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AGRICULTURE AND AGRICULTURAL TARGET POPULATIONS  
IN SOUTHERN DISTRICT'S COMMUNAL FIRST DEVELOPMENT AREA

by

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CHAPTER 1

Introduction

A. Agriculture and Communal First Development Area Policy

Development planners in Botswana identify two themes, employment creation and rural development, as characterising development efforts (Ministry of Finance and Development Planning). In November 1980, the Rural Development Council agreed that these ends be pursued in the communal areas of Botswana (i.e. those areas not characterised by freehold, leasehold, or state tenure) in a systematic fashion, beginning in Communal First Development Areas. In most communal areas, it was argued, employment and income generation would mean the complementary development of mixed farming, rural industries, and labour-intensive development projects (CFDA Working Group).

The first component, 'agricultural development', has become a commonly stated goal in Botswana, as it has been in rural-based societies throughout the world. One of the intentions behind the creation of the CFDA policy is to focus attention on the fact that if agricultural development in Botswana is to involve, positively, the majority of its rural population, it will have to comprise more than the creation of a commercialised livestock sector.

The administrative districts of Botswana were entrusted with the task of selecting CFDAs. In April 1981 Southern District Council endorsed the policy and selected the Pitsane/Phitshane-Molopo corridor as its CFDA (Southern District Council). This present paper attempts to provide an overview of agriculture in Southern District's CFDA, and to suggest some ways similar overviews could be developed in other CFDAs. It is based

primarily on agricultural statistics; sociological, anthropological, and other studies done in or near the CFDA which have information on agriculture; and the author's conversations with Southern District planning personnel, agricultural extension personnel, and consultation of the records kept by agricultural extension personnel. These latter sources were consulted in the District in late October and early November of 1981.

## B. An Outline of the Paper

The paper begins with an overview of agriculture in the area, first as seen in the relevant portions of recent national Agricultural Statistics (Agricultural Statistics Unit and Central Statistics Office, various), and in some of the work of the anthropologists John Comaroff (1977, 1980) and Ornull Gulbrandsen (Gulbrandsen). It then develops a 'quick and dirty' methodology which might be used by District planning personnel to create a policy-oriented typology of farmers in a CFDA. An example of this methodology applied to Kgoro village, in Southern District, is provided. This, in turn, provokes a re-examination of the often-made assumption that the Barolong Farms area, within which much of the CFDA lies, is a 'successful' crop growing area. It is concluded that the Barolong Farms are, indeed, marked by 'important internal variations', as stressed by Comaroff (1977), and that, in fact, even the overall agricultural production in Barolong has probably never been as high as is usually thought. Some of the implications this has for agricultural policy in the area, and in Botswana's communal areas generally, are pointed out. The paper concludes with some general observations on communal area agricultural research.

## CHAPTER II

### Southern District CFDA and the Barolong and Ngwaketse South Agricultural Districts

#### A. The Agricultural Statistics

The material presented immediately below is from the three most recent nationwide agricultural surveys, for 1978/79, 1979/80, and 1980/81 (Agricultural Statistics Unit and Central Statistics office, various). The first year was a dry year; the latter two might be considered normal to good years (see also Tables 55 and 56, below). In reading this statistical material, the reader should remember three things in particular. First, in the Agricultural Statistics, coefficients of variation (cv's) are generally higher for the Agricultural Extension District estimates than for Agricultural Region estimates, which in turn are higher than the cv's for Botswana as a whole. Second, the District-level Agricultural Statistics are usually in the form of totals, means, or percentages of farmers having a given characteristic. As will be elaborated below, such statistics can hide significant internal variations, as Comaroff argues. Third, these figures usually concern Barolong and Ngwaketse South Agricultural Extension Districts. The CFDA lies within these two Districts but comprises, roughly, only 6 of the 29 Agricultural Extension Areas within them.

The Barolong Agricultural District has under 2 percent of Botswana's farmers, as estimated by recent Agricultural Statistics; the Ngwaketse South Agricultural District over 5 percent.<sup>1</sup>

#### 1. Types of Farming

It is commonly assumed that crop production in Southern Agricultural Region, and particularly Barolong, is more emphasised than it is in Botswana as a whole. Recent Agricultural Statistics help to define and sharpen the parameters behind this general presumption, and to give an overview of agricultural enterprise as it exists in the two Districts within which the CFDA lies (Tables 1-7).

As expected, the percentages of Barolong farmers who held cattle were somewhat lower than the percentages for all Botswana. The estimated percentages for Ngwaketse South were higher than the national percentages (Table 1). Estimated mean herd sizes for Barolong were lower than for all Botswana. Those for Ngwaketse South were the same to somewhat lower than the national figures (Table 2).

Interestingly enough, the estimated percentages of farmers holding arable lands in Barolong and Ngwaketse South were virtually indistinguishable from those nationally, or perhaps lower (Table 3). And the percentages of farmers actually ploughing and planting crops in the three years

TABLE 1

Percentages of Farmers Holding Cattle

AREA	1978/79	1979/80	1980/81
Barolong	60	64	62
Ngwaketse South	89	82	76
Botswana	77	72	69

TABLE 2

Mean Herd Sizes for Farmers Holding Cattle

AREA	1978/79	1979/80	1980/81
Barolong	31	28	22
Ngwaketse South	41	34	37
Botswana	40	42	43

TABLE 3

Percentages of Farmers Holding Arable Land

AREA	1978/79	1979/80	1980/81
Barolong	87	86	69
Ngwaketse South	79	82	72
Botswana	85	88	84

TABLE 4

Percentages of Farmers Planting Crops

AREA	1978/79	1979/80	1980/81
Barolong	53	71	62
Ngwaketse South	39	68	67
Botswana	55	82	81

TABLE 5

'Mixed' Farmers as a Percentage of Total Farmers

AREA	1978/79	1979/80	1980/81
Barolong	47	50	31
Ngwaketse South	68	64	48
Botswana	62	60	53

TABLE 6

'Cattle Only' Farmers as a Percentage of Total Farmers

AREA	1978/79	1979/80	1980/81
Barolong	13	14	31
Ngwaketse South	21	18	28
Botswana	15	12	16

TABLE 7

'Lands Only' Farmers as a Percentage of Total Farmers

AREA	1978/79	1979/80	1980/81
Barolong	40	36	38
Ngwaketse South	11	18	24
Botswana	23	28	31

in question tended to be lower in Barolong and Ngwaketse South than in all Botswana (Table 4). This means that in the two Agricultural Districts somewhat lower percentages of farmers who hold land actually planted crops in any given year. The figures for the individual years support this conclusion regardless of whether the year was dry, as in 1978/79, or not.

It is notable that only 25 percent more Barolong farmers ploughed in 1979/80 and 1980/81 than in 1978/79, whereas in Ngwaketse South the numbers doubled, and nationally they increased by around 50 percent. These figures support the tentative conclusion that proportionately more Barolong farmers who plough in normal to good years continue to plough in a

drought year like 1978/79. Presumably more Barolong farmers are larger arable farmers who, in a bad year, do not drop out but rather reduce their hectarages.

If it is assumed that all farmers either held cattle, or lands, or both (i.e. that no farmer qualified as such solely on the basis of, say, smallstock holding), percentages of 'mixed', 'cattle only', and 'lands only' farmers can be calculated.

'Mixed' farmers are those who hold both lands and cattle. Fewer Barolong farmers were mixed farmers than in Botswana generally. The percentages for Ngwaketse South were more comparable to the national figures (Table 5). More Ngwaketse South farmers were 'cattle only' farmers than nationally. The percentages for Barolong varied widely (Table 6). More Barolong farmers and fewer Ngwaketse South farmers were 'lands only' farmers than in Botswana generally (Table 7).

2. Crop Farming--Basic Statistics

The presupposition that Barolong and Ngwaketse South have more arable activity than other Agricultural Districts is borne out by some of the data (Tables 8-15).

TABLE 8

Mean Hectarage Per Ploughing Farmer

AREA	1978/79 <sup>1</sup>	1979/80	1980/81
Barolong	5.1	11.7	12.4
Ngwaketse South	5.8	8.7	8.5
Botswana	3.6	4.1	4.0

1. Sorghum, maize, beans, and millet only.

TABLE 9

Percentages of Planting Farmers Who Harvested Some Crop

AREA	1978/79	1979/80	1980/81
Barolong	NA	80	80
Ngwaketse South	NA	80	87
Botswana	NA	83	84

TABLE 10

Percentages of Planted Hectares Which Were Harvested

AREA	1978/79 <sup>1</sup>	1979/80	1980/81
Barolong	78	92	92
Ngwaketse South	37	87	93
Botswana	53	75	75

1. Sorghum, maize, beans, and millet only.

TABLE 11

Yield Per Harvested Hectare--Food Crops<sup>1</sup>  
(kg/ha)

AREA	1978/79	1979/80	1980/81
Barolong	80	363	637
Ngwaketse South	65	276	392
Botswana	89	196	237

1. Sorghum, maize, beans, and millet.

TABLE 12

Percentages of Total National 'Traditional'  
Food Crop<sup>1</sup> Output, by Volume

AREA	1978/79	1979/80	1980/81
Barolong	3.5	7.8	14.0
Ngwaketse South	2.9	15.2	20.3
Botswana	100.0	100.0	100.0

1. Sorghum, maize, beans, and millet.

TABLE 13

Percentages of Total National 'Traditional' Groundnut and Sunflower Output, by Volume, Southern Agricultural Region<sup>1</sup>

CROP	1978/79	1979/80	1980/81
Groundnuts	12	31	67
Sunflower	67	81	92

1. Southern Agricultural Region includes Barolong and Ngwaketse South Agricultural Districts.

TABLE 14

Percentage of Total Hectarage Planted to Given Crops--1979/80<sup>1</sup>

AREA	SORGHUM	MAIZE	MILLET	BEANS	OTHER
Barolong	29.9	42.7	-	6.0	21.4
Ngwaketse South	49.6	38.1	-	5.0	7.3
Botswana	52.6	27.7	6.2	8.6	4.8

1. Area from mixed fields is allocated among the various crops by weight of seed applied.

TABLE 15

Percentage of Total Hectarage Planted to Given Crops--1980/81<sup>1</sup>

AREA	SORGHUM	MAIZE	MILLET	BEANS	OTHER
Barolong	32.3	48.4	-	10.5	8.9
Ngwaketse South	32.8	58.1	-	8.3	0.8
Botswana	50.4	30.1	7.3	9.6	2.6

1. Area from mixed fields is allocated among the various crops by weight of seed applied.

Mean hectarage per ploughing farmer has been higher in the two districts in the years under discussion (Table 8).<sup>2</sup> The percentage of planting farmers who actually harvested some crop appears to be no different in the two Districts than it was nationally in the normal to good years of 1979/80 and 1980/81 (Table 9). However, in these same years the percentage of planted hectarage which was harvested in both Barolong and Ngwaketse South was higher than in Botswana as a whole (Table 10). In the dry year of 1978/79 Barolong farmers still managed to harvest 78 percent of their planted area, while nationally the figure dropped to 53 percent and in Ngwaketse South to only 37 percent of planted hectarage.<sup>3</sup>

Another measure of arable performance is yield per harvested hectare. Here, in the good years, estimated yields for food crops were higher in the Districts in question, with Barolong, as expected, leading Ngwaketse South (Table 11). In the dry year, 1978/79, yields were uniformly low.

Given the generally larger hectarages, higher harvesting ratios, and greater yields for Barolong and Ngwaketse South, one would expect farmers there to account for disproportionately large amounts of national crop production. This in fact has been the case for food crops in the two good rainfall years (Table 12).<sup>4</sup> In the cash crops of groundnuts and sunflower the dominance of Southern Agricultural Region, taken as a whole, in national 'traditional' output is even more striking (Table 13).<sup>5</sup> In fact, considering hectarage figures for crops other than the basic food crops, it appears likely that most of this Southern Region groundnut and sunflower production comes from Barolong Agricultural District.

Southern Region farmers, particularly Barolong farmers, tend to plant more maize and 'other' crops than do Botswana farmers generally (Tables 14 and 15).

### 3. Crop Farming--Farm Practices

The following estimates concerning farm practices in the 1979/80 and 1980/81 Agricultural Statistics are worth noting (Tables 16-21).

TABLE 16

Draught Access--Percentages of Ploughing Farmers  
Using Owned or Mafisa'd Draught

AREA	1979/80	1980/81
Barolong	65	50
Ngwaketse South	65	50
Botswana	53	50

TABLE 17

Draught Type--Percentages of Ploughing Farmers  
Using Tractors or Tractors Plus Animals

AREA	1979/80	1980/81
Barolong	30	15
Ngwaketse South	33	24
Botswana	22	18

TABLE 18

Draught Type--Percentages of Ploughing Farmers Using Donkeys Only

AREA	1979/80	1980/81
Barolong	35	20
Ngwaketse South	10	19
Botswana	10	9

TABLE 19

Draught Type--Percentages of Ploughing Farmers  
Using Oxen and Other Cattle, or Cattle Plus Donkeys

AREA	1979/80	1980/81
Barolong	35	65
Ngwaketse South	57	56
Botswana	67	72

TABLE 20

Row Planting--Percentages of Ploughing Farmers  
Planting Some or All of Their Lands in Rows

AREA	1979/80	1980/81
Barolong	50	40
Ngwaketse South	33	16
Botswana	7	5

TABLE 21

Date of First Planting--Percentages of Ploughing Farmers

AREA	1979/80		1980/81	
	Before Dec.	Before Jan.	Before Dec.	Before Jan.
Barolong	40	95	40	95
Ngwaketse South	23	85	23	95
Botswana	26	79	30	81

In 1979/80 percentages of owned and mafisa'd draught for both Barolong and Ngwaketse South were estimated as higher than for Botswana (Table 16). In 1980/81 all three figures were the same.

Overall, higher proportions of farmers in Barolong and Ngwaketse South use tractors or donkeys than in Botswana as a whole, although estimates of the two years differ somewhat (Tables 17-19).<sup>6</sup> (It is likely that the donkey draught estimate for Barolong in 1979/80 is an overestimate, and that, correspondingly, the cattle draught estimate is too low for Barolong in that year).

Row planting was also estimated to be much higher in these two districts than elsewhere (Table 20).<sup>7</sup> Finally, Barolong farmers appeared to plant earlier than farmers in Ngwaketse South or nationally in these two years (Table 21).

4. Cattle Holding

Two estimates for cattle holding, percentage of farmers holding cattle and mean herd size, have already been presented. Several other notable estimates follow immediately (Tables 22-26).

TABLE 22

Cattle Herd Composition--Oxen as a Percentage of the Total Herd

AREA	1978/79	1979/80	1980/81
Barolong	22	10	16
Ngwaketse South	12	10	12
Botswana	14	13	11

TABLE 23

Cattle Herd Composition--Cows as a Percentage of the Total Herd

AREA	1978/79	1979/80	1980/81
Barolong	35	39	40
Ngwaketse South	43	45	41
Botswana	41	41	41

TABLE 24

Effective Calving Rates<sup>1</sup>--Percentages

AREA	1978/79	1979/80	1980/81
Barolong	58	53	49
Ngwaketse South	56	44	48
Botswana	49	49	49

1. Defined as calves/cows rather than births/cows.

TABLE 25

Cattle Mortality Rates--Percentages

AREA	1978/79	1979/80	1980/81
Barolong	7	12	9
Ngwaketse South	8	14	10
Botswana	11	14	14

In 1978/79 and 1980/81 Barolong farmers appeared to be holding larger proportions of oxen. Ngwaketse South trek oxen proportions did not appear to differ significantly from the national proportions (Table 22). There were odd years in which the proportions of cows relative to total herd size in Barolong or Ngwaketse South differed from the national figure, but no consistent pattern emerged (Table 23).

TABLE 26  
Cattle Offtake Rates<sup>1</sup>--Percentages

AREA	1978/79	1979/80	1980/81
Barolong	12	14	13
Ngwaketse South	11	13	5
Botswana	10	8	9

1. Defined as (sales + home slaughter)/total cattle.

With respect to biological herd performance parameters, it seems possible that the herds in Barolong and Ngwaketse South sometimes surpassed the national herd. When effective calving rates in the two Districts differed from national calving rates, they tended to be higher (Table 24); and when mortality rates in Barolong and Ngwaketse South diverged from those nationally, they tended to be lower (Table 25). However, these figures should probably be interpreted cautiously.

Finally, offtake rates in Barolong appear to have been somewhat higher than national rates. The rates for Ngwaketse South displayed no consistent pattern (Table 26).

#### 5. Smallstock

This statistical overview of agriculture in Barolong and Ngwaketse South Agricultural Districts is concluded with a brief look at smallstock (Tables 27-32).

TABLE 27  
Percentages of Farmers Holding Goats

AREA	1978/79	1979/80	1980/81
Barolong	67	64	44
Ngwaketse South	58	66	67
Botswana	59	57	56

TABLE 28

Percentages of Farmers Holding Sheep

AREA	1978/79	1979/80	1980/81
Barolong	40	43	38
Ngwaketse South	37	34	26
Botswana	18	17	15

TABLE 29

Mean Flock Size for Farmers Holding Goats

AREA	1978/79	1979/80	1980/81
Barolong	16	11	13
Ngwaketse South	18	12	11
Botswana	12	14	13

TABLE 30

Mean Flock Size for Farmers Holding Sheep

AREA	1978/79	1979/80	1980/81
Barolong	17	13	13
Ngwaketse South	11	10	10
Botswana	7	10	10

TABLE 31

Goat Mortality Rates--Percentages

AREA	1978/79	1979/80	1980/81
Barolong	38	40	28
Ngwaketse South	28	42	40
Botswana	46	35	32

TABLE 32

Sheep Mortality Rates--Percentages

AREA	1978/79	1979/80	1980/81
Barolong	25	46	30
Ngwaketse South	33	48	32
Botswana	39	32	26

Smallstock holdings appear to have been more extensive and larger in these two southern Agricultural Districts than nationally, particularly in Barolong and particularly in sheep holdings (Tables 27-30). However, the estimates for smallstock in Barolong and Ngwaketse South, both in terms of percentages holding sheep and goats and mean flock sizes, appear to have been declining (with the exception of the percentage holding goats in Ngwaketse South). Furthermore, mortality rates in Barolong and Ngwaketse South were higher than nationally in 1979/80 and 1980/81, with the exception of the mortality rate for goats in Barolong in the most recent year (Tables 31 and 32). No general patterns appear discernible in effective birth rates or offtake rates for smallstock. (Tables for these variables are not reproduced here for reasons of space).

B. Anthropological Investigations--The Work of John Comaroff and Ormulf Gulbrandsen

The bare bones of the Agricultural Statistics can be fleshed out by considering the analyses of two major anthropological studies, one done in Barolong Agricultural District (Comaroff 1977, 1980) and the other in Ngwaketse South Agricultural District (Gulbrandsen). Both of these are much wider in scope than the present paper, which cannot begin to do them justice, but they must be considered in any discussion of agriculture in the area.

1. Barolong in the Mid-1970's--Comaroff

John Comaroff did 14 months' field research in Barolong in 1974/75. The two publications stemming from this field work which are considered here (Comaroff 1977, 1980) present both a static description of Barolong agriculture in the mid-'970's and an analysis of its historical antecedents and process of transformation. Besides considering agriculture, "The Structure of Agricultural Transformation in Barolong" (Comaroff 1977) gives an overview of Barolong's development needs in general, and, as its subtitle would suggest, presents policy recommendations for integrated development. "Class and Culture in a Peasant Economy" (Comaroff 1980) concerns itself more specifically with land tenure, emphasises the historical process of agricultural transformation, and presents a much deeper analysis of the interaction between 'internal structures and external forces' in shaping that transformation.

The static picture which Comaroff describes is of an overwhelmingly successful arable agriculture, in total. For 1973/74 he estimates total grain crop production of 31,500 metric tonnes. Mean yields are estimated at anywhere between 200 kg/ha, in a poor year for small farmers, and 1600 kg/ha.<sup>8</sup> Comaroff estimates that of 1500 farming families, almost all row planted; 67 percent undertook regular crop rotation; 48 percent used the 129 working tractors for something other than transport; 66 percent owned planters; 98 percent, ploughs; 46 percent, cultivators; 4 percent, threshing machines; and 57 percent, other implements. Production was aimed regularly at the market, with 98 percent of the farming households selling grain, and 81 percent of farming households selling 25 or more 90 kg bags in 1973/74.

At the same time, Comaroff estimates only 47 percent of Barolong farmers held cattle. The percentages he estimates for cattle distribution imply mean herd size per cattle owner might be around 22, median size perhaps below 15, and a total Barolong herd of about 16,000 head.

As mentioned, Comaroff claims the popular picture of agriculture in Barolong hides significant internal variation. He classifies the total population into four categories.

A small group of large farmers all had access to abundant land, owned tractors, produced large outputs, and employed much seasonal agricultural labour. Much of their income came from renting out implements, services, and transport; and many entered sharecropping arrangements with other farmers to gain access to more land.

A majority of farmers were middle range, although this proportion was decreasing rapidly in 1973/74. The immediate, economic cause for this was a narrowing profit margin due to the combination of rising costs and static output prices. Comaroff claims this was true despite the fact that middle-range farmers were more productive in terms of output per unit area. These farmers were the primary clientele for hiring mechanised agricultural services, which often forced them to commit cash resources early in the season. They were more likely than other farmers to allow some of their land to be sharecropped.

An increasing proportion of the farming community in 1973/74 was small farmers. Most used animal draught, particularly donkeys, and owned few implements. On their small holdings they produced subsistence or small surpluses for sale. Many had to supplement the incomes they gained from their agricultural holdings, and to rely more on reciprocal exchanges with other poor households.

Finally, the rest of the population consisted of non-farming households who tended, increasingly, to form a pool of labour for the large farmers.

As mentioned, Comaroff's 1980 Journal of African Law article analyses, more deeply, the historic dimension of the transformation of agriculture in Barolong from low productivity to an apparently very successful enterprise. He argues that among the Tshidi, the group of Barolong who

occupy the farms, the classic Tswana hierarchy is 'highly negotiable' in terms of individual interests. Furthermore, the Barolong of the farms have escaped some of the constraints on risky, semi-arid agriculture posed, in the Tswana political system, by chiefly control of people's movement between the central, capital village and the arable lands. This was due to the increasing political separation of the Barolong in the farms from the capital at Mafikeng, now in South Africa, because of the anomalies of externally imposed boundaries and contests over the control of land.<sup>9</sup>

Particularly since Botswana's independence, the class of large farmers has solidified its position not only through its control of agricultural capital in the form of tractors and implements, but also through gaining control over local administrative institutions. These, in particular, have been those charged with the allocation and adjudication of land and the planning of land use. This has occurred despite the fact that few large farmers have kinship ties with Tshidi royalty. Rather, they have formed economic and political alliances with both 'traditional' and 'modern' political authority in the pursuit of their interests.

## 2. Mmathethe Village, Ngwaketse South--Gulbrandsen

Ornulf Gulbrandsen also did field work in the mid-1970's, spending 15 months in Mmathethe in 1976/77 (Gulbrandsen). Mmathethe lies immediately to the north of that part of Ngwaketse South which is in the CFDA. Gulbrandsen's description of Mmathethe agriculture resembles the expected for Botswana much more than does Comaroff's picture of Barolong.

Gulbrandsen estimates about 80 percent of his sample of 148 households were involved in arable agriculture, but the level of activity was variable and output generally low. Mean hectarage per ploughing household was somewhat over 3 ha in 1975/76 and somewhat under 3 ha. in 1976/77. Yields (roughly equivalent to yields per harvested hectare) were around 150 kg/ha in 1975/76 and 115 kg/ha in 1976/77. Gulbrandsen estimates that only 5 or 6 percent of all ploughing households in both years produced over 20 bags of 90 kg, let alone sold that many.

Gulbrandsen states that in 1976/77, 26 percent of the farmers in his Mmathethe sample used only oxen for ploughing, 63 percent used oxen plus other cattle, 6 percent used donkeys, and 5 percent tractors. Of the 116 households he classifies as arable farmers, based on activity over two years, 36 depended on draught animals from an extended family pool to make up a span, and 9 relied on mafisa'd animals to make up a span. In 1976/77 only 5 households pooled animals with other than close relatives; 5 'put in hands', or exchanged labour for draught; and only 3 hired draught, in all cases tractors. Gulbrandsen estimates that of ploughing households in 1976/77, 91 percent owned a plough, 30 percent a planter, and 18 percent a cultivator. Twenty-six percent used kral manure or fertiliser regularly or irregularly and 17 percent practised systematic crop rotation.

Calculations from Gulbrandsen's cattle ownership and cattle holding figures indicate perhaps 78 percent of his sample held cattle. The mean

herd size per cattle owner was perhaps around 17 head and the median around 9 head. If cattle of other family members held in the kraals of household heads were included, mean herd size might increase to near 21 head and median herd size to 15.

This distinction between cattle owned by household head and by other family members, and Gulbrandsen's division of cattle-holding households by age and sex of household head, are quite important means of classification given his analysis. Some of the more salient features of this analysis are listed below.

Gulbrandsen's work is grounded in an examination of the extended family structure. Very few families in this sample could survive on their agricultural production alone, and therefore they were dependent on the remittances of family members who had wage income, often men between 20 and 40 or 50. Some arable agriculture might have been dependent on cash remittances from migrant workers, or on the return of migrant male labour at ploughing time. At the same time crop agriculture relied crucially on the amount of draught power available to the three or more generation extended family.

Nonetheless, Gulbrandsen argues, many families did not fully utilise their household labour and draught power in arable production. He adduces two major reasons. First, those households in the best position to plough, usually those headed by senior males, often needed crop income the least. They were more likely to have greater cattle security and remittance income from employed children. Furthermore, there may have been a conflict of economic interest between senior male heads of household who monopolised crop income, and unmarried sons who provided labour but received limited benefits. Second, the marginal utility of allocating labour to risky, low output arable agriculture was very low.

In qualification of Gulbrandsen's arguments concerning underutilisation of resources in arable agriculture, it should be noted that he used the lowest herd size criterion for indicating adequate draught, namely 10 head. This corresponds to the bottom of the adequate draught category as defined by ALDEP (ALDEP 1979a), or the bottom of the 'medium sized', or 'mixed production' class identified in national data by Litschauer and Kelly (Litschauer and Kelly). On the other hand, it has been argued, usually on the basis of average proportions of oxen in a herd, that 30 to 40 head of cattle are required for independent ploughing. Forty head is the top of the ALDEP and Litschauer and Kelly classifications.<sup>10</sup>

In favour of Gulbrandsen's 'under-utilisation' hypothesis, however, one might note that ownership of ploughs, including two furrow ploughs, planters, and cultivators among his sample farmers was certainly higher than it is, today, in Botswana generally. This indicates greater agricultural capitalisation on the part of Gulbrandsen's sample. Yet mean hectareage ploughed appears to have been indistinguishable from national means.

Finally, Gulbrandsen explicitly states that in the mid-1970's only skilled workers in Botswana towns--a minority of migrants to towns--could

invest substantially in cattle, and thus indirectly in the means for crop production. Similar results have been reported by Cooper (1980). On the other hand, migrant miners were often in a better position to invest in agro-pastoral production, although this only dated from the relative increase in mine wages in the early to mid-1970's. Whether they in fact chose to follow a mixed production strategy rather than simply building up herds has been partially discussed above in the summary of Gulbrandsen's analysis.

### C. Summary

In summary, recent Agricultural Statistics, Comaroff, and, to a much lesser extent, Gulbrandsen,<sup>11</sup> do describe the area within which the Southern District CFDA lies as more oriented to arable agriculture than Botswana in general. This is particularly true for Barolong, as expected; and livestock holding is less prevalent there than nationally, both in terms of percentage of farmers holding livestock and mean herd size. 'Orientation to arable agriculture' has been more specifically defined in terms of mean hectares planted, harvesting ratios, yields, ownership of agricultural capital, and use of practices often recommended by agricultural extension such as row planting. Also, it appears that some poorer farmers in the area compensate for lack of other draught with donkeys. Another factor differentiating agriculture in Barolong and Ngwaketse South may be a greater emphasis on smallstock in those two Extension Districts. There is some evidence that these Southern Region smallstock holdings may have been in decline in the last several years.

Comaroff's description of Barolong agriculture does show total arable production in 1973/74 as between four and five times as much as estimated in 1980/81. On the other hand, Gulbrandsen's report shows arable production in one village in Ngwaketse South as being rather less successful than recent Agricultural Statistics show for the whole District.

Both Comaroff's and Gulbrandsen's works contain possible explanations for some of these discrepancies. Comaroff portrays Barolong as increasingly polarised into a few large and many small farmers, with more middle-range farmers moving down than up. Gulbrandsen argues that farmers in his sample often underutilised arable production capacity. In other parts of Gulbrandsen's monograph, not cited above, he notes farmers in other areas of the District--notably at the Integrated Farming Pilot Project; and large tractor farmers, some of whom, from Kanye, were pressing on grazing lands at Magoriapitse and Mokgomane--who would have tended to be much larger crop producers.

This present paper will return to some of these differences later. First, however, some specific recent estimates of agricultural parameters within the CFDA proper will be considered.

## CHAPTER III

### Towards a Farmer Typology for Southern District's CFDA

#### A. Other Relevant Classification Schemes and Some Reasons for This One

One of the original goals of the work summarised in this paper was to produce a policy-oriented 'typology', or classification scheme, for farmers in the Southern Region CFDA. Classifications of the rural population in Botswana are quite common. As we have seen, Comaroff has provided such a classification for the Barolong Farms area. As do most of the other schemes listed below, Comaroff's divides the population into non-farmers, and small, middle, and large farmers. Other typologies of Botswana farmers have been provided by Alverson (Alverson 1979a), Cooper (Cooper 1980), Litschauer and Kelly (Litschauer and Kelly), and Opschoor (Opschoor 1981a, 1981b). Litschauer and Kelly's assessment is notable because it is based on the 1979/80 Agricultural Survey (Agricultural Statistics Unit and Central Statistics Office 1980), a probability sample survey covering approximately 98 percent of all 'traditional' farm holders in Botswana. The classifications due to Cooper and Opschoor also consider non-farm wage income--an important source of income for many rural families.

In this paper a very similar classification scheme will be proposed. It will, however, have three specific aims. First, this paper aims to develop a simple, reasonably effective methodology which will allow CFDA planners to categorise farmers within their own CFDAs. Second, the 'recommendation domains' or 'target populations' identified by the methodology are intended to be relevant to policy. In this the assumption followed is that of Farming Systems Research, namely that there are groups of farmers with similar characteristics--similar resources, culture, or marketing opportunities, for example--who are likely to respond in the same way to agricultural programmes (Gilbert, Norman, and Winch). In addition, the methodology should allow CFDA planners to relate the structure of agriculture in their areas to the structures described in the literature noted above.

A further assumption behind the proposed approach also stems from Farming Systems Research. This is that CFDA planning and implementation resources are limited. There is neither the time, money, nor personnel to collect detailed information on each farm enterprise in a CFDA, or to devise and extend an individual programme for each enterprise. In fact, the approach proposed here is a decided simplification of Farming Systems Research, since it depends for implementation on an unspecified set of 'CFDA planners', rather than on a carefully chosen interdisciplinary team composed of both natural and social scientists.

## B. A Methodology for Creating a CFDA Farmer Typology

In this section steps which can be taken in creating a farmer typology are discussed. Collection of background information is followed by a simple agricultural survey. A cross-classification of farmers by cattle holding and crop production is used as the basis of constructing a farmer typology. The resulting farmer groups are analysed in terms of some of the other variables collected by the survey.

Throughout the following discussion it should be borne in mind that the proposed methodology will not necessarily identify any particular household as belonging to the group in which in-depth household research might place it. Rather, it creates a classification which is valid for a defined geographic area. The reason for this is that there are sources of variation outside the proposed methodology which may cause individual households to be misclassified. This should become clearer in the discussion below.

Two general principles guide the approach, preferably held in creative tension. First, all possible sources of information should be examined.<sup>12</sup> Second, in deciding how much information to collect in any agricultural survey, District planners should consider carefully how much time they have available to analyse the resulting information.

The first step in creating a farmer typology is reviewing background information on agriculture in the area. There are at least two kinds of sources which may be consulted. The first consists of previously published studies, both social and statistical.<sup>13</sup> The second source consists particularly of local agricultural extension personnel, but also of anyone else who might have some useful perspective on agriculture in the area--for example, tribal authorities.

The second step is to conduct a household survey. This would be constructed with information elicited in Step 1 in mind. Three lists of suggested variables are given in the appendix--a short list of absolutely essential information a medium list, and a long list. All other things equal, it is better for the purposes of a CFDA farmer typology to ask fewer questions of more farmers than more questions of fewer farmers, provided that reasonably accurate answers are obtained to the crucial questions. There are at least two reasons for this. The first, mentioned above, is the likelihood of limited resources for data analysis. The second is the probability of substantial sampling error because of the wide ranges in crucial agricultural variables in Botswana. Furthermore, the advice of a professional statistician is unlikely.<sup>14</sup>

The third step is to analyse the data based on a simple cross-classification of farm households by cattle holdings, and bags of food crops produced in a normal to good year. For these purposes a 'farm household' is defined as one which either (1) holds cattle; (2) holds 4 smallstock; (3) holds arable land; (4) owns a plough, or (5) ploughed in the last arable season.<sup>15</sup>

The importance of cattle in Botswana's rural economy is too well known to require elaboration here. It is likely that the final typology will be based particularly on cattle-holding classes. The point to be stressed here is that increased arable activity is likely to be associated with increased cattle ownership.<sup>16</sup> This is not intended to contradict the observation that in most of eastern Botswana, above a certain herd size--perhaps around 40 head--the cattle owner usually chooses either to substantially expand arable activity or to reduce it to relatively quite minimal levels, if not drop it altogether (Carl Bro International; Litschauer and Kelly). In other words, large arable farmers tend to be larger cattle farmers, but the converse is not always the case.

The following divisions of cattle holdings are largely based on the recent report by the Livestock Evaluation Unit, which presents herd size thresholds determined both by herd management goals (e.g. provision of draught power) and problems (e.g. watering) (Carl Bro International). As seen in Section H.B.2 above, some of the thresholds, notably at 10 and 40 head, have been discussed by other researchers as well. The suggested cattle holding classes are 0, 1-5, 6-10, 11-20, 21-30, 31-40, 41-50, 51+ head.<sup>17</sup>

The methodology also includes a variable to reflect arable activity. As stated above, it is suggested that there will be a positive association between cattle holding and arable activity, but the configurations of households who do not fit the pattern (e.g. people with lower cattle holding who are large crop producers, or people with large cattle holdings who produce little or no crops) will be of interest.

The choice here is between bags of food crops produced and area ploughed. It is recommended that the former be used for measurement reasons. Unless areas are actually measured, if only by pacing, by a well-trained research team, they are likely to be highly inaccurate. Farmers probably have a good idea of the area of their fields in relation to the amount they expect to produce, but are unlikely to translate that into an objective measurement.<sup>18</sup>

It can quite legitimately be argued that the number of bags of food crops produced per household varies widely from year to year. In fact, area ploughed would be subject to much the same criticism. Despite this criticism, it is felt that the inclusion of an arable variable remains important, particularly in an area such as Southern District. There are several partial solutions to the problem. Information from a normal to good year should be used, with 'normal to good' being left deliberately undefined and up to the wisdom of the CFDA planners.<sup>19</sup> Bags produced even in a normal to good year will vary, both in any individual household or in an area, but the range within the relevant CFDA should be wide enough to permit the construction of useful categories of crop production.<sup>20</sup> If interviewing is done after a bad year, crop production figures for a recent 'normal' year should be obtained. These, of course, will be less accurate than figures for the immediately preceding crop year. This leads to a related point. The best time for the interviews would be immediately after the completion of harvest.

For the reasons just listed, and because classes of crop production relate less clearly to management than do classes of cattle holding, division of the 'bags produced' variable into classes is less intuitive than division of 'cattle held'. The numerous estimates of household self-sufficiency which have been made do, however, influence the proposed division. Eleven to twenty bags per household per year can be considered a 'low self-sufficiency' range, and 21-30 bags a 'high self-sufficiency' range.<sup>21</sup> The suggested division is: those with no lands (i.e. those who have qualified as farmers on one of the other criteria above, and who have not borrowed land for ploughing); those with lands who did not plough; 0 bags harvested; 1-5 bags harvested; 6-10 bags harvested; 11-20 bags harvested; 21-30 bags harvested; 31-50 bags harvested; 51-100 bags harvested, and 101+ bags harvested.<sup>22</sup>

On the basis of these size categories (or others thought more relevant) farmers are cross-classified by cattle holding and bags of food crops produced, and a frequency table is prepared. (An example is given below in the text). Several general principles can be used to group households. First, the cattle categories may be the more important variable in any grouping. Second, the frequency table can be inspected visually to see if there are any apparent clusters. The third principle is to concentrate specifically on the farmers on either side of the Livestock Evaluation Unit's cattle holding thresholds, particularly those at 6-10 and 40 head, the minimum and maximum thresholds usually cited as indicating 'adequate' draught. The fourth thing to keep in mind is those crop producers who might be fitted into groups other than those in which a strict cattle classification might place them.

After making a tentative division in this way, the farmer groups can be examined to compare the distributions of other variables collected in the survey. On this basis some revision may be made of the original typology. Finally, the CFDA planners should begin to look at the groups as 'recommendation domains'. This analysis is likely to be an ongoing, painful process during the course of CFDA planning. It should be remembered that in many ways the target populations identified will be similar to those in other parts of Botswana. Thus, experience and analysis from other researchers and other CFDAs should be relevant to the CFDA in question.

There is one crucial aspect of Botswana's rural society which has been ignored to this point but must be mentioned. It is likely to be one of the larger sources of variation which is not explained by a farmer typology constructed as outlined above.

To this point, it has been implicitly assumed that the unit of investigation is the 'small lolwapa' or 'dwelling unit'. This is what every large scale social or economic survey in Botswana currently does, in practice. Further, a rough method of determining which units are 'farm households' has been proposed.

However, the social unit responsible for economic production is very often not contiguous with a single physical location (Kerven 1981, 1982).

This pattern, already evident in the classic Setswana village/lands/cattle post pattern of settlement, has only been accentuated by wage labour migration. Today, both socio-anthropological studies and production statistics emphasise that most families do not produce enough food to feed themselves, even in relatively 'good' years; nor do their agricultural operations always appear capable of generating enough cash to pay for certain inputs. Furthermore, the location of the household within the family life cycle of generational maturation and the splitting off of new households influence both the resources the household can command in agricultural production and the incentives household members have to engage in such production (Gulbrandsen).

These factors should be borne in mind when using the farmer classification. Assessing them is one reason complementary in-depth research in a CFDA would be useful. To date, anthropological research in Botswana has provided clear evidence of the qualitative importance of household linkages. Anthropological and other research has not, however, provided the final word on the net impact of these linkages.<sup>23</sup>

### C. A Preliminary Farmer Typology for Kgoro Village

Data reworked from Peggy Ntseane's study of Kgoro is now used as the basis of a simple example of the methodology proposed above. These data are from a sample of 50 out of approximately 120 households in Kgoro, one of the Barolong 'villages' in the Southern District CFDA. Ntseane examines her data in greater detail in the second chapter in this volume.

In Figure 1 the Kgoro sample is cross-classified by cattle holdings and bags of food crops produced in 1980/81. The proposed division is as outlined in the figure.

The poorest three groups can be identified by cattle class only. Group I consists of all farmers with 5 or fewer cattle; Group II of all farmers with 6-10 head; and Group III of all farmers with 11-20 head. In Groups IV and V crop production also enters into the division. Group IV consists of farmers with 21-40 head of cattle, but 50 or fewer bags produced; Group V of farmers with 41 or more cattle or production of 101 or more bags, or both. Both of these groups could be interestingly subdivided. Group IVA had no arable activity in 1980/81; IVB produced crops at 'sub-subsistence' levels (under 20 bags); and IVC produced subsistence or better levels of crops. The farmers in Group VA had little or no crop production in 1980/81 despite being large cattle owners who also had the necessary implements; those in VB were large crop producers but only held cattle at an intermediate level; and those in VC were both large cattle and crop farmers.<sup>24</sup>

A look at some other identifying characteristics seems to show some support for the proposed division. However, the subcategories in Classes IV and V, though suggestive, contain too few individuals to permit meaningful analysis in the discussion below.

FIGURE 1

Kgoro: Cross-Classification of Sample Households  
by Cattle Holdings and Bags of Food Crops Produced, 1980/81

	C A T T L E 1 9 8 1								Total
	0	1-5	6-10	11-20	21-30	31-40	41-50	51+	
No lands		1			1				2
Did not plough	3	1	2		1			1	8
0 bags	3	2	3						8
1-5 bags	4	5	1	3	2		1		16
6-10 bags	1		2	2	1	1		1	8
11-20 bags				2					2
21-30 bags						1			1
31-50 bags						1			1
51-100 bags									0
101+ bags					1	1		2	4
<b>Total</b>	<b>11</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>4</b>	<b>1</b>	<b>4</b>	<b>50</b>

There are not too many demographic variables distinguishing the five groups which can be identified. Mean age of head of household is fairly constant across groups (around 50); with the mean for the wealthiest group, Group V, perhaps being a little higher. There are younger and older heads in all groups; two of the largest farmers (in V) are under 40. This author does not have complete information on sex of head of household. None of the household heads in the wealthiest group, V, are women. At least two female-headed households can be identified as headed by women who are mothers of men in the largest farmer class. They are not too badly off.

Nearly all Kgoro farmers had access to land, and there did not appear to be any significant variation by group. In fact, Mtseane's sample frame was constructed from the records of the Kgoro-Bethel pilot land inventory of 1980.<sup>25</sup> However, a few of the recorded plot holders in the inventory told Mtseane they held no fields. Still, land holding in Kgoro appears to be more universal than in four other CFDA villages surveyed by Narayan-Parker, in which 15 percent of all households did not have access to land (Narayan-Parker)

Agricultural capital in the form of implements increased by group, moving from Groups I to V. For example, the frequency of plough ownership ranged from only 25 percent in Group I to 100 percent in Group V. The percentage of ploughs which were multiple furrow--more common in Barolong than in Botswana generally--also increased by group, with the surprising exception of Group I, where 4 of the 5 plough-owning households had multiple furrow ploughs.<sup>26</sup> Planter ownership was virtually confined to Group V, in which 5 of 7 households owned planters. One other farmer, in Group IV, had a planter.

Access to draught for ploughing households is recorded in table 33. Primary draught sources were classified as owned, hired, or borrowed/exchanged/pooled. The table shows draught ownership increased moving from Groups I to V. Hiring was predominantly confined to Groups I through II, but it was fairly constant across those groups. Borrowing, exchanging labour for draught, or pooling was also confined to Groups I, II, and III; but it was most frequent in Group I, least frequent in Group III.

TABLE 33

Access to Draught, Ploughing Households--Kgoro 1980/81  
(percentages)

	FARMER GROUP				
	I	II	III	IV	V
Owned or owned + hired, etc.	7	33	57	100	83
Hired	27	33	29	-	17
Borrowed/exchanged/pooled	67	33	14	-	-

Ox draught was by far the most common in Kgoro. Only 3 farmers in Group I used donkeys. Tractor draught predominated at the other end of the scale. Four of the 6 ploughing farmers in Group V used tractors; one of these was not owned. Otherwise, only one farmer in each of Groups I, II, and III ploughed solely with hired tractors and one other farmer in Group III supplemented ox draught with a hired tractor.

A concentration on smallstock ownership in Kgoro is often noted by local agricultural extension personnel. Smallstock ownership, too, follows the pattern of other agricultural capital. Frequency of smallstock ownership increases from over 50 percent in Group I to 100 percent in Group V. For households owning smallstock, mean herd size is under 10 in Group I, between 10 and 20 in Groups II, III, and IV, and, due to several large flocks, nearly 70 in Group V.

Arable success, by several criteria, was greater in the wealthier farmer groups. Frequency of ploughing in 1980/81 did not vary that much by group. In the intermediate Group, III, all households ploughed, in no group was the frequency below 75 percent. Harvesting rates did vary. All ploughing households in Groups III, IV, and V harvested at least some crops. A third of the ploughing households in Group I and half of the ploughing households in Group II harvested no crop. Furthermore, as mentioned above, Groups I, II, and III can be categorised solely on the basis of cattle ownership. But Table 34 demonstrates that mean bags of food crops produced, both per ploughing household and per harvesting household, increases from Group I through Group III. As might be expected, frequency of crop sales by ploughing households was higher in Groups IV and V than in Groups I, II, and III; in fact, highest in Group V.<sup>27</sup> Crop proportions also differed interestingly by groups in 1980/81. More of the total production in Groups IV and V--around 80 percent--was sorghum than in Groups I through III--55 to 73 percent. Sunflower was grown by only one household in Group IV and one in Group V.

In summary, this typology of Kgoro farmers has distinguished five groups. In general, ownership of draught, implements, and smallstock, and food crop production, increase by group--all in addition to the increases in the primary identifying characteristic of cattle ownership. At least 56 percent of the households (those in Groups I and II) to 70

TABLE 34

Mean Bags of Food Crops Produced;  
Kgoro, 1980/81--Groups I, II, III

	FARMER GROUP		
	I	II	III
Per ploughing household	2.1	3.3	8.1
Per harvesting household	3.2	6.7	8.1

percent (those in Groups I, II, and III) could be considered poor, as farmers. They tend to be constrained in growing more food by lack of draught and implements. In Groups IV and V, there are households which did not grow much food in 1980/81, but most of them appeared capable of doing so. Only the 4 households in VB and VC would fit into Comaroff's 'mid-range' category, in all likelihood, on the basis of the 'ploughing 50 acres or more' criterion (Comaroff 1977).

D. Kgoro and the Southern District CFDA

In an attempt to see if this typology for Kgoro might be broadly applicable to the CFDA, several summary statistics for Kgoro are compared to similar statistics for four other CFDA villages (Narayan-Parker).<sup>28</sup> These comparisons are summarised in Tables 35 through 44. Dinatshana and Metlojane, like Kgoro, are in Barolong Agricultural District. Mokgomane and Phitsane-Molopo are in Ngwaketse South Agricultural District.

Several salient points emerge from the tables presented above. A majority of the residents of all five villages would have to be classified as small farmers. Crop production in the Barolong villages is higher than in the Ngwaketse South villages. However, crop production is very unevenly distributed, perhaps even more so than cattle ownership. Furthermore, in Narayan-Parker's wealth ranking, the higher crop-producing

TABLE 35

Percentage of Total Households Holding Cattle, 1980/81

KGORO	DINATSHANA	METLOJANE	MOKGOMANE	PHITSANE/MOLOPO
78	49	69	69	69

TABLE 36

Cattle Holding Distribution, 1980/81  
(percentages)

NO. OF HEAD	V I L L A G E				
	Kgoro	Dinatshana	Metlojane	Mokgomane	Phitsane/Molopo
0	22	51	31	31	31
1-10	34	38	35	49	33
11-20	14	9	17	4	14
21+	30	2	17	16	22

TABLE 37

Access to Land, 1980/81: Percentage of Total Households

KGORO	DINATSHANA	METLOJANE	MOKGOMANE	PHITSANE/MOLOPO
92 <sup>1</sup>	73	79	100	86

1. According to the Kgoro-Bethel pilot land inventory, 100 percent.

TABLE 38

Ploughing Households, 1980/81  
(percentage of total households)

KGORO	DINATSHANA	METLOJANE	MOKGOMANE	PHITSANE/MOLOPO
80	49	64	82	38

TABLE 39

Mean Food Crop Production Per Ploughing Household, 1980/81

KGORO	DINATSHANA	METLOJANE	MOKGOMANE	PHITSANE/MOLOPO
3520	1710	4320	850	380

TABLE 40

Food Crop Sellers as a Percentage of Ploughing Households, 1980/81

KGORO	DINATSHANA	METLOJANE	MOKGOMANE	PHITSANE/MOLOPO
22.5	approx. 10	approx. 20	approx. 20	probably nil

TABLE 41

Skewness of Food Crop Production--Percentage of Total Production  
Produced by the Top 10% of Ploughing Households, 1980/81

KGORO	DINATSHANA	METLOJANE	MOKGOMANE	PHITSANE/MOLOPO
90	57	45	40	27

TABLE 42

Percentage of Total Households Who Are 'Poor'--Based on  
Criterion of 20 Head of Cattle or Less, 1980/81

KGORO	DINATSHANA	METLOJANE	MOKGOMANE	PHITSANE/MOLOPO
70	98	83	84	78

TABLE 43

Percentage of Total Households Who Are 'Poor'--Based on  
Criterion of Less Than 20 Bags Produced, 1980/81

KGORO	DINATSHANA	METLOJANE	MOKGOMANE	PHITSANE/MOLOPO
86	91	63	85	100

TABLE 44

Distribution of Wealth Based on Guttman Scale

	KGORO	DINATSHANA	METLOJANE	MOKGOMANE	PHITSANE/MOLOPO
Low	NA	82	60	37	16
Medium	NA	7	26	58	54
High	NA	11	14	5	30

Barolong villages are less wealthy than the Ngwaketse South villages. In fact, neither crop production nor cattle ownership appears to account completely for the wealth ranking. This underscores the importance of off-farm income in determining the level of material well-being.<sup>29</sup> Finally, in Narayan-Parker's villages, involvement in arable agriculture appears to be constrained both by lack of wealth (Dinatshana) or other factors (Phitsane-Molopo).

#### E. Kgoro and the Barolong Farms

One of the reasons the Pitsane/Phitsane-Molopo corridor was chosen as Southern District's CFDA was that it was felt that an integrated, employment-oriented development programme would have greater chances of

success if located in an area in which arable agriculture was already 'successful'. It has been seen above that there are indications that agriculture, particularly in the Barolong part of the CFDA, is more crop-oriented than elsewhere in eastern Botswana. However, crop production in the area appears to be very unevenly distributed, and does not seem to contribute much to the incomes of most farmers. Even in Metlojane, the village surveyed by Narayan-Parker in which larger crop production is combined with a more equal distribution, the majority of farmers are small farmers. Very few farmer. in the areas surveyed by Narayan-Parker or Ntseane qualify as large farmers, by Comaroff's definition--access to up to 400 ha or more, tractor ownership, production of 1000 or more 90 kg bags in a normal year (Comaroff 1980). In fact, in a village like Kgoro, it has been seen that few farmers are even mid-range farmers by Comaroff's criteria.<sup>30</sup>

Since the emergent picture of the CFDA differs from the often made assumption of Barolong as an overwhelmingly successful crop area, a few comparisons between Kgoro and the Barolong Agricultural District, as portrayed by recent national Agricultural Statistics, will be made in the tables below. These will not completely settle the question of how 'different' the Barolong part of the CFDA is from the rest of Barolong, but it should suggest a few possible answers.

TABLE 45

Percentage of Households with Cattle

KGORO 1980/81	BAROLONG 1980/81	BAROLONG 1979/80
78 <sup>1</sup>	62.5 <sup>2</sup>	64 <sup>2</sup>

1. Percentage of total households. In Kgoro, however, 'total households' and 'farm households' are nearly synonymous.

2. Percentage of 'farm households' only, by Agricultural Statistics criteria.

TABLE 46

Mean Number of Cattle Per Cattle Owning Household

KGORO 1980/81	BAROLONG 1980/81	BAROLONG 1979/80
20.3	22.0	27.8

TABLE 47

Percentage of Households with Smallstock

KGORO 1980/81	BAROLONG 1980/81		BAROLONG 1979/80	
	Goats	Sheep	Goats	Sheep
72 <sup>1</sup>	43.8 <sup>2</sup>	37.5 <sup>2</sup>	64 <sup>2</sup>	40 <sup>2</sup>

1. Percentage of total households.
2. Percentage of farm households.

TABLE 48

Mean Number of Smallstock Per Smallstock Owning Household

KGORO 1980/81	BAROLONG 1980/81	BAROLONG 1979/80
23	13.8 <sup>1</sup> to 25.7 <sup>2</sup>	12.9 <sup>1</sup> to 20 <sup>1</sup>

1. Assumes minimum overlap of goat and sheep owners.
2. Assumes maximum overlap of goat and sheep owners.

TABLE 49

Percentage of Households Ploughing

KGORO 1980/81	BAROLONG 1980/81	BAROLONG 1979/80
80 <sup>1</sup>	62.5 <sup>2</sup>	71.4 <sup>2</sup>

1. Percentage of total households.
2. Percentage of farm households.

TABLE 50

Type of Draught  
(percentage of ploughing households)

	KGORO 1980/81	BAROLONG 1980/81	BAROLONG 1979/80
Ox/cattle	72.5	60	35
Donkey	7.5	20	35
Cattle/donkey	-	5	-
Tractor	17.5	15	25
Tractor/animal	2.5	-	5

TABLE 51

Access to Draught  
(percentage of ploughing households)

	KGORO 1980/81	BAROLONG 1980/81	BAROLONG 1979/80
Own	42.5	45	65
Mafisa	-	5	-
Hire	32.5	20	20
Borrow	17.5	15	5
Combination	7.5	15	10

TABLE 52

Crop Mix  
(percentage of land planted)

	KGORO <sup>1</sup> 1980/81	KGORO <sup>1</sup> 1979/80	BAROLONG 1980/81	BAROLONG 1979/80
Sorghum	48.7	49.8	32.3	29.9
Maize	33.9	38.3	48.4	42.7
Beans/pulses	3.6	3.2	10.5	6.0
Sunflower/other	13.8	8.7	8.9	21.4

1. From records of Kgoro-Bethel pilot land inventory.

TABLE 53

Harvesting Households as a Percentage of Ploughing Households

KGORO 1980/81	BAROLONG 1980/81	BAROLONG 1979/80
80	80	80

TABLE 54

Mean Food Crop Production Per Ploughing Household

KGORO 1980/81	BAROLONG 1980/81	BAROLONG 1979/80
3520	6625	2975

A look at these tables shows some differences at the level, at least, of gross statistical evidence. Ownership of cattle and smallstock appears to be more widely distributed in Kgoro than in Barolong as a whole. In recent years, a greater proportion of Kgoro households ploughed, and their production was weighted more towards sorghum than in Barolong generally. However, Kgoro crop farmers relied more on hired and borrowed draught, and their total crop production, per household, was not as large as the Barolong figures in 1980/81.

The differences just noted, however, are differences of degree. There is nothing at this level to suggest that Kgoro is totally anomalous in Barolong, just as there was nothing to suggest it as anomalous in the CFDA. This leads to the preliminary conclusion that recent Agricultural Statistics for Barolong are not inconsistent with the studies of Ntseane and Narayan-Parker. Neither are they inconsistent with the view that a majority of crop farmers are small, but mean production levels are brought up considerably by a few large producers. In fact, several other sources concerning isolated areas--the Farm Management Survey in Makokwe from 1977/78 to the present (Ministry of Agriculture 1980, 1981), and the Arable Lands Survey in Mokatoko in late 1978 (Odell)--also suggest farming communities in which large crop output, if it exists at all, comes from a few large producers and is not spread across relatively large numbers of mid-range farmers. Only the Rural Income Distribution Survey (RIDS) (Central Statistics Office 1976), which sampled farmers in Papatlo and Logagana in 1974/75, shows a more general arable prosperity.<sup>31</sup>

These considerations, combined with the sheer magnitude of the difference in the total crop production estimates of Comaroff and the Agricultural Statistics, make it necessary to reconsider some of the basic statistics before proceeding to the policy implications of any farmer

typology. There is no doubt that an agricultural transformation has taken place in Barolong. But in a policy context, there is an important reason for trying to accurately assess the quantitative dimension of this transformation. If a large percentage of the farming population has risen to substantial commercial agricultural production, and if many households have done this with small cattle holdings (say, fewer than 20 head), then Barolong could serve as a model for the development of crop agriculture in eastern Botswana, if output alone is the target. Serious questions of social equity and employment opportunities would remain. However, if the number of Barolong who have been able to develop commercial crop production is relatively small, these questions of equity and employment become even larger. Furthermore, a strategy of 'emulating Barolong' would be less likely to achieve even production goals.

To some degree policy-makers have assumed Barolong is a successful arable area, and have not looked into Comaroff's own analysis of 'significant internal variations' in the Barolong agricultural community. There has thus been a tendency to believe that there is great potential in Southern Region, particularly Barolong, for further agricultural development. In fact, successful agricultural policy there may be as difficult to formulate as elsewhere in Botswana, if not more difficult.

CHAPTER IV

Barolong Agricultural Production Reconsidered

There are at least four explanations for the sizeable differences in the estimates of Barolong crop production as seen in Comaroff and KIDS, and as seen in the recent Agricultural Statistics and the other sources cited in the preceding section. First, Comaroff's total production estimates could be overestimated. Second, recent statistical data could be underestimated. Third, there could have been a dramatic reduction in crop production between the mid-1970's and today due to a lull in rainfall. The fourth, and most interesting possibility is that a lull in crop production has occurred due to a decline in the number of mid-range farmers and the polarisation of the Barolong farming community into a few large and many small farmers.

The final explanation is the most difficult to assess, consideration will be postponed. The third possibility is relatively easy to dispose of with data from the Meteorological Service. Table 55, for Kamatlabama, shows if rainfall in September and October was over 50 mm; rainfall totals in the crucial months of November, December, and January; and seasonal rainfall totals. Table 56 shows the same information for Good Hope. A glance at these tables should convince the reader that the years Comaroff refers to, 1973/74 and 1974/75, were indeed good rainfall years in the two localities above; but not outstandingly different from some of the years since. The relatively poor rainfall shown for Good Hope in 1979/80 may help explain the rather low total production figures for Barolong in what we have been assuming was a normal rainfall year.

TABLE 55

Rainfall--Ramatlabama, Botswana  
(mm)

YEAR	50 SEPT-OCT ?	NOV-DEC-JAN	AUG-JULY
1962/63	no	273	395
1963/64	yes	163	310
1964/65	no	194	354
1965/66	no	206	420
1966/67	yes	249	727
1967/68	yes	132	556
1968/69	no	226	484
1969/70	no	234	396
1970/71	yes	249	459
1971/72	yes	377	637
1972/73	no	122	341

(cont Inued)

(Table 55, Rainfall--Ramatlabama, cont.)

YEAR	50 SEPT-OCT ?	NOV-DEC-JAN	AUG-JULY
1973/74	yes	268	612
1974/75	no	303	775
1975/76	no	246	669
1976/77	yes	303	663
1977/78	NA	NA	NA
1978/79	no	155	311
1979/80	yes	368	671
1980/81	yes	429	611
1981/82	no	299	510 <sup>1</sup>

FOR 1962/63 THROUGH 1980/81 : 18 YEARS  
(with the exception of 1977/78)

	NOV-DEC-JAN		AUG-JULY
Upper quartile	303	Upper quartile	663
Median	247.5	Median	520
Lower quartile	194	Lower quartile	395
Mean	250	Mean	522

1. August through March only.

TABLE 56

Rainfall--Good Hope, Botswana  
(mm)

YEAR	50 SEPT-OCT ?	NOV-DEC-JAN	AUG-JULY
1968/69	no	100	375
1969/70	yes	181	350
1970/71	no	277	477
1971/72	yes	318	673
1972/73	no	127	374
1973/74	yes	380	664
1974/75	no	340	720
1975/76	yes	241	668
1976/77	yes	247	593
1977/78	yes	168	555
1978/79	yes	162	311
1979/80	no	196	536

(continued)

(Table 57, Rainfall--Good Hope, cont.)

YEAR	50 SEPT-OCT ?	NOV-DEC-JAN	AUG-JULY
1980/81	yes	547	749
1981/82	no	366	512 <sup>1</sup>

FOR 1968/69 THROUGH 1980/81 : 13 YEARS

	NOV-DEC-JAN		AUG-JULY
Upper quartile	318	Upper quartile	668
Median	241	Median	555
Lower quartile	168	Lower quartile	375
Mean	253	Mean	542

1. August through March only.

The first and second questions, i.e. the reliability of various production and ownership estimates, will be discussed with the aid of Tables 57 through 67 below. These tables present estimates for the Barolong Farms from the following three sources: Comaroff, 1977 and 1980; Agricultural Demonstrators' estimates as reported in Annual Plans for the early 1980's and in Staps; and Agricultural Statistics for 1971/72,<sup>32</sup> 1978/79, 1979/80, and 1980/81.

TABLE 57

Number of Farmers or Farm Households, Barolong Farms

YEAR	LANDS ONLY	CATTLE ONLY	LANDS + CATTLE	TOTAL WITH LANDS	ACTUALLY PLOUGHING	TOTAL HOUSEHOLDS	SOURCE
1971/72	300	100	1400	1700	1600	1700 <sup>1</sup>	Ag Survey
1973/74	NA	NA	NA	1500?	NA	1500	Comaroff
1978/79	600	200	700	1300	800	1500	Ag Survey
1979/80	500	200	700	1200	1000	1400	Ag Survey
1980/81	600	500	500	1100	1000	1600	Ag Survey
1980/81	NA	NA	NA	NA	NA	2200	ADs' APs

1. Not equal to sum of first three columns due to rounding.

TABLE 58

Total Food Crop Production, Barolong Farms  
(metric tonnes)

YEAR	FOOD CROP PRODUCTION	SOURCE
'Before 1960's'	1,800	Comaroff
1971/72	9,200	Ag Survey
1973/74	31,500	Comaroff
1978/79	255 <sup>1</sup>	Ag Survey
1979/80	2,975 <sup>1</sup>	Ag Survey
1979/80	13,100	ADs/Staps
1980/81	6,625 <sup>1</sup>	Ag Survey
1980/81	13,100	ADs/Staps

1. Includes pulses.

TABLE 59

Crop Area Estimates, Barolong Farms  
(planted and harvested areas for food crops only)

YEAR	TOTAL ARABLE AREA (ha)	PLANTED AREA (ha)	HARVESTED AREA (ha)	HARVESTING RATIO (%)	SOURCE
1971/72	NA	16,100	NA	NA	Ag Survey
1971/72	NA	14,900 <sup>1</sup>	14,800 <sup>1</sup>	99 <sup>1</sup>	Ag Survey
1974	37,600	NA	NA	NA	Comaroff
1978/79	NA	4,100	3,200	78	Ag Survey
1979/80	16,100	9,200	8,200	89	Ag Survey
1979/80	30,700	22,700	13,100	58	ADs/Staps
1980/81	17,800	11,300	10,400	92	Ag Survey
1980/81	30,700	16,500	9,200	56	ADs/Staps
1980/81	35,100	NA	NA	NA	ADs' APs

1. Sorghum and maize only.

TABLE 60

Yield Per Hectare, Barolong Farms--Food Crops

YEAR	Y I E L D (kg/ha)	SOURCE
1971/72	622 <sup>1,2</sup>	Ag Survey
1973/74	1) 15 large farmers--approx. 1000 <sup>3</sup> 2) mid-range farmers a) '15 randomly chosen mid-range farmers with a single tractor (hired or owned)' --approx. 1600 <sup>3</sup> b) 'largest non-tractorized operation with which we were familiar'--approx. 1200 <sup>3</sup> 3) small farmers--anywhere between 200 (bad year) and 1000 (good year) <sup>3</sup>	Comaroff
1978/79	80 <sup>2</sup>	Ag Survey
1979/80	363 <sup>2</sup>	Ag Survey
1979/80	1,000 <sup>2</sup>	ADs/Staps
1980/81	637 <sup>2</sup>	Ag Survey
1980/81	1,420 <sup>2</sup>	ADs/Staps

'up to 1700 to 2600'--cited by 'Barolong farmers' as reported in Staps.

1. Sorghum and maize only.
2. Per harvested hectare.
3. Per planted hectare. As noted in fn. 8 to main text, given Comaroff's estimates of farmers falling into each category, yields for each category, and areas for each category, a plausible mean yield for all Barolong might be in the vicinity of 1,000 kg/ha.

TABLE 61

Cattle Ownership, Barolong Farms

YEAR	TOTAL CATTLE	HOUSE- OWNING HOLDS	MEAN HERD SIZE PER CATTLE OWNING HOUSEHOLD	NUMBER OF TREK OXEN	TREK OXEN	TREK OXEN	SOURCE
					AS % OF TOTAL HERD	AS % OF TOTAL BOTSWANA HERD <sup>1</sup>	
1971/72	27,000	1,500	18.0	10,700	39.6	23.7	Ag Survey
1973/74	16,000	710	22.5	NA	NA	-	From Comaroff 1977, calculated on the basis of cattle owning distribution

(Table 51, Cattle Ownership, cont.)

YEAR	TOTAL CATTLE	CATTLE OWNING HOUSE-HOLDS	MEAN HERD SIZE PER CATTLE OWNING HOUSEHOLD	NUMBER OF TREK OXEN	TREK OXEN AS % OF TOTAL HERD	TREK OXEN AS % OF TOTAL BOTSWANA HERD <sup>1</sup>	SOURCE
1978/79	28,000	900	31.1	6,200	22.1	13.5	Ag Survey
1979/80	25,000	900	27.8	2,600	10.4	12.6	Ag Survey
1980/81	22,000	1,000	22.0	3,400	15.5	11.0	Ag Survey
1980/81	21 000	NA	NA	NA	NA	-	ADs' APs

1. 'Traditional' cattle herds only.

TABLE 62

Barolong Farms--Percentage of Farmers  
With Land Who Own Cattle

YEAR	PERCENTAGE	SOURCE
1971/72	82	Ag Survey
1973/74	47	Comaroff
1978/79	54	Ag Survey
1979/80	58	Ag Survey
1980/81	45	Ag Survey

TABLE 63

Draught Ownership, Barolong Farms

YEAR	FARMERS WHO OWNED DRAUGHT	FARMERS WHO PLOUGHED WITH OWN OR MAFISA'D DRAUGHT	PERCENTAGE OF ALL PLOUGHING FARMERS	PERCENTAGE OF TOTAL PLOUGH CATTLE OWNED OR MAFISA'D	SOURCE
1971/72	NA	NA	NA	72	Ag Survey
1979/80	NA	650	65	NA	Ag Survey
1980/81	NA	500	50	NA	Ag Survey
1980/81	720 <sup>1</sup>	NA	NA	NA	ADs' APs

1. Assumes no overlap of ownership of different kinds of draught. In fact, ADs' Farmers' Record Cards note some farmers with both ox and donkey spans, or an ox span and a tractor.

TABLE 64

Type of Draught, Barolong Farms<sup>1</sup>  
(percentage of ploughing households)

YEAR	OXEN/ CATTLE	DONKEYS	CATTLE/ DONKEYS	TRACTORS	TRACTORS/ ANIMALS	SOURCE
1971/72	67	22	-	11		Ag Survey
1973/74	NA	NA	NA		33-37 <sup>2</sup>	Comaroff
1979/80	35	35	-	25	5	Ag Survey
1980/81	60	20	5	15	-	Ag Survey

1. For the early 1980's, AD's report 55.6 percent of owned draught was oxen; 27.1 percent of owned draught, donkeys; and 17.3 percent of owned draught, tractors. The percentages, however, are also subject to the unwarranted assumption that there is no overlap of draught types. Two related figures are of interest here. Comaroff states there were 129 working tractors in Barolong in the mid-1970's. For the early 1980's, ADs' Annual Plans report 153 working tractors owned by 120 individual owners and 5 tractor syndicates.

2. Calculated on the basis of Comaroff's estimates of number of farming households, total tractor numbers, and percentage of non-tractor owners ploughing with tractors in a normal to good year.

TABLE 65

Ploughs, Barolong Farms

YEAR	SINGLE PLOUGHS OWNED	DOUBLE PLOUGHS OWNED	SINGLE PLOUGHS USED	DOUBLE PLOUGHS USED	NUMBER FARMERS WHO PLOUGHED	% OF FARMERS WHO USED OWN PLOUGH FOR PLOUGHING	SOURCE
1971-72	750	1120	1000	1300	1600	82 <sup>1</sup>	Ag Survey
1973-74	NA	NA	NA	NA	1500?	98	Comaroff
1980-81	NA	NA	600	450	1000	NA	Ag Survey
1980-81		610	NA	NA	NA	NA	ADs' APs

1. Also includes own harrows.

TABLE 66

Planters, Barolong Farms

YEAR	PLANTERS OWNED	PLANTERS USED	NUMBER FARMERS WHO PLOUGHED	% OF PLOUGHING FARMERS WHO OWNED PLANTERS	% OF PLOUGHING FARMERS WHO ROW PLANTED	SOURCE
1971/72	480	1300	1600	30	80 <sup>1</sup>	Ag Survey
1973/74	990	NA	1500?	66	100 <sup>1</sup>	Comaroff
1979/80	NA	NA	1000	NA	50	Ag Survey
1980/81	NA	NA	1000	NA	40	Ag Survey
1980/81	360	NA	NA	NA	NA	ADs' APs

1. Approximations, according to texts of sources cited.

TABLE 67

Cultivators, Barolong Farms

YEAR	CULTIVATORS OWNED	CULTIVATORS USED	NUMBER FARMERS WHO PLOUGHED	% OF PLOUGHING FARMERS WHO OWNED CULTIVATORS	% OF PLOUGHING FARMERS WHO USED CULTIVATORS	SOURCE
1971/72	420	1100	1600	26	70 <sup>1</sup>	Ag Survey
1973/74	690	NA	1500?	46	NA	Comaroff
1980/81	NA	150	1000	NA	15	Ag Survey
1980/81	310	NA	NA	NA	NA	ADs' APs

1. Approximation, according to text of source cited.

It can be presumed that the sampling design for the Agricultural Surveys is the most sophisticated of those used by the three kinds of sources summarised in the tables. In fact, it is not likely that Agricultural Demonstrators base their estimates on any kind of sampling procedure. In the opinion of this author, ADs' estimates of such things as total crop production and area are not very reliable. The ad hoc procedure which they use may be to look at figures for larger farmers in their extension area, with whom they are most familiar, and expand those figures by factors derived from the total number of farmers in their areas.<sup>33</sup> On

the other hand, ADs' estimates of things which can be easily counted, for example large, visible items like tractors, are likely to be much more reliable.

Many of Comaroff's estimates are based on a survey (Agri I) conducted in early 1975. According to Comaroff, 'for purposes of drawing a sample, the Farms were divided by extension area and an equal number of farmers selected at random within each' (1977). In other words, Comaroff was doubtless sampling from a list frame, perhaps provided by agricultural extension personnel. Without knowing the sampling fraction for each extension area, it is not really possible to form estimates, in a statistical sense, for all the Barolong Farms.<sup>34</sup> However, Comaroff's survey does cover the entire farms area, unlike most of the other sources cited above in III.C. through III.E, and it is complemented by Comaroff's intensive anthropological field work.

Finally, the Agricultural Surveys cited here are based on probability sampling. In addition, they use area frames, with second stage sampling determined by the estimated number of dwelling units within a defined area. Nonetheless, there are, to this author, several ambiguities concerning which 'Barolong farmers' are sampled by the Agricultural Survey. First, Panyane farm, as a freehold farm area, would not be included in the Agricultural Survey's area frame of 'traditional' farms. Individual farms there should be included instead in the Survey's list frame of commercial farms. It is not within the scope of this paper to answer the rather metaphysical question of whether Panyane is or is not in the Barolong Farms. It should only be pointed out that in the minds of some people it is, and in the minds of others, it is not. In the Agricultural Survey, it is left out of the 'traditional' farm estimates which have been cited here.

Furthermore, within the Barolong tribal area proper there are currently three leasehold arable areas covering approximately 1850 ha (Staps). It is unclear to this author whether this area is included in the Agricultural Survey's 'traditional' or 'commercial' frame. If it is considered 'traditional' land, at least one holding of approximately 1050 ha would not be covered at all, since the lessee does not reside in the Barolong Farms.

Whether these areas are or are not included in one's estimates or one's conception of Barolong Farms agricultural production is important because they are areas of large-scale, market-oriented crop production. In Barolong, as elsewhere in Botswana, total crop production as well as livestock ownership is very skewed. Inclusion of a few representatives of the high end of a distribution can substantially alter estimates of totals, means, and percentages from what they would be if these individuals were omitted from a sample frame, or omitted from the sample by the luck of the draw. Furthermore, estimates of means, though useful in a limited way, can be highly misleading. Some indication of distribution, at least an estimate of the median, is more useful in disclosing the relative positions of more farmers.<sup>35</sup> Unfortunately these estimates are usually more difficult to make.

The question of who is or is not included in one's sample frame is especially important for all surveys done in Botswana, not just the Agricultural Survey. Several other examples from Southern District's CFDA illustrate the point:

1) One large farmer, a committee member of the Barolong Farmers' Association, lists Metlojane as his place of residence. Either he was omitted from Narayan-Parker's sample or his total production was drastically underreported. Had it been included it would probably have increased estimated total crop production for Metlojane several times over.<sup>36</sup>

2) Estimated total crop production for Mokgomane, Ngwaketse South, from Narayan-Parker's survey makes Mokgomane appear to be a 'food deficit' area. It could probably be made to seem a 'food surplus' area if the production of several large farmers from Kanye who plough in the Mokgomane area were included.

3) Some Phitsane-Molopo farmers plough at Ilhojatau, and some Mokgomane farmers plough at Tswaanyaneng. As with the farmers in (2), above, depending on the niceties of sample design their production could be considered 'Barolong' production or 'Ngwaketse South' production.

It is felt that despite the difficulties mentioned above, the Agricultural Survey's estimates should have less sampling error than Comaroff's, which in turn should have less sampling error than the ADs' estimates. If it is argued that these latter estimates are somehow better than the Agricultural Survey's, it must mean that the Agricultural Survey's measurement error is disproportionately large. In the opinion of this author, there are reasons for all three sources--the Agricultural Survey, Comaroff, and the Agricultural Demonstrators--being subject to measurement error. For example, the Agricultural Survey's estimates of ploughed and harvested land areas are probably more reliable than the estimates of total land area. A figure for total Barolong arable land of somewhat over 30,000 ha is supported by ALDEP figures (Staps). These, in turn, were based on interpretation of aerial photographs. All three Agricultural Survey estimates, for total, ploughed, and harvested area, purport to be based on physical measurements, but it is easy to see how unploughed fields could be ignored, especially in an area in which a 'land grab' has taken place (Comaroff 1980). Since Comaroff's estimates were supplemented by detailed local investigation, they may be, on the whole, less subject to measurement error than those of the other sources cited here.

In the opinion of this author, the estimates of the Agricultural Statistics are, overall, the most reliable, although not without fault. In addition to the advantages of the Agricultural Statistics' sampling procedures, there are at least three other reasons for supporting this view.

First, the crucial recent figures on total crop production are for the most part supported by records of the Phitsane depot of the Botswana

Agricultural Marketing Board (BAMB). The relevant information is summarised in Tables 68 and 69. BAMB's Pitsane depot obtains crops from a wider area than Barolong alone; to draw a cut-off point somewhere, figures are presented for the three Agricultural Districts in Southern Agricultural Region.

TABLE 68<sup>1</sup>

Southern Region Agricultural Production Statistics  
and Pitsane BAMB Purchases, 1979/80  
(in metric tonnes)

CROP	AGRICULTURAL DISTRICT			SOUTHERN REGION TOTAL	PITSANE BAMB PURCHASES
	Barolong	Ngwaketse South	Ngwaketse South		
Sorghum	1195	4420	2515	8130	2572
Maize	1670	1195	1050	3915	3471* or 5538 <sup>2</sup>
Total grains	2865	5615	3565	12045	6043* or 8187
Beans/pulses	110	190	170	470	77
Total food crops	2975	5805	3735	12515	6120* or 8110
Sunflower	undifferentiated			600	450

1. Sources: Production--1980 Botswana Agricultural Statistics; BAMB Pitsane purchases--calculated from bin and silo cards, Pitsane depot, viewed through the courtesy of Mr. Elliott Thakanelo, manager. All errors in interpretation are the author's.

2. This confusion arises because one silo card for white maize, which was with the other 1980/81 cards, and which recorded purchases since 29th May 1981, nonetheless stated at the top that it recorded produce from the 1980 season. The 2067 mt on that card probably refer to 1980/81 production, but figures are presented in both years excluding and including that amount.

Second, the estimates of total crop production, yield, and area must be related by the equation yield equals (total production) divided by (area). Comaroff's total production estimate of 31,500 mt and a plausible mean yield, given his other figures, of 1000 kg/ha (see fn. 8), imply over 30,000 ha were ploughed and harvested in 1973/74--in other words virtually all of the arable land in Barolong. To accept these total production and yield figures means to accept the notion that there was very little agricultural land controlled by large farmers in 1973/74 but left unploughed. It also means one has to believe harvested area in recent normal to good rainfall years has only been one third of what it was in the mid-1970's.

TABLE 69<sup>1</sup>

Southern Region Agricultural Production Statistics  
and Pitsane BAMB Purchases, 1980/81  
(in metric tonnes)

CROP	AGRICULTURAL DISTRICT			SOUTHERN REGION TOTAL	PITSANE BAMB PURCHASES <sup>2</sup>
	Barolong	Ngwaketse South	Ngwaketse South		
Sorghum	2295	2970	2075	7340	1834
Maize	4175	6425	915	11515	4282 or 6349 <sup>3</sup>
Total grains	6470	9395	2990	18855	6116 or 8183*
Beans/pulses	155	210	325	690	159
Total food crops	6625	9605	3315	19545	6275 or 8342*
Sunflower		undifferentiated		370	360

1. Sources: Production--1981 Botswana Agricultural Statistics; BAMB Pitsane purchases--calculated from bin and silo cards, Pitsane depot.

2. To October 1981.

3. See In. 2, Table 68. The numbers believed to be correct are marked with an asterisk.

Alternatively, one has to assume that less area was ploughed in 1973/74, but that mean yield was even higher. One thousand kg/ha seems high as an area wide mean, but certainly not impossible. But the higher the mean yields one calculates, the more unlikely they become. On this ground alone, Comaroff's 1973/74 grain production estimate is in all likelihood too high.

Third, Comaroff's figures do not show how this bumper crop could have been produced, given the available draught. Comaroff estimates there were approximately 130 working tractors and a farming population of 1500. In other words, if each tractor owner owned a single tractor, under 9 percent of the farming population owned tractors. Yet elsewhere, Comaroff estimates 5-9 percent of the farming population consisted of large farmers, all of whom owned tractors, sometimes as many as 5 or 6; and that at least a few mid-range farmers owned tractors too. This seems to more than exhaust the 130 tractors.

In an attempt to determine how many of the 1500 farmers had 'adequate' draught, one can assume that all tractor owners owned a single tractor. Comaroff estimates 28 percent of the non-tractor owners hired tractors for ploughing in an average or better year. If tractor draught is 'adequate draught', 37 percent of the farming population had adequate

tractor draught. It can be further assumed that none of these tractor using farmers had adequate cattle draught (a patently false assumption, since cattle ownership tends to parallel arable activity). Comaroff estimates only 15 percent of all farmers owned over 20 head of cattle. The figure for farmers owning over 10 head of cattle is not estimated, but may have been in the region of a third of all farmers. On the basis of these assumptions, and the additional assumptions that 10 or 20 head of cattle define 'adequate draught', 50 to 70 percent of the Barolong farmers had adequate draught in 1973/74. (In addition, some of the small farmers used donkeys). The point to be made here is that every assumption has to be stretched, Comaroff's figures given the benefit of every doubt, in order to arrive at the 50 to 70 percent figure. The true figure had to be lower. Yet Comaroff estimates 68 percent of the farming community were mid-range farmers or larger, or controlled the acreages and implements to be at least mid-range farmers. Furthermore, 98 percent of Comaroff's sample sold grain in 1973/74, and 81 percent sold (not produced) over 25 90-kg bags. It is hard to see how this universal productivity and market orientation could be obtained in a situation where apparently many farmers lacked adequate draught. It thus seems likely that Comaroff's sample overrepresents large and middle-range Barolong farmers but nonetheless underestimates cattle holdings.

The 1971/72 Agricultural Survey, which also shows greater total crop production than recent Surveys, does offer one explanation of Barolong's production additional to the greater use of tractors. In Table 61 it can be seen that in 1971/72 the proportion of trek oxen in the Barolong herd was very high, much higher than the proportion in the national herd. In fact, this difference has tended to persist into the more recent past, although both the national and Barolong trek oxen proportions have fallen.

In summary, these are the conclusions of this author. They are certainly arguable, but seem to fit the available evidence the best. First, the total crop production estimates of recent Agricultural Surveys may somewhat underestimate actual production of the entire 'Barolong region' --that is, the Barolong farms, including leasehold arable land, plus Panyane's freehold arable land. Second, Comaroff's total production estimates are too high. Third, and most interesting, there has probably been a reduction in crop production between the mid-1970's and today due to the increasing polarisation of the Barolong farming community. The 1971/72 Agricultural Survey, as well as Comaroff's work, indicates higher levels of arable activity, arable production, and implement ownership than do more recent Agricultural Statistics. Unlike many of the other Agricultural Surveys of the early and mid-1970's, the 1971/72 Survey was based on a sampling procedure similar to the one used by recent Surveys. Furthermore, as Tables 55 and 56 have shown, rainfall in 1971/72 and 1980/81 was not all that different. Although the quantitative dimensions of an arable decline in Barolong remain unclear, as do the quantitative dimensions of the original transformation, Comaroff, particularly in his 1980 article, offers an excellent historical and political argument concerning its causes and effects. Complementary research might be undertaken in the future to trace the investment and disinvestment patterns of individual Barolong farming families.

Such descriptions and analyses of the Barolong experience might certainly give policy-makers pause before they recommend increased arable investment as a solution to all of rural Botswana's employment ills. This is not to argue against such a policy; it is only to suggest that Barolong's history shows, first, that increased arable production is not always concurrent with increased equity; second, partly for that very reason, an agricultural transformation resulting in increased production may possibly continue into a further phase in which total production actually falls; and third, even in an area like Barolong, more families depend on off-farm activity for income than is commonly supposed. It is to a further consideration of policy, in the light of such knowledge, that this paper turns next.

## CHAPTER V

### Policy Implications

#### A. Some Reasons Why Agricultural Policy Is Difficult in Botswana

There are at least three general reasons why agricultural policy-making for CFDA's is difficult.

First, CFDA planners are constrained to a large extent to work within existing Government-funded projects (CFDA Working Group). Thus many of the policy implications generated by the construction of a farmer typology may be beyond the immediate power of District planning staffs to implement. However, it is the co-ordination of such projects at the District level which the CFDA programme envisions, and a typology may begin to suggest to the creative planner how this might be done.

Second, the issues generated even by a simple farmer classification are very complex. Thus, at the level of national Government policy, decisions must be taken with a multitude of interrelated factors kept in mind. Too often (although quite understandably, given the nature of bureaucratic administration) policies for one sector or sub-sector of the economy are in conflict with the policies or political reality in another sector.<sup>37</sup>

Third, at the level of the farming system, a typology may suggest the need for many interrelated changes if the system itself is to be made 'more productive'. In Botswana, for example, Litschauer contends that preliminary evidence shows that the ALDEP planter and draught packages alone may increase total production (through an increase in planted areas) but not necessarily yields per hectare. He further implies that other support such as greater extension effort and greater use of fertiliser and improved seeds will probably be required for yields to increase (Litschauer). On the other hand, farmers are much more likely to make incremental changes in their farming system than to adopt a complete package at one time (Gilbert, Norman and Winch). The general lack of success of the minimum tillage package developed in the early 1970's testified to the tendency of comprehensively developed farming systems which work well at the experiment station to do much less well in farmers' fields.

Given these difficulties, it is not surprising that contradictory policy recommendations often arise for Botswana's agriculture. For example, some of the main elements in an economic policy for arable agriculture in Botswana are input subsidies, subsidies for the purchase of draught animals,<sup>38</sup> output price subsidies, and expansion of marketing infrastructure. A glance at the policy literature (e.g. ALDEP 1979b; Duggan; Eakes; Jones) reveals rather wide differences in opinion about which type or types of policy should be favoured. In fact, a single paper, such as the ALDEP pricing and subsidies discussion, can sometimes appear internally contradictory.

## B. The Policy Environment

The farmer typology for Kgoro, above, and the subsequent discussion of both the Southern District CFDA and the Barolong Farms, do not suggest any radical departures for policy. What follows will seem, to many readers, merely a rearrangement or reemphasis of familiar elements.

From a technical point of view, 'the drier the area the more important are the interactions between mechanisation and improved varieties' and 'the more pronounced are the advantages of animal traction compared with hoe cultivation and of tractors compared with ox ploughs' (Ruthenberg). In this author's opinion, of all the much discussed constraints to arable agriculture in communal eastern Botswana, the lack of timely access to adequate draught power is the binding constraint for more farmers than is any other.

The experience of Southern District, particularly the Barolong Farms, has demonstrated this importance of agricultural capital, particularly in mechanised forms. The most successful arable farmers, in terms of total output, are those who have been able to invest in implements, tractors, or the development of several animal draught teams. (On the last point, see the case of 'Ramotobi', cited by Gulbrandsen). It is true that some Barolong farmers have taken advantage of permanent residence at their lands and perhaps higher ox proportions in their herds. But it seems evident as well that there, as elsewhere in Southern District or eastern Botswana, the initial development of arable agriculture has not proceeded mainly on the basis of the investment of crop income. Rather, sources of capital appear to have been wage income, cattle income, or Government. (The last source, for example, can be seen in the Integrated Farming Pilot Project at Pelotshetlha in Ngwaketse South). The patterns and quantitative flows of investment, however, have as yet not been exhaustively studied.

The importance of investment is recognised in the area. When asked to identify major problems of small farmers (and to a certain extent intermediate farmers as well), the AD's on the Ngwaketse side of the CFDA tended to give a more traditional analysis of the lack of draught or implements, of crop damage by cattle, or of widespread labour migration to South Africa (the last particularly in the case of Phitsane-Molopo). On the Barolong side, where successful crop production is more prevalent, the first problem of small farmers was inevitably identified as 'lack of funds'. Similarly, the respondents in Narayan-Parker's survey ranked unemployment as their first problem, overall (Narayan-Parker). Instead of agriculture being viewed as a source of employment, wage employment elsewhere was seen as a source of income with which to buy cattle, to hire ploughing (Deepa Narayan-Parker, personal communication).

In this context, 'traditional' agriculture has become increasingly monetised on both the output and the input sides. Cash markets for grain output permit a few farmers to obtain regular cash incomes, and afford the opportunity for poor arable farmers to raise occasional small amounts of emergency cash. Similarly, cash markets for inputs are characterised by different forms of behaviour. The farmer can attempt to break through

into much larger scale arable production through expenditure on mechanisation.<sup>39</sup> Or he or she can continue to use a low return, probably lower risk system which requires minimum cash inputs.

For many farmers, the first option may be constrained not only by unwillingness to risk large amounts of family earnings or savings, but by the low levels of absolute wealth and income. For a few (for example the low crop producing households in Groups IV and V in Kgoro), the first reason may be the more important. Given the levels of expected earnings in migrant labour, the subjective disutility of agricultural labour, the low expected return from crop agriculture, and, sometimes, the differences in objectives among family members, these farmers may still choose to keep their investment (and effort) in arable agriculture low (Gulbrandsen).

In recognition of these constraints, the most crucial elements of current Government arable policy are those designed to increase capital investment, particularly through subsidised purchase of draught power and planter/cultivator packages. By lowering the relative prices of specific inputs, the Government hopes to encourage the use of those inputs. Even with current subsidies, however, the amount of investment required is a quantum leap for many farmers. A large number of very arbitrary assumptions (e.g. about replacement value of crops grown, past cost of hiring draught, discount rate, time horizon, frequency of crop failure) can be used to calculate break-even points for small farmers who take up current ALDEP ox or donkey draught packages, or planter/cultivator packages. If the farmer is to service the loan out of crop income, it appears he or she must either increase yields by anywhere from 60 to 100 kg/ha on the same area, or maintain lower yields but increase areas anywhere from 35 to 100 percent.<sup>40</sup> The exact figures may be disputed, but the increase in production is substantial. It is likely that decision thresholds are even higher than break-even points, often for risk-related reasons. What is not clear is if many farmers can successfully make these kinds of investments, even with the subsidies offered by the Government.

Litschauer's analysis of the 1981 ALDEP pilot project survey shows that for recipients of the planter/cultivator package two crucial variables, land held and land destumped, are far above the national means, let alone medians. If this finding is accurate and continues to be the case, Litschauer states, 'one of the goals specified for ALDEP--land holdings at full development--could well be reached through the ALDEP participant selection process itself' (Litschauer).<sup>41</sup> In other words, it appears that the ALDEP component aimed at one version of 'middle range' farmers--those with 11 to 40 head of cattle--will, even if successful, increase production only among those farmers who have already committed themselves to arable farming. This may not be an unworthy end, but it does only involve a small segment of the farming population. In fairness to ALDEP, it must be noted that Litschauer's survey does not analyse the draught power component. As will be seen in greater detail below, this component is controversial at both the analytical and political levels. But it is aimed at a potentially larger group of farmers.

It appears that even a 'successful' ALDEP will not radically alter the development path of arable agriculture, although much more analysis

must be done before this conclusion can be reached. In semi-arid dryland agriculture as practised in Botswana, yield enhancing, risk reducing technological changes are much less likely to be labour absorbing than such changes in irrigated tropical agriculture. In Botswana, as small sectors of the farming population become increasingly and more regularly market oriented, the distribution of total crop output becomes increasingly skewed. Tables 70 and 71 show crude Gini coefficients, calculated from the Agricultural Statistics, for cattle holding and total food crop production in 1979/80 and 1980/81. They demonstrate that there is very little difference in the amount of inequality in cattle holding and in total food crop production.<sup>42</sup> And, as with the livestock sector, it seems that Government policy for crop agriculture, no matter what its intentions, is as likely to increase gaps in agricultural income as to reduce them.

TABLE 70

Gini Coefficients for Botswana Agriculture, 1979/80  
(percent)

	CATTLE HOLDERS ONLY	ALL FARMERS <sup>1</sup>
CATTLE	78	84
	PLOUGHING FARMERS ONLY	ALL FARMERS <sup>1</sup>
TOTAL FOOD CROP PRODUCTION	77	81

1. As defined in the Agricultural Statistics.

TABLE 71

Gini Coefficients for Botswana Agriculture, 1980/81  
(percent)

	CATTLE HOLDERS ONLY	ALL FARMERS <sup>1</sup>
CATTLE	79	86
	PLOUGHING FARMERS ONLY	ALL FARMERS <sup>1</sup>
TOTAL FOOD CROP PRODUCTION	79	83

1. As defined in the Agricultural Statistics.

In conclusion, research has continually shown that farmer groups do differ significantly in their resource endowments and thus in their ability to earn agricultural income. As has been seen above, this is reflected at a gross aggregate statistical level. However, there is a strong tendency for agricultural policy to attempt to do something for every farmer. There is political pressure to direct resources to 'those who can be productive with them', i.e. the already wealthy. In addition, another argument for not designating specific target groups is sometimes made from a sociological viewpoint. Since families are interrelated and can command resources outside the nuclear family, and since they pursue their economic ends through a diversity of means, it is argued that rural society is so complex that any attempt to focus on a particular target group or groups will result in creating divisions and reducing the existing rural support network. In response to this last argument, it can be noted that Barolong's historical development has been marked by a decrease in inter-household links, and an increase in class divisions, with the rise of commercial agriculture (Comaroff 1980). So even in the absence of specific production policy, the rural support network can be weakened if not totally destroyed. A policy of deliberately supporting all of rural society may be justifiable, but such pronouncements are too often vague, and exploited by a minority class of wealthy farmers to its own ends. It seems more likely that only a policy of deliberately discriminating in favour of poorer farmers has even a small chance of improving the lot of more than a small minority of Botswana's rural population (Egner and Klausen).

### C. A Few Suggestions for Southern District's CFDA

The following recommendations are not exhaustive. In addition, they constitute only one of a chorus of voices advising CFDA planners on agriculture. They are offered here only as a basis for discussion.

First, the agricultural programme in Southern District CFDA should be aimed at Groups I, II, and III as identified in Kgoro, above (see Section III.C), if it is to be at all employment oriented. In other words, it should focus mainly on those farmers holding 20 or fewer head of cattle. This will still involve 70 percent or more of the farming population in the CFDA.

Second, the aid of Agricultural Demonstrators could be actively solicited in compiling lists of such farmers in their extension areas, along with one other crucial piece of information--whether the farmer usually ploughs in a normal year. It is often pointed out that AD's do not know all of the farmers in their extension areas, particularly the poorer ones. Yet the completion of farmers' record cards is considered an onerous addition to their work loads. If they could be convinced that the compilation of the above information is vital to the CFDA programme, it would have the additional effect of introducing some of the AD's to the poorer farmers in their area. In addition, it would take less time than filling out a complete set of farmers' record cards.

Third, efforts should be made to ensure an adequate supply of improved seed to every ploughing farmer in the CFDA. There may be good arguments for not subsidising the purchase of seed, which, in any case, is a relatively minor cash expense (Eakes). Furthermore, there is the inevitable argument that any single change, such as use of improved seed, will not have any effect in the absence of many other changes. However, farmers' record cards in the Southern District CFDA indicate that improved seed, probably because it forms such a small proportion of total input, is often one of the first recommended practices actually adopted by farmers.<sup>43</sup> Improved seed, particularly that with good germination potential, is a small change which could benefit even the poorest arable farmers. If it did not, neither the farmers nor the Government would have lost that much.

Fourth, efforts should be made to encourage an ALDEP subsidy for the purchase of ploughs, on at least a pilot basis. In the current farming system, this is the basic piece of equipment. Plough ownership is currently a requirement for the ALDEP planter/cultivator package; they can be obtained as part of the draught power package, if required. It should not be difficult to expand the flexibility of the package to meet the needs of farmers who might wish to buy a plough but no draught animals.

Fifth, all or part of the Southern District CFDA could be made an experimental area for a concerted effort to promote the ALDEP draught power package. It has been argued above that draught power is the crucial constraint for more farmers than is any other. Yet draught power subsidies remain controversial. It is sometimes argued that the market can better determine appropriate input combinations (ALDEP 1979b; Eakes; Jones), and therefore more emphasis should be placed on output subsidies if subsidies are granted to arable agriculture (Jones); that draught subsidies might weaken current arrangements for spreading draught power over many farmers (Duggan; Eakes); or that since farmers are attempting to build their herds, an ox subsidy would benefit those beginning to take cattle out of crop production more than the cattle-poor, since even with strictly enforced herd size restrictions, the larger herd owner could negotiate with a smaller owner to their mutual advantage (Duggan). Other concerns often expressed include lack of supply of draught animals, or aggravation of overgrazing. Southern District would be a good place to attempt to answer at least some of these questions because of the greater emphasis on arable agriculture there and the concomitant likelihood that, at least in Barolong, herd owners maintain larger relative numbers of oxen in their herds. A concerted extension effort should accompany an emphasis on draught loans, promoting timely ploughing and the use of improved harness.

Alternatively, perhaps one part of the CFDA, or another part of Southern District, could be selected for a pilot of the fixed ploughing allowance for anyone ploughing more than a specified area, suggested by Eakes. In any case, Eakes' call for a specific study focusing on ways of subsidising draught power remains timely (Eakes).<sup>44</sup>

Finally, in the absence of a very carefully thought-out programme, group projects (e.g. in implement ownership, smallstock dosing) are more

likely than not to benefit larger farmers. This is the fear of smaller farmers in some of the CFDA extension areas, and it appears justified (Comaroff 1977; author's interviews with AD's). As explained by Comaroff, the growth of a commercially oriented large farmer class has been accompanied by a greater emphasis on independent farming operations in that class (Comaroff 1977, 1980). In a separate, local example, Ntseane's study of Kgoro has revealed that the smallstock dosing group there is primarily the preserve of larger arable farmers or cattle owners (Ntseane). At the very least, a careful study of the failures of past 'voluntary' associations should be made before much reliance is placed on them as a vehicle of agricultural transformation.

## CHAPTER VI

### Conclusion

In conclusion, it has been seen that in Botswana, the transformation of the arable economy to much greater total production and greater commercialisation does not inevitably lead to greater equality of income in the farm population. While no definitive study of the subject has been made, it is likely that the employment effects of such a transformation are not necessarily positive either. The presence of large commercial farmers in Barolong may not, at present, lead to increased employment in the area itself. There is evidence that despite the large numbers of non-farmers or poor farmers in Barolong, large farmers are more likely to recruit labour in other parts of Botswana (Wylie). In inequality of income and, possibly, negative employment effects, the development of arable agriculture has proceeded along similar lines to the development of the cattle industry.

In such a context, reliance on agriculture as the primary means for increasing rural employment may be unfounded. If there is to be any chance for the success of an employment-oriented policy, it must be actively focused on the poorer segments of the farming population.

Two interrelated, specific areas of research could prove invaluable in clarifying both the present agricultural situation and the objectives for policy. First, a detailed empirical study of the sources and expenditure patterns of agricultural investment in eastern Botswana would, among other things, trace the rise of currently successful farmers. Their histories could be scrutinised for ideas which might be applicable in the larger farming population, particularly if they started from relatively modest beginnings.

Second, the quantitative effects of the 'diversity of strategies' and 'complex social interactions' often noted in the sociological and anthropological literature need to be spelled out. Detailed knowledge of individual cases must now be supplemented with better evidence at the gross statistical level, distasteful as such a task might be to some researchers. This is necessary if policy is ever to be directed towards 'strengthening the existing support system'.

Finally, a word of encouragement should be offered to District-level CFDA planners. Their watchwords should be to think small, be flexible, see what works, and not be overly concerned with calls from Gaborone for the provision of x jobs by year y. If local-level experience is to count for anything, it may be less in the design of national development programmes than in the discovery of which elements of such programmes actually lead to desirable ends.

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APPENDIX

The following is a list of suggested variables for a household agricultural survey to be used in developing a farmer typology. The variables marked with a double asterisk (\*\*), are those which are essential to any survey. The variables marked with a single asterisk (\*) could be added in a slightly longer survey. Those variables which are unmarked may be included in a very extensive survey.

As a rule of thumb, the following procedure for determining which list (all variables, only those marked, or only those marked with a \*\*) to use is suggested. If it is felt that there is just enough time to analyse the total body of information, only the marked items should be used. If it is felt there is just enough time to analyse the variables marked with \* and \*\*, only the items marked with \*\* should be used. In other words, it is wise to be cautious about the amount of time and effort required to conduct a survey and analyse its results.

- \*\*1. Name, age, and sex of household head.
- \*2. Number of people present at dwelling unit.
3. Names, ages, sexes of other present dwelling unit members.
- \*\*4. Number of absent or present wage workers in the family.
5. Jobs these workers do.
- \*\*6. Access to land and use of land last agricultural season. Does household 'own' land? Did they plough it last season? Did they plough on borrowed land? Was land sharecropped in? Sharecropped out? (More than one item can be indicated).
- \*\*7. Draught. Ox (numbers). Donkey (numbers). Tractor. (More than one item can be indicated).
- \*\*8. Access to draught. Owned, hired, borrowed, mafisa'd. Cross-classify with information from No. 7, above. (More than one item can be indicated).
- \*9. If draught is not owned, who is the owner? Relationship of owner to household head?
- \*\*10. Plough. Owned, not owned; multiple or single.
11. If plough is not owned, who owns? (Answer will often be the same as for draught).
12. Planter. Owned, not owned; multiple or single.
13. If planter is not owned, who owns?
- \*14. Were crops planted in immediately preceding agricultural season? Season before that?
15. Row planting last agricultural season--all, some, none of planted land?

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- \*\*16. Bags of crops produced last agricultural season, specifically excluding sunflower, groundnuts. Include bags harvested, bags sold.
- \*17. Same as No. 16 for season before last.
- \*18. Sorghum last agricultural season. Bags harvested, bags sold.
- 19. Same as No. 18 for season before last.
- \*20. Maize last agricultural season. Bags harvested, bags sold.
- 21. Same as No. 20 for season before last.
- \*22. All beans/pulses last agricultural season. Bags harvested, bags sold.
- 23. Same as No. 22 for season before last.
- \*24. (Southern Region only). Sunflower last agricultural season. Bags harvested, bags sold.
- 25. List of other crops grown, even if only in small amounts.
- \*\*26. Are any smallstock kept?
- \*27. Number of goats.
- \*28. Number of sheep.
- \*\*29. Number of cattle.
- 30. Cattle herd composition.
- \*\*31. Cattle sales within last year. Number of beasts sold. Have cattle ever been sold?
- 32. Smallstock sales within last year. Number of animals sold. Have smallstock ever been sold.?

FOOTNOTES

\* The original version of this report was written at the request of Southern District planning personnel and the Applied Research Unit, Ministry of Local Government and Lands. Persons familiar with that report might note that many of the larger changes I have made result from my considering John Comaroff's 1980 Journal of African Law piece, "Class and Culture in a Peasant Economy: The Transformation of Land Tenure in Barolong", at greater length, and my looking at the data for Barolong in the Agricultural Surveys for 1971/72 and 1980/81.

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1. In the 1979/80 and 1980/81 Agricultural Statistics there are only two notable differences in estimates of basic socioeconomic variables between the two Districts in question and Botswana. Mean household size per holder's dwelling unit is higher for Barolong than for all Botswana. The percentage of holders in Ngwaketse South with 7 or more years of education is lower than nationally.

2. In the recovery from the dry year of 1978/79 to the better years in 1979/80 and 1980/81, the increase in the national mean hectareage was proportionately smaller than the increases in mean hectares in Barolong and Ngwaketse South. This is probably because in a normal to good year,

nationally, increases in ploughed hectarage per farmer are counterbalanced by greater numbers of people ploughing. It is fairly widely accepted that smaller farmers often do not plough at all in a bad year but may plough in a better year.

3. In this case the measure was for food crops only, unlike in the two later years. However food crops make up a sizeable proportion of total hectarage.

4. As 'traditional' food crop production in all three years was 85-87 percent of total Botswana food crop production, these figures could be adjusted slightly downward accordingly, if so desired.

5. In 1978/79, 78 percent of all Botswana groundnut production was by 'traditional' farmers; in 1979/80 only 12 percent; and in 1980/81, 33 percent. The corresponding figures for sunflower were 62 percent, 53 percent, and 34 percent. Thus, particularly in normal to good years, Southern Region's share of all Botswana's groundnut and sunflower production is substantially reduced from the figures given in the text.

6. Higher percentages for tractor ploughing in Ngwaketse South could possibly correspond to the higher percentages for hired draught observed there.

7. The generally lower estimates for 1980/81 for owned draught, tractor draught, and row planting, in both the Agricultural Districts under consideration and all Botswana, might plausibly be explained as due to more small farmers ploughing in 1980/81 than in 1979/80. Short term trend of some other nature, or statistical error of either the sampling or measurement variety cannot be completely ruled out, however.

8. Given Comaroff's various estimates of numbers of farmers falling into each category--large, middle, and small; yields for each category of farmer; and hectarages ploughed, for each category of farmer, plausible estimated mean yields for all Barolong might have been in the vicinity of 1000 kg/ha in the mid-1970's.

9. These political conflicts were of many kinds--Rolong vs. Ngwaketse, African vs. Boer, English vs. Boer.

10. For a fairly complete summary of various herd size thresholds and what they mean for livestock management in the context of multiple household objectives, the reader is referred to the recent work of the Livestock Evaluation Unit (Carl Bro International).

11. See the second to last paragraph in this section.

12. For example, the methodology suggested here would not be designed to replace, but to complement any in-depth sociological research in the CFDA which might be agreed upon between the District and some available researcher.

13. The National Institute of Research should be consulted for its latest compilation of communal area documentation. The author of the

present paper is familiar with an early bibliography done by the Ad Hoc Committee on Research in the CFDA's, "Partial Bibliography on Communal Area Research." Kerven and Simmons (1981) index many works on the 'society, culture and political economy of post-independence Botswana' by administrative District. Many national Agricultural Statistics are now also available in a breakdown by Agricultural Region and Agricultural District.

14. To the author of this paper, it seems that in the Botswana social science research community a good deal of heat, without much light, is generated by debates between those (often anthropologists) who believe that definitional and measurement errors must be guarded against at all costs, and those (often economists or statisticians) to whom sampling error is the bête noire. (To the latter, stopping measurement error is merely a matter of checking code sheets, not asking whether the right measures of crucial variables are being considered, or even which variables are crucial). Sociologists are caught uncomfortably in the middle. In this author's opinion, many representatives of either camp should be more careful about both sources of error. From personal experience he has learned how easy it is to make both kinds of mistake.

It should be noted in this context that in the analysis of the data collected, described below in the text, it is not intended that statistical tests necessarily be conducted of differences between groups.

15. These criteria are similar to but simpler than those used by the national Agricultural Statistics.

16. Farmers record cards filled out by Agricultural Demonstrators for some of the farmers in their extension areas reveal this to be the case even in the Barolong part of Southern District CFDA. Greater land holdings, greater ownership of agricultural implements, and greater use of 'improved' arable practices are all positively associated with greater cattle holdings.

17. There are other cattle holding thresholds above this, but they are of more interest in discussions of the commercialisation of the livestock industry. In the context of a CFDA farmer typology, they would probably not include enough individuals to be of interest for the planning of agricultural programmes.

18. The relatively recent transition from English to metric units is also a source of confusion. It seems possible the agricultural extension personnel sometimes use '1 acre = 1 hectare' or '2 acres = 1 hectare', rather than '2.47 acres = 1 hectare', as the implicit mental conversion ratio.

19. It is likely that in a bad year CFDA planners will be more concerned with drought relief than with farmer typologies for agricultural programmes.

20. In other words, though the categories of crop producers with given characteristics other than output will vary from year to year in their crop output, any typologies for the CFDA resulting from the

cross-classification with cattle holdings should be roughly similar regardless of in which normal to good year it was done. In a bad year, apart from large crop producers, the range of crop production by household is likely to be too narrow to permit meaningful distinctions.

21. In the following discussion, metric bags of 70 kg are assumed. In the past, results have often been reported for imperial bags of 90 kg, as for example, in the work of Comaroff, Gulbrandsen, or in the FAO report cited below. Furthermore, it is assumed that a 'dwelling unit' is made up of 6 people, in the sources where household variables are referred to. Conversions to bags per household have been made on these assumptions.

Of the many estimates of food requirements which have been made, there are two basic types: estimates of actual grain consumption and calculations based on nutritional requirements. Actual consumption estimates include 11 bags per household per year (Colclough and McCarthy); 13 bags (FAO); 18 bags (ALDEP 1979c). For those estimates 10 percent 'seed, feed, and waste' losses have been assumed. Nutritional requirement estimates include 12 bags per household per year (ALDEP 1979c); 20 bags (ibid.); 22 bags (Lipton); and 30 bags, the only estimate to include pulses (Kerven 1979). These latter estimates vary on the basis of differences in assumptions or implicit assumptions about seed saving; storage losses; milling rates; caloric requirements; household age/sex distribution; and proportion of caloric requirements to be met from grains or grains and pulses.

Gulbrandsen estimates a family of 5 to 7 persons needs roughly 19 70-kg bags per annum (Gulbrandsen). His methodology is unstated but it may reflect both actual consumption and nutritional factors.

22. There are doubtless other production thresholds above this, but, as with cattle, these divisions will not include enough people to be interesting for an all-farmer typology. As will be seen below in the text, this appears to be true even in the Barolong part of the CFDA. This is not to say that the very large crop farmer, in Barolong or elsewhere, or the large cattleman anywhere, does not play an important role in determining the agricultural prospects of his smaller neighbours.

23. For example, in the opinion of this author, the definitive study analysing net investment in cattle or in crop agriculture by wage workers has yet to be written. Lucas analyses some evidence on investment of several types from the National Migration Study data, but does not specifically answer the question of whether there are net investment flows from one form of economic activity (e.g. cattle, crops, or wage earnings) to another (Lucas). Alverson argues that the 'consensus' is that income from wages and sale of stock 'subsidises' crop agriculture for most households, although 'it is cheaper to subsidise subsistence agriculture than to buy food in shops with money earned elsewhere' (Alverson 1979b). If one assumes price at which food grains are purchased is higher than the cost of production, these statements together seem plausible; but the literature which Alverson reviews is certainly not exhaustive. Furthermore, the use of the term 'subsidise' implies that by ploughing to save cash expense on food the household is behaving in an economically sub-optimal manner, when in fact this behaviour may be perfectly rational.

24. Ntseane (in this volume, below) calls the VB farmers 'intermediate' farmers, along with others holding 21-40 head. Indeed, circumstances are such that a cross-classification by bags produced and cattle, done next year, might find both of these farmers in this author's Class IV due to sharply reduced crop output. In the long run one appears to be disinvesting in crop production and might stay in the intermediate farmer group, while the other is investing and might eventually stabilise his position as a large crop producer.

25. Kindly made available by Joep Staps, DO(L) Barolong at the time Ntseane and this author visited Southern District.

26. Many more observations of this nature would provide support for arguments about the decline of the mid-range farmer in Barolong.

27. Poor households in Botswana who produce sub-subsistence harvests of food crops nonetheless sometimes do sell crops. This is important in any understanding of how they generate household income. However, this does not invalidate the claim that larger arable farmers are more market oriented than small farmers, as market orientation may be defined not only by the existence of sales but also by their regularity and the amounts involved. Small farmers may wish to be more 'market oriented' and may even be aiming at the accumulation of the capital which would permit this; on the other hand, the small farmer who sells an occasional bag, or smaller amount, to meet an immediate cash need may not see regular production for the market as a realistic goal.

28. These were obtained through the courtesy of Deepa Narayan-Parker. Her survey on small scale non-agricultural production also collected information on agricultural variables (Narayan-Parker). Most of these figures were obtained by this author as grouped data and so the assumptions used to calculate certain totals, means, etc. might not give the exact statistic as calculated from ungrouped data.

29. Narayan-Parker reports the following percentages of people who listed their most important source of cash and second most important source of cash:

	Most Important Source of Cash			
	V I L L A G E			
	Dinatshana	Metlojane	Mokgomane	Phitsane/Molopo
Crops	14	42	7	2
Cattle/smallstock	0	2	11	20
Cash remittances, savings, salaried job in village	61	35	53	50
Informal sector	20	14	27	28
No means	5	7	2	0

(continued)

Second Most Important Source of Cash

	V I L L A G E			
	Dinatshana	Metlojane	Mokgomane	Phitsane/Molopo
Crops	5	12	18	2
Cattle/smallstock	4	12	9	14
Cash remittances, savings, salaried job in village	20	26	22	36
Informal sector	39	19	23	34
No means	31	31	28	14

30. At one point Staps claims most Kgoro-Bethel fields are 'in the hands of small farmers' (p. 23); at another he states the Kgoro-Bethel lands area is ploughed by intermediate farmers who produce surpluses for the market (p. 39) (Staps).

31. Most of these studies in isolated areas of the Barolong Farms, particularly the RIDS, sometimes give the impression that they are representative of all of the Farms. In a statistical sense, they are not.

32. The Agricultural Survey for 1971/72 is the most thorough of the early 1970's surveys; it was based on a probability sample which used 1971 census information; and unlike many of the other earlier surveys, it presents figures specifically for the Barolong Farms. The year 1971/72 also had good rainfall.

33. Total farmer numbers may be overstated by AD's. See Table 57 in the text. In addition, area estimates are subject to measurement problems, some of which are described in III.B, above, and in fn. 18.

34. It is possible, in addition, that a list frame provided by extension personnel could be weighted more heavily in favour of larger farmers.

35. The RAO, Lobatse, gave total crop production figures for three very large Barolong farmers in 1980/81. If all three were included in the Agricultural Statistics' 1980/81 sample, they would have accounted for slightly over one third of total production. If all were not included, they would have accounted for slightly over one quarter. One farmer alone could have accounted for one sixth to one quarter of total Barolong production in 1980/81.

36. Forty-three out of 50 reported households were interviewed in Metlojane.

37. I am grateful to Greg Scott for stressing this point. Each reader familiar with Botswana can probably cite several examples of his or her own which demonstrate such conflicts. Roe and Kerven, for example, in separate work demonstrate that investment in agricultural research and development has been and continues to be weighted heavily in favour of livestock rather than crops (Roe; Kerven 1982). Furthermore, since independence 'in real terms BMC producer prices rose against both South

African slaughter stock prices and Botswana Government salary and wage rates as well as against grain prices' (Hubbard). Price advantages to beef production along with the reductions in both the percentage of draught oxen and their availability through 'traditional' interchanges have reduced the incentives for arable production (Colclough and McCarthy; Jones; Table 32 in text, above).

38. Draught power is an input too, but is probably the most crucial one. Furthermore, draught animals have other uses besides pulling ploughs, and, if they are cattle, they have a market value greater than the value of their draught power. Thus they are considered separately.

39. An example given by Comaroff (1980) is that of farmers who 'were persuaded to extend themselves in order to pay the hiring costs' (of large farmers' tractors and implements) 'by the promise of large yields which might be similarly invested in mechanised means, and thereby afford them entry into the ranks of the larger commercial producers.' In the mid-1970's some of Comaroff's 'middle range' farmers tried to enlarge their capital by soliciting aid from wealthier relatives or partnership with poorer ones. This was done more to maintain their level of production than to expand it.

40. As noted above in the text, Litschauer's analysis contends that the first ALDEP farmers may tend to increase areas rather than yields.

41. On one other variable--use of manure or chemical fertiliser--the interviewed pilot farmers appeared well ahead of the general Botswana farming population. This also indicates that recipients of ALDEP planter/cultivator packages have tended to be those farmers already more involved in arable agriculture.

42. It is hypothesised that in a dry year like 1978/79, for which a Gini coefficient for crops could not be calculated, food crop production would be more equally distributed.

43. The Farm Management Survey's agricultural practices survey for 1980 showed that many more sample farmers got seed from outside sources than farmers who row planted, autumn ploughed, or used chemical fertiliser or even kraal manure (Ministry of Agriculture 1981).

44. A CFDA in another part of eastern Botswana might be an appropriate place for a concentrated effort to improve marketing, as suggested by Duggan (Duggan).

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