol. I, p. 15). However, both Kerven's analysis of data from the 1977/78 Activities Survey of 250 households (1979: Table II) and Mueller's re-analysis of 1974/75 data from the nationwide Rural Income Distribution Survey (1979: Table 4) support the observation that the percentage of a day spent by persons on cattlework and animal husbandry does decline in the dry season, as illustrated in Table A-5. With the end of the cropping season the time spent on livestock as a proportion of total agricultural time increases. Higher livestock labor requirements often begin in December with the special strain which plowing puts on the herding enterprise. As Gulbrandsen (1980: 64) notes, not only are cattle apt to go astray when labor is tied up in the plowing operation, but since draft animals are used during the day, they may have to be grazed at night rather than being kraaled (penned). In sum, there are at least three factors at work that raise the labor requirements for herding during wet season:

(a) The rains disperse surface water points and areas of grazing, so that cattle will also be scattered rather than concentrated around a few water points as in the dry season.

(b) Use of animals during the day--whether for destumping, plowing, or transport --raises the possible need for night grazing and for early morning herding.

(c) Growing crops must be protected from straying livestock. Bailey (1980), Opschoor (1980) and Willett (1981: Chapter 9) have found widespread complaints of crop damage in areas of eastern Botswana.

TABLE A-4:

Comparison of Monthly Labor Requirements in Agriculture

	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.
Recommended 1976/77 Labor Inputs on Crops (Person Hours/Month)[1]	-	13.52	61.66	58.29	73.05	142.44	126.64	136.57	134.96	190.56	60.30	24.24
Recommended 1976/77 Labor Inputs on Livestock (Person Hours/Month)[1]	91.19	89.21	87.36	97.92	110.88	130.53	143.84	126.44	114.06	137.76	75.24	83.45
1977/78 Labor Utilization (Person Days per Herd)for Cattle Work By[2]:												
Average (All Farms) (Ave. Herd - 30.8)	7.5	8.2	7.9	10.5	12.9	12.4	14.5	14.1	13.2	11.7	9.2	7.4
Average (Bottom 1/3 Farms (Ave. Herd - 14.4)	5.8	5.9	5.9	8.1	12.2	11.6	14.6	14.6	13.9	12.0	9.0	6.0
1980 Labor Utilization (Person Days Per Herd)for Cattle Work By[3]:												
Average (All Farms) (Ave. Herd - 32.4)	6.2	6.3	7.8	8.0	10.1	10.8	12.5	12.2	12.2	9.5	7.1	5.5
Average (Bottom 1/3 Farms) (Ave. Herd - 26.4)	6.6	7.4	8.7	8.8	9.8	10.5	12.6	11.2	11.3	8.4	5.6	4.4

- Sources:
1. Gulbrandsen (1980: 72) for the Integrated Farming Pilot Project
2. Fox (Undated: 86,89) for the Farm Management Survey
3. Fox (1981: 119,122). for the Farm Management Survey

Table A-5:

Percent of Total Time Spent During Four Days on Livestock Activities by All Adults and Children[14]

	1977	1978		
	December	March	May	August
Percent of Day Spent on Cattle	12%	10%	8%	8%
Percent of Day Spent on Livestock (Total)	17%	15%	12%	12%
Percent of Total Daily Agricultural Time Spent on Livestock	58%	47%	38%	61%

Source: Kerven, 1979: Table II.

There are definite age and sex differences in cattle and livestock work. Both Kerven's analysis of the Activities Survey and Mueller's of the RIDS confirm that working with livestock is pre-eminently a male task, especially among adult males, although both found some female time in such activities (Kerven, 1979: 12; Mueller, 1979: Table 4). Lipton notes also that an early 1970s Shoshong survey found boys aged 7-14 spent 451 percent (!) as much time in cattle care as they spent in school, while the respective percentage for girls at the same age is 61 percent, itself a substantial percentage (1978: Vol. II, p. 239).

(6) Seasonal Livestock Movements. It is generally assumed that trekking cattle from the village or cattlepost to the lands areas at the beginning of the rainy season acts as a constraint on timely plowing (Lightfoot, 1981b: 4; Lipton, 1978: Vol. I, p. 65). Indeed, Bailey found in the Water Points Survey that there was a marked increase in the number of cattle herds in plowing areas between October and January of 1979/80 (1980: Figure 2). As Bailey points out, though, many households keep their cattle herds continuously present at the lands or mixed lands and cattleposts, where the movement of cattle is typically for one water point to another as the seasons change, rather than

[14]As Kerven and Mueller concede, there are a number of problems with using, as the unit of analysis, the proportion of total time spent in a set of activities by different age and sex groupings. Both surveys had a fixed sample of households visited periodically (four and five visits, respectively), where time use information was asked of members of the sample households for the day prior to the visit. Where the unit of production is not the same as the household, i.e., where neighbors play a consistently important role in some agricultural activities, then the fact that a household member may be spending less time on a given activity compared to the prior visit may simply indicate the presence of more neighbors helping in that task than before. Thus, the proportion of time spent for each household activity may be more than spent by the household members on that activity.

from a village or cattlepost kraal to another kraal in the cropping areas.[15] This fallback strategy is described in more detail in Chapter II.

Thus, it is not surprising that a number of cattle-holding households rate the need for convenient, nearby livestock water points to be greatest from October through December, since some households are moving livestock to the lands during the beginning of the plowing season, while they and others are also having to increase their labor time in crop and livestock work as a result of calving and plowing activities during this same period (see Bailey, 1980: 25-26).

Seasonal and Cyclical Factors in Crop Production. Although yields are low and production erratic, more Batswana are involved in crop agriculture than are directly involved in livestock. Bailey (1982: 278) found that of the 347 households in the Water Points Survey, 88 percent plowed in 1979/80, though 69 percent held cattle at that time. It is likely that some 75 percent of the rural households cultivate in a good rainfall year (UN/FAO, 1974: 3-4; Bailey, 1982: 277). Mixed cropping is the traditional mode of arable production in eastern Botswana, where a mixture of seeds (primarily sorghum, but also including legumes, cucurbits, millet or maize) is typically broadcast and plowed under with a moldboard plow in one operation (Lightfoot, 1981: 3; Singh and Kelly, undated: 106; Labovitch, undated: 187; Garforth, 1979: 7; Bailey, 1982: 279). One earlier and one more recent description of the cropping calendar for this production system are as follows:

> The periods of most intense agricultural activity are planting (late November, December, and early January. . .), weeding (January, February and March), scaring away the birds (May), reaping and threshing (June and July). (Schapera and Goodwin, 1937: 148)

> Sowing takes place from October until January, and weeding from January until March. . . Traditional sorghum varieties mature in May to June, at which time the farmer cuts off the heads with a knife, leaving the stems to be eaten by cattle. In winter he [sic] departs for his village. . . (Labovitch, undated: 187)

It should be recognized that dividing the crop calendar into periods of plowing and planting, weeding, birdscaring, harvesting and, thereafter, assigning months to such operations has more than one element of arbitrariness: not only does regional variation in rainfall alter the timing of crop operations, but, under this mixed cropping system,

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[15] See also Almagor (1980) on the Mbanderu practice of trekking livestock between rainy and dry season pastures in Ngamiland.

melons and maize ("green mealies") often mature earlier than sorghum. Thus, harvesting of some crops may occur simultaneously with weeding and birdscaring for others (see Schapera and Goodwin, 1937: 149). Ideally, the following discussion should be on a regional, month-by-month basis, estimating also the range of year-to-year variation, but the available data do not permit this level of detail. These points should be borne in mind throughout in the following descriptions.

(1) Plowing and Planting. Of the 13 cropping seasons between 1968 and 1981, the 1968/69, 69/70, 72/73 and 78/79 seasons were considered poor ones, while the five-year period covering the 1973/74—1977/78 seasons was one of especially good rains. Table A-6 gives data from twelve different studies in eastern Botswana showing the percentage of households plowing by month for seven of the thirteen cropping seasons. This table illustrates that many households do not plow immediately after the first rains: in all but one of the studies, the majority of farming households plowed in December and later (see also Hertel, 1977: 7). It may be that the five-year period of good rains encouraged a number of households to plow earlier (Bond, 1974: Table 6.2; Odell, 1980: 23), but, as a study of two villages in Central District suggests, even during this period there were localities much of whose population often waited until December and later to plow (Otzen et al.)

It is important to understand the implications of these survey findings. It is often said that the lack of timely access to draft animals is one of the major reasons for poor crop production (Alverson 1978: 7-8; Odell, 1980: 29; UN/FAO, 1974: 7), making the assumption that late plowing by the calendar leads to lower yields.[16] Households who do not own their own draft animals are said to be especially disadvantaged when it comes to timely access to draft power (Odell, 1980: 26-31; Koojiman, 1978: 192-193). For example, Bailey (1982: 308-310) found in the Water Points Survey that those households who held cattle plowed significantly earlier than those who did not hold cattle. Similarly, data collected on the 1970/71 cropping season in eastern Botswana show that those who held their own draft source did indeed plow earlier than others who had to borrow or hire it (see Table A-7). Yet, many of these households who had their

[16]There are really two kinds of "late plowing"--late in the season and late after each rainfall. Plowing and planting later than three to five days after a rainfall is said to lead to lower yields (Lightfoot, personal communication). But, we have been able to find only three studies with some evidence that suggests late monthly plowing leads to low yields (Sheppard, 1979: 9; Otzen et al., 1979: 65; UN/FAO, 1974: 7, 46-49). In both the Sheppard and UN/FAO studies, the line of argument is that those who plant late also plant less hectarage and thereby get less bags of grain. We have found no survey of rural farmers showing a cross-tabulation of time of plowing and bags of grain produced, controlling for such variables as hectarage planted.

TABLE A-6: Month of First Plowing (% Plowing Households)

Year	Survey Area	October and Before	November	December	January (and later)
1980/81	Four Tswapong Villages[1]	29%	25%	30%	16%
	Ministry of Agriculture[2] National Survey (All Regions)	6%	25%	50%	19%
1979/80	12 Eastern Communal Areas[3]	13%	35%	27%	25%*
	Ministry of Agriculture National Survey (All Regions[4]	7%	20%	52%	21%
1978/79	Three Villages in Southeastern Botswana[5]	3%	24%	31%	42%
	Three Sites in Kgatleng[6]	9%	16%	45%	30%*
1977/78	Two Villages in Central District[7]	42% before December			58% after December
1970/71	Eastern Botswana[8]	4%	30%	41%	25%
	Bokaa[9]	--	21%	46%	33%
1969/70	Moshupa Lands[10]	1%	30%	57%	12%*
1968/69	Moshupa Lands[10]	4%	40%	47%	9%
	Shoshong Area[11]	--	11%	51%	38%

[1] Zufferey (1982)
[2] Singh, Kelly and Motsemme (Undated: 109)
[3] Bailey (personal communication)
[4] Singh and Kelly (undated: 109)
[5] Sheppard (1979:6)
[6] Opschoor (1980: 25)
[7] Otzen et al (1979: 163,65)
[8] UN/FAO (1974: Table B2.3.9.)
[9] Kooijman (1978: 192)
[10] Eding (Undated: Table 2-2)
[11] Syson (1973: 20) includes six sites.

*Excludes post-January and/or unknown dates.

TABLE A-7:

Relationship Between Time Plowed and Plowing Arrangement

A. 1970/71 Season in Eastern Botswana

Draft Plowing Arrangment	% of Total HHs Plowing	Time Started Plowing (% Plowing Households) Sept./Oct.	Nov.	Dec.	Jan. (and later)	Totals N	%
Held	51%	6%	38%	43%	13%	25,240	100%
Borrowed/Exchanged	26	2	26	49	23	13,130	100
Hired	23	2	16	30	52	11,680	100
TOTAL	100%	4%	30%	41%	25%	50,050	100

Source: UN/FAO, 1974: Table B2.3.9

B. 1979/80 in Eastern Botswana

Ownership of Plowing Team	% of Total HHs Plowing	Oct.	Nov.	Dec.	Jan. (and later)	Totals N	%
Owned/Mafisa'd In	63%	16%	37%	24%	23%	174	100 %
Borrowed	16	3	27	43	27	44	100
Hired	21	9	29	26	36	58	100
TOTAL	100 %	12 %	34 %	28 %	26 %	276	100

Source: Bailey (personal communication). Does not include unknown dates or plowing households with mixed categories of owned, borrowed or hired teams.

own draft animals waited until December and after to plow, even though the 1970/71 and 1979/80 cropping seasons were better rainfall years in many communal areas than the previous year (UN/FAO, 1974: 23; Koojiman, 1978: 189-190; Bailey, 1982: 48). In other words, a number of households who have their own draft power do not seem to take advantage of this difference in productivity by plowing early. Why might this be the case?

Of the 304 farmers plowing in the Water Points Survey during 1979/80, 170 (56 percent) said they plowed later than they would have liked, the major reasons being the lack of adequate rainfall and the shortage of draft power (Bailey, 1982: 284). Yet these reasons are very general and may reflect more specific, seasonal factors which militate against plowing in October and November, as both Gulbrandsen (1980: 63-64) and Pilane et al. (1981: 30-31) show for their study areas:

(a) Even after the first rains, some soils remain hard and compact, requiring additional rainfall to increase soil moisture, thereby making plowing easier and seed germination more probable.

(b) "Many farmers stressed to me that they did not want to start plowing before 'the rain really comes because then we can see what kind of year this is going to be' " (Gulbrandsen, 1980: 64). As noted above, the period of maximum daily rainfall may not begin until December in a number of eastern areas.

(c) Farmers say that they must first wait until their own draft animals have gained weight (see also Fox, 1981: 36).

(d) Early plowing and planting is perceived to lead to greater chance of damage due to birds, e.g., by acting as a "magnet" for birds thereby allowing other farmers who plowed slightly later some relief from their birdscaring requirements.

(e) ". . . many farmers wait with their planting until the weeds have germinated in order to kill the weeds by plowing under them" (Pilane et al., 1981: 30).

(f) Farmers may not know when the very first rains have fallen, since many of them are still in the village in October and must wait for communication from the lands as to where and when rain has fallen (Hertel, 1977: 7). Similarly, from "early September until late November people stay in the villages to participate in all kinds of celebrations" (Gulbrandsen, 1980: 63).

(g) A number of households wait until they feel there are sufficient ephemeral water sources for livestock and domestic purposes at the lands before moving there.

While some adult women do spend time plowing, this activity has traditionally been regarded as a male occupation and so it is to a large extent even today (Campbell,

1970: 329; Bond, 1974: 14, 16, 17). Finally, although autumn or winter plowing and row planting have been recommended by the Ministry of Agriculture, such improved cropping practices are undertaken only by a small percentage of farming households (Gulbrandsen, 1980: 134-135; Fox, 1981: 36; Lightfoot, 1981: 3).

(2) Weeding. According to Lightfoot, "Most farmers do weed, but very few of them weed more than once and it is difficult to know how effective the weeding operation has been" (1981: 4; see also Odell, 1980: 21). Moreover, just as there is a range of plowing dates, weeding dates can be expected to vary between January and March (Gulbrandsen, 1980: 65; Labovitch, undated: 187).

Since the primary weeding implement is the hand hoe, it is not unexpected that a number of households often give the lack of labor as the major reason for not weeding more than once (Fox, 1981: 44; Pilane et al., 1981: 18; Garforth, 1979: 40; Labovitch, undated: 187). Weeding is pre-eminently seen as a female activity (Bond, 1974: 14, 16, 17). Kerven's analysis of the 1977/78 Activities Survey found March weeding to be the most time consuming agricultural activity done by females, though, as with other cropping operations, males did some weeding as well (1979: Figure III). In fact, her analysis indicates that "weeding is actually the most time-consuming activity in agriculture, for the population as a whole" (Ibid: 6). Gulbrandsen (1980: 52-53) credits school attendance by young girls as having an especially depressing effect on the household's weeding operations and Kerven's figures do suggest that young girls spent less time in weeding than even adult males in March, 1978 (Ibid: Table II).

(3) Birdscaring. As with weeding, birdscaring is perceived largely, but not exclusively, as a female activity (Bond, 1974: 14, 16, 17; Campbell, 1970: 330; Kerven, 1979: Table II). "Birdscaring is essential only for sorghum, and it is, of course, extremely time-consuming," writes Gulbrandsen (1980: 66). Vierich records birdscaring taking place as early as January and February (1979: 43), though Schapera and Goodwin identify May as the common month.

(4) Harvesting. Reflecting the range of plowing times is the set of variable harvesting dates. Clearly, grain harvesting does not always occur in June and July. In a survey of 140 households in southeastern Kweneng District, Hamilton found that of those who harvested a crop (113 households), 21 percent harvested in June, 19 percent in July, 43 percent in August, and 17 percent in September and October (1975: 165). (The rather late harvesting was explained by an unusually good season.) Hamilton also found that the incidence of heavy infestation of crops was said to have increased with late harvesting (Ibid: 170-172). There is evidence that some farmers are harvesting earlier than they would like in order to minimize losses due to crop damage by livestock (Zufferey, 1981: 14).

As with weeding and birdscaring, harvesting has traditionally been perceived and still remains largely a female occupation in Botswana (Bond, 1974: 14, 16, 17; Campbell, 1970: 330; Kerven, 1979: Figure III).

(5) Time Spent on Crop Work. Kerven's analysis of the Activities Survey shows that the most time consuming adult female agricultural operations are in descending order: weeding, harvesting, birdscaring and plowing, with the crop work percentage of adult male time per day exceeding that of females only in the plowing operation (1979: Figure III). Women also spend proportionately more daily time on threshing and storing crops than do men. Peak crop work requirements for adult males were found to be in December for plowing, while peak adult female requirements occurred in March for weeding.[17] Labor peaks for children occurred with birdscaring and harvesting in May and plowing and livestock care in December. Nonetheless, both males and females are involved in all major stages of crop work.

Less information exists on the monthly distribution of labor inputs for crop work than for cattle work. Table A-4 shows what has been generally recognized, that crop work is more seasonally fluctuating and less evenly distributed than is livestock work (Kerven, 1979: 6; Lipton, 1978: Vol. I, p. 15). What is interesting to note is that on a total labor requirement basis, these figures suggest that post-January activities, which include weeding, birdscaring and harvesting, can be much more labor demanding than is plowing (see also Rural Sociology Unit, 1975: Section II.3).

Lipton quotes a 1970s Shoshong survey which found that of the extra labor time needed for the average household in its primary operations during a cropping season, 51 percent came specifically from cutbacks in domestic household activities, 17 percent from reduced social activities and 23 percent from increases in household size (1978: Vol. II, p. 133). On the other hand, Mueller concluded from her analysis of time use patterns of rural households during the 1974/75 cropping season that "time devoted to housekeeping activities and child care is quite insensitive to the fluctuations in agricultural work, suggesting that even during the busy season women do not experience severe time pressure" (1979: 7).

This difficulty in assessing whether or not households have sufficient labor to undertake agricultural activities without changing other time uses reflects not only a paucity of data, but also the ongoing debate over whether or not there is a labor constraint, particularly in crop agriculture. On the one hand, commentators such as

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[17] On the other hand, Mueller's re-analysis of the RIDS data found both the peak female and male crop times to be in May--presumably harvesting and birdscaring time--in comparison to crop time figures for July, September, November, and January (1979: Table 4).

Lipton (1978), Gulbrandsen (1980) and Lightfoot (1981) argue that there is no real labor shortage, while a number of Batswana farming households themselves say there is a labor constraint in some, if not all, crop operations (see the following surveys: Syson, 1973; UN/FAO, 1974; Eding, undated; Fox, 1981; Pilane et al., 1981). Unfortunately, some of those who contend there is sufficient labor for cropping do so after comparing average person days required per crop with average household size, even though a number of households do not have all their members at the lands during the agricultural calendar. More specifically, Duggan explains farmer perceptions of labor shortages as really complaints about the low productivity of crop agriculture:

> Farm owners everywhere complain about the shortage of labor: what they are actually lamenting is the difficulty of finding labor at the wage they are offering. . . . The labor problem is not a shortage or surplus, but rather low returns to labor, varying according to the productive assets to which a family has access. An absence of workers is a result, not a cause, of low output and productivity. (Duggan, 1979: 4, 13)

The important point to bear in mind here is that there is abundant survey evidence which shows that many Batswana farmers from locations around the country perceive there to be a labor constraint in agricultural production. And as explained in Chapters II and III, these households act upon this perception by placing a premium on the availability of convenient water sources during certain times of the year.

Nutrition and Seasonal Shortfalls in Production. While the impact of drought on the health and agricultural production of households has been recently studied in Botswana (Sheppard, 1979 and Vierich, 1979), very little is known about the effects of the wet season/dry season cycle on household health and nutrition and their interaction with its labor productivity. It is during the cropping season, though, that food shortages most likely occur for many rural households, a factor which has been said to contribute to the higher rate of livestock sales before harvesting time (UN/FAO, 1974: 50). Cooper found in his survey that, next to plowing costs, food purchases for those at the lands represented the largest expense for those who remitted cash to these lands residents (1980: 101).[18] In the Shoshong area during 1970/71, household sorghum consumption was at its highest in July after harvest and at its lowest in February during the cropping season (Syson, 1971: 6, Graph No. 1). In the late 1970s survey of 109

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[18] In the past, crop prices have often been higher before harvest than after (UN/FAO, 1974: 8; Cole, 1971: 74). Note also the increased November cattle sales recorded in Figure A-2 above, consistent with increased financial demands represented by plowing and living at the lands.

households in two villages in Central District, 80 percent reported making sorghum purchases during summer months and 67 percent said they lacked food in the summer as compared to one percent and six percent reporting this only in the winter (Otzen et al., 1979: 143). In particular, the Otzen et al. study found that those households which were nutritionally at risk seem more likely to lack sorghum, maize or vegetables in the summer than households not at risk[19] (Ibid: 149, 69-70). Certainly there is evidence that households with children at risk appear to have a number of problems in plowing at the same levels as households who are not at risk, though the cause-effect linkages are not clear (Turner, undated; Otzen, et al., 1979: 76ff). In her 1970/71 Shoshong area study, Syson found the number of well-nourished village children decreased in "the hunger month" before harvest and that, overall, children's nutritional status seemed to improve after harvest (1971: 22, Graph No. 16). The seasonal hunger of many households at the lands during the cropping period before harvest is eased somewhat by the more readily available milk supplies, the early harvesting of cucurbits, beans and green mealies, and the gathering of wild veld foods (Willett, 1981: Chapter 12; Egner and Klausen, 1980: 12-13; Syson, 1971: 20). The issue of seasonal hunger is a complex one, however, with a number of unanswered questions, e.g., if food shortfalls in the wet season are the norm, then why do many farmers continue the practice of plowing and planting less in the season following a good harvest (see Colclough and McCarthy, 1980: 125-127; Hamilton, 1975: 194-197). Nonetheless, it seems likely that there are some household members who probably are not physically able, because of poor nutrition, to sustain the level of labor inputs implied in the figures in Table A-4 required during the agricultural calendar.[20] Unemployment in crop agriculture because of illness can have devastating consequences for those people who are unable to be employed in more productive activities and for whom arable farming is the last legal alternative (Egner and Klausen, 1980: 13).

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[19] A household nutritionally "at risk" was one defined as having two or more children classified as wasted or stunted and wasted, according to the anthropometric survey (Otzen et al., 1979: 38-40). Others, particularly Clement-Jones (1980), argue that a number of small children in Botswana are in fact not malnourished, such that a weight for age measure of at-risk households overestimates malnutrition.

[20] Also, Copperman notes: "Diarrhoeal diseases reach a peak during January and February (the hot season) which affects the weight level as people become dehydrated and lose weight" (1978: 51). A contributing factor to the greater chance of sickness and ill-health in the wet season may be the decline in domestic maintenance activities in some households in order to undertake the added requirements of crop cultivation, though the evidence is far from conclusive in this matter. Other households, however, may actually increase the number of meals consumed per day during the cropping season since "more energy is required at this time and more meals might therefore be needed" (Syson, 1971: 5).

In addition to the wet season higher availability of milk and the early harvesting of cucurbits, beans and green mealies, there are three other "food" cycles which supplement the crop and livestock production of some households: (1) as noted above, hunting and gathering of wild veld foods increases in the wet season (Sheppard, 1979: 55; Syson, 1971: 15-17; see also Vierich and Sheppard, 1980: 101; Otzen et al., 1979: 42; Copperman, 1978: 66); (2) traditional beer-making increases, especially after harvest (Copperman, 1978: 22; Syson, 1971: 7-8); and (3) stock theft, illegal hunting, and natural livestock deaths expand toward the end of the dry season (Egner and Klauser, 1980: 13; Syson, 1971: 20). Each of these activities, in turn, may have an effect on where household members move to and thus on the level of their water demands in these areas.

The Effect of Drought On Agricultural Production and Health. An interesting case study of the impact of drought on one district's agricultural production and the health of its cattle and human populations shows that, in comparison to the better 1977/78 rainfall year, the 1978/79 drought in Kweneng led to a faster rate of decline in crop work than in livestock work; out-migration of household members increased; and the health of children, especially in poorer families, seemed to deteriorate (Vierich and Sheppard, 1980: 110, 54, 25; Vierich, 1979: 55ff). During a drought a number of households see little or no reason for as many of their members to remain at the lands for the length of time they would during a year of good rainfall.

Seasonal Population Shifts. Population movements between villages, lands, cattleposts and elsewhere, both inside and outside Botswana, have long been a part of Tswana demography and settlement. The movement of household members from the village to the lands for the cropping season, only to return to the village after harvest, remains an important settlement pattern in many localities of eastern Botswana. Forexample, Figure A-3 shows the monthly locations of members (age ten years or older) of the households enumerated in the Water Points Survey. Most of the people who left the lands in April, 1979—somewhat earlier than usual because of the poor crop production during the 1978/79 drought—returned to the villages. Vierich and Sheppard (1980: 55) found a similar post-harvest population shift for roughly the same period of time in 1979. Two other population shifts should also be noted: (1) the December decrease in population migrating away and the concomitant increase in lands population, presumably because of plowing requirements and (2) the January decrease in the lands population probably as a result of some men migrating out after plowing (see also Vierich and Sheppard, 1980: 55, and Kerven, 1979b: 66). The April "harvesting" also seems to have pulled labor from villages and elsewhere to the lands.

The post-harvest shift from the lands to the village has a number of forces compelling it, apart from being the "traditional" residence pattern of many households. Two factors deserve special mention here. Reliable domestic and livestock watering sources become increasingly difficult to obtain at the lands as the dry season progresses (Bailey, 1980: 26; Koojiman, 1978: 86; Willett, 1981: Chapter 14). In addition, since part of the cost of undertaking cropping at the lands may well be decreased time spent on social and leisure activities, villages become all the more attractive after harvest by offering greater opportunities for such activities (Copperman, 1978: 22; Koojiman, 1978: 84ff). As Table A-4 implies, there is little reason for households to stay at the lands at cropping season levels, even if cattle are to be tended there.

Figure A-3 deserves closer examination since it, along with other factors discussed above, provides some insights into issues raised throughout this appendix and in Chapter I:

(1) Several of the Ministry of Agriculture's recommendations to farmers clearly run counter to agricultural and residence cycles. While oxen may be in comparatively good condition in July and August after harvest, there is probably little labor remaining at the lands to undertake autumn or winter plowing as recommended by the Ministry. Similarly, APRU's recommendation to sell cows after weaning in the late dry season does not fully recognize the fact that livestock are sold largely before August and September in part because grass and weight conditions are better then. It is highly improbable that cows—especially after weaning—would be in good condition at that time. APRU's recommended calving period, October to December, a time when they presumably need good grazing supplies, coincides with what another branch of the Ministry of Agriculture has identified as the period where such grazing can cause critical damage to grass growth (see Figure A-1 above). Also, Chambers and Feldman's recommendation (1973: 90) that groups be used to construct such farm improvements as contour banks and grain storage facilities "outside the growing season" runs afoul of the post-harvest out-migration from the lands.

(2) The Water Points Survey data on 1979/80 plowing dates shows that only some 13 percent of the households plowed in October (Table A-6). Figure A-3 suggests a reason why this was the case, i.e., a comparison of the lands and village population curves shows that in October most people were still in their village. These data support the observation made previously that some households who do in fact have their own draft power simply did not to go to the lands in time to plow early.

(3) The issue of how to decide when a permanently settled lands area becomes a small village has at least one possible answer: one can classify a locality as lands,

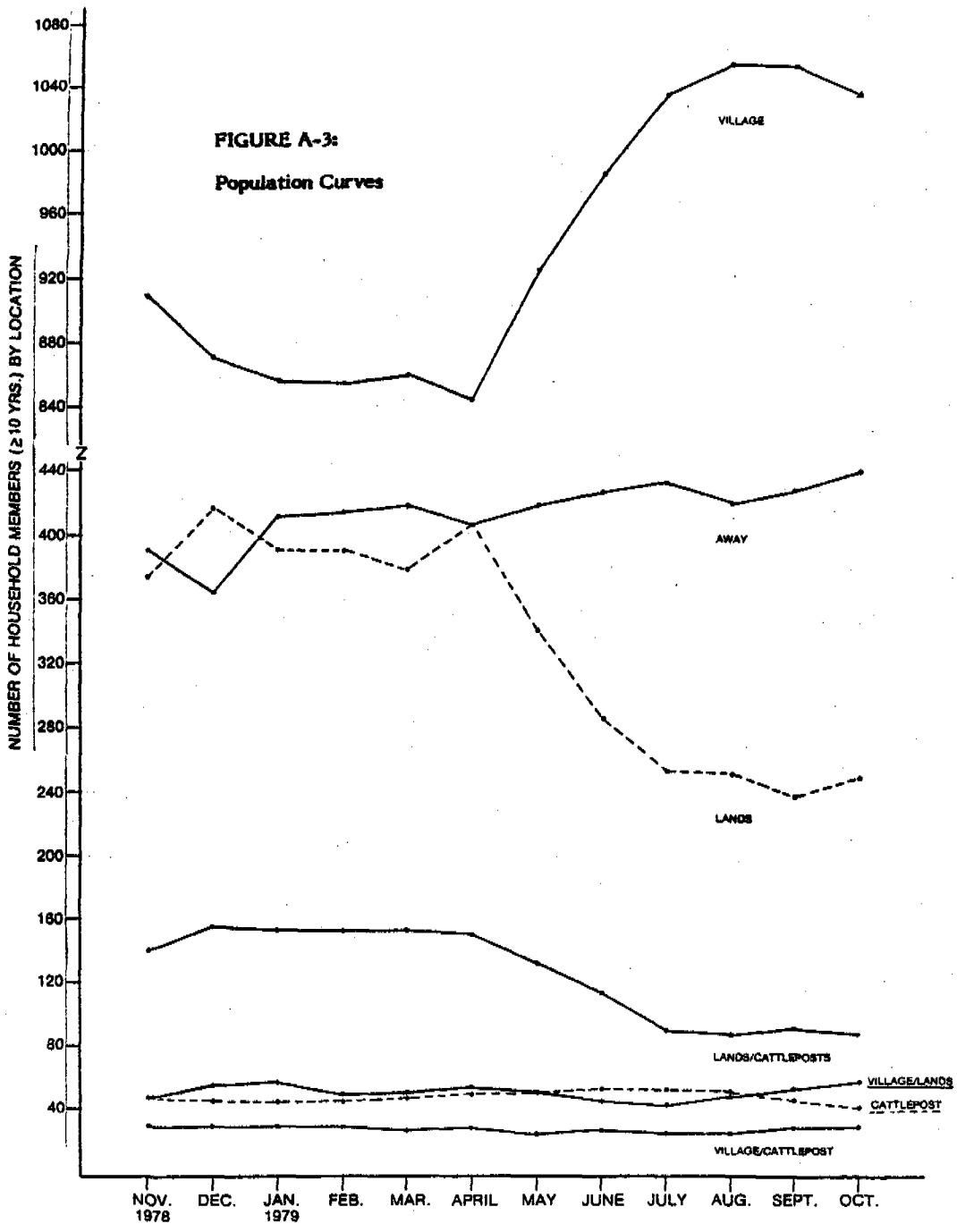
FIGURE A-3:
Population Curves
NUMBER OF HOUSEHOLD MEMBERS (≥10 YRS.) BY LOCATION
1080
1040
1000
960
920
880
840
440
400
360
320
280
240
200
160
120
80
40
VILLAGE
AWAY
LANDS
LANDS/CATTLEPOSTS
VILLAGE/LANDS
CATTLEPOST
VILLAGE/CATTLEPOST
NOV. 1978
DEC.
JAN. 1979
FEB.
MAR.
APRIL
MAY
JUNE
JULY
AUG.
SEPT.
OCT.

village or cattlepost by the seasonal population curve it most closely approximates. Assuming for the sake of argument that the curves shown in Figure A-3 are fairly representative, then an effort can be made to categorize anomalous combinations of "mixed lands and cattleposts" more rigorously. The "lands/cattlepost" population curve more closely approximates the lands curve than the cattlepost one, while the "village/cattlepost" locality seem more like a cattlepost in seasonal population shifts than a village.[21] In addition, the special attention given recently to treating "permanent settlement at the lands" as a new and important residence type creates something of a bogus issue: it is probable that many lands, cattleposts, and mixed areas are continuously populated throughout the year. Similarly, these "lands" are often really mixed land and cattleposts.

Figure A-3 illustrates the problems attached to equating a household with its dwelling compound. The problem is not resolved by saying that a household's members are, at any one time, in a number of different places, since the structure of the household appears to be intimately related to the seasonally changing social and productive functions of residences in which members are located through time. It is the population shifts among locations that determine what these locations are as socioeconomic entities—the lands become a grazing area after harvest, the village becomes a cattlepost in times of drought (see Chapter II), and so on. Use of the household as the unit of analysis, especially in cross-sectional studies, raises a host of longitudinal questions not only about where household members are located, but the changing nature of the localities themselves as a result of population movements. Moreover, Figure A-3 illustrates how difficult it sometimes is to treat a village in isolation from its lands, since their population curves are essentially mirror reflections of each other. This seasonally shifting structure of residence and/or population[22] has profound implications for the operation of institutions in localities, as discussed in Appendix 5.

(4) The manifold effects of seasonality are realized both in terms of temporal and spatial problems confronting the farming household, where the management of one set of problems has implications for the other. For example, Bailey found that households

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[21] Clearly, a larger sample, over a greater period of time, is necessary before comprehensive population curves can be formulated.

[22] In some localities one need not have a residence in a lands area in order to cultivate there (Sutherland, 1980: 72).

with members permanently residing at the lands did in fact plow earlier than seasonal residents (1982: 300). Yet it can be argued that in trying to solve the timeliness problem associated with plowing, these farmers have in turn raised a host of spatial and physical problems, e.g., neighbors comparatively more unavailable for assisting in early plowing, earlier and perhaps more laborious birdscaring, and plowing through more compacted soils. Similarly, we know that a number of those who say they have settled permanently at their lands did so in order to be better able physically to tend their stock (Fortmann and Roe, 1982). In fact, one can speculate that one of the reasons for operating traditionally large plow teams may be that such plowing spans act as a way of herding those livestock when male labor is physically tied up in the plowing operation. Moreover, as we argue in Chapter V, even the communality of land tenure can be seen in part as a response to the temporal demands of rural households to move among different localities. Management of time in rural Botswana is thus often converted into management of space.

Appendix 2

DEFINITIONS OF WATER POINT PHYSICAL TYPES

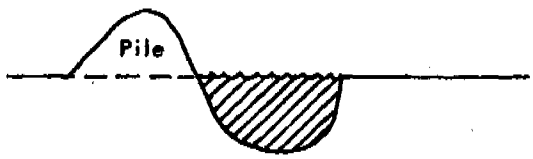
1. DAM:

In a dam, the dam wall holds back the water, and more than half of the water at full storage lies above the ground level that existed before the dam was built.
(Setswana: tamo, letamo, letlamo.)

2. HAFFIR-DAM:

In a haffir-dam the dam wall holds back the water, but less than half of the water at full storage lies above the ground level that existed before the haffir-dam was built.
(Setswana: tamo e nnye, mahuti, letlamo, letangwana.)

3. HAFFIR:



//// = Water lying below the original ground level (shown by dashed lines).

In a haffir, the wall is just a convenient place to put the soil taken out of the hole. It does not hold back standing water. All of the water at full storage lies below ground level in a hole or pit.
(Setswana: letamole lennye, letamo, lekidi, letlamo, letangwana, tamo e nnye, tangwana.)

4. RIVER: A seasonal or perennial flow of water along a defined water course. A linear rather than a point source of water.
(Setswana: molapo, noka.)

5. PAN: A low spot or depression in which water seasonally collects.
(Setswana: mogobe, letsha, letlodi.)

6. BOREHOLE: A machine-drilled, small diameter hole of variable depth, often lined with casing pipe. An engine and pump, or a hand pump is required for obtaining water.
(Setswana: sediba se se dirisaleng engine, motobetso, mokhenyembule, sediba, sediba sa engine, sediba se se thunthunyetswang, dipompo.)

7. OPEN WELL: A shaft deeper than it is wide, the top portion of which is lined with logs to prevent cave-ins. It is commonly equipped with a roller, chain and bucket. Some owners have installed a hand pump or an engine and pump.
(Setswana: sediba se se epilweng, petse, sediba, sediba se se tiraesewang, sediba se se epilweng sa terai, sediba sa petse.)

8. SAND RIVER WELL: A shallow well penetrating to ground water in sand rivers. It is reconstructed after every rainy season which causes water to flow over the surface of the sand. Water is typically obtained with a bucket.
(Setswana: sediba se se epilweng mo molapong, sediba se se mo nokeng, sedibana se se tswelang se epilwe fa nokeng.)

9. SEEP WELL OR PIT: A pit often wider than it is deep, unlined in the top portion, and tapping groundwater which lies above an impervious layer. Water is obtained with a bucket.
(Setswana: sediba se se epilweng, sediba, petse, madutledi, sediba se se fato lotsweng gore metsi atswe ka diatla, lehoti, motswedi, mokorwana.)

10. SPRING: A spontaneous flow of water out of the ground. The volume typically varies with the season.
(Setswana: mosenyana, motswedi, molatswana, madutledi.)

Appendix 3

SURVEY METHODS

The Water Points Survey combined surveys of a random sample of households, in-depth monitoring of water points and interviews with and observations of water management groups in rural eastern Botswana. The original survey design called for a long-term comprehensive survey at a limited number of sites and a quick, point-in-time survey at a large number of water points. The long term survey was begun first. Early experience with this survey made it clear than an individual water point taken in isolation was of very limited value as a unit of analysis. The use and management of a water point can only be understood in the context of the annual cycle of use of the larger system of water points at which it is a part. For this reason, the research design was changed after four months of field work by replacing the point-in-time survey with an expansion of the number of water points monitored at each site.

All household interviews were done by twelve Botswana enumerators who lived full time at their sites. Supplementary observations were done by the Cornell team and by Mr. Flatman Ntshayagae who was seconded from the Ministry of Agriculture Rural Sociology Unit to the project.

The Survey Region

The research was carried out in the communal areas of eastern Botswana. The line separating this region from that of the Kgalagadi sandveld in Figure I-1 roughly follows that in Sir Alexander Gibb and Partners, 1976, "Reconnaissance Study for Major Surface Water Schemes in Eastern Botswana—Phase 1" (Map No. 7548/2).

The Survey Sites

Area Selection. The consultancy proposal adopted a cluster sampling procedure for the selection of sites. In discussions with district, regional and central Ministry of Agriculture officials, 19 areas were identified which were considered to differ ecologically, agriculturally or in the type and organization of water points. These areas were:

Southern District
1. Barolong Farms
2. Mokgomane
3. Ntlhantlhe/Ranaka/Kgomokasitwa (and the adjacent area of South East District)
4. Metsemotlhaba Catchment Area
5. Pelotshetlha

South East District
6. Tlokweng

Kweneng District
7. Metsemotlhaba Catchment Area
8. Hardveld/sandveld transition area

Kgatleng District
9. Hardveld/sandveld transition area
10. Southeast Kgatleng District

Central District
11. Shoshong
12. Tswapong North
13. Tswapong South
14. Mahalapye East
15. Serowe
16. Bobirwa
17. Tonota/Mmadinare
18. Shashe Dam area

North East District
19. Bokalaka North

Site Selection. The method for choosing actual sites in the twelve areas varied north and south of Mahalapye because it had been decided to use air photos wherever possible in site selection and no recent air photography existed for the northern area.

South of Mahalapye, 1976 air photography was available. An air photo interpreter identified boreholes, open wells, dams, haffir-dams and haffirs from these photos and plotted them on 1:50,000 maps. The 1971 census enumeration areas were drawn onto these maps. Only enumeration areas falling within the hardveld and for which 1:50,000 maps existed were considered. The mapped water points were counted for each enumeration area. Borehole counts were up-dated in Southern District on the basis of reliable TGLP (Tribal Grazing Land Policy) borehole maps. All Ministry of Agriculture dams were mapped and counts tallied by enumeration area. The mean and standard deviation for each type of water point as well as the total number of water points was calculated for each district. Enumeration areas which fell outside plus or minus one standard deviation for any type of water point or for the total number of water points were discarded from consideration. By this means, enumeration areas which had far more or far fewer total water points or water points of a particular type than did the eastern communal areas of that district, on the average, were eliminated. The major villages were eliminated (although their lands areas were not), as few cattle are kept there permanently and the water for human consumption is often provided by a district council borehole. This process reduced the number of enumeration areas under consideration from approximately 160 to 70.

North of Mahalapye, sites were chosen through consultation with local officials. An attempt was made to find areas which had boreholes, wells and dams in order to maximize the variety of water points to allow comparison of types.

Field selection of the final sites was done in the same manner in the north and south. Available maps of livestock stocking rates, human population density and existing and proposed land use were used to eliminate exceptional sites. Potential sites at which there was not available housing for the enumerator or where local officials were uncooperative were eliminated. Sites which were too large to be covered by an enumerator on a bicycle were also discarded. Finally, because of the emphasis on Ministry of Agriculture water points, sites which had Ministry dams were more likely to be chosen.

The field selection resulted in twelve sites chosen from the enumeration areas. These sites (see Figure I-1) are as follows:

1. Barolong Farms: Mokatako: dam, river, syndicated boreholes and (in Ditlharapa) private boreholes.

2. Ntlhantlhe/Ranaka/Kgomokasitwa: Ntlhantlhe: several lands Ministry dams, sand rivers.

3. Metsemotlhaba Catchment Area: Gamodubu: wells, private borehole, Ministry dams with varying management systems.

4. Kweneng Transition Area: Lentsweletau: Ministry dams, haffirs, boreholes and equipped wells (district council and private).

5. Kgatleng Transition Area: Dikgonnye: borehole syndicates, open wells, dams.

6. South-Eastern Kgatleng: Matebele: haffirs, dams, private borehole.

7. Mahalapye East: Mmaphashalala: haffirs, wells.

8. Shoshong: Mosolotshane: dams, haffirs, wells.

9. Tswapong North: Ramokgonami: haffirs, Ministry dams.

10. Mmadinare/Tonota: Phokoje: open wells, seep wells, equipped open wells.

11. Bobirwa: Motongolong: open wells, spring.

12. Bokalaka North: Makaleng: Ministry dams, haffirs and haffir-dams, sand river, village managed livestock borehole.

Additional Comments on Site Selection. No substantial difference in soils were found among the sites for which evidence was available. Rainfall figures were not available for each site.

Because it was used in selecting the southern sites, the limitations of air photography should be clearly understood. Air photos were used because available lists of boreholes and Ministry of Agriculture dams are inaccurate and incomplete. There are no lists of water points such as wells, small haffirs, seep wells and so on. The use of air photos provided only a slight improvement. First, the photos were over three years old. Second, most air photography in Botswana has been flown at 7,190 meters. At this height, cattle kraals and boreholes are easily confused. Finally, certain water points--those under trees, sand river wells, small water points which hold water only seasonally--are likely to not appear at all. The current state of the art is such that on-the-ground-mapping is the only way to do a water point census. Anyone who wishes to choose a random sample of water points must map the area of study on the ground first. This is something which we feel would be of great benefit in land use planning, but emphasize that it can not be done properly unless it is done in consultation with the local people.

The final sample of twelve sites, which was approved by the Survey's Interministerial Reference Group, was in the considered judgment of knowledgeable persons representative of the water situation in the eastern communal areas. That is, the sites include the major ecologically, agriculturally and hydrogeologically distinct zones of the eastern communal areas. Second, they were chosen from the areas in which the Ministry of Agriculture builds its dams, that is, the mixed village, lands and cattlepost areas rather than the large town-like villages or the single isolated cattlepost. Third, they were chosen to be as representative as possible of the number and type of water points found in a district, of the population density in that district and of its stocking rate. They were as typical as possible of the situation a planner would face in making

decisions about water development in that area. Finally, they were chosen to include as wide a variety of water points as possible in order to allow comparisons of the effect of different kinds of water points within an environment.

The Household Sample

Thirty households were chosen for interviews at each site. Where it was possible to get a complete listing of households, this list was used. At all other sites, the actual malwapa were counted. The total number of households was divided by 30 to give a number, n. The enumerator then chose every nth household on the village list or every nth lolwapa walking a spiral from the centre of the village. Refusals were replaced by taking the next nth household.

The Water Points Sample

The total number of water points which could be monitored at each site was limited by the time available from the Ministry of Agriculture range ecology staff. Where possible, four water points were chosen at each site. Whenever there was a dam or borehole used for cattle watering, it was chosen because of the Ministry's interest in these structures. Hence, the sample of water points is not necessarily representative of the distribution of physical types of water points in an area but rather allows management comparisons of policy interest to be carried out. It is felt, however, that the sample is representative of the range of management practices found for the physical types examined.

The "Dry Areas" Sample

As the study progressed, it became apparent that the method of choosing sites effectively eliminated those with severe water problems. For this reason, three "dry" sites were chosen: Mahibitswana (Kweneng); Maiswe (Central-Bobirwa); and Tobela (Central-Shoshong). The latter two sites were chosen in consultation with local officials, while Mahibitswana was selected on the basis of unpublished survey data from the Rural Sociology Unit's Losilakgokong study, which indicated the lack of river, well and dam water sources there.

These three areas are not necessarily representative of all areas with severe water problems in the eastern communal areas. For a start, no one knows how many such areas there are. The three areas simply allow an illustration of areas with water problems and a comparison of such areas to the Survey areas which represent the more common water situation. These sites are included in Table II-2 only.

Survey Instruments

1. Water Point Monitoring was done approximately once every six to eight weeks. In most cases the enumerators spent two consecutive days at a water point recording the number and type of beasts drinking there and the number of people coming for domestic water (a water point "diary"). From May to July as many dams, haffir-dams and haffirs as possible were monitored to determine when they went dry. Monitoring at Makaleng only was continued to mid-October, 1980.

2. Structural and Economic Data Sheets were completed for all monitored water points plus as many other water points for which it was possible to collect information.

3. Household Questionnaires were administered in October/November, 1979, to the sample of 358 households in the twelve Survey sites and in Februrary/March, 1980, to 30 households in each of the "dry" areas for a total of 448 households. These

questionnaires were translated into Setswana and back-translated. Additional corrections to the Setswana were made in the course of training the enumerators. Enumerators were also provided with an English translation of the questionnaires. It should be pointed out that Setswana is not an easy language to translate into a written form. However, it is felt very strongly by the research team that field translation of questionnaires by enumerators introduces such an element of uncertainty into the survey process as to render some results useless. It is felt that the constant checking of the language of the questionnaire eliminated all but the most trivial errors. The questionnaire was pretested using enumerators from the Agricultural Statistics Unit. The household questionnaire concerned patterns of water use, basic demographic and economic data and information on farming practices.

4. Cattle Owners Questionnaires were administered in December, 1979, to all households in the household sample owning more than one beast. This questionnaire which concerns cattle management was also translated into Setswana. The Cattle Owners and Water Users Questionnaire Round Two was administered in March, 1980, to as many of the original sample of households of the twelve sites as could be located (351 households). This questionnaire concerned detailed herd movement and watering data, changes in the status of the herd since the administration of the Cattle Owners Questionnaire, more detailed agricultural information, information on water sales, perceived need for additional water points and reasons for settlement in the village or lands. This questionnaire was also translated into Setswana. The information from Bailey (1980 and 1982) is based on these questionnaires.

5. Key Informant Interviews were done with pumpers, water point owners, headman, chiefs, AD's, dam groups, VDC's and anyone else who could provide information on water points and water use.

6. A census of water points in each survey area was done and water points plotted on 1:50,000 baseline maps.

Analysis

The analysis was done at Cornell University. Data were analysed using packages described in Norman H. Nie et al. (1975). Statistical Package for the Social Sciences Second Edition New York (McGraw-Hill Book Company) and SAS User's Guide 1979 edition, SAS Institute Inc. SAS Circle, P.O. Box 10066, Raleigh, NC. 27605, USA.

Cases of Use as a Unit of Analysis. Much of the analysis in this monograph is done using units such as households, water points, cattle. None of these units capture the usage of the water system. There is a very simple measure of use—volume of water consumed. However, measuring the amount of water consumed by each household, including its cattle, at each water point it used was beyond the time and budget available to this Survey. The next best alternative was to use "cases of use" which is the sum of all water points used by all households. For example, if one household used two water points and a second household used three water points, there are five cases of use represented by those two households, even if they are using some of the same water points. Cases of use is thus a means of describing a situation in which one household uses more than one water point and one water point is used by more than one household.

The following analogy is offered. Imagine a room of ten people all eating cake. There are seven different kinds of cake. There are 13 cakes. Some people are eating more than one kind of cake. If we wish to describe what is going on in that room, we

can talk about people and we can talk about cakes but we must also talk about eating slices of cake. Cases of use are analogous to eating slices of cake.

Cases of use is the only unit of analysis which allows us to make sense of information about fees and about distance. It is important to know, for example, how many households pay fees and the number of water points at which fees are charged. However, a household may pay fees at only one of the water points it uses. And different households may pay different fees at the same water point. Similarly, not all the households using a water point live the same distance from it. Nor are all water points used by a household equidistant from it. "Cases of use" get us around these analytical difficulties.

Guttman Scale of Relative Wealth. Relative wealth was measured by an eleven item Guttman scale of possessions. Most of these were characteristics of the respondent's lolwapa as observed by the enumerator, measures which have been suggested by at least one previous researcher in Botswana (Henderson, 1974). The house was the one at the site where the interview for the household questionnaire took place. In a number of cases, if this house was at the lands, it was the household's permanent dwelling place. Thus, although lands residences are expected to be more spartan than village residences, there is no reason to suspect a systematic underestimation of wealth.

Guttman Scale of Relative Wealth

Step 1	Respondent's lolwapa contains more than one hut.
Step 2	Enumerator was offered a chair to sit in.
Step 3	House has a good thatch roof in good repair.
Step 4	House has a neat fence.
Step 5	House has a metal doorframe.
Step 6	House has glass windows.
Step 7	Respondent owns a watch.
Step 8	House has a tin roof.
Step 9	House has cement or concrete construction.
Step 10	House has toilet or latrine.
Step 11	Respondent owns a truck, car or tractor.

Loevinger's Homogeneity Index 0.4699 Chronbach's Alpha 0.7721

Any household which fell below scale step one was assigned a scale value of zero.

Verification of Survey Findings

Preliminary survey results and policy recommendations and the maps of each site were taken back to kgotla meetings, Ministry of Agriculture extension monthly meetings, land board meetings, and other district land use planning meetings for comments, corrections and additions during October, November and December, 1980.

Appendix 4

APPLICATION FOR CONSTRUCTION OF HAFFIR AND DAM

Str. No: _____

District: _____

Name of Dam: _____

Group: _____

Location: _____

	Name of Applicant(s) M.L.U.		Name of Applicant(s) M.L.U.
1.		11.	
2.		12.	
3.		13.	
4.		14.	
5.		15.	
6.		16.	
7.		17.	
8.		18.	
9.		19.	
10.		20.	
		Total	_____

A. The Applicant(s) Acceptance of the Terms Stated Overleaf:
Date:

B. Division of Land Utilization: Approval of Technical Suitability:
Date:

C. District Council: Agreement to the Construction of the Dam:
Date:

D. Land Board: Approval for Allocation of Site:
Date:

E. Water Apportionment Board: Approval for Extraction:
Date:

TERMS OF AGREEMENT

1) The Applicant(s) Agree
   a) To dig or ensure that test pits at the recommended sites are done as requested
   b) To maintain the fence around the dam
   c) To maintain the watering point below the dam
   d) To keep the stock off the dam wall
   e) To keep the wall grassed
   f) To maintain the spillway

2) The Applicant(s) agree to collect watering fees of (.....) M.L.U./year and to hold money in Central Fund or pay to Councils as required to be used for maintaining the dam.
   (n.b.) M.L.U. means Mature Livestock Unit or Equivalent. One M.L.U. is approximately 6 Small Stock Units in terms of watering needs.
   Quoted from Paragraph 3 of Dam and Haffir Building Policy of 1974, "Under this Policy the first option is for the District Councils to take complete administrative control of the Dams, to appoint a person to look after the dams, to maintain the fence around the dam, the watering point below it, if there is one, to keep Stock off the dam wall, to keep the wall grassed and collect watering fees.
   A second option would be for the Council to hand over complete responsibility for maintenance to an established group of farmers using the money in a fund for maintenance of the dam (sic). A fee of 72t/M.L.U./Year/Head is to be charged to all dam users".

3) The Applicant(s) agree not to allow more than 400 Livestock Units to water at the dam.

4) The Applicant(s) will notify the Land Board and DAO of any changes in membership or number of cattle in the group.

5) The Tribal Board and The District Council have the right to take appropriate action in the case of any of the above mentioned conditions not being fulfilled.

Distribution:		
White	White (Original)	DLU
Blue	(Copy)	RAO-DAO
Pink		District Council
Yellow		Land Board
Green		Water Apportionment Board
		Applicant

Appendix 5

POSSIBLE GOVERNMENT PROGRAMS FOR IMPROVED LOCAL-LEVEL MANAGEMENT OF COMMUNAL RANGE AND WATER RESOURCES

In recent years there have been a number of schemes proposed for improved local-level resource management in Botswana, particularly with respect to communal range and water resources (Reynolds, 1977; Gulbrandsen, 1980; Sandford, 1980; Fortmann and Roe, 1981; Devitt, 1981; Willett, 1981). It is not possible to do justice here to their variety and complexity--Willett's "preliminary survey" of projects involving local-level group management is over 750 pages alone! Whatever the differences in these proposals, however, many of these authors are in common agreement over the difficult problems associated with identifying and demarcating communities which have populations that are mobile, boundaries that are not fixed in practice, or both.

Yet, while recognizing this, researchers such as Devitt, Sandford and Gulbrandsen argue forcefully for giving priority to demarcating communal areas and then turning over exclusive land rights in each area to its bona-fide members (Devitt, 1981; Sandford, 1980; Gulbrandsen, 1980: 235-236). As Sandford has put it: "An essential element in land-use planning is seen to be the permanent association of a particular community with a particular piece of land. . ." (1980: viii). Willett also contends that the demarcation of areas is a necessary step in more comprehensive land planning in a number of communal areas (1981: Chapter 11). In some proposals, for example, "outsiders" would be allowed in an area only after there has been a negotiation for rights of access or after purchase of a "share" of the range and water rights allocated in that area (Reynolds, 1977; Colclough and McCarthy, 1980: 120; Gulbrandsen, 1980: 238; Devitt, 1981: 32-33). Willett, Gulbrandsen, Devitt and Sandford see the kgotla as the appropriate institution in some, but not all, areas for directing communal resource management, though Willett appears less sanguine in this regard than is Gulbrandsen or Sandford.[1] These proposals have the credibility of representing considerable professional experience and detailed research in a number of diverse areas of Botswana. The preceding analysis, though, raises four problem areas that question how effective the implementation of such proposed schemes would be.

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[1] See Devitt (1981: 34); Gulbrandsen (1980: 241); Willett (1981: passim); Sandford (1980: 50). Willett stresses the potential role that farmers committees can have in communal resource management (1981: Chapter 26), while Devitt (1981: 34) writes of grazing subcommittees of the kgotla for the administration of some communal area management schemes.

Problems of Identifying Communities With Localities

The demarcation of localities and their alignment with unambiguous communities would probably be one of the most expensive rural development projects ever undertaken in Botswana, particularly in terms of personnel. This is because it is the lack of mutually recognized and enforced boundaries which characterizes much of eastern Botswana, especially where communal areas are shared with other villages and contain mixed land uses. Nonetheless, a desire to demarcate has been shown in the form of drift fence construction which often, but not always, has been limited to the intra-locality demarcation of lands and grazing areas in localities with mixed land uses.

Nor are there satisfactory ways in many areas of identifying unambiguous communities for resource management in each locality. In the first place, not all communal areas are clearly associated with villages. For example, there are villages which have contiguous lands areas, where the village water supply also serves as the major lands water source. Other villages, though, have distant lands, so that the management of the village water supply does not directly regulate water use at the lands. In addition, there is the issue of newly established, semi-autonomous settlements in some communal areas which do not have the traditional features of Tswana communities, e.g., permanently settled lands areas may lack a headman and kgotla to undertake local-level management of communal resources there. In effect, local-level management cannot always be presumed as community management in eastern Botswana. Further, the most severe problems of management are frequently greatest while the identity and coherence of "communities" is weakest.

As we have seen, seasonal shifts in population remain the pivot of rural life for most Batswana. Who should manage a given locality's communal resources, when that locality is part of an compound locality? The year-round locality residents (e.g., herders in the mixed lands and cattleposts or the elderly in the villages) for whom the locality may be serving a different productive or social function than for its seasonal residents? Should communal water points be managed by those who are their greatest users, even if they are "absentee" livestock holders? Should there be different management schemes for summer and winter? Local-level resource management is especially difficult when the resources for management—the people, their land and livestock—are themselves variable and not fixed for the locality concerned.[2]

The argument that communities will be compelled to manage better their localities' resources when they see they have no access to alternative water and range resources outside seems, on the face of it, a reasonable assumption. It seems plausible to believe that people would see no real choice under these circumstances but to reduce

stock numbers and change cultivation practices where this is necessary to ensure that their now quite finite communal resources are not prematurely exhausted. Is it, though, something which can be expected? We have seen that privatization of grazing land in Botswana has not, by itself, led to improved grazing conditions in the areas concerned.

More to the point, one need only look to the south of Botswana's border to see how well the policy of identification of communities with demarcated localities has fared. Even in the late nineteenth century, well before institutionalized apartheid, an alliance of colonial and white settler interest in British Bechuanaland was justifying the establishment of permanent, never-to-be-enlarged (or so it was believed), "reserves" for Batswana as a way of eventually compelling their "surplus" populations to leave these areas (Hall, 1973: 188ff). This policy, which has its continued expression in today's Bantustan (the so-called Bophuthatswana), has in no way discouraged or stopped Batswana land hunger from arising. Population growth has continued and with it increasing claims on outside settler areas, much as is happening in Botswana today with increasing communal area claims on TGLP commercial areas largely earmarked for the minority of wealthier cattle owners (e.g., Gulbrandsen, 1980: 215-224).

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[2] As Almagor points out, there is even an ethnic group in Botswana whose ethos as a community is predicated on not having formal attachments to just one locality:

> Indeed, Mbanderu view themselves as separated by localities but as forming one people who are closely related genealogically and united economically and socially through being affiliated to a single and exclusive community. . . Overall, Mbanderu see their most important social relationships as not necessarily existing within the locality in which they happen to live. . . The individual's ties, which are spread over all the localities, are based not only on the genealogical connections, but through reciprocal and economic relationships. These are expressed through the almost free access each individual has to other localities, not only if he wishes to settle elsewhere but though the various "rights" people feel they have in other localities, which include reciprocal hospitality (for visits of short or long duration). These factors prevented people from developing sentimental attachments to their own localities, but instead emphasized the close relationship of persons—within the general category of "relative"—wherever they are. (1980: 50-51)

A policy of identifying communities with localities runs the risk of heightening political awareness of land scarcity, particularly along ethnic lines (since the communities will likely have in a number of cases unique tribal and sub-tribal affiliations). It is not probable that the Government of Botswana would willingly encourage this, especially given its ideology of developing a Tswana society along non-racial lines in deliberate contrast to its neighbor to the south. What is probable, though, is that land hunger will increase and grow in communal areas as long as rural Batswana have no other alternative investment opportunities than cattle and crops.

Problems of Resource Management by Assemblies

Vesting daily or even monthly management of communal range and water decisions in a committee or group, such as the kgotla, borders on a contradiction in terms. Even presuming membership in a community has been agreed, it is unrealistic to expect the average farmer to be able to attend meetings regularly during the cropping season and after harvest if these meetings were to be held at the lands. The ability to attend such meetings may be an attribute most characteristic of elites or other special groups. In fact, there probably is nothing quite as unrepresentative of a lands locality as a kgotla meeting in its village involving a few old men around a damp morning fire in late December.

It is important to understand the multiple implications of this problem of attending meetings. Given the factors associated with seasonality seen in Chapter I, it is difficult to imagine many adult males actively involved in regular group meetings and activities during the months between November and January when calving and plowing are at their peak. Moreover, after January some males migrate out of rural areas altogether. A number of women are unlikely to be able to be actively involved in regular group meetings at the lands between the January weeding and the July threshing and storing.[3] Even the venue for a group meeting becomes difficult to identify because of the distances between the widely scattered lands dwellings. Nor may all people be in good enough health prior to harvest to attend meetings and walk these distances in addition to their normal work loads.

There is also the very important problem of how people would be expected to communicate about lands meetings—their dates, time, venue and topics--in the first place, though this is less of a difficulty in the case where lands areas and villages are

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[3]Even though an outside observer might think such rural females and males do have considerable time for meetings during the cropping season, many rural producers themselves perceive labor shortages at every stage of agricultural production.

adjacent and villager travel between them is frequent. Nonetheless, those who are able to attend meetings regularly are likely to be those who have ample labor and time resources, namely, the wealthy. To say that people will meet if they see it in their interest to do so—apart from bordering on tautology—ignores many practical and economic difficulties for residents while at the lands.

The fact that many villagers are at the lands during the cropping season also means that matters which have to be considered on behalf of the people in the village, such as business of the village development committee, may have to be held in abeyance until these people are able to quit the lands after harvest and the drying up of surface water sources there. Once this occurs, however, the potential for group activities at the lands falls precipitously, while village meetings encounter widespread "apathy" from people who would prefer to relax and drink in the period after harvest and before they have to return once again to the lands.

Furthermore, there is the potentially debilitating effect of drought or other natural disaster on rural participation and communal resource management. Drought often drives people from the lands and villages or keeps them in localities where they normally would not be at that time of year, thereby putting increased strain on any local organizations operating in these localities during "normal" times (see Willett, 1981: Chapter 8; Sutherland, 1980: 81). Drought creates pressure on government to institute relief schemes such as food-for-work, but such schemes have yet to contribute to building and sustaining local participatory structures which persist after the drought--again not surprising since a number of the people involved in such schemes start "disappearing" from these localities after the drought.

Historically, chiefs appear to have "solved" the attendance problems associated with attempting governance by assembly, by vesting considerable authority over areas in selected individuals. Headmen and chief's representatives were accountable to the chief for fulfilling their duties and presumably had sufficient means to undertake these duties in addition to carrying out their own private agricultural activities. In post-Independence terms, this historical precedent can be adapted by placing the day-to-day management of communal range and water resources in the hands of a manager, who, if not directly elected by the "members of the community," would be accountable to some committee of locality representatives which met periodically. As Willett put it when summarizing his research on group development in communal areas:

> The observations of this study about the organization of group projects strongly supports this recognition for effective traditional leadership if a community is to function, and indeed endorses Stephen

> Sandford's view [1980: 38-39] that the responsibility for insuring that a community obeys rules should rest with one man, and not with a committee. . . (1981: Chapter 26)

Problems of Methodology

Most important, many of the recent proposals for communal resource management, particularly those seeking fixed management areas, all pivot on setting stocking rates according to some measure of the carrying capacity of the land (Reynolds, 1977: 12-13; Devitt, 1981: 34; Gulbrandsen, 1980: 237). Yet no methodologies are presently available for the satisfactory computation of carrying capacities, let alone for stocking rates (see Chapter V above). It is argued here that a locality demarcation exercise, which attempted to set boundaries so as to ensure enough land was available to "carry" that locality's stock population, is itself a bankrupt exercise from the outset, unless more satisfactory estimation procedures can be devised.

In fact, the lack of a variety of technologies and methodologies constrains effective implementation of local-level communal resource management in other ways. For example, there are few cheap means to provide convenient and reliable water to households in dispersed areas; the lack of effective communication and transport networks makes consultation and management difficult among these widely dispersed dwellings at the lands; there is no easy way to demarcate and adjudicate boundaries, etc. There appear to be few cheap and replicable technical packages for local-level management of communal range and water on an area-wide basis, even for those areas which today have cohesive, adjacent and bounded communities and the desire to manage communal resources in a better fashion.

Problems of the Division of Legitimate Government Responsibilities

In a sense the major problems associated with proposals for local-level management of communal resources are not their great expense and the difficulties in their design and implementation. Certainly there are some fairly homogeneous communities, living in adjacent localities and inter-localities with relatively fixed boundaries, some of whose members would be willing today to manage better their communal resources. One could start with these communities as prototypes. Or one could simply maintain that the above problems do not constitute sufficient cause for not developing other field efforts to evolve local-level communal resource management strategies. But there is a more important problem to be addressed. What if a community decided that the cost of overgrazing and range degradation in its locality was worth the short-term benefits accruing to them from having more stock numbers?

According to the policies and laws of Botswana, there is a government responsibility to prevent overstocking andrange degradation, a responsibility shared between both the central government and local government. For example, the Tribal Land Act stipulates that each land board holds tribal land "in trust" for future generations, a series of generations which community members may not have in mind when deciding to "overstock" their area. In fact, local-level management of communal resources may lead to a set of circumstances inconsistent with other government policies. For example, the Government of Botswana has the national interest in raising grain production in the countryside in order to reduce the balance of payments deficit. Yet the resource management decisions of each community, when aggregated together, could run counter to this national interest.

Clearly government could manipulate prices and subsidies in order to achieve these ends without precluding local-level resource management, but this simply begs the question: indicative market planning, such as favorable barter terms of trade for livestock, apparently has yet to increase offtake and reduce overgrazing. In effect, the national interest of government, as presently constituted, may not be consistent with the objectives of the electorate in a number of rural localities. Thus, the topic of communal resource management is really one of specifying the level and scale of government in Botswana. The creation of communities out of localities and their empowerment to control the use and management of resources, such as water and range, cultivation and fallow, hunting and gathering, firewood and thatch, is itself an act of decentralizing and restructuring functions presently held by local and central government. Yet it is this process of establishing new levels of government and agreeing upon the division of legitimate duties and responsibilities which has scarcely been addressed in proposals for local-level management of communal resources (for an exception, see Wynne, 1981).

Issues for Action

In the remaining pages we will not make recommendations on what form, if any, this decentralization and government restructuring should take. It would be presumptuous to do so, not only for the reason that we lack information about other factors which would presumably be part of this decentralization process, e.g., the size and configuration of a locality might depend in part on the location of taxable community members, which would depend upon other responsibilities given to the community in addition to that of management of communal resources. Rather, the following recommendations for improved local-level management of such resources are meant for

whatever level of government—central, local, or some as-yet-unestablished level—might have the responsibility to undertake them. These recommendations are less a cookbook for improved local-level resource management than a set of priority issues which can be acted upon today as a step toward such improved management.

The Need to Define Overgrazing. A priority research area is to devise improved methods for estimating carrying capacities and stocking rates in the communal areas. The broad outlines of what is needed are clear and center around government recognition that its present understanding of overgrazing is both definitionally and methodologically different than that of the many rural Batswana who attribute overgrazing to poor rainfall and sometimes measure its presence by the incidence of certain noxious weeds. An effort should be made to bring these two understandings into closer alignment. First, government research needs to be undertaken in the communal (hardveld) areas and not, as at present, almost exclusively in the sandveld.

There are two reasons why the grazing index devised as a result of this research should not be based on forage assessment alone: (1) case studies reviewed by Gilles and Jamtgaard (1980: 4) suggest that where local management of the commons has not degenerated into a "tragedy" one sometimes finds that the local managers have independent measures of change in forage quality and consumption, e.g., by monitoring milk yields or wool production, and (2) some measure of changing livestock productivity as a function of forage changes is needed, since declining livestock productivity is predicted as the ultimate result of a "tragedy of the commons".

It is important to know how much overgrazing can be tolerated before witnessing a "major" change in livestock productivity. Research may, in fact, show that specifying such a tradeoff is next to impossible. One fruitful area of study would seem to be an effort to determine just how strong a functional relationship there is between rainfall levels and carcass weights by locality, since many Batswana believe overgrazing to be rainfall-dependent.[4] Once having a more satisfactory procedure for assessing the relation between forage and livestock productivity, an attempt could then be made to establish stocking rate equivalencies.

Jinally, there is a need for officials to recognize that the "overgrazing problem" is really a complex of very different problems, each of which probably requires its own policy strategy. In addition to the depletion of forage by too many livestock in an area, other grazing problems include, inter alia, trampling and erosion, the need for night grazing of draft and transport livestock during the cropping season, and the need for

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[4]This analysis could be tried by taking monthly BMC carcass figures for livestock marketing cooperatives from areas near government rain gauges.

forage supplementation of breeding cattle. Perhaps the most intractable aspect of the "overgrazing problem," however, is the almost complete lack of credibility the government has earned from its past and present communal resource policies. Since colonial times, government has preached about the need for conserving range and water as scarce resources, while at the same time it has been unflagging in its efforts to subsidize as much of the cost of livestock and livestock water point development as it could. Cattle numbers have increased as a result of government policy, not in spite of it. That rural people continue to treat range and water as renewable and replenishable resources and not as scarce ones, must be credited not to the public good of communal land tenure, but to the much more pernicious public good of political expediency.

The Need to Reduce the Demand for Water. A continuing headache faced by Botswana government officials is the seemingly insatiable demand by rural people for more and more water points, as if people will not be happy until each and every one has the most convenient, least-cost, and reliable water source possible.[5] If this continued

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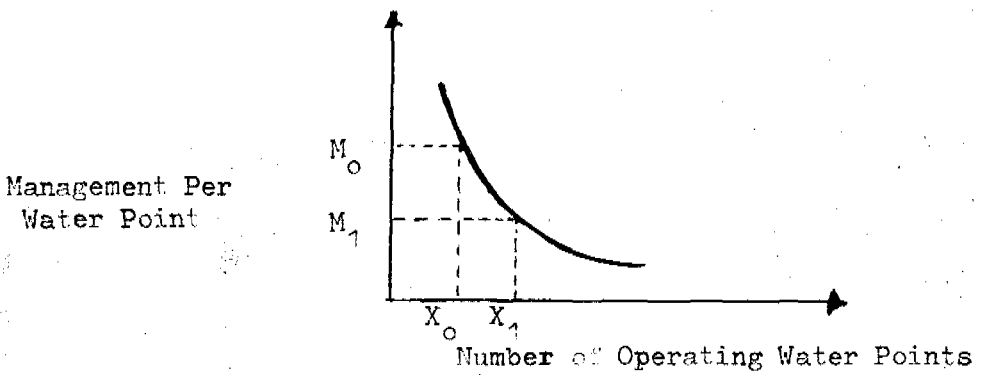
[5]It is not difficult to see why Batswana desire more and more watering sources. Any locality's water point management potential can be represented as follows, as suggested by our colleague at Cornell, Professor Gil Levine:



As the dry season is superceded by the wet season, we see an increase in the number of seasonally available water sources, particularly ephemeral ones. This leads for all practical purposes both to a decline in household management expended per water point and for all water points used in the wet season (the curve is generally inelastic). Similarly, with more wet season water points comes a greater volume of water available for use. Thus, it is not surprising that rural people want more water sources in order not to have to worry about their household water supplies. This desire is largely ignored by policy-makers who expect these people to manage each new government water point in an area as if that water point and its management were independent of all other water points in the locality. The construction of a government dam or borehole, for example, might well allow some users to suspend management at other water sources for which the government water point now provides a better alternative.

and increasing water demand in some areas is due to the presence of large stock populations, then part of this problem's remedy could be to get rid of the extra stock. In other words, the underlying cause of the headache might well be excess or maldistributed livestock, but without knowing the magnitude of this overstocking, the cure becomes problematic. While one is waiting for the correct diagnosis, though, there is still the political and bureaucratic pressure to provide more water sources. Are there any policies and projects available which can provide restraints on this increased demand for watering points, particularly given government budgetary and personnel constraints? Even analgesics and palliatives have their role in the absence of a firm diagnosis.

From the household user's viewpoint, the important water-related issue is to improve its access to a water source or sources for a given purpose, with the objective of enhancing the reliability, convenience and/or cost of the household's water supply. In this view improving household water accessibility means enhancing the household's ability and/or opportunities to participate in the use and management of a set of water points over time. There are at least six ways to improve the household's access to water, only the first two of which are commonly considered:[6]

(a) Construct more water points that are more reliable/convenient/cheap in the locality;

(b) Enable the household or its herd to move to a different locality which already has more water points of the desired type;

(c) Increase household mobility in a locality so that household members can get to a water source more easily and in shorter periods of time, e.g., give households bicycles or carts for transporting water;

(d) Make the water points themselves more mobile, e.g., subsidize water transport carriers or increase the use of water tanks and water reticulation piping;

(e) Ameliorate the constraints affecting household resources presently allocated to water use, e.g., reduce the number of restrictions (fees, hours of operation, etc.) on use at certain water points in the locality, or free up from other activities more labor to draw water for the purposes desired; and

(f) Lower people's standards and expectations as to what makes for reliable, convenient, or inexpensive water. For example, certain WHO standards for hydrochemical and bacterial water purity in domestic water supplies may be set too high for Botswana conditions (Fortmann and Roe, 1981: 407-408).

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[6]The following options are adapted from Moseley (1979).

Thus, the first step is to determine if what is demanded cannot be provided at least in the short run by some of the comparatively "cheap" strategies covered in the last four points.[7]

Another way to lessen the perceived pressure for more water points is to consider the implications of arguing for improved household accessibility to water sources within the context of existing proposals for local-level management of communal resources. In a sense, as soon as one discusses water and range management proposals that seek to assign rights of membership in fixed management areas, then, from the households' viewpoint, the policy issue might well shift from one of management for improving household water accessibility to that of management for ensuring household mobility. It is one thing to fix locality boundaries and only allow some emergency shifts in population between localities thereafter, as Sandford proposes (1980: 48). It is quite another matter to permit unfixed boundaries and still allow regulated population shifts to be made as and when needed. It is not at all clear to us which option a Motswana would choose, for example: (1) being able to maintain a herd of cattle no greater than 15, but still able to trek cattle to alternative water and range supplies outside his or her area or (2) being able to maintain a herd of 30 head, but only in his or her assigned communal area. In effect, improving household water accessibility and ensuring the possibility of inter-locality household mobility can be treated by planners as forming a trade-off for policy purposes.

Other planning scenarios are not difficult to imagine, especially where a judgment--scientific, bureaucratic, local-level--has been made that an area is being overgrazed. For example, residents of such a locality could be presented with two options: new livestock water development there would be approved as and when requested with no other assurances or, if residents agreed (say, by majority vote) to forgo such development, government would guarantee them access to better grazing or fodder elsewhere on a periodic emergency basis. Similarly, residents of a locality who wished to have encroachment into their locality stopped would agree to take their livestock, if herded outside the locality, only into government-sanctioned

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[7] What this list highlights is the fact that the options for improving household water accessibility without any new capital development are few. Households are already undertaking the option of seasonal movement in returning to the comparatively well-watered villages after the drying up of surface water sources at the lands. Private investment in improving water accessibility does occur—many people do buy bicycles and carts for water transport, haffirs are constructed—but most water technologies, especially for ensuring year-round reliable and convenient water at the lands—are largely outside the budget of poorer water point users. Thus, funds for improving household water access will likely have to come from the state, until the rural economy is better able to generate such investment itself.

areas in return for which the appropriate land board would agree to suspend any new application approvals for residential and arable sites in the locality, unless first approved by other residents.[8] And so on.

Tradeoffs. To carry this point even further, household water accessibility and household mobility do not form the only trade-off for policy purposes nor is grazing control the only policy issue. Previous chapters suggest there are at least three more sets of trade-offs:

—Maintenance, regulation and fee collection. These three sub-activities of water point management are not independent of each other. It may well be that the better maintained a water point is, the less the amount of charges needed. Or the more poorly usage is regulated at a water point, the greater its subsequent maintenance requirements.

—Convenience, cost and reliability. Few, if any, households in the countryside have a water supply as convenient, cheap and reliable as they would like. In many communal areas, the most reliable water point is often not the nearest one. Some people might be willing to pay a little more if that would assure them a year-round water supply. Nearness to a water point during busy times of the agricultural calendar may be more important to some households than the fact that a water point has a full year's worth of water available for use. And where convenience of domestic water supply is the pre-eminent concern it is possible to design small-scale water systems which can provide this need without encouraging large-scale livestock exploitation in the process.

—Timeliness and adequacy. Throughout the discussion on fallback strategies, it was assumed that the household search was for a more convenient, reliable, and/or cheaper water supply which would be both timely and adequate for the use demanded. (In fact, evaluating the convenience, cost and reliability of a water point is part of the way many households judge the degree to which a water supply is timely and adequate.) It can be expected that households or their members differ as to what they take to be an acceptable timely or adequate water supply, i.e., some would prefer to have more of one supply even if it meant less of the other.

How susceptible to policy manipulation are these four sets of possible trade-offs depends, of course, on both the issue being addressed and site-specific characteristics

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[8]Determining the boundaries of a locality in the process of dispute settlement over locality encroachment by outsiders is probably a much more valid reason for demarcation within the Botswana context than is the better management hypothesized to result when a community sees itself as identified to a fixed locality without any other alternatives.

of the localities concerned. Ironically, these latter factors may be of secondary importance, given the nature of government organizations presently making policy in Botswana. As we have seen, the bureaucratic perception of what these trade-offs are and what the rural water users consider them to be often represent two widely divergent views. The priority may have to be one of first convincing bureaucrats and politicians to think and plan in terms of variables and dimensions in these trade-offs, an issue which leads to our third major point.

The Need to Bring Learning into Government. How one re-orients a government bureaucracy is substantially less clear than the directions it should re-orient to. In addition to those directions already mentioned the following deserve special comment:

(a) The beginning of this process of bureaucratic re-orientation[9] lies in officials' recognizing the multiple-level nature of resource disputes and conflict in eastern Botswana. While understandable, the tendency to reduce such conflicts to the level of isolated individuals has only contributed to the maintenance of a very distorted picture of resource use and management in the communal areas. As we have described, few of these resource disputes involve just individuals; rather they include locality and compound locality considerations. The bureaucratic framework of discussion and argumentation over resource conflicts should be enlarged to incorporate these linkages.

(b) With a greater appreciation of the multiple levels of resource conflict should also come the recognition by officials of just how limited the option is for using the water point qua water point as a means of controlling stocking pressure in the eastern communal areas. There has been the view in government that the water point can act as a "lever! for adjusting the stocking rate at the point, that is, a change in the source's water volume, hours of operation, or users' physical access entails an associated change in stocking pressure. In terms of Table VI-1, this is the view one would get if restricted solely to talking about managing a water point at its source. While this view is not incorrect, it is only part of the picture when describing water-related grazing patterns, particularly when addressing the issue of using a water point to regulate an area's stocking rate.

In more specific terms, our analysis suggests that the following inter-related conditions must be approximated before it can realistically be expected that managing a livestock watering point incorporates managing the grazing around it:

(i) The water point clearly determines the land use, that is, the land surrounding the livestock watering source would not be available for grazing purposes without it. In

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[9]See Korten and Uphoff (1981) for a general statement of this subject.

short, the water point is both a necessary and sufficient condition for turning the savanna into grazing land.

(ii) The water point is a reliable source which at the same time serves as each of its users' reliable (household) water supply.

(iii) There are no alternative water points for the purpose desired. Or to phrase it somewhat differently, if there are alternatives they can be so completely managed as a system that, at any one time, users will feel there is no "effective" alternative to using their water point except in the way desired by the system's managers.

(iv) Water point managers must not only be willing and able to restrict access to a water point in order to regulate stocking numbers, they must in fact actually do that. In addition, access to the grazing area surrounding the water point must be restricted only to those stock sanctioned to use the water point. (Otherwise, an area that is more effectively managed compared to other areas will invite encroachment from outside.) This, at a minimum, requires monitoring and enforcement of subsidies or penalties to ensure restricted access is maintained.

(v) Any domestic water supplies needed in the process of using and managing a livestock watering point must be regulated in conjunction with that watering point. Unfortunately, how this should proceed is not clear. If domestic water supplies are provided directly from the livestock point, fee collection will be made difficult. If, on the other hand, domestic sources are separate from the livestock point, there will be pressure to use the domestic supplies as livestock sources when they represent more convenient, cheaper or reliable sources. Again, there may be trade-offs which are worth investigating. The ideal situation is where the livestock watering source also serves as the most convenient, least-cost and reliable domestic point.

There are few cases, certainly in eastern Botswana, where these conditions—singly or in combination, let alone as a whole—are fulfilled. While selected management of a water point must be taken into account in an overall program to reduce grazing pressure in an area, it cannot be the sole strategy, nor will it likely ever be the most important strategy in terms of effectiveness at the locality and compound locality levels. In fact, since it would be difficult in many areas to control a locality's water point alternatives or a compound locality's fallback water point system(s), a strategy to reduce an area's stocking pressure might require recourse to policies and programs only marginally involving water points, namely, projects to ensure improved range productivity, increased livestock productivity (such as disease control), increased marketing and off-take facilities, and forced cattle sales.[10]

Units of Organization. A constant question officials must ask and answer in planning for a given communal area is this: In what sense is it reasonable to talk about the locality being planned for as a distinct unit? Or more specifically, what are its inter-locality connections, if any, in terms of the institutional, cultural and seasonally-related demographic and socioeconomic factors discussed in Chapter I? There are some localities which are isolated and autonomous in rural eastern Botswana, but they are in the minority. Thus, what seems especially pernicious in this regard is the division of portfolio responsibility between the Ministry of Agriculture and the Ministry of Local Government and Lands. This has led to policies which favor assigning village development committees with development responsibilities in the village only, while farmers committees are encouraged to restrict their development projects to the lands and cattleposts—a set of policies which, where effective at the locality level, cannot but have encouraged unnecessary functional and spatial separation of a village from its formerly integral lands and cattleposts.

We have already suggested a way one of these important inter-locality factors can be used for defining the nature of localities. The population curves described in Chapter I are based on monthly inter-locality shifts of human populations.[11] There is probably no better way to define what a locality is, from the compound locality perspective, than to compare its monthly population curve with those aggregated over a number of areas in eastern Botswana (again, grouped by what their sampled residents claim the different areas to be).[12] As already noted, it is accepted by many rural Batswana that different types of localities require different types of water development—e.g., a large village should not have daily livestock watering facilities in its midst—so that the association of such a procedure for differentiating localities with

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[10]This emphasizes the fact that, should central government be unable to improve grazing conditions on a site-by-site basis by virtue of having an "optimal" water point type or spacing strategy, its options for controlling stocking pressure may be largely restricted to official manipulation of gross macro-policy variables such as livestock pricing, extension programs, and new laws.

[11]Bailey (1980) has provided monthly population curves for cattle herds in the Water Point Survey eastern communal areas.

[12]The lack of locality boundaries for some lands, cattleposts and mixed areas need not necessarily bias the final household sample used to construct the curves in each area, since the adjacent localities often share the same general land use as the locality in question (Werbner, 1977: 27-28).

differential criteria for water point development is practicable now in Botswana (see Roe and Fortmann, 1981).

(d) Finally, there are several reasons why improving household water accessibility and locality water availability cannot and should not remain a matter of the individual household alone. There remains a clear need for a strong government role in the rural water sector. First, the vast majority of rural households do not have access to enough private resources for developing major kinds of improvement schemes presently technically possible, such as borehole reticulation schemes. Moreover, in some cases improving accessibility may defeat longer term socioeconomic objectives by degrading range and water resources for future generations. A corollary of this—and of much real concern to poorer Batswana—is that the unrestrained private development of water points, especially livestock watering boreholes for large cattle-owners, jeopardizes the future access of the poor to quality range and water sources. Similarly, proposals to privatize the commons and restrict access to grazing land may well jeopardize use by the poor of open access fallback water points.

The problems facing government in the management of communal resources are, therefore, formidable. Its funds are limited and its direct management capacity even more so. There are no low-cost technologies for providing convenient, reliable and inexpensive water to households. In fact, technologies for local-level management of communal resources in general are few and far between. Privatizing the range, just as allowing unrestrained private improvements in household water accessibility for livestock purposes, produces large social costs. Community "privatization" of a locality probably would not satisfy land hunger anyway.

Where there are localities, there are not always communities; and even where there are communities, boundaries may be vague or changing under pressure of population growth and demands for mobility. Thus, the challenge facing government is not one only of determining <u>where management</u> is <u>needed</u> (e.g., the incidence of overgrazing), nor is it one of devising <u>cheaper and more effective technologies</u> for improving household access to water, nor is it one of developing a set of <u>management strategies and sanctions</u> where communal water supplies can be regulated at the local-level without range and water degradation, nor is it only a matter of creating <u>more representative local institutions</u> to approve and carry through technical and management packages for local-level water management.

In other words, the challenge is not merely one of government being able to penetrate to the local level in order to facilitate local-level resource management. If

this were the case, then the admittedly difficult issue of increasing community participation in the selection, development and regulation of technologies, institutions and management strategies could straightforwardly be addressed. However, as we said in Chapter VI, the government challenge in a number of communal areas is nothing less than creating communities out of localities for the regulation of their range and water resources. Thus, we come back to the earlier recognition that local-level management of communal resources, to the extent it is meant to be community-based, raises issues about the appropriate level and scale of government in Botswana.

BIBLIOGRAPHY

Alidi, F.S. 1979. "Prevention of Long-Term Ecological Damage in a Drought," in Proceedings of the Symposium on Drought in Botswana (M.T. Hinchey, ed.), The Botswana Society/Clark University Press, U.S.A.

Allen, S. 1982. "Maps of Traditional Tribal Sub-Divisions Among the Balete of Ramotswa," Botswana Notes and Records, Vol. 12.

Almagor, U. 1980. "Pastoral Identity and Reluctance to Change: The Mbanderu of Ngamiland," Journal of African Law, Vol. 24, No. 1.

Alverson, H. 1978. "Agricultural Development in Botswana: Targets and Constraints," Institute of Development Management Public Lecture, Gaborone.

----------. 1978b. Mind In The Heart of Darkness, Yale University Press, New Haven.

Animal Production Research Unit. Undated. A Five Year Program of Integrated Beef Cattle and Range Research in Botswana, 1970-1975 (Part 2), Ministry of Agriculture, Gaborone.

----------. 1980. Beef Production and Range Management in Botswana, Ministry of Agriculture, Gaborone.

Bailey, C. 1980. Keeping Cattle and the Cost of Water in Eastern Botswana, Ministry of Agriculture, Gaborone.

----------. 1982. Cattle Husbandry in the Communal Areas of Eastern Botswana, Ph.D. Dissertation, Department of Agricultural Economics, Cornell University.

Bernhardt, Roger. 1975. Real Property in a Nutshell, West Publishing Company, St. Paul, Minn.

Beresford, M. 1971. "Location of Boreholes," Natural Resources Technical Committee, Ministry of Finance and Development Planning(?), Gaborone.

Bond, C.A. 1974. Women's Involvement in Agriculture in Botswana, Government Printer, Gaborone.

Bond, G.C. 1975(?). A Report on Livestock Marketing, Government Printer, Gaborone.

Campbell, A. 1970. "baNgwaketse Marriage and Dissolution of Marriage," in Comparative and International Law Journal of Southern Africa.

----------. 1979. "The 1960s Drought in Botswana," in Proceedings of the Symposium on Drought in Botswana (M.T. Hinchey, ed.), The Botswana Society/Clark University Press, U.S.A.

Caponera, Denk. 1979. Water Law in Selected African Countries, FAO Legislative Study No. 17, Rome.

Carruthers, I.D. 1973. Impact and Economics of Community Water Supply: A Study of Rural Water Investment in Kenya, Agrarian Development Studies Report No. 6, Wye College, Ashford, Kent.

Central Statistics Office. 1972. Report of the Population Census 1971, Government Printer, Gaborone.

---------. 1976. The Rural Income Distribution Survey in Botswana 1974/75, Ministry of Finance and Development Planning, Gaborone.

Chambers, R. and D. Feldman. 1973. Report on Rural Development, Ministry of Finance and Development Planning, Government Printer, Gaborone.

Chambers, R. 1978. "Seasonal Dimensions to Rural Poverty," Institute of Development Studies, University of Sussex.

Classen, G.A. 1980. Arable Lands Development Program: Consultant's Report on Small Scale Rural Water Supplies, Ministry of Agriculture, Gaborone.

Clement-Jones, D. 1980. "Finding, Measuring, and Predicting Malnourishment in Botswana," Discussion Paper, Nutrition Unit of the Ministry of Health/Central Statistics Office, Gaborone.

Colclough, C. and S. McCarthy. 1980. The Political Economy of Botswana: A Study of Growth and Distribution, Oxford University Press.

Cole, G. 1971. Preliminary Investigation Into the Marketing of Crops and Livestock in Botswana, Ministry of Agriculture, Gaborone.

Colson, E. 1959. "The Plateau Tonga of Northern Rhodesia," in Seven Tribes of British Central Africa (E. Colson and M. Gluckman, eds.), Manchester University Press.

Comaroff, J. 1978. "Rules and Rulers: Political Processes in a Tswana Chiefdom," Man (N.S.) 13.

----------. 1980. "The Transformation of Land Tenure in Barolong: Class and Culture in a Peasant Economy," University of Chicago.

Comaroff, J. and S. Roberts. 1977. "The Invocation of Norms in Dispute Settlement: The Tswana Case," in Social Anthropology and Law (I. Hamnett, ed.), A.S.A. Monograph 14, Academic Press, London.

Cooper, D. 1980. How Urban Workers in Botswana Manage Their Cattle and Lands: Selebi-Pikwe Case Studies, Working Paper No. 4, National Migration Study, Gaborone.

Copperman, J. 1978. The Impact of Village Water Supplies in Botswana: A Study of Four Villages, SIDA, Gaborone.

Cory, H. 1954. The Indigenous System of the Sukuma and Proposals for Political Reform, East African Studies No. 2, East African Institute of Social Research, Kampala.

Devitt, P. 1981. The Management of Communal Grazing in Botswana, Discussion Paper, Evaluation Unit, Ramatlabama, Botswana.

DHV Consulting Engineers. 1979. Countrywide Animal and Range Assessment Project, Commission of the European Communities (European Development Fund), Ministry of Commerce and Industry, Gaborone(?).

Director of Agriculture. 18 June, 1965. "Soil and Water Conservation and Land Use Planning," A/5/2.

Duggan, W.R. 1979. Informal Markets, Technology and Employment in Arable Land in Botswana, ALDEP Employment Study Paper II, Ministry of Agriculture, Gaborone.

Dyson-Hudson, N. 1966. Karamojong Politics, Oxford University Press.

Eding, D. Undated. Moshupa Catchment Study, Government Printer, Gaborone.

----------, A. Udo, and M. Sekgoma. 1972. Report on Village Studies, Ministry of Agriculture, Gaborone.

---------- and M.S.P. Sekgoma. 1972. Kweneng Resource Survey, Government Printer, Gaborone.

Egner, E.B. and A.-L. Klausen. 1980. Poverty in Botswana, National Institute of Development and Cultural Research, Working Paper No. 29, Gaborone.

Evans-Pritchard, E.E. 1940. The Nuer, Clarendon Press, Oxford.

Field, D.I. 1978(?). Potential Carrying Capacity of Rangeland in Botswana, Land Utilization Division, Ministry of Agriculture, Gaborone.

Field, R.F. 1980. Patterns of Settlement at the Lands: Family Strategy in a Variegated Economy, Report to ALDEP Team, Ministry of Agriculture, Gaborone.

Fortmann, L. 1981. Women's Agriculture in a Cattle Economy, Ministry of Agriculture, Gaborone.

Fortmann, L. and E. Roe. 1981. The Water Points Survey. Ministry of Agriculture, Gaborone.

----------. 1982. "Settlement on Tap: The Role of Water in Permanent Settlement at the Lands," in Settlement in Botswana: The Historical Development of a Human Landscape (R. Renee Hitchcock and Mary Smith, eds.), Heinemann.

Fox, R.S. Undated. 1977/78 Farm Management Survey, Ministry of Agriculture, Gaborone.

----------. 1981. Farm Management Survey Results: 1980 Survey, Ministry of Agriculture, Gaborone.

Funes, F. 1975. "Effects of Fire and Grazing in the Maintenance of Tropical Grasslands," Cuban Journal of Agricultural Science, Vol. 9, No. 3.

Gardiner, I.B. 1968. "Appraisal Studies of FFHC-Sponsored Development Projects in Botswana: The Soil Conservation and Farm Dam Construction Unit," Ministry of Agriculture, Gaborone.

----------. 1970. "Appraisal Study of the FFHC-Sponsored Soil Conservation and Farm Dam Construction Project in Botswana," Gaborone.

Garforth, C.J. 1979. Crop Husbandry in Southern Botswana: Report of a Knowledge, Attitudes and Practices Study, Ministry of Agriculture, Gaborone.

Gilles, J.L. and K. Jamtgaard. 1980. "Overgrazing in Pastoral Areas: The Commons Reconsidered," Department of Rural Sociology, University of Missouri-Columbia, U.S.A.

Government of Botswana. 1976(?). Lefatshe La Rona: Popular Version of the Tribal Grazing Land Policy, Government Printer, Gaborone.

Grant, S. 1982. "'Reduced Almost to Nothing'? Chieftaincy and a Traditional Town. The Case of Linchwe II Kgapela and Mochudi," Botswana Notes and Records, Vol. 12.

Gulbrandsen, Ørnulf. 1980. Agro-Pastoral Production and Communal Land Use: A Socio-Economic Study of the Bangwaketse, University of Bergen/Rural Sociology Unit, Ministry of Agriculture, Gaborone.

Gulliver, P.H. 1955. The Family Herds, Routledge and Kegan Paul Ltd., London.

Hall, K.O. 1973. "British Bechuanaland: The Price of Protection," The International Journal of African Historical Studies, Vol. 6, No. 2.

Hamilton, A.G. 1975. A Review of Post-Harvest Technologies: Botswana, Gaborone(?).

Head, Bessie. 1981. Serowe, Village of the Rain Wind, Heinemann, London, Ibadan, Nairobi.

Henderson, W. 1974. "A Note on Economic Status and Village House Types," Botswana Notes and Records, Vol. 6.

----------. Undated. "Borehole Syndicates in Letlhakeng," Chapter 8 of a Ph.D. Thesis(?).

Hendzel, L. 1981. Range Management Handbook for Botswana, Ministry of Agriculture, Gaborone.

Hertel, T.W. 1977. The System of Mafisa and the Highly Dependent Agricultural Sector, Rural Sociology Report Series No. 11, Ministry of Agriculture, Gaborone.

Hitchcock, R.K. 1978. Kalahari Cattle Posts, Volumes I and II of a Preliminary Draft, Ministry of Local Government and Lands, Gaborone.

----------. 1980. "Sandveld Agriculture in Botswana," Ministry of Agriculture, Gaborone.

----------. Forthcoming. "Traditional Systems of Land Tenure and Agrarian Reform in Botswana," in African Agrarian Structures: Transformation in Botswana (R.P. Werbner, ed.), In Press.

Jennings, C.M.H. 1974. The Hydrogeology of Botswana, Unpublished Ph.D. Dissertation, University of Natal, Johannesburg.

Jones, D.B. 1979. "Drought and Arable Farming," in Proceedings of the Symposium on Drought in Botswana (M.T. Hinchey, ed.), The Bostwana Society/Clark University Press, U.S.A.

Kerven, C. 1979. Agricultural Work and Absenteeism, National Migration Study, Gaborone.

----------. 1979b. Botswana Mine Labor Migration to South Africa, National Migration Study, Gaborone.

Koojiman, K.F.M. 1978. Social and Economic Change in a Tswana Village, Afrika-Studiecentrum, Leiden.

Korten, D.C. and N.T. Uphoff. 1981. Bureaucratic Reorientation for Participatory Rural Development, NASPAA, Washington.

Kramer, A. and M.J. Odell. 1979. Planning for Development: Western Kweneng District, District Administration, Molepolole/Rural Sociology Unit, Gaborone.

Labovitch, L. Undated. "Traditional and New Methods of Dealing with Arable Weeds in Botswana," in Botswana Notes and Records, Vol. 10.

Lambert, H.E. 1956. Kikuyu Social and Political Institutions, Oxford University Press.

Levine, G. 1980. "Observations on Botswana Water Points," Cornell University.

----------. 1980b. "The Relationship of Design, Operation, and Management," in Irrigation and Agricultural Development in Asia (W. Coward, ed.), Cornell University Press.

Lewis, I.M. 1961. A Pastoral Democracy, Oxford University Press.

Lightfoot, C.W.F. 1981. EFSAIP: An Evaluation of Improved and Traditional Technologies--Broadcast Planting in Perspective, Ministry of Agriculture, Gaborone.

----------. 1981b. "Some Suggestions for Research Needs in Crop and Livestock Linkages," a paper presented to the Symposium on Botswana's First Livestock Development Project and Its Future Implications, 4-6 August 1981, Gaborone.

Lipton, M. 1978. Botswana: Employment and Labor Use in Botswana, Final Report in Two Volumes, Government Printer, Gaborone.

Litschauer, J. and W. Kelly. 1981. The Structure of Traditional Agriculture in Botswana, Ministry of Agriculture, Gaborone.

----------. 1981b. Traditional Versus Commercial Agriculture in Botswana, Ministry of Agriculture, Gaborone.

Lucas, R.E.B. 1979. The Distribution and Efficiency of Crop Production in Tribal Areas of Botswana, Boston University.

Mahoney, N. 1977. "Contract and Neighborly Exchange Among the Birwa of Botswana," Journal of African Law, Vol. 21, No. 1.

Malcolm, D.W. 1953. Sukumaland, Oxford University Press.

McDonald, I. 1978. Botswana: A Handbook of Livestock Statistics-1978, Animal Production Division, Ministry of Agriculture, Gaborone.

----------. Undated. Draft: A Report on Cattle Marketing in Botswana, Animal Production Division, Ministry of Agriculture, Gaborone.

McGowan and Associates. 1979. Botswana: A Study of Drought Relief and Contingency Measures Relating to the Livestock Sector--Draft Final Report, Commonwealth Fund for Technical Cooperation, the Commonwealth Secretariat, 2 Volumes.

Mettrick, H. and B. Thomson. 1970. "Small Dam Construction Pricing Policy," Ministries of Agriculture and Finance and Development Planning, Gaborone.

Ministry of Agriculture. April, 1971. "Pricing and Disposal of Watering Points," Gaborone.

----------. 1974. "Dam and Haffir Building Policy," Gaborone.

----------. 1978. Agricultural Statistics 1977, Gaborone.

Ministry of Local Government and Lands. Undated. "Ministry Portfolio Responsibilities and Organization Charts," Gaborone.

----------. 1978. Interministerial Committee Report on Land Board Operations, Government Printer, Gaborone.

Moseley, M.J. 1979. Accessibility: The Rural Challenge, Methuen & Co. Ltd., London.

Mueller, E. 1979. "Time Use in Rural Botswana," Population Studies Center, University of Michigan, Ann Arbor.

Mukwaya, A.B. 1953. Land Tenure in Buganda: Present Day Tendencies, East African Studies No. 1, The East African Institute of Social Research, Kampala.

Natural Resources Technical Committee. June, 1970. "Minutes of the Fourth Meeting of the NRTC," Ministry of Finance and Development Planning, Gaborone.

Nickum, J.E. 1977. "Management of the Meich'uan Reservoir Irrigation District," Chinese Economic Studies, X (4).

Odell, M.L. 1980. Planning for Agriculture in Botswana: A Report on the Arable Lands Survey, Institute of Development Management in cooperation with Planning and Statistics Division, Ministry of Agriculture, Gaborone.

----------. 1980b. Draft: Botswana's First Livestock Development Project, Report to SIDA, Gaborone.

Opschoor, J.B. 1980. Socio-Economic Activity Patterns and Environmental Resource Utilization in Kgatleng District: Some First Results of a Household Survey, NIR Research Note No. 1, National Institute of Development and Cultural Research, Gaborone.

Otzen, U.; K. Hildebrand; R. Hellberg; B. Ralle; R. Korte; and L. Camman. 1979. Integrated Rural Development Planning With Emphasis on Nutritional Basic Needs for Serowe District/Botswana, German Development Institute, Berlin.

Peters, P. Undated. "Preliminary Findings and Observations on Borehole Syndicates in Kgatleng District," Mochudi, Botswana.

Picard, L.A. 1980. "Bureaucracts, Cattle, and Public Policy: Land Tenure Changes in Botswana," Comparative Political Studies, Vol. 13, No. 3.

Pike, J.G. 1971. Rainfall and Evaporation in Botswana, Technical Document No. 1, UNDP/FAO Surveys and Training for the Development of Water Resources and Agricultural Production, Gaborone.

Pilane, J., A.E. Tvedten and P. Gaosegelwe. 1981. A Very Preliminary Summary Report From a Survey Done in Phase I of the Project 'Agricultural Development--Ngamiland' National Plan No. AR02, Department of Agricultural Research, Ministry of Agriculture, Maun, Botswana.

Pratchett, D.; B.G. Capper; D.E. Light; M.D. Miller; A.S. Rutherford; T.W. Rennie; N.G. Buck and J.C. Trail. 1977. "Factors Limiting Liveweight Gain of Beef Cattle on Rangeland in Botswana," Journal of Range Management 30 (6).

Republic of Botswana. Undated. The Tribal Land Act, 1968 (with Amendments), Gaborone.

----------. 1968(?). "Small Dam Construction Unit," Ministry of Agriculture, Gaborone.

----------. 1979. Report of the Presidential Commission on Local Government Structure in Botswana 1979 (Volume 1), Government Printer, Gaborone.

Reynolds, N. 1977. "Rural Development In Botswana," SALDRU Working Paper No. 13, Cape Town.

Rigby, M.D. 1980. Cultivated Lands Survey, Botswana, done for the ALDEP Team, DHV Consulting Engineers, Gaborone.

Roberts, S. 1980. "Arable Land Tenure and Administrative Change in the Kgatleng," Journal of African Law, Vol. 24, No. 1.

Roe, E. 1980. Development of Livestock, Agriculture and Water Supplies in Eastern Botswana Before Independence: A Short History and Policy Analysis, Occasional Paper No. 10, Rural Development Committee, Cornell University.

---------- and L. Fortmann. 1981. Allocation of Water Points at the Lands, Ministry of Local Government and Lands, Gaborone.

----------. Forthcoming. "Who Brews Traditional Beer in Rural Botswana?: A Review of the Literature and Policy Analysis," in Botswana Notes and Records (In Press), Gaborone.

Rural Sociology Unit. 1975. "Pelotshetlha Survey," Ministry of Agriculture, Gaborone.

----------. 1977. Report on the Sociological Survey of the Losilakgokong Area-Kweneng District, Ministry of Agriculture, Gaborone.

Sandford, S. 1977. Dealing with Drought and Livestock in Botswana, Overseas Development Institute, Gaborone(?).

----------. 1980. Keeping an Eye on TGLP, National Institute of Development and Cultural Research, University College of Botswana, Gaborone.

Schapera, I. and A. Goodwin. 1937. "Work and Wealth," in The Bantu-Speaking Tribes of South Africa: An Ethnographical Survey (I. Schapera, ed.), George Routledge and Sons, London.

Schapera, I. 1938 (New Impression, 1977). A Handbook of Tswana Law and Custom, Case Library of African Law No. 4, Frank Case, London.

----------. 1943. Native Land Tenure in the Bechuanaland Protectorate, The Lovedale Press, Alice.

----------. 1947. The Political Annals of a Tswana Tribe: Minutes of Ngwaketse Public Assemblies, School of African Studies, Cape Town.

----------. 1957. "The Sources of Law in Tswana Tribal Courts: Legislation and Precedent," Journal of African Law, Vol. 1, No. 3.

----------. 1970. Tribal Innovators: Tswana Chiefs and Social Change 1795-1940, Humanities Press, New York.

Sekgoma, M. and D. Eding. 1971. "Attitudes Toward the FFHC Dams in the Metsemotlhaba," Sixth Paper, Baikago, Ministry of Agriculture, Gaborone.

Sheppard, C. 1979. Coping With Drought In Botswana, Interim Report, Rural Sociology Unit, Ministry of Agriculture, Gaborone.

Silberbauer, G.B. 1972. "The G/wi Bushmen," in Hunters and Gatherers Today (M.G. Biccieri, ed.), Holt, Rinehart and Winston, Inc., U.S.A.

Silitshena, R.M.K. Undated. "Notes on Some Characteristics of Population That Has Migrated Permanently to the Lands in the Kweneng District," Botswana Notes and Records, Vol. 10.

----------. 1979. "Chiefly Authority and the Organization of Space in Botswana: Towards an Exploration of Nucleated Settlements Among the Tswana," Botswana Notes and Records, Vol. 11.

Sims, D. 1981. Agroclimatological Information, Crop Requirements and Agricultural Zones for Botswana, Land Utilization Division, Ministry of Agriculture, Gaborone.

Singh, M.G. and W.F. Kelly. Undated. 1980 Botswana Agricultural Statistics, Ministries of Finance and Development Planning and Agriculture, Gaborone.

Singh, M.G., W.F. Kelly and G.L. Motsemme. Undated. 1981 Botswana Agricultural Statistics, Ministries of Agriculture and Finance and Development Planning, Gaborone.

Sutherland, A. 1980. "Grass Roots Land Tenure Among Yeyi of North-Western Botswana," Journal of African Law, Vol. 24, No. 1.

----------. 1981. "Report on Land Tenure in Western Ngamiland's First Communal-First Development Area," Ministry of Local Government and Lands and North-West District Council, Botswana.

Swedish International Development Authority and the Government of Botswana. 1973. Population and Water Usage at Mahalapye: 1972, K. Konsult, Stockholm, Sweden/Gaborone.

Syson, L. 1971. Food Consumption and Quak Stick Measurements: Report of a Survey in the Shoshong Area, 1970-1971, UNDP/FAO, Gaborone.

----------. 1971b. A Profile of Cattle Sales in the Shoshong Area, UNDP/FAO, Gaborone.

----------. 1973. Some Agricultural Data from the Shoshong Area, 1969-71, Technical Note No. 3, UNDP/FAO, Gaborone.

Tanaka, J. 1976. "Subsistence Ecology of Central Kalahari San," in Kalahari Hunter-Gatherers: Studies of the !Kung San and Their Neighbors (R.B. Lee and I. DeVore, eds.), Harvard University Press, Cambridge, Mass.

Turner, M. Undated. "Preliminary Findings and Observations From a Nutritional Survey Carried Out in the Moshaneng Area," Gaborone.

UN/FAO and Ministry of Agriculture. 1974. Report on a Study of Constraints on Agricultural Development in the Republic of Botswana, Rome, Reprint: Government Printer and Ministry of Agriculture, 1980.

UNDP/FAO. 1972. Botswana: The Water Resources of Eastern and Northern Botswana and Their Development, Surveys and Training for the Development of Water Resources and Agricultural Production, Rome.

USAID. 1979. "Somalia Comprehensive Groundwater Project," Project Paper 649-0104.

Van Der Poel, P. 1979. Maximum Amount of Rainfall in One Day, Division of Land Utilization, Ministry of Agriculture, Gaborone.

van Niekerk, B.J. 1966. "Notes on the Administration of Justice Among the Kwena," African Studies, Vol. 25, No. 1.

Vengroff, R. 1977. Botswana, Rural Development in The Shadow of Apartheid, Farleigh Dickinson University Press, U.S.A.

Vierich, H. 1979. Drought 1979: Socioeconomic Survey of Drought Impact in Kweneng, Ministry of Agriculture, Gaborone.

---------- and C. Sheppard. 1980. Drought in Rural Botswana: Socioeconomic Impact and Government Policy, Rural Sociology Unit, Ministry of Agriculture, Gaborone.

Warner, D. 1973. Evaluation of the Development Impact of Rural Water Supply Projects in East African Villages, Report EEP-50. Program in Engineering Economic Planning, Stanford University.

Werbner, R.P. 1975. "Land, Movement, and Status Among Kalanga of Botswana," in Studies in African Social Anthropology (M. Fortes and S. Patterson, eds.), Academic Press, London.

----------. 1977. "Small Man Politics and the Rule of Law: Center-Periphery Relations in East-Central Botswana," Journal of African Law, Vol. 21, No. 1.

----------. 1980. "The Quasi-Judicial and the Experience of the Absurd: Remaking Land Law in North-Eastern Botswana," Journal of African Law, Vol. 24, No. 1.

----------. 1980b. "Production and Reproduction: The Dynamics of Botswana's North-Eastern Micro-Regions," University of Manchester.

White, G.F., D.J. Bradley, and A.U. White. 1972. Drawers of Water, The University of Chicago Press, Chicago and London.

Willett, A.B.J. 1981. Agricultural Group Development in Botswana, Draft, Vol. 1, USAID/Botswana.

Wynne, S. 1981. "Thinking About Redesigning Resource Management Institutions in Botswana: Some Suggestions from Alexis de Tocqueville," Department of Political Science, Bloomington, Indiana.

Youthed, S. Undated. "Stockwatering and Grazing Control," written with W. Halkon, Ministry of Agriculture, Gaborone.

----------. 1968. "Small Dam Construction Unit," Ministry of Agriculture Savingram A9/41/1, Gaborone.

Zufferey, F. 1981. Institutional Research in Two Tswapong Communities: Summary of Findings--Preliminary Analysis, Rural Sociology Unit, Serowe, Botswana.

----------. 1982. Impact of Communal Fencing in Three Communities of Central District: Baseline Data--Phase 1 Report (Draft), Ministry of Agriculture, Gaborone.

Zumer-Linder, M. 1976. "Botswana," in Can Desert Encroachment Be Stopped? (A. Rapp, H.N. LeHouerou, and B. Lundholm, eds.), Ecological Bulletins 24, Swedish Natural Science Research Council, Stockholm.

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