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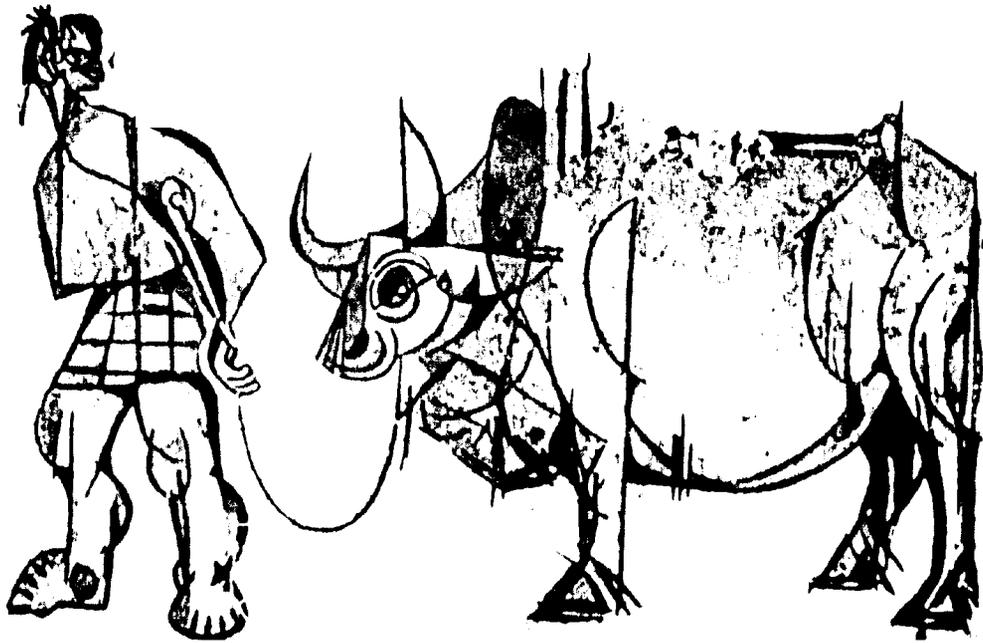
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RURAL DEVELOPMENT COMMITTEE



Occasional Papers

**DEVELOPMENT OF LIVESTOCK, AGRICULTURE
AND WATER SUPPLIES IN BOTSWANA
BEFORE INDEPENDENCE:
A SHORT HISTORY AND POLICY ANALYSIS**

Emery Roe

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DEVELOPMENT OF LIVESTOCK, AGRICULTURE AND WATER SUPPLIES
IN BOTSWANA BEFORE INDEPENDENCE:
A SHORT HISTORY AND POLICY ANALYSIS

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Rural Development Committee
Cornell University

and

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INTRODUCTION

This paper reconstructs the policies and patterns of development in the rural sector of what is now Botswana, formerly known as the Bechuanaland Protectorate under British colonial administration up to 1965. The present-day development efforts need to be seen against the background of what has gone before, and this review drawing on a wide variety of published sources sketches in the outlines of past development. It was not undertaken as an academic study and thus has not attempted to raise and deal with theoretical issues. Rather, it was intended to orient the Rural Development Committee at Cornell University to the policy context of any rural development work in Botswana. Because this history and analysis appear to provide an overview of experience in Botswana that can be useful to others, the RDC is publishing this paper for more general readership.

The first three sections of this paper provide chronologies of the major events affecting the Bechuanaland Protectorate's livestock, agricultural and water supply sectors between 1895 and 1965. Each of these sections concludes with some general comments on the course of development of the sector described. Section IV provides some analysis of the important factors which determined the course of these events and identifies the major linkages connecting the sectors through time. Summary comments are provided in Section V, and an Appendix follows with a note on the data sources used in the compilation of tables for the paper.

The description and analysis provided by the author have been based largely on the use of aggregate statistics which have often been incomplete and at times conflicting. The author appreciates that a district-by-district study of the historical development of agriculture, livestock and water sources is needed to provide a more complete picture. We appreciate the amount of insight which he has been able to generate from such aggregate statistics and often remote historical accounts.

The author, Emery Roe, is a member of the Cornell University Team conducting a Water Point Survey being undertaken on behalf of the Botswana Ministry of Agriculture and funded under a cooperative agreement between USAID and the Rural Development Committee at Cornell. The views in this

paper are not necessarily those of the Ministry of Agriculture, or USAID, or Cornell University. Mr. Roe wishes to thank David Cooper, David Jones and John Pielmeier for their comments, and to convey special thanks to Alex Campbell, Brian Egner and Louise Fortmann for their assistance and encouragement. We want to express great appreciation to Jody Swatling for the painstaking work of typing this monograph. The Rural Development Committee looks forward to more publications from the team which will help to inform broader circles about the efforts being made and the experience being gained in rural development in Botswana.

March, 1980

Norman Uphoff, for the
Rural Development Committee
Cornell University

I. THE DEVELOPMENT OF THE LIVESTOCK SECTOR, 1895-1965

A Chronology of Major Events, 1895-1965

1895/96. A devastating epidemic of rinderpest occurred, estimated to have killed up to 95% of the cattle in the Protectorate (BPAR¹, 1918/19, p.3; Pim Report, 1933, p.14). This decrease in the supply of cattle resulted in their price rising to new levels in certain areas of the country (Parsons, p.126).

1905. The Veterinary Department was established with a small staff; in 1913/14 there were still only one veterinary officer and a stock inspector (Pim Report, 1933, p.87; cf. Falconer, 1971, p.74).

1910. The Bechuanaland Protectorate, Basutoland, Swaziland, and South Africa entered into a new Customs Agreement (in force until 1969) which was to provide the Protectorate with access to the South African markets for its main export, cattle (Ettinger, 1972, p.21).

1909-1912. A quarantine on the export of cattle from the Protectorate to South Africa was imposed because of lung sickness. Some easing of these restrictions occurred with the opening up of the Johannesburg municipal abattoir in 1912, but quarantine restrictions continued in some form until 1923 (Ettinger, 1972, p.21; Pim Report, 1933, pp.14-15). The 1911 national census estimated the Bechuanaland cattle population to number 323,911 beasts, an increase of 133% over the estimated herd size of 1904 (Table 1; BPAR, 1910/11, p.4),

1911-1919. The steady recovery in the national herd after 1895 was ended by recurring drought, considered at that time to be the worst ever experienced by some tribes. It is thought, for example, that one-third of the Bangwaketse livestock died in 1914 (Pim Report, 1933, p.26; see also Parsons, 1977, p.131).

1920-1924. A worldwide economic depression, a severe drought and a series of locust attacks served to reduce cattle exports (Table 1; various BPARs). The 1921 national census put the Protectorate cattle population at 495,062, an increase of 53% over the 1911 figure (BPAR, 1921/22, p.5).

¹An acronym used for "Bechuanaland Protectorate Annual Report (Colonial Office)". Complete references are given in Bibliography, page 53.

TABLE 1

BECHUANALAND PROTECTORATE CATTLE AND GRAIN EXPORTS*

Year	Population (No.)	Cattle			Sorghum		Price Ratio Cattle/ Sorghum (X 100)
		Total Exports (No.)	Offtake (Col. 3/ Col. 2)	Price Index (1910=100)	No. Bags	Price Index (1910=100)	
1899/1900							
1900/1901							
1901/02							
1902/03							
1903/04							
1904/05	139,071						
1905/06							
1906/07		3,622					
1907/08		3,084					
1908/09							
1909/10							
1910/11				100		100	100.0
1911/12	323,911	14,312	4.4%	110		71	155.0
1912/13		15,673		104		57	182.5
1913/14				100		157	63.7
1914/15				117		85	137.7
1915/16		17,664		109		72	151.4
1916/17		18,876		106		87	121.8
1917/18				105		114	92.1
1918/19		26,571		107		115	93.0
1919/20		23,569		98		142	69.0
1920/21		32,450*		89		199	44.7
1921/22	495,062 (425,963)	25,884*	5.2	81		101	80.2
1922/23		26,046*		74		101	73.3
1923/24		18,147 (32,706)		69	5,379	128	53.9
1924/25		24,481 (25,162)		69	6,306	114	60.5
1925/26		33,563 (34,434)		70	6,403	100	70.0
1926/27		31,889*		65	3,989	114	57.0
1927/28		30,050*		70	1,659*	200	35.0
1928/29		33,784*		71	38*	128	55.5
1929		30,673*		73	739*	100	73.0
1930		28,177*		66	7,079*	72	91.7
1931		25,927 (26,209)		68	5,666*	114	59.6
1932	777,000	25,103*		63	6,882	86	73.3
1933	800,000	715*		64	--	72	98.9
1934	1.4-1.2 million	1,800 (2,871)		75	150	86	87.2
1935		12,466 (24,577)		71	18,145	72	98.6
1936	540,795*	19,022*	3.5	77	32,672	129	59.7
1937	602,388	6,318 (8,515)	1.1 (1.4)	83	25,225	100	83.0
1938	649,424*	21,570*	3.3	87	3,530	114	76.3
1939	647,011 (671,011)	24,461	3.8	87	--	87	100.0
1940	732,978*	33,928*	4.6	84	--	100	84.0
1941	749,333 (805,682)	31,108* (33,009)	3.9-4.2	87	--	143	60.8
1942	811,655*	44,933*	5.5	100	--	171	58.5
1943	836,843*	42,931*	5.1	103	--	199	51.8
1944	895,902*	35,937*	4.0	106	9,904	156	67.9
1945	920,175*	42,024*	4.6	107	--	158	67.7
1946	958,789*	46,994*	4.9	109	--	285	38.2
1947	966,940*	53,783*	5.6	105	--	298	35.2
1948	978,500*	42,024*	4.3	108	--	200	54.0
1949	982,951*	70,403*	7.2	107	--	256	41.8
1950	1,049,966*	70,169*	6.7	108	1,850	270	40.0
1951	1,026,845*	77,995*	7.6	113	31,378	290	37.9
1952	1,054,296*	73,168*	6.9	124	8,463	426	29.1
1953	1,097,681*	71,116*	6.5	119	28,200	299	39.4
1954	1,104,403* (1,139,773*)	74,603*	6.0-6.8	119	41,793*	270	44.1
1955	1,173,191* (1,152,494)	71,895 (71,890)		120	103,971 (108,531)	399	30.1
1956	1,235,668*	70,534*	5.7	137	135,892 (134,269)	412	33.3
1957	1,309,950*	64,425	4.9	147	66,963*	327	45.0
1958	1,314,238* (1,312,840)	69,026	5.3	146	41,391*	313	46.7
1959	1,317,236* (1,325,000)	97,115	7.3-7.4	146	52,008*	298	49.0
1960	1,271,818*	35,150	6.7		234*		
1961	1,319,127*	89,208	6.8		178,934		
1962	1,351,778*	109,029	8.1		8,722		
1963	1,349,773*	127,467	9.4		128		
1964	1,346,533*	123,051	9.1		157		
1965	1,097,322*	155,982	14.2		45		

Sources: See Appendix, pages 49-52; symbols used in tables are explained there.

1922-1923. The staff of the Veterinary Department was increased to a chief veterinary officer, one veterinary officer, a laboratory assistant, two stock inspectors, one scab inspector, and a clerk.

1924-1941. Cattle exports from the Protectorate to Johannesburg were subject to a number of severe weight and supply restrictions, limiting the Protectorate's ability to export (Ettinger, 1972, p.23; Walker and Hobday, 1939, p.11). However, a number of new markets opened sporadically during the period--Northern Rhodesia in 1930, Southern Rhodesia commencing in 1939, Angola between 1926-1930, Italy between 1925-1936, and the Belgian Congo between 1921-1932--which reduced the overall impact of restrictions to the Johannesburg market (Ryan Report, 1958, p.27; various BPARs).

1925. An agreement was signed between the Protectorate Administration and the Imperial Cold Storage and Supply company to erect a storage and refrigerating unit at Lobatse and the new factory was opened in August, 1927, at a cost of some £40,000 (BPAR, 1927/28, pp.5,32; Ettinger, 1972, p.23).² Abattoir activity did not really commence until 1934/35, primarily due to the restrictions and weight regulations on Protectorate cattle exports (Ettinger, 1972, p. 23; BPAR, 1934, p.42; Falconer, 1971, p.75). Veterinary restrictions, low producer prices, and weight and supply restrictions were constantly to plague the operation of this Lobatse abattoir and by 1941 it had ceased operations altogether (Falconer, 1971, p.75).

1926. A dairy inspector was engaged by the Protectorate administration, leading to a rapid development in African dairy production up to the Great Depression (BPAR, 1926/27, p.18; and various BPARs).

1931-1938. These eight years were the worst in the economic history of the Protectorate. Between 1931-38, there occurred not only the worst drought up to that time (1933-35) and an as-yet unparalleled economic depression, but also major outbreaks of foot and mouth disease (1933-34) and locust attacks (1934-35). The cattle export industry basically collapsed. The amount and value of official cattle exports from the Protectorate plummeted in the early 1930s (Tables 1 and 2), primarily as a consequence of foot and mouth disease embargoes. The national cattle herd may have fallen

²Falconer dates the agreement as of 1927 (1971, p.75).

from levels as high as 1.2-1.4 million head in the early 1930s to 540,000-640,000 in the mid- and late 1930s (Table 1; Schapera, 1943, p.213; Falconer, 1971, p.75; Walker and Hobday Report, 1939, p.4). It has been estimated that some 400,000 cattle died between 1933 and 1936 because of the drought, while at least a further 250,000 were lost due to illegal smuggling of cattle to the Union between 1935-38 (Walker and Hobday Report, 1939, p.5; Ryan, 1958, p.6; see also Schapera, 1943, pp.210-215). The foot and mouth disease embargoes on official cattle exports placed an incredible hardship on African producers, necessitating the smuggling activities: as Table 2 shows, the early 1930s may have been a period of widespread dissavings, with many African producers spending more than they were able to earn. Tax rates were reduced and tax collections fell (Table 2); by 1933, the U.K. grants-in-aid had begun again for the first time since the Protectorate had become self-sufficient in 1912/13 (Pim Report, 1933, pp.170-171; BPAR, 1937, p.41).

During this period, the activities of the Veterinary Department increased. Over a million head of cattle were inoculated during the foot and mouth campaign of 1933/34 (Fosbrooke, 1973, p.35; Walker and Hobday Report, 1939, p.4). In 1936, 66 African cattle guards were appointed in order to detect and control outbreaks of disease (Schapera, 1943, p.212; Falconer, 1971, p.76). Livestock Improvement Centers were started in several tribal areas, beginning in 1936 (BPAR, 1936, p.49). Similarly, in the late 1930s the Department appointed a hide-and-skins officer to improve African production (BPAR, 1936, p.50). Much of this development owed its impetus to the recommendations of the Pim Report of March, 1933, on the economic and financial position of the Protectorate.

1939-1950. The value of African livestock exports began increasing again, as the average price of cattle began rising, with World War II further stimulating demand (Table 1). In response, the Union of South Africa lifted its weight restrictions on cattle imports from the Protectorate which grew substantially thereafter. In 1939, net revenue from the major livestock exports was roughly £215,000; by 1950, it exceeded £1.4 million (Table 2). Tribal innovations such as local cattle auctions became increasingly popular among a few tribes during the 1940s (Schapera, 1947a, p.131). World War II and the post-War increase demand for

livestock products profoundly altered the structure of the territory's livestock industry. After 1950, the aggregate value of livestock products exported from the Protectorate never fell below £1.5 million (Table 2; cf. BPAR, 1946, p.82).

1951-1959. This was a period of rapid and substantial infrastructure development within the Protectorate's cattle industry. In 1954, the Colonial Development Corporation completed a new export abattoir at Lobatse and, thereafter, the value of carcasses exceeded the value of live cattle exports. Between 1951 and 1957, the Veterinary Department field staff expanded considerably; a veterinary school was established at Ramatlabama; and a system of cordon fences and quarantine camps was constructed across the territory (Falconer, 1971, pp.76-77). In 1956, the European Advisory Council gave consideration to the need for a second abattoir in the north the Protectorate (Ryan, 1958, p.1). In 1958, the Adviser on Cooperatives to the Secretary of State for the Colonies visited Bechuanaland to investigate the feasibility of cooperative cattle marketing (Ibid., p. 3).

While foot and mouth disease outbreaks occurred, reducing cattle exports and offtake at particular times (Ryan, 1958, p.1,21), the value of livestock exports increased between 1951 and 1959, from approximately £1.8 million to £2.5 million. Cattle auctions became less popular during the 1950s, both because they were viewed as too risky by Batswana and because the recurrence of foot and mouth disease tended to discourage cattle speculation (Ibid., p. 17; Falconer, personal communication).

1960-65. This period included not only continued outbreaks of foot and mouth disease, but also the worst drought in the Protectorate's history. Some 400,000 head of cattle were said to have been lost in the drought of 1965/66 (Ronald, 1972, p.4). In the early 1960s, U.K. veterinary authorities had agreed for the first time to the importation of Protectorate cattle carcasses and by 1965 the value of these carcasses from the Lobatse Abattoir had reached an all-time high of over £2.9 million, with an official record offtake of 14.2 percent of the national herd (Tables 1 and 2; Falconer, personal communication). In 1965 the Abattoir was nationalized, thereafter becoming known as the Botswana Meat Commission. Livestock marketing cooperatives were officially organized during 1965 as well (BPAR, 1965, p.55).

Table 2

AFRICAN INCOME AND EXPENDITURE, 1900-1965

Year	PRINCIPAL AFRICAN LIVESTOCK REVENUE				PRINCIPAL AFRICAN TAXES		
	Net Cattle (Live) Rev. (b)	Net Smallstock Revenue (b)	Hides and Skins (b)	Car-casses (b)	Hut (African) Tax (b)	Native Fund Tax (b)	Cattle Export Tax (b)
1899/1900					5,934	--	--
1900/01					7,844	--	--
1901/02					9,976*	--	--
1902/03					9,446*	--	--
1903/04					10,566*	--	--
1904/05					11,529*	--	--
1905/06					11,268*	--	--
1906/07	36,222*				11,606*	--	--
1907/08	26,623*				13,526*	--	--
1908/09					25,656*	--	--
1909/10					29,980*	--	--
1910/11					29,994*	--	--
1911/12	69,090*				34,565*	--	--
1912/13					35,745*	--	--
1913/14					36,887*	--	--
1914/15					31,844*	--	--
1915/16					39,854*	--	--
1916/17					36,452*	--	2,385
1917/18					38,573	--	2,955
1918/19					40,750*	--	3,321
1919/20					38,620*	--	3,420
1920/21					38,446	5,303	4,939
1921/22					36,215	6,328	6,750
1922/23					29,275	5,003	6,893
1923/24	71,155*	5,457*	16,398	--	32,237	6,214	7,068
1924/25	86,256*	12,009*	22,118	--	35,375	6,953	3,385
1925/26	144,686*	8,457*	29,768	--	36,823	7,403	--
1926/27	159,445*	11,359*	45,259	--	39,134	7,870	--
1927/28	124,369*	9,070*	70,426*	--	38,575	7,767	--
1928/29	154,533*	9,338*	73,842*	--	41,054*	8,166	--
1929	139,401*	10,717*	43,206*	--	42,451	10,205	--
1930	113,608*	4,018*	21,449*	--	40,740*	10,002*	--
1931	92,510	4,255*	11,184*	--	31,921*	7,952	--
1932	93,507	8,356	5,464*	--	26,027	6,420	--
1933	2,918	63	679	--	9,624	7,223	--
1934		2,399	19,540	--	22,703	9,356	--
1935	59,810	15,025	41,993	--	33,693	14,493	--
1936	101,172	9,352	19,923	29,863	30,181	12,372	--
1937	50,649	1,312	15,585	7,500	38,902	13,910*	--
1938	171,730	9,552	16,014	--	62,354	--	--
1939	193,674*	4,660*	13,919	--	61,655	--	--
1940	245,109*	6,086*	14,797	--	69,055	--	--
1941	237,065*	7,640*	17,785	--	70,357	18,030*	--
1942	427,660*	13,218*	18,431	--	N/A	--	--
1943	506,655				75,923	7,070*	4,931*
1944	418,880				79,172	6,983*	4,783*
1945	506,274				78,664	7,268*	5,657*
1946	514,617*	6,727*	15,652*		79,803	--	4,838
1947	615,789*	27,580*	47,949*		82,564	--	7,693
1948	505,681*	25,169*	61,189*	--	83,221	--	5,276
1949	878,089*	34,134*	78,071*	--	86,425	--	9,993
1950	1,131,578*	61,665*	208,626*	--	95,933	--	22,142
1951	1,439,339*	106,812*	275,060*	--	103,531	--	33,004
1952	1,462,474*	115,884*	126,667*	--	102,702	--	37,433
1953	1,465,811*	64,508*	112,552*	--	133,818	--	65,131
1954	1,433,516*	55,940*	86,834*	118,471*	129,320	--	57,126
1955	95,916*	39,206*	218,529*	1,378,541*	135,733	--	71,431
1956	70,844*	50,712*	226,294*	1,555,355*	131,907	--	65,742
1957	146,493*	36,965*	181,665*	1,368,722*	134,780	--	50,433
1958	161,864*	8,229*	167,778*	1,473,688*	181,113	--	76,410
1959	143,926	9,509	386,594	1,980,581*	191,405	--	86,559
1960	37,001	9,233	104,452	1,577,659*	165,941	--	69,812
1961	182,790		292,053	1,657,990*	192,196	--	106,005
1962	280,207		271,779	2,046,059*	173,032	--	132,536
1963	535,494		230,338	2,282,978*	162,269	--	132,654
1964	264,000		244,000	2,386,903	145,810	--	145,631
1965	419,000*		329,000	2,903,388			

* Excludes value of imports (N/A)

* Consolidated in 1938/39 with Native Tax

Table 2
(Continued)

PRINCIPAL AFRICAN AGRICULTURAL EXPORTS/IMPORTS						FINANCIAL TRANSACTIONS			NET AFRICAN REVENUE
Sorghum Export Revenue (h)	Sorghum Imports (h)	Sorghum Surplus (Deficit) (h)	Maize/Mealie Export Rev. (h)	Maize/Mealie Import Rev. (h)	Maize/Mealie Surplus (Deficit) (h)	African Livestock Income (h) (1)	African Grain Surplus (Deficit) (h) (2)	African Taxes (h) (3)	Columns (1+2-3)
								38,837	
								41,528	
								44,071	
								42,040	
								52,688	
								49,293	
								41,171	
3,348			484			~ 93,010	N/A	45,519	
4,438			40			~ 120,383	N/A	45,913	
2,815			5,654			~ 172,911	N/A	44,226	
4,122			1,546			~ 216,063	N/A	47,004	
1,121	8,470*	(7,349)	---	29,045*	(29,045)	204,365	(36,394)	46,342	121,629
23*	5,722*	(5,699)	---	22,684*	(22,684)	237,713	(28,383)	49,220	160,110
427*	9,876*	(9,449)	587*	16,456*	(15,869)	193,324	(25,318)	52,656	115,350
3,785*	1,330*	2,455	1,222*	7,729*	(6,507)	139,075	(4,052)	50,742	84,281
3,101*	974*	2,127	793*	9,937*	(9,144)	107,949	(7,017)	39,873	61,059
2,937*	1,445*	1,492	1,051	8,493	(7,422)	107,327	(5,950)	32,647	68,730
---	10,847*	(10,847)	75	14,574	(14,499)	3,660	(25,346)	16,847	(38,533)
64*	1,237*	(1,173)	139	10,839	(10,700)	~ 21,938	(11,873)	32,059	(21,994)
8,004*	1,673*	6,331	5,323	15,607	(10,284)	~ 116,828	(3,953)	48,186	64,689
21,853*	2,966*	18,887	1,557	21,554	(19,997)	160,310	(1,110)	42,553	116,647
11,148*	3,508*	7,640	118	16,233*	(16,115)	75,046	(8,475)	52,812	13,759
1,981*	13,979*	(11,998)	251	26,711*	(26,460)	197,296	(38,458)	62,354	96,484
6,155*	1,311*	4,844	1,376*	22,577*	(21,195)	~ 212,253	(16,351)	~ 61,655	134,247
4,389*	2,566*	1,823	445*	20,791*	(20,346)	~ 265,992	(18,523)	~ 69,055	178,414
6,002	11,756	(5,754)	122	41,688	(41,566)	~ 262,490	(47,320)	~ 88,387	126,783
3,661	3,600	61		66,889	(66,889)	~ 461,889	(66,828)	N/A	
						506,655		87,924	
18,429	6,895	11,534	--	27,790	(27,790)	418,880	(6,256)	86,155	
---	28,370	(28,370)	---	62,135	(62,135)	506,274	(90,505)	21,589	
---	5,808*	(5,808)	---	68,541	(68,541)	~ 536,996	(74,349)	84,641	378,006
---	63,070	(63,070)	---	244,000*	(244,000)	691,318	(307,070)	90,257	293,991
---	12,064	(12,064)	---	57,697*	(57,697)	592,039	(69,761)	88,497	433,781
---	14,272	(14,272)	---	63,256*	(63,256)	990,294	(77,528)	96,118	816,648
2,945*	4,664	(1,719)	---	54,941*	(54,941)	1,401,869	(56,660)	118,075	1,227,133
73,400*	1,161	72,239	2,500*	109,102*	(106,602)	~ 1,821,211	(34,363)	136,535	1,650,313
21,831*	33,200	(11,369)	---	259,094*	(259,094)	~ 1,705,025	(270,463)	140,135	1,294,427
40,911*	12,569*	28,342	388*	72,690*	(72,302)	1,642,871	(43,960)	198,949	1,399,962
124,750*	126*	124,624	---	30,576*	(30,576)	1,694,761	94,048	186,446	1,602,363
259,940*	738*	259,202	---	26,134*	(26,134)	1,732,192	233,068	207,164	1,758,096
270,973*	---	270,973	---	43,975*	(43,975)	1,903,205	226,998	197,649	1,932,554
122,343*	---	122,345	---	89,818*	(89,818)	1,733,845	32,527	185,213	1,581,159
66,200*	150*	66,050	---	94,374*	(94,374)	1,811,559	(28,324)	257,523	1,525,712
78,000	4,700*	73,300	---	156,831*	(156,831)	2,520,610	(83,531)	278,043	2,159,036
351	107,220*	(106,869)	---	436,414	(436,414)	1,728,350	(543,283)	235,753	949,314
	14,130			146,379					
	64,522			276,210					
	136,863			352,236					
	188,500			556,500					

Figures in parentheses indicate negative numbers

Sources: See Appendix, pages 49-52; symbols used in tables are explained there.

General Comments

There is one clear and invariant theme that runs through the economic history of the Protectorate between 1895 and 1965: the livestock sector was the major source of income from trade for the Batswana. Whatever the voice, whatever the year, the refrain was the same:

- (1) BPAR, 1915/16, p.5: "The staple industry of the Protectorate is stock raising, and this constitutes the main purchasing power of the people."
- (2) Pim Report, 1933, p.25: "The means of raising money without leaving the Territory are...reduced to the sale of cattle, hides and skins, and dairy produce. Cattle are the main wealth of the Bechuana, and for most of them the only liquid capital."
- (3) Walker and Hobday Report, 1939, p.2: "Attention has always been given by Government during the history of Bechuaraland as a Protectorate to the subject of cattle export, since it is on this factor that the economy of the territory has always depended and still largely depends today."
- (4) I. Schapera, Native Land Tenure, 1943, p.209: "The country is notoriously more suitable for ranching than for the cultivation of crops..."
- (5) Morse Commission, 1960, p.53: "The cattle industry is...the dominant source of cash income for the African peasant and the farming community generally, especially in the larger Tribal Territories..."
- (6) Biggs Report, 1966, p.85: "It appears to be inevitable that Bechuanaland will have to rely primarily on its cattle industry for its main source of income..."

One indicator of the primary importance of the livestock sector lay in the funding priority given to the disease control activities of the Veterinary Department during the colonial period. Although the Veterinary Department was understaffed, given its responsibilities for most of the period, expenditures on veterinary services exceeded those for governmental medical services until 1936/37 and, even thereafter, the two Departments concerned alternated in funding priority (Pim Report, 1933, pp.172-173; various BPARs). A number of other consequences following from this view of the role of livestock in the Protectorate's economy will be discussed in subsequent sections.

As Tables 1 and 2 show, the Batswana had a history of selling live-stock and livestock products during the colonial period. Writing in 1941, Schapera put it this way:

"...the Natives of Bechuanaland have no marked reluctance against disposing of their beasts. Whatever may have been the position in the past, they do not now hold that cattle are a sacred trust handed down from one generation to another, nor does the custom of bogadi, where it persists, contribute greatly to hoarding...they have certainly grown well accustomed to the habit of selling cattle and other livestock, and a common request at meetings of the Native Advisory Council and elsewhere is that the Administration should try to provide them with better market facilities." (Native Land Tenure, p.211)

As Schapera was quick to add, this description was not saying that Batswana produced cattle solely for the market or sold more cattle, the higher the price for cattle. On the other hand, it would be incorrect to say that Batswana producers exhibited a classic "cattle complex" or perverse supply behavior during this period. While the price and quantity of cattle sold did not vary directly, Batswana livestock producers were sensitive to increasing or decreasing costs in the goods and services which could only be obtained through the sale of livestock and livestock products (as the sole or primary source of cash income). Ryan described this relationship succinctly as follows in 1958:

"...it is generally agreed that a drop in price of livestock, unaccompanied by a similar drop in the price of other commodities, would oblige the African to sell more stock..." (p.14)

It was argued that the higher the tax obligations or the greater the grain shortfall, the more pressure the Batswana felt to obtain and sell livestock (e.g., Schapera, 1933, pp. 644-652). Under such a regime, one would expect to find a negative correlation between the number of cattle exports and the price ratio of cattle to sorghum (a grain that had to be purchased frequently). Indeed the correlation coefficient (r) is $-.78$ for the period 1918-1959 (see the time series data in Table 1). It is probably truer to say that, generally, cattle exports from the Protectorate were limited less by traditional beliefs toward cattle than by periodic Union embargoes and weight and supply restrictions.

During the colonial period, approximately 90 percent of the territory's cattle population was estimated to have been owned by Batswana (see various Official Yearbooks of the Union of South Africa for 1910 through 1941; Morse Commission, p.23; Veterinary Annual Report, 1950, p.1). Most of these cattle were in the eastern (hardveld) areas of the country (Ryan, 1958 p.6) and an estimated 95 percent of the total Batswana population was said to have been engaged in some aspect of stock raising (BPAR, 1955, p.9; Economic Survey of the Colonial Territories (1951), p.75). Similarly, although largely sold through speculation, Batswana-supplied cattle dominated the export trade, e.g., between 1920-1932, they owned approximately 93 percent of the cattle exported and between 1938-42, they averaged some 96 percent of all livestock exports (Pim Report, 1933, p.161; Schapera, 1947a, p. 132). Compared to export transactions, there was little internal livestock trade in the Protectorate: even during the drought of the 1960s, internal offtake was estimated to be about 1 percent of the national herd, as compared to 7-16 percent for exports during that period (Ronald, 1972, p.4; Campbell, 1979, p.103; see also Pim Report, 1933, p. 126; BPAR, 1947, p.31).

While the vast majority of Batswana were involved in stock raising, there still existed a skewed distribution of livestock holdings. In 1932/33, Schapera estimated that 20 percent of the Kgatla herd was owned by 4 men, while some 20 percent of the tribe did not have enough cattle to sell annually for meeting their tax and other cash obligations (Schapera, 1933, p. 650). Writing in 1944, Schapera referred to a sample of some 4,000 families in six different tribal areas which showed that some 25 percent of these households were too poor in cattle to derive regular family income from stock farming (Schapera, 1947a, p. 113).

While there is some evidence that the savings of early migrant labor appreciably increased the number of households owning cattle (Pim Report, 1933 p.26), especially among poorer families, the general trend through the colonial period appears to have been one of an increasingly unequal distribution of holdings. As will be shown below, the number of private boreholes and cattle posts increased considerably over time, thereby creating a situation where relatively larger herds had access to fairly permanent water supplies, while the smaller herds of poorer stock holders were left to communal water sources that were traditionally highly susceptible to drought stress and attendant overgrazing (Ronald, 1972, p.4).

II. THE DEVELOPMENT OF THE AGRICULTURAL SECTOR

A Chronology of Major Events, 1895-1965

1895-1929. During this period, African agriculture production was almost exclusively undertaken for subsistence purposes (Schapera, 1943, p.123; various BPAKs). The plough had been rapidly replacing the hoe in African agriculture (thereby making farming an increasingly male occupation) for some time (Parsons, 1977, p.123; Kooijman, 1978, p.70), but this innovation had not appreciably led to commercial farming among the majority of Batswana. A few European farmers around Lobatse and Francistown were the principal producers of agricultural surpluses, and by 1918, the Lobatse Farmers Association was holding its second Agricultural Show (BPAR, 1918/19, p.7).

There was little government intervention to improve and increase African agricultural production. Tribal custom regulated cropping activities. In many tribes, the separation of village from lands and cattle post, prohibitions against the sale of sorghum by tribesmen to traders, and the Chief's prerogative in saying when villagers should proceed to the lands to plant and harvest were strictly maintained (Schapera, 1943, passim). Yearly cropping activities would fluctuate widely as a function of prevailing drought conditions (Schapera, 1947a, p. 131). Between 1905 and 1929, varying drought conditions were said to exist in some part of the Protectorate for at least 15 cropping seasons (Sandford, 1977, pp.B22-24). There were, however, important regional and tribal differences in production. For example, the Bakgatla and Barolong, by farming in the more fertile eastern areas, were more often than other tribes able to be self-sufficient in sorghum production (Pim Report, 1933, pp.24,96).

1930-1939. African agriculture remained predominantly subsistence production. Yields were estimated to be much less than two 200-pound bags of sorghum per acre and the combined effect of the economic depression, drought and locust attacks in the early 1930s led to stagnation in agriculture in most of the country. (The sales of sorghum in Table 2 shown for 1930-1933 should be attributed more to the selling of critical grain reserves for essential cash requirements than to any crop "surpluses".)

However, intertribal trade of grain grew in this period between the grain-deficit tribes such as the Bangwaketse and the Bakwena and the occasionally grain-surplus tribes such as the Bakgatla (Schapera, 1943, p.203).

Estimates varied considerably as to the amount of land under African cultivation, e.g., the Pim Report estimated 200,000 acres in 1933, while seven years later the Protectorate government quoted 352,000 acres (Pim Report 1933, p. 136; BPAR, 1938, p.11). In the early 1930s, it was estimated that annual grain production for local consumption was some 200,000 bags (BPG, Savingram No.250, 1933). Figures such as these were highly speculative.

The early 1930s saw a change of attitude toward the improvement of African agriculture. In 1930, the first Native Agricultural Show was held in Mochudi, followed by similar shows in Kanye and Ramoutswa the next year (BPAR, 1930, p.33; BPAR, 1931, pp.13-14). By 1936, over 17,500 ploughs-- 1 for every 13 persons--were recorded in the eight Tribal Reserves. Government activities increased as well; for example, six additional agricultural demonstrators were trained in 1932, though, as Pim noted, "no clear idea appears as yet to have been formed as to how these men are actually to be employed" (Pim Report, 1933, p.88).

The most important development of this period, though, was the establishment of a separate Agricultural Department in 1935/36, some 30 years after the formation of the Veterinary Department. Its headquarters was based at Mahalapye through the secondment of three officers from the Dairy Division of the Veterinary Department, one of whom became Principal Agricultural Officer (Dawe, 1972, p.265). This Department was responsible for all government agricultural work, crop experimentation, pasture research, dairy work and pig and poultry development (BPAR, 1935, p.10). After the Department's formation, work accelerated at the Mahalapye Experimentation Station and, in 1936, the Grass Research Station was established at Morale through a grant from the Colonial Development Fund (BPAR, 1935-37, passim). Pasture research in the Protectorate really began with the Pole-Evans survey of grasses there in 1930/31, received encouragement through the Pim Report, and, consistent with staff background, became the major preoccupation of the Agricultural Department in the late 1930s, e.g., some 50% of the experimental plots at the Mahalapye Station were devoted to fodder and

pasture crops such as sudangrass, kudzu, johnsongrass, saltbush and spineless cactus (BPAR, 1936, p.12; see also, BPAR, 1930, p.11; Pim Report, 1933, pp.134-36). Work by the Department was always limited by shortage of funds and it was not until 1955 that its annual budget even passed the £25,000 mark (Hermans, 1974, p.84).³

In the late 1930s, the Agricultural Department encouraged Batswana to undertake autumn plowing, early sowing, crop rotation and fertilization; some success with these recommendations was noted, although some recommendations, notably ensiling, failed (BPAR, 1937-1938, passim). Sorghum yields at the Mahalapye Station were reported to be much higher than traditional yields, with 6½ to 7 200-pound bags of grain per acre (BPAR, 1936, p.12).

1940-1952. African agriculture remained subsistence-based with low returns. For example, Schapera reports sorghum yields to have averaged less than half a 200-pound bag per acre in the Kgatla Reserve. In 1947, the government put the Protectorate's average sorghum yield at three-quarters of a bag per acre and by 1951, yields were still considered to have averaged less than one bag per acre (Schapera, 1943, p. 125; BPAR, 1947, p.17; Economic Survey of the Colonial Territories (1951), p.79). Regional variation in production persisted. Even in the best of these cases, yields were said to have rarely exceeded two bags per acre (Schapera, 1943, p.234). By the late 1940s, however, sorghum yields at 10-15 bags per acre were being recorded on the Agricultural Department's experimental stations (BPAR, 1947, p.17). It was estimated that most Batswana farmers cultivated 10 acres or less (Schapera, 1943, p.134; Economic Survey of the Colonial Territories (1951), p.78).

Deficits in grain production also persisted, even though the advent of World War II led the government to undertake an intensive campaign to increase African agricultural production (Schapera, 1947a, p.8). Similarly, the rising grain prices following World War II appear to have done little to stimulate increased sorghum or maize export (see Tables 1 and 2). The primary problem accounting for the grain deficits in the post-War period lay in the series of droughts that afflicted all or part of the Protectorate

³ Compare this figure with the much larger ones given for the Veterinary Department in Hermans' article.

between 1946-1952. Local grain production in the early 1950s was estimated to have been 350,000 bags or more (Economic Survey of the Colonial Territories (1951), p.79).

A large program for the construction of tribal and government granaries was virtually completed by 1945, with some 63 tribal granaries built (BPAR, 1946, p.68). The Agricultural Department undertook major irrigation schemes at Mogobane and Kanye during this period (BPAR, 1947, pp.17-18) and the Colonial Welfare and Development Fund increased funding to the Department for both capital and recurrent costs involving various agricultural projects (see various BPARs).

1953-1965. This was a unique period in the history of agricultural development in the Protectorate, having begun with an unrivalled series of good cropping seasons and ending with the worst prolonged drought ever. Table 3 shows that between 1953-1959, the Protectorate farmers exported considerably more sorghum than they imported and, similarly maize imports were substantially less than they had been in prior years. Apparently, much of this increase was due to more Batswana bringing new acreage under cultivation, since yields were still low and average field size still was said to be between 5-10 acres per household (Morse Commission, pp.125, 166). In 1958, a good cropping year for sorghum, traditional subsistence farming was said to have yielded a maximum of 1½ bags per acre (BPAR, 1958, p.37). This period was also one of generally rising grain prices (see Table 1). Originally proposed in 1953, a maize mill, located in Lobatse, began operations in 1960 as the only authorized firm for the milling of maize in the country (Biggs, 1966, pp.22ff).

In 1963, Bawden and Stobbs concluded that some 8.2 million acres out of approximately 25 million acres in the eastern part of the Protectorate they surveyed were suitable for both cultivation and grazing (Bawden and Stobbs, 1963, p.73). Examining aerial photography covering the period 1947-1961, they suggested that some 945,000 acres of the area suitable for grazing and cultivation had been under cultivation in the recent past (Ibid.). However, by the drought year of 1965, estimates of local grain production varied between only 50,000 to 100,000 180-pound bags (Campbell, 1979, p.104; Jones, 1979, p.235; Biggs, 1966, p.9), and it was clear that the country was importing considerably more cereals than it had been producing locally by that time. The consumption of maize relative to sorghum increased during the 1960s (Table 2; Biggs, 1966, p.25).

The Agricultural Department expanded its extension program for aiding progressive farmers whose sorghum yields were often 10 bags or more per acre (BPAR, 1958, p.37). Improved varieties of maize, sorghum and millet were introduced by the Department, though these varieties were more readily adopted by European farmers than Batswana (Morse Commission, 1960, p.126). Agricultural marketing and supply cooperatives were first systematically begun in 1964 (BPAR, 1964, p.49). By 1965, many of the tribal granaries had long ceased being used for storing grain reserves (Biggs, 1966, p.7).

General Comments

Throughout the Protectorate's colonial period, the African agricultural sector remained almost exclusively a subsistence one. Overall yields remained extremely low and there appears to have been little change in the amount of land cultivated per household. Increasing yields were limited to some European farms, government experiment stations and a comparative handful of progressive Batswana farmers. While some internal grain trade existed, it was minimal at best. In aggregate terms, the Protectorate had a chronic grain deficit, primarily indicated by the amount of maize and mealie meal imports. The occasional sorghum exports rarely reduced the overall grain deficit, except for the extraordinary years of the mid-1950s.

Underlying the belief that the livestock sector was the mainstay of the Batswana economy in the colonial period was a belief in the general unsuitability of arable farming for commercial production of crop surpluses, let alone for sustained subsistence requirements (see, for example, BPAR, 1958, p.10). This view of Protectorate agriculture structured the Agricultural Department's activities in a number of significant ways:

(1) Because of the primary role of African livestock in the economy, much of the Department's early efforts were in pasture and fodder research and not in improved crop production. Given the history of the Department's establishment, the veterinary background of its original staff and its limited budget, this initial emphasis is understandable. Agricultural development was seen as supporting and assisting the growth of a viable livestock sector and, within such a context, it did not seem incongruous at the time for the Department to be responsible for such animal husbandry activities.

(2) Focusing on those few farmers who had access to the inputs which allowed them to produce regular commercial surpluses using the Department's recommended practices seemed to make considerable sense, especially given the shortage of the Department staff and the frequency of unfavorable weather.

(3) Many of the Department's efforts and policies were geared to stabilizing the supply of grain. For example, the granary project was designed to provide sufficient reserves to cover shortfalls in local production. Similarly in 1957, the marketing and pricing of maize and maize products in the Protectorate were controlled by the Union's Mealie Industry Control Board, thereby allowing Batswana producers access to the Board's stabilization fund during periods of crop shortfalls (BPAR, 1957, p.36; Biggs, 1966, p.5).

(4) The Department maintained that tribal custom sometimes limited the timely access of labor to the lands and cattle posts, thereby lowering farmer productivity in these sectors (Schapera, 1943, pp.267-276).

III. THE DEVELOPMENT OF THE WATER SUPPLIES SECTOR

A Chronology of Major Events Affecting Dam Construction, 1895-1965

1911-1912. Tribal work resumed on the construction of Mmakgodumo dam, just outside Kanye. (Poorly constructed, this dam would later be converted into Bathoen dam in the late 1930s.) The purpose of this tribal dam was one of providing the village cattle with water (Schapera, 1947b, pp.30,70).

1927/28. By the end of the year, Rhodesian Railways had constructed six dams for its operations, ranging from 5 million to 45 million gallons in capacity and having an aggregate capacity of 101 million gallons (BPAR, 1927/28, p.32).

1930. Village dams were being constructed at Serowe, Molepolole and for the Batlokwa tribe (BPAR, 1930, p.21).

1937. The dam at Mogobane, with a capacity of some 350 million gallons, was finished. Smaller dam construction was completed as well (BPAR, 1937, p.36).

1938. Work on Bathoen dam, potentially storing at least 250 million gallons, had been started. Smaller dam construction continued (BPAR, 1938, p.37).

1940-1954. Irrigation schemes were initiated at both Mogobane and Bathoen dams in the late 1940s (BPAR, 1946, p.9). The Colonial Welfare and Development grants amounted to nearly £105,000 for its Surface Water Development Schemes (D990,A; see Table 3), and up to 1955, some 65 stock watering dams had been completed in the six eastern tribal reserves (BPAR, 1955, p.37).

1955-1965. A CD&W grant of some £88,400 was given to the Protectorate for continued surface water development projects during the period (Table 3). Construction of large Rhodesian Railway dams at Palapye (60 million gallons) and Notwane (427 million gallons) were completed (BPAR, 1955, p.58; BPAR, 1960, p.69). Many of the stock dams built under the CD&W grant of the late 1940s and 1950s were in need of repair by 1962 (BPAR, 1961-62, p.71). Major dam work was undertaken at Lobatse and Gaborone and by 1965, the Gaborone dam, with a capacity of 8,000 million gallons was completed (BPAR, 1965, p.131).

TABLE 3

COLONIAL DEVELOPMENT FUND/COMMONWEALTH DEVELOPMENT AND WELFARE ACT
FUNDING OF SURFACE AND UNDERGROUND WATER SUPPLIES IN THE
BECHUANALAND PROTECTORATE

Year	Underground Water ¹ Supplies (₤)	Surface Water ² Supplies (₤)	Total
1935-37	25,300	--	25,300
1937-46	127,312	--	127,312
1946-55	243,127	104,930	348,057
1955-60*	411,628	88,396	500,024
1960-65	<u>42,650**</u>	<u>--</u>	<u>42,650</u>
TOTAL	850,017	193,326	1,043,343

¹Included Schemes D310; D466,B; D611; D678,A; D2639,A-D; and D4609. Does not include Schemes D1409 and D1409A (₤50,000) for the acquisition of borehole drilling equipment and a dam building unit.

²Includes Schemes D990,A and D2553,A. Does not include D1409 and D1409A(₤50,000) for the acquisition of borehole drilling equipment and a dam building unit.

*It should be noted that the original Symon Report recommendations for the period 1955-60 were ₤840,000 and ₤140,000 for underground water development and surface water development, respectively (Symon Report, p. 73).

**Does not include funds for Scheme D5657 for ₤26,000 for a survey of underground water sources.

General Comments: Dams

Throughout the Protectorate's history, wells, and later boreholes, generally played a more important role in providing water for livestock than did dams. Wells were much more numerous and popular than medium or large-sized dams by the early 1930s (BPAR, 1929, p.28) and, thereafter, government's funding priorities consistently favored borehole drilling over dam building in providing rural water supplies, as Table 3 illustrates. Early village dams, while being designed in large part for livestock purposes, were often not meant to water any other livestock than those residing in the respective villages having the dams (Schapera, 1947b, p. 70). (Small dams at individual land areas have, however, remained popular even until today.) It is not clear how the large number of stock dams built between 1947 and 1955 affected livestock watering in the communal areas, but the fact that many were in great need of repair by the early 1960s suggests their usefulness was often questionable. Equally questionable were some aspects of the irrigation schemes tried out at Mogobane and Bathoen dams, e.g.,

"The Bamaletu tribe, in whose reserve Mogobane lies, are changing their previously somewhat hostile attitude towards the [irrigation] scheme and, impressed by the results achieved by advanced farming methods, are now genuinely interested, but it will be some time before the peasants will themselves be able to undertake such intricate husbandry as irrigational farming without close European supervision." (BPAR, 1947, p.3)

One can speculate that such problems as these--management problems at irrigation schemes, the use of regimental labor in the construction of many of the early village dams, and the fact that, ultimately, dams were not reliable perennial water sources, but ones susceptible to drought--contributed to their comparative unpopularity as a permanent means of providing stock watering and agricultural supplies. By the mid-1960s major dam construction was being undertaken only for large, heavily populated areas and for Rhodesian Railways.

A Chronology of Major Events in the Construction of Groundwater Supplies,
1895-1965.

1902-1910. Wells newly constructed at Serowe were said to have cost up to £250 each (Parsons, 1977, p.130).

1910-1917. Reading over the minutes of various Bangwaketse public assemblies for this period shows that, while tax payments and livestock management were pre-eminent concerns of the Chief at the time, the development of livestock water supplies was of secondary interest, except during the severe drought of 1914 (Schapera, 1947b, passim).

1919-1929. This period has been best described by Schapera:

"At first practically all water development in the Reserves was undertaken and paid for directly by the Tswana themselves. The Administration's share was limited almost entirely to sinking wells along a few of the principal routes by which cattle for export were trekked to the railhead. In 1919, however, a special Native Fund was created...[and the Fund's] omission of specific reference to the provision of water supplies indicated the relative unimportance in which they were held at the time...Nevertheless, the Native Fund had contributed in a modest way to the most notable effort made by any tribe to improve its water position. In 1927 Isang, while Acting Chief of the Kgatla, carried out an elaborate program of boring for water in his Reserve. A grant of £500 from the Fund proving inadequate, he imposed a levy of £6.10s upon every taxpayer in the tribe. He raised about £4,000 altogether; £1,500 was spent on boring, with a drill and expert labor hired from the Union Government, and the balance paid for installing pumps and reservoirs. Sixteen boreholes in all were sunk, of which seven proved successful: two in Mochudi, and the other five in grazing districts. The sites were selected by Isang himself, and not by expert geologists, which accounts partly for the high proportion of failures." (Native Land Tenure, pp.241-42)

Although by 1929 most of the water supplies in the tribal areas were wells, Isang's communal borehole drilling program signalled a shift toward increased borehole drilling. As the Protectorate Annual Report for 1929 put it:

"A very serious aspect of these wells is that the underground water level appears to be receding and each year three or four more feet have to be added to the depth of the wells. The proposed use of Government drills for water-boring throughout the Protectorate should in time go far towards enabling the native population to have a reasonable supply of water..." (p.28)

1930-1940. This period was one of rapid change in the provision of underground water supplies, with increasing emphasis on borehole drilling

in the tribal areas and government provision of such supplies. In 1930, government had drilled 13 boreholes, while in 1938 it drilled 35 (BPAR, 1930, p.21; BPAR, 1938, p.37). It is estimated that by the end of 1940, some 120 boreholes had been drilled by government, opening up communal grazing for at least 70,000 head of cattle or about 10 percent of the national herd for that year (see Table 1; Schapera, 1943, p.243). It was also said that approximately 18 percent of the cattle of the Bangwaketse were watering at the 16 boreholes in the tribal reserve by 1940 (*Ibid.*, p. 248). As the number of government drilling rigs increased, the use of government well-sinking teams decreased substantially (BPAR, 1938, p.37). Nonetheless, wells still remained a major source of water for most tribesmen in the Protectorate. In 1932, the government estimated that 774 wells existed in the Ngwato area and listed only two recorded African boreholes (BPG, Savingram No.S.858.B, 1932; see also Pim Report, 1933, p.111). The Walker and Hobday report of 1939 also refers to the importance of wells as water sources, especially in the dry seasons (p.7).⁴

The transition to increased provision of government-drilled communal boreholes gained impetus from the recommendations of the Pim Report of 1933,

"At every stage of our enquiries, whether they related to agriculture, to cattle, or to human health and amenities, we realized that the absolutely essential condition to any progress was the improvement of the existing water supplies and the provision of new water supplies. (p.110)

Following the Pim Report came the major water supply development of the decade: two grants from the Colonial Development Fund, one for £25,300 in 1935 and another for £114,060 in 1937, for the construction of underground water supplies in the tribal areas (Table 3; see Schapera, 1943, p.242; BPAR, 1935-1938). The substantial increase in the government's drilling capacity stemmed directly and almost exclusively from the influx of these funds in the mid and late 1930s.

The cost of sinking a well, let alone a borehole, was so prohibitive that only the very wealthy could afford a well for private use; the provision for communal use had to be funded either through tribal treasuries or by syndicates of large livestock owners. For example, the Pim Report estimated that the average cost of a borehole was some £300 in 1932 (p.186)

⁴Kooljman notes that some wells dating back to 1898 were still being used in Bokaa in the early 1970s (p.171).

and Chief Tshekedi argued before the Commission that, with respect to well sinking, it "was not possible for a man owning 40 head of cattle to sink a waterhole, the expenses would be too high for him" (Schapera, 1943, p.241). Still, enough wealth existed in the Ngwato area for there to have been at least 774 wells and boreholes there in 1932. Regional variation in water supplies did exist, however: in 1938, the District Commissioner at Molepolole reported that there were only 17 wells in the grazing areas of the tribal reserve there (Ibid.). As noted above, the Bakgatla were at the forefront of tribal borehole drilling in the 1930s, with their unique management system of "syndicates" (Kooijman, 1978, pp.73-74).

1941-1955. After a general suspension of government drilling during World War II (BPAR, 1946, p.63), the administration resumed drilling operations in a major way with a substantial CD&W grant of over £200,000 for the development of underground water supplies (Table 3). The Morse Commission estimated that between 1946 and 1956, the government drilled 414 boreholes (220 successful ones), with an additional 395 boreholes being drilled for private use by drilling contractors (Morse, 1960, p.138; Table 4). Such growth in the number of private boreholes, used primarily for stock watering purposes, was indicative of the growth in the value of the livestock sector during this period (Section I above; Table 2; Morse, 1960, p.66). In 1954, the Symon Report proposed an ambitious program for the water development of the settled eastern areas of the Protectorate.

1956-1960. This was the most remarkable period in the Protectorate government's provision of boreholes in the eastern communal and border sandveld areas. Funded by a large CD&W grant of over £400,000, explicitly for the purpose of increasing the cattle population (Symon Report, 1954, p.84), government-sponsored borehole drilling expanded from 73 boreholes in 1955 to 152 in 1958 (BPAR, 1955, p.76; BPAR, 1958, p.96). In 1958 alone, as many successful boreholes were drilled in the Kgatla tribal area as had been operating there by 1941 (BPAR, 1958, p.96; see Map 1 in Schapera, 1943, p.128). The Morse Commission estimated that between 1955-1960, the government-sponsored borehole drilling led to 437 new boreholes (270 successful) with an additional 220 drilled for private use by drilling contractors (Morse, 1960, p.138; Table 4). In short, almost as many

TABLE 4

ESTIMATES OF BOREHOLES DRILLED: BECHUANALAND PROTECTORATE
 (Figures in parentheses are for successful boreholes.)

<u>Director, Geological Survey</u>			<u>Morse Commission</u>			<u>Campbell</u>			
<u>Government</u>	<u>Private</u>	<u>Total</u>	<u>Government</u>	<u>Private</u>	<u>Total</u>	<u>Govt. & Private</u>	<u>Total</u>		
1929-59	1152 (662)	1146 (823)	2298 (1485)	1946-56	414 (220)	(395)	(615)	Up to 1954	(1350)
				1956-60	437 (270)	(220)	(490)	1955-60	(1700)
1929-59				1946-60				Up to 1960	
Total			(1485)	Total	(490)	(615)	(1105)	Total	(3050)

boreholes had been drilled between 1956 and 1960 as had been drilled between 1946-1955. This dramatic increase in government drilling capacity was accounted for by using funds from the CD&W grant for a special program of having private contractors drill some 238 boreholes (166 successful) mainly in the eastern communal areas between 1957-1959 (BPAR, 1959, p. 70; BPG, Savingram W.2.III, 1959).⁵ In 1959, the Drilling Branch, formerly under the Public Works Department, was transferred to Geological Survey. That year, the Director of Geological Survey expressed fears that the development of water sources may have been depleting underground water reserves (BPG, Savingram W.2.III, 1959).

The majority of boreholes sunk during this period, both by Government and private funds, were drilled for stock watering purposes (Ibid.). However, by 1959, the Director of Geological Survey was arguing that borehole development in the eastern communal areas would have to be restricted to redistributing cattle numbers there (since, in his opinion, most of those areas were fully stocked, if not overstocked), such that "the majority of new water points... will have to take place in sandveld regions" (Ibid.).

The cost of borehole drilling (exclusive of equipping) was estimated to be between £950 and £1325 in 1960 (Morse, 1960, p. 138).

1961-1965. Government drilling declined to around 100 boreholes or less drilled per annum in the early 1960s (BPAR, 1960-1965, passim). In 1963, the Drilling Branch began a program for the drilling of boreholes for private cattle owners on a repayment basis (BPAR, 1963, p. 81). By 1965, drilling activities were dominated by drought relief measures (BPAR, 1965, p. 78). Between 1964-66, approximately 1,100 private boreholes were sunk, many of which were in sandveld areas (Campbell, 1979, pp. 99-104).

CD&W funding for underground water supplies had been considerably reduced for this period (Table 3). By 1962, the aggregate capacity of operating Rhodesian Railway boreholes was nearly 95,000 gallons per hour (Lund Report, 1965/66, p. 186).

General Comments: Wells and Boreholes

Just as the development of the livestock sector was seen as the principal source of cash income from trade for Batswana in the Protectorate, so was the

⁵This contract drilling program was said to have been more successful in the Banwaketse and Bakwena tribal areas (Ryan, 1958, p. 7).

lack of sufficient water supplies seen as the limiting factor in the growth of the livestock sector:

"Of the two factors, grazing and watering, the latter is far more important from the cattle point of view in the Bechuanaland Protectorate. Cattle having easy access to adequate clean water, even when grazing is at its poorest, maintain better condition and health than cattle on good grazing with insufficient or dirty watering facilities."

(Walker-Hobday Report, 1939, pp. 7-8)

"The main handicap of animal husbandry, even in the east, is the lack of water supplies. Many areas with good grazing cannot be used at all during the dry season. When there is nothing for the cattle to drink, the provision of wells, boreholes, and dams, has recently made some such areas permanently available, and thereby increased the carrying capacity of the land."

(Schapera, 1943, p. 215)

"Water is the limiting resource so far as economic development in the Bechuanaland Protectorate is concerned."

(Morse, 1960, p. 65)

Not only was the lack of water supplies seen as restricting expansion in the livestock sector, but it was also seen as reducing the carrying capacity of the range, thereby encouraging overstocking around too few watering points (e.g., BPAR, 1911/12, p. 10; BPG, Savingram 250, 1932). Thus, the lack of livestock watering supplies was viewed as the principal cause of low livestock productivity and overgrazing in the Protectorate and it was not until the late 1950s and early 1960s that the blame for overgrazing was substantially shifted to unfettered borehole drilling and unregulated increases in stock numbers watering at these points (Pim Report, 1933, p. 185; Schapera, 1943, p. 215; Morse, 1960, pp. 54, 139; BPG, Savingram W.2.III, 1959).

Since the development of the livestock industry was seen as conditional on the provision of adequate and permanent water supplies, it is not surprising to find that borehole drilling was almost exclusively undertaken for livestock development reasons in the Protectorate. Of the some 20 boreholes operating in the Kgatla tribal area in 1941, only 1 was located in an arable lands area, while 14 others were located in specific grazing areas (Schapera, 1943, Map 1, p. 128). Similarly, of the some 500 successfully drilled boreholes drilled with government funds between 1946 and 1959, at least 250 were for stock watering purposes. Of the 614 private boreholes drilled during this same period, 450 were for stock watering (Morse, 1960, p. 66; see also BPAR, 1959, p. 70). Ryan noted that the drilling program, especially in the late 1950s, was indeed successful in increasing stock watering and grazing capacity

in a few tribal areas (Ryan, 1958, p. 7). Thus, the CDF/CD&W grants for borehole drilling, totalling over £850,000 between 1935-1965, proved to be a direct and critically important subsidy to the livestock sector in the Protectorate after the Great Depression.

By 1965, however, a transformation had occurred in the role of water provision vis-a-vis livestock production in the Protectorate: livestock water development was largely concentrated in sandveld areas by private livestock holders, where their ability to open up these areas drew heavily from the government experience of over a quarter of a century of borehole drilling in the Kalahari as a means of opening up the desert to stock routes and ranches.

Thus, critical to the growth of the Protectorate's water supply sector was innovation and learning. The 40 years of active government borehole drilling saw the introduction of increasingly better drilling rigs, improved siting methods, and the accumulation of substantial drilling experience in a variety of hardveld and sandveld areas all over the country. While government drilling operations still had a number of serious problems by Independence, the drilling capacity, both in terms of management and technology, had grown considerably over what it had been in the late 1920s.

In terms of regional differentiation in borehole drilling, Table 5 provides a summary of the recorded borehole drillings in two Districts--Southern (Ngwaketse and Barolong) and the Kweneng--for the period 1929-1965. There are substantial differences between the Districts in the number of boreholes drilled although these figures confirm that the 1950s, especially 1956-1965, was an extraordinary period in borehole drilling in the Protectorate. (As noted above, the periods 1935/39 and 1961/65 were also important times of drilling).

Finally, by becoming part and parcel of the development of the Protectorate's livestock sector, borehole drilling and ownership became both a consequence and cause of an increasingly skewed distribution of livestock holdings. Drilling was feasible only if the livestock sector was viable and, conversely, the growth of livestock numbers in the country was primarily a function of the increasing number of boreholes there. Historically, as one sector grew, so did the other: between 1946-1959, African livestock income increased nearly fivefold and the majority of private boreholes had been drilled (Table 2; BPG, Savingram WS.2 III, 1959). Since the cost of borehole drilling (exclusive of

equipping) increased considerably faster than the cost of living (using figures quoted above, from some £100 per bore in 1927 to an average of some £1000 in 1960), some of this increase in real cost was doubtless due to increased demand for drilling, where, in turn, this growing demand reflected increasing incomes of those benefiting from the commercialization of the livestock sector. Sufficient private funds existed in periods of extreme adversity--the drought of the 1910s, the Great Depression and the 1965/66 drought--for substantial drilling to occur even then. The skewed distribution of livestock holdings and borehole ownership grew mutually reinforcing through time.

IV. ANALYSIS OF RELATIONS AMONG CATTLE, AGRICULTURE AND WATER DEVELOPMENT

So far this discussion has dealt descriptively with the livestock, agricultural and water supply sectors largely in isolation from one another. In this section, attention will be given to what are seen as the major linkages among these sectors. The most crucial of these have been succinctly summarized in the following passage from one of the Protectorate's Annual Reports:

"The country for the great part is unsuitable for the cultivation of maize and even the more drought-resistant [sorghum] yields a satisfactory crop on an average only once in every three or even four years... Agriculture is conducted almost entirely for the purpose of subsistence and, except in years of good crops, is inadequate for the purpose. On the other hand the rainfall is adequate in ordinary years to produce good pasture, and such surveys as have been made show that the Protectorate is richly furnished with grasses of high food value...With the aid of a grant from the Colonial Development Fund, water supplies are gradually being developed in these areas...From what has been said above it will be clear that the livestock industry constitutes the mainstay of the economic life of the country, and at present offers the only reasonable possibility of development...The provision of further water supplies will remove the main difficulty in the development of the livestock industry of the Bechuanaland Protectorate and to this end drilling machines are now being utilized with successful results in various parts of the Territory to tap underground water supplies." (BPAR, 1938, pp.10-12).

The nature and development of each primary sector was viewed as conditional on the other two sectors. In discussing the direct and indirect interrelationships among these primary sectors, the roles of national disasters, primary education, South Africa and the two Rhodesias, migrant labor, traders, technology, tribal customs, and the skewed distribution of livestock holdings will be examined. First, though, the relationship between livestock and agriculture must be analyzed in further detail.

The Central Linkage Between Livestock and Agriculture

Why did Batswana hold livestock in the Protectorate? The obvious reasons--to meet tax obligations and tribal levies, for prestige and wealth purposes, to pay for imported trade goods not produced locally--all have been mentioned in the literature (see, e.g., Economic Survey of the Colonial Territories (1951), p.80; Schapera, 1943, p. 211). Yet one reason deserves special mention--Batswana traditionally held livestock as a "reserve" for covering the nearly perennial shortfalls in subsistence grain production. In his paper "Economic Conditions of a Bechuanaland Native Reserve," Schapera refers to the

TABLE 5

PRELIMINARY BOREHOLE, DRILLING COUNTS: KWENENG AND SOUTHERN DISTRICTS*

<u>Year</u>	<u>Southern</u>	<u>Kwenerg</u>	<u>Total</u>
1929	-	2	2
1930	-	2	2
1931	-	-	-
1932	1	-	1
1933	-	-	-
1934	-	-	-
1935	-	-	-
1936	-	2	2
1937	5	4	9
1938	16	2	18
1939	17	2	19
1940	7	4	11
1941	-	-	-
1942	-	-	-
1943	-	-	-
1944	-	-	-
1945	1	-	1
1946	3	-	3
1947	1	-	1
1948	2	-	2
1949	7	-	7
1950	5	11	16
1951	26	17	43
1952	5 ¹ / ₄	6	60
1953	13	-	13
1954	29	6	35
1955	14	9	23
1956	7	44	51
1957	57	42	99
1958	36	4	40
1959	22	9	31
1960	26	-	26
1961	8	7	15
1962	15	8	23
1963	32	14	46
1964	14	9	23
1965	<u>28</u>	<u>14</u>	<u>42</u>
TOTALS	446	218	664

*Figures are given for boreholes with only known dates of drilling.

sale and barter of livestock for the purposes of obtaining grain (pp. 637, 648; also Kooijman, 1978, pp. 180, 187; Bond, 1975, p. 55). As Table 3 shows, in aggregate terms the Protectorate both imported more grain than it exported (with shortfalls in sorghum production occurring almost as often as surpluses) and sold livestock products in sufficient quantities to more than offset the value of these grain deficits. In effect, the frequent shortfalls in subsistence agricultural production served as a goad to the commercialization of the livestock industry. (As mentioned above, the sale of livestock was the principal, if not sole, source of cash income for many Batswana.) It appears that the most persistent pressure on Batswana in the Protectorate both to hold and sell cattle lay in the continual cereal shortages they faced. (In fact, rising rural incomes in the livestock sector probably stimulated demand for grain as well.)

More specifically, the price of grain and the sale of cattle were positively correlated during the colonial period, that is, as the price of sorghum or maize products increased (decreased), so did the number of cattle exported. The correlation coefficient (r) between the price of sorghum and the amount of cattle exported is $+0.89$ between 1918 and 1959 (see the figures in Table 1). Similarly, associated with such a relationship was the negative correlation, referred to above, between the value of cattle exports and the ratio of the price of cattle to the price of grain which prevailed during the same period. This implies that an increase in the production and supply of grain in the Protectorate would have led to a decline in cattle sales, other things being equal. As Tables 1 and 2 show, this indeed did occur: although complicated by foot and mouth embargoes, cattle offtake declined dramatically between 1955 and 1958, the period of unparalleled agricultural production in the Protectorate. Moreover, Ryan points out that those tribes which had less developed agricultural production (such as the Bamangwato and Batawana) also had higher livestock sales and offtake (Ryan, 1958, pp. 11-14).

Thus, under a system where the greater the shortfall in grain production the greater the need to hold cattle, it should not be surprising to find that those areas which had a shortage of arable lands were often seriously overstocked as well. For example in Schapera's study of the Tati, he found a rough correlation between population density and the stocking rate of an area, where a locality such as Moroka, which had the highest population density and a serious shortage of arable land, also had one of the highest overgrazing levels (Schapera, 1971, passim).

Conversely, the fact that livestock could often be sold or bartered more readily than sufficient grain could be locally produced militated against improvements in the supply of grain. As Schapera points out with respect to expansion in tribal granaries in the late 1930s, "it is perhaps unlike. that very much progress will be made as long as people can still rely upon the sale of their cattle as a source of income" (Schapera, 1943, p. 207). This comment proved to be prophetic, as most of these granaries were in disuse by 1965 (Biggs, 1966, p. 7).⁶

Finally, as the commercial livestock sector grew, it literally ate away at the productive assets of agriculture in the Protectorate. Draft oxen have always accounted for most of the throughput at the BMC, averaging a percentage remarkably constant through time--an estimated 74 percent over the period 1955/57 and 75 percent between 1966/74 (Ryan, 1958, pp. 24-25; Bond, 1975, p. 11). What apparently has changed, though, is that the average age of these slaughtered oxen has become increasingly younger (Bond, 1975, pp. 20-22; Ryan, 1958, p. 13). This doubtlessly reflects shifting barter terms of trade in favor of livestock and against agriculture during the late 1950s and early 1960s.⁷

These linkages between the livestock and agricultural sectors had two very important implications:

(1) An increase in agricultural production meant a decline in livestock sales, leading to increased grazing pressure at watering points, among other things. An increase in livestock sales, on the other hand, often coincided with low or declining agricultural productivity, if not actual production.

(2) Any independent factor that contributed to the maintenance of subsistence agriculture thereby promoted livestock commercialization and vice-versa. A discussion of these factors follows.

Drought, Livestock Disease, and Economic Depression

The period of Protectorate history under examination in this paper opened with the near decimation of the national herd through a rinderpest epidemic, closed with probably its worst drought ever, and midway through, suffered a

⁶Hamilton (1975, pp.36-37) points out that there were also serious design and construction faults associated with these tribal granaries.

⁷It does not appear, for example, that this increase in the youthful composition of oxen throughout could be accounted for by an increase in the number of oxen in the national herd, which was fairly consistent around 27 percent between 1945 and 1965. (Republic of Botswana, Statistical Abstract 1966, p.33).

series of disasters--economic depression, drought, foot and mouth outbreaks, and locust attacks--which never occurred before or after in such cumulative severity. Persistent environmental and economic stress was the hallmark of most of the Protectorate's history.

The economic depressions of the early 1920s and (especially) early 1930s accelerated the trend of labor migration from the Protectorate and it was during those adverse economic times that migrant labor really became a way of life for many Batswana (Schapera, 1947a). Livestock disease, especially foot and mouth outbreaks, punctuated the Protectorate's history with a series of cattle export embargoes, which restricted even further African livestock income.

But it was drought that shaped the course of development of all three sectors--livestock, agricultural and water supply. The impact of recurring drought on these sectors has been described above. Two points should, however, be added here:

(1) There is evidence that the drought of the 1960s increased the skewed distribution of livestock holdings among the Batswana, that is, those with small herds lost disproportionately more of their livestock than owners of larger herds (Campbell, 1979, p. 108; Kooijman, 1978, p. 78). It is likely that this dynamic was also at work in the devastating drought of the 1930s and explains partly the dramatic increase in the number of migrant laborers during that time.

(2) In aggregate terms, the borehole drilling during 40 years up to 1965, especially during the period 1946-1960, does not appear to have lessened the vulnerability the Protectorate economy to drought in any substantial way. Here the figures are highly speculative, but it has been estimated that in both the droughts of the 1930s and the 1960s, approximately 1/3 of the national herd--some 400,000 cattle or more--died. Yet between these dates at least 1,500 successful boreholes were sunk, most of them for stock watering purposes (Table 4; Ryan, 1958, p. 6; Walker-Hobday Report, 1939, pp. 4-5; Kooijman, 1978, p. 78). This simply emphasizes that in prolonged drought it is not water which is the limiting factor, but rather, grazing. The extent to which the drilling of these new boreholes contributed to a shortage of grazing by the time of the 1960s drought is a moot point (see Campbell). What is clear, though, is that those livestock holders with larger herds were better able to endure the hardship of drought since they often had the assets with which to sink wells or boreholes in new grazing areas during these times.

Primary Education

A number of writers have pointed out that the traditional form of cattle post management (having boys spend the better part of their youth herding cattle) worked against their receiving an adequate education and, indeed, the number of male children attending primary schools unlike in most LDCs was always considerably less than the number of females attending (Pim Report, 1933, pp. 82-83; Schapera, 1947a, p. 219).⁸ Nonetheless, the percentage of boys attending school did increase through time (from 31% in 1936 to 41% in 1960; see South African Yearbooks and BPAR, 1960, p.52), and doubtless this put pressure on cattle post management by constricting labor inputs. Still, it should be noted that the practice of using male children for herding purposes was often considered to be a poor management strategy (Schapera, 1943, p. 221).

What has not been sufficiently stressed in the past was the negative impact that primary school enrollments must have had on subsistence agricultural production. The availability of agricultural labor, especially before and after the first rains and during harvesting, was always affected by trends of increased enrollment in education.

"Natives schools fluctuate enormously according to the season; for instance, a school which, at full strength, contains 300 pupils, may, between ploughing and reaping seasons, be reduced to 20 or 30 pupils..." (BPAR, 1916/17, p.5)

"...the unavoidable annual break in the school working, when most of the children are away at work on the land, has never during the last sixteen years been so long or so detrimental to their educational interests. Owing to the abundant harvest (the reaping of which was still unfinished at the end of September), for most of the pupils the so-called school year consisted only of a period of two or three months." (BPAR, 1925/26, p.15)

Despite the demands for labor coming from the agricultural sector, the proportion of the Protectorate's school age population actually attending primary school increased substantially through time (from an estimated 27% in 1948 to 56% in 1960; see Economic Survey of the Colonial Territories (1951), p. 76; Morse, 1960, p. 84) and this may well have put considerable pressure on the labor supply to agriculture. Moreover, girls, always more important to agricultural production than to the livestock sector, were attending schools at higher proportions than boys as noted above.

⁸The probable lack of female:male parity complicated this analysis.

South Africa and the Two Rhodesias

More than one book has been written on the manifold and subtle ways in which South African and Northern and Southern Rhodesian economic policies have affected the economy and society of the Bechuanaland Protectorate. A short paper such as this cannot do justice to these interconnections and must be limited to stressing only a few points:

(1) As noted above, the main, if not the major, benefit originally seen from the Protectorate's early involvement in the South Africa Customs Union was that this arrangement provided access for Protectorate cattle to export markets (Ettinger, 1972, p. 21). While a number of serious problems were encountered in cattle export, it is clear that the availability of South African cattle export markets often sustained and at times encouraged the livestock industry in the Protectorate.

(2) However, this arrangement had a decisively negative impact on other sectors of the indigenous economy. As early as 1906, the Protectorate government was criticizing both the pervasiveness of South African-supplied goods in the Protectorate and the tariff preferences given to these goods:

"It will appear clearly...that however valuable and important to the Protectorate is its inclusion in the South African Customs Union, the tariff framed under the Convention is by no means an unqualified success, regarded as a means of providing revenue. As a matter of fact, except for the clothes upon his back, which so far do not appear to have been manufactured in South Africa, the person of simple tastes who does not desire American or Egyptian tobacco, Java coffee, China tea, French brandy, Scotch whiskey, or West Indian sugar, practically escapes taxation under the present Customs Union tariff (BPAR, 1906/07, p. 5)

By 1941, the Motswana had even lost the shirt off his back, among other things, to Union imports.

"...Most of the traditional handicrafts are decaying rapidly, these products being replaced to an increasing extent by imported goods. Almost all the inhabitants of the towns and larger villages now wear clothing of European pattern and material..."
(Schapera, 1944, p. 18; see also ILO Review, 1934, p. 401).

In fact, the Customs Union Agreement often had a negative effect on agricultural production in the Protectorate, as Biggs described for citrus producers in the late 1960s Bechuanaland (Biggs, 1966, p. 47).

The decline in and retardation of indigenous production under the terms of the various Union Custom Agreements should be viewed as a cost borne by Batswana as a way of subsidizing export livestock sales to South Africa.⁹

(3) Agricultural marketing in the Protectorate was for all intents and purposes an extension of South African marketing policies. By 1965, the pricing structure for Bechuanaland's marketed sorghum and maize, dairy products, and groundnuts was under the direct control of the Republic of South Africa's Mealie Industry Control Board, Dairy Industry Control Board, and Oilseeds Control Board, respectively (Biggs, 1966).

(4) During the early 1950s, the two Rhodesias began to rival the Union as the chief export market for Protectorate cattle (Ryan, 1958, Appendix C). The influence of Northern and Southern Rhodesia, especially during this period, extended in a number of complex ways. For example, the then General Manager of the Southern Rhodesian Cold Storage Commission--considered to have been a competitor with the Lobatse Abattoir--was hired as a consultant in charge of the design and construction of the CDC-financed Lobatse Abattoir; similarly, the then Director of Livestock and Agricultural Services for Northern Rhodesia--who had earlier served in the same position in Bechuanaland--was seconded to the CDC in the early 1950s to advise on the Corporation's projects in the Protectorate, one of which was the Lobatse Abattoir (Ryan, 1958, pp. 35, 49ff.; Symon, 1954, p. 64). The two Rhodesias and, especially, South Africa also had an impact on the movement of migrant labor and trade goods into and out of the Protectorate as will be discussed presently.

Migrant Labor

Migrating labor from Bechuanaland played a major role in determining the course of development in the livestock, agricultural and water supplies sectors of the Protectorate.

(1) The exodus of male Batswana, primarily to South African mines and fields, put serious restrictions on the supply of labor to the livestock sector in the Protectorate. Schapera, in his book on Batswana migrant labor, spends

⁹A fuller understanding of the nature of this cost would have to take into consideration the fact that South Africa was itself a colonial importer of many of the goods it in turn exported to the Protectorate.

considerable time outlining the deleterious consequences of labor shortage on cattle management (Schapera, 1947a, p. 164).

(2) Migrating labor from the Protectorate also meant increasingly restricted labor inputs into subsistence agriculture. The widespread replacement of the hoe by the plough had increased subsistence agriculture's reliance on male labor, at the same time the number of migrating male laborers, was increasing along with the length of their absences from the Protectorate. As a result, the peak labor requirements of agriculture became more and more difficult to satisfy, thereby leading to lower levels of agricultural productivity (Schapera, 1947a, pp. 165-167, p. 222).¹⁰

(3) Since the agricultural sector never really was a cash-earning proposition for the vast majority of Batswana, those who migrated tended to be non-livestock holders or smallholders whose sales of livestock were insufficient to cover cash expenses (Ibid., p. 144). Throughout most of the history of the Protectorate, net livestock income averaged about 65% of the value of all of Bechuanaland's imports, and, in the period of the Great Depression, it accounted for substantially less (Table 6). This shortfall in cash receipts was met through alternative employment, which was primarily migrant labor. In fact, the cash returns to migrant labor increased faster than livestock income in the 1930s to a point, where in the mid-1940s, Schapera estimated they exceeded livestock income (Ibid., pp. 139, 161; BPAR, 1912/13, p. 5). However, as Table 6 implies, not long after that, in aggregate terms, returns from the livestock sector regained their dominance as the principal source of African cash income (see figures supplied by Ryan, 1958, p. 4, and Morse, 1960, pp. 52-53).

Moreover, Ryan argued that there was an inverse relationship between the number of migrant laborers and cattle offtake among the various tribes in the Protectorate. Those tribes with high South African mine recruitment (e.g., the Bakwena and the Bangwaketse) tended to have low cattle offtake figures, while, conversely, tribes such as the Bamangwato and Batawana, with low recruitment levels, had comparatively higher offtake rates (Ryan, 1958, p. 14). This relationship

¹⁰The analysis of the actual reduction in total Protectorate grain production (not productivity) attributable to this migrating labor is complicated by the possibility that, should resident family size have increased (in part as a response to and consequence of increased migrant opportunities relative to agricultural employment) then the decline in agricultural production may have been less than expected.

TABLE 6

VALUE OF BECHUANALAND EXPORTS, IMPORTS AND NET LIVESTOCK REVENUE (₤)

Year	Imports	Exports	Net Livestock Revenue	Net Livestock Revenue as a Percentage of Imports
1926/27	331,200	297,056	216,063	65%
1927/28	309,836	288,832	204,365	66
1928/29	288,224	314,719	237,713	83
1929	288,228	281,612	193,324	67
1930	237,085	210,331	139,075	59
1931	215,861	179,831	107,949	50
1932	176,002	169,320	107,327	61
1933	150,896	37,964	3,660	2
1934	178,674	139,138	21,938	12
1935	294,378	260,204	116,828	40
1936	355,760	347,858	160,310	45
1937	341,536	243,187	75,046	22
1938	361,316	375,719	197,296	55
1939	392,427	406,525	212,253	54
1940	440,453	445,772	265,992	60
.				
.				
.				
1945	911,590	720,413	506,274	56
1946	1,280,474	728,990	536,996	42
1947	1,438,984	889,878	691,318	48
1948	1,176,037	723,788	592,039	50
1949	1,314,733	1,159,868	990,294	75
1950	1,469,093	1,626,014	1,401,869	95
1951	1,767,065	2,153,365	1,821,211	103
1952	2,023,913	2,058,702	1,705,025	84
1953	2,416,404	2,168,155	1,642,871	68
1954	2,053,423	2,423,683	1,694,761	83
1955	2,462,495	2,821,647	1,732,192	70
1956	3,055,642	2,887,609	1,903,205	62
1957	2,731,175	2,411,505	1,733,845	64
1958	3,503,647	2,586,906	1,811,559	52
1959	3,406,560	3,364,112	2,520,610	74
1960	3,282,692	2,678,644	1,728,350	53

TABLE 7

RATIO OF REAL CATTLE PRICES TO REAL MIGRANT EARNINGS,
SOUTH AFRICA, 1911-1966

Year	Real Cattle Price Index (1910=100)	African Migrant Labor Stahl Series (1938=100)	Real Earnings Wilson Series (1936=100)	Price/Wage Ratio (X 100)		Ratio of These Price/Wage Indexes
				Stahl	Wilson	
1911	110	72	100	158	110	144
1916	106	70	90	151	118	129
1921	81	58	69	140	117	120
1926	65	67	88	97	74	131
1931	68	69	92	99	74	134
1936	77	75	100	103	77	134
1941	87	67	89	130	98	137
1946	109	67	92	163	119	137
1951	113	64	89	177	127	139
1956	137	64	89	214	154	139

seemed to imply that the availability of migrant labor opportunities, especially in South Africa, lessened pressure to sell cattle in order to meet basic living necessities. Indeed, there existed a very rough correlation between the return from livestock production and the need to migrate. A 9% and 20% decline in aggregate livestock revenue in the periods 1926/30 and 1931/35, respectively, was matched by an increase of 24% and 108% in Protectorate migrant labor to South Africa (Table 6; Schapera, 1947a, p. 222).

Thus, the opportunity cost of remaining in agricultural production was set by the return to labor in livestock holdings, or barring that, by the wage rate prevailing for migrant labor. For example, in the 1930s, when the Protectorate's livestock export industry collapsed, the barter terms of trade went against stock holding and moved in favor of migrant wage employment. While there was nearly a fourfold increase in the number of Protectorate laborers migrating to South Africa between 1931 and 1940, the real earnings for migrant labor remained roughly constant during this time (Table 7).

(4) As noted above, the 1940s brought a substantial improvement in the real price of Protectorate cattle exports. Table 7 shows this trend as well, with the barter terms of trade substantially improving with respect to livestock holdings and moving against migrant wage employment after 1941. However, this trend may have actually increased the pressure to migrate, since it was the price of cattle that was rising relative to the earnings from migrant labor.¹¹ In other words, the set-up costs of starting a herd or improving a small herd were increasing, such that more, not less time spent at the mines was needed, especially as real migrant earnings remained almost static for over a half century. If these shifting barter terms of trade did on balance increase the pressure to migrate, then this trend reinforced the labor shortage facing agriculture in the Protectorate. Moreover, it is highly likely that migrant earnings, to the extent they were invested at all in the rural economy, were used more to purchase livestock inputs than agricultural ones (Schapera, 1947a, p. 163; Koolman, 1978, p.76). The study of the role of migrant labor in affecting agriculture and livestock production needs much more research.

¹¹Note from the last column on Table 7 that from the 1920s on, the relation of both wage indexes to the price for cattle was remarkably stable.

General Traders

An appreciation of the linkages among the agricultural, livestock and water supply sectors would not be complete without understanding the major role that traders have played in the rural economy, both prior to and after 1895 (Parsons, 1977). In brief:

(1) It was through the general trader that the South African goods-- ploughs, imported grain supplies and general merchandise--were sold. In fact, the general trader would more likely than not be South African himself;

(2) The general trader was almost always subject to criticism in the Protectorate. Batswana grain farmers felt themselves compelled "to sell cheap and buy dear" from traders, as described by Biggs:

"The practice followed by the traders of exporting as soon as possible to the Republic of South Africa the sorghum which they have purchased from Bechuanaland producers and then importing quantities of sorghum from the Republic later in the same crop year in order to meet the demand in Bechuanaland has given rise to a widely expressed view that the Bechuanaland producer gets too low a price for the sorghum which he produces and has to pay too high a price for sorghum if he wishes to purchase it from the trader later in the same year. And complaint has been made also that, while the Bechuanaland producer selling to the trader obtains a low price, in years of shortage, he has to pay the trader a high price for imported sorghum." (Biggs, 1966, p. 4-5)

Moreover, various government officials criticized traders for not paying premium prices for African commodities and felt that they could increase their short-term capacity to store grain before sale to South Africa (BPG, Savingram 250, 1933, p. 5; Biggs, 1966, p. 7).

(3) While most of the cattle slaughtered at the Lobatse Abattoir were originally from African livestock holders, they were overwhelmingly sold to traders first who then sold them to the Abattoir (Ryan, 1958, p. 19; Best, 1970, p. 604). By virtue of the Control of Livestock Industry Proclamation, general traders were eligible for free livestock buyers' licenses and, according to Ryan, by 1958/59, there were few traders in the Protectorate not speculating in cattle (Ryan, 1958, p. 18). However, there were only 45 African traders licensed at that time as compared to 200 European and Indian general dealers (*Ibid.*, p. 20). In fact, prior to 1936, it had not been the official policy of the Protectorate government to encourage African-owned trading stores, e.g., of the 144 trading stores operating in the Protectorate in 1932, none were owned by Batswana (Schapera, 1943, p. 90; Best, 1970, p. 602).

(4) In some cases, the terms of the leases in the tribal areas for the trading stores permitted traders both to graze cattle and to sink wells or drill boreholes for the watering of livestock they speculated in (Ryan, 1958, p.19; Best, 1970, p. 601).

Innovation, Research and Funding

The persistent environmental and economic stress on the rural economy of Bechuanaland formed a complex of difficulties for its livestock and agricultural sectors. In particular, the livestock industry faced three major problems throughout the colonial period: (1) the lack of sufficient water supplies allowing year-round cattle grazing; (2) control and eradication of a variety of livestock diseases; and (3) limited markets for sustained livestock sales. The agricultural sector also confronted three major problems, somewhat similar to those of the livestock sector: (1) the lack of sufficient, well-distributed rainfall; (2) the difficulty of getting adequate agricultural labor during peak seasonal periods; and (3) the lack of economic and non-economic incentives for sustained production. The impact of innovation, research and funding in solving these set of problems overwhelmingly favored the livestock sector.

Whether it was funding for the Veterinary Department or special CDF/CD&W grants for livestock-related projects, the level of these funds were always substantially greater than those allocated to the Agricultural Department and agricultural projects. This, of course, was part and parcel of a deliberate strategy to encourage livestock development as the principal industry in the Protectorate's economy.

Technology and research--much of it imported--proved crucial in meeting the livestock sector's three major problems. Improved drilling rigs and siting techniques for establishing permanent underground water supplies; new and more reliable vaccination and quarantine systems for disease control; and the use of refrigeration and cold storage facilities at Lobatse as a means of partially circumventing some of the Union's regulations and restrictions on cattle exports--such innovations and advances contributed appreciably to progress in the livestock sector.

On the other hand, technology and research played an ambiguous, if not even counterproductive role in the development of the agricultural sector. The very early substitution of the plough for the hoe literally harnessed agriculture to the development of the livestock industry and tied agriculture to the increasingly

skewed distribution of livestock holdings and related commercial pressures on the mafisa system of draft oxen for ploughing. In addition, many of the Agricultural Department's recommendations to farmers, e.g., autumn ploughing, early sowing, use of improved pasture grasses, ensiling and crop rotation, increased labor requirements in farming, when it was precisely the shortage of labor in peak seasons that plagued the sector. Moreover, the Department's early emphasis on livestock pasture research, while making good sense at the time, contributed almost nothing to the pre-eminent agricultural problem, that is, the development of high-yielding, drought-resistant grain crops having low cultivation and harvesting requirements.

In the same vein, projects, such as the construction of tribal granaries and marketing policies tied to Union prices and grain supply had the deliberate goal of stabilizing grain supplies, just when it was increasing grain production that was needed. While Protectorate grain prices were fluctuating widely before the introduction of "floor prices" under the Union's Mealie Industry Control Board, the following period of price stability probably cost producers as well: in seven out of the eleven cropping seasons between 1946 and 1957, sorghum prices were equal to or higher than the highest price quoted by the Board between 1957 and 1966, and there was only one year, 1947/48, when the price fell below the lowest price quoted by the Board from 1957 to 1966 (Biggs, 1966, p. 15).

The consequence of this history of cumulative underdevelopment in the agricultural sector was that, when agricultural production and prices rose between 1953 and 1959, with barter terms of trade generally favoring agriculture after World War II, little technology, research or funding existed in the Protectorate to take advantage of these crop and price increases as a means of providing new directions in agricultural production.

Tribal Customs

Tribal custom and land tenure profoundly affected the development of livestock and agriculture in the Protectorate, but it is beyond the scope of this paper to discuss more than a few of these linkages:

(1) The separation of villages, land and cattle posts does seem to have lowered productivity in these sectors. It is clear that this division affected agriculture much more seriously than it did the livestock industry. The availability of seasonal labor was much more critical for agriculture and the separation

made it all the more difficult for sufficient labor to be readily available just before and after the first rains. Where a farmer had more than one field to plow, this labor supply problem became all the more acute (Schapera, 1943, p. 135).

The separation of lands and cattle posts, in particular, decisively structured the access to improved water supplies in the lands areas. Borehole drilling was from the very first identified with livestock production and, as such, boreholes were located largely in grazing areas or at sandveld cattle posts. The resulting comparative shortage of permanent water supplies in the lands areas had the effect of all the more reinforcing the subordination of agriculture to the livestock sector.

(2) Tribal custom often seemed much less rigid in the livestock sector than in agriculture. While changes in land tenure were by no means the hallmark of the livestock sector, where tribal custom conflicted with economic imperative, then this custom was likely to change, and such change is recorded even in the very early years of the Protectorate:

"Up to this time [1914] no young member of the [Bangwaketse] tribe could own separately an animal acquired as the result of his labors. Tribal custom decreed that it belonged to his father. The discipline of the tribe has been largely destroyed by the stopping of the initiation schools, and the younger members found themselves with a new outlook, wanting to own cattle, but not under the control of their fathers or elder brothers. As a result of being unable to own cattle they spent their wages earned at the diamond mines, or at the Rand, on 'swagger' suits, watches, or other articles of little use to them. The Chief [of the Bangwaketse] saw the effect of these changes and had a law passed making it possible for anyone to hold cattle in separate ownership."

(Pim Report, 1933, p. 26)

Similarly, the Motswana's constant aversion to the fencing of communal grazing areas can be understood as stemming not so much from traditionally-held, conservative herding practices as from the fact that fencing would have ultimately restricted access to water supplies, where such supplies were seen both by Batswana and the colonial officials as the limiting factor to increased livestock production for most of the Protectorate's colonial history.

On the other hand, since agriculture was never really under any pressure to change from its predominantly subsistence orientation, this sector was conservative by default. Many customs did not change because there simply was a lack of interest in altering them (Morbe, 1960, p. 62). As Schapera put it: "The conservatism of agricultural techniques is due largely to the fact that for a long time

the Tswana raised crops for their subsistence only" (Schapera, 1943, p.123).

The Skewed Distribution of Livestock Holdings

A number of references have been made in this paper to the unequal distribution of livestock holdings among Batswana in the Protectorate. Cattle ownership was traditionally tied to representatives and close associated of the tribal chieftaincy along with, somewhat later, a minority of entrepreneurs, such as school teachers and government employees, who invested their wages into cattle holdings (Parsons, 1977, p. 120; Schapera, 1943, pp.218-219). Whatever increase in livestock numbers the small herder managed to acquire was probably wiped out for the father in the drought of the 1930s and for the son in the drought of the 1960s. Moreover, the increase both in the cost of buying cattle and in private borehole drilling by large cattle owners between the period of these two droughts, could only have resulted in a perpetuation, if not a widening, of the gap between small and large cattle holders. It is probably correct to say that throughout the history of the Protectorate, livestock ownership was unequally distributed and highly skewed.

The more interesting question is what happened to the Motswana's access to livestock which he or she did not own, namely, under the mafisa system, a practice of putting out cattle to be tended on a basis akin to share-cropping in agriculture. This is a question which requires much more study and cannot be answered here. What can be said, though, is that, even if the commercialization of the livestock sector had left the traditional mafisa system unscathed, this system would still have remained overwhelmingly oriented to a subsistence mode of production. One would be hard pressed to find that many historical cases where access to mafisa cattle proved decisive in moving a farmer from a dependent subsistence to an independent commercial level of grain or cattle production. The structural relationship, on one hand, between the agricultural and livestock sectors (which permitted the latter to grow at the expense of the former) and, on the other hand, between large and small herd owners in a drought-prone environment, was the continuing context in which the mafisa system--even at its best--operated and responded to.

V. CONCLUSIONS

A former Permanent Secretary, Ministry of Finance and Development Planning, described the period presently under study in the following terms:

"... it is quite clear that nothing occurred between 1885 and 1955 which contributed significantly to Botswana's economic and financial development. Bechuanaland's economy and the domestic fiscal resources available to its Administration were inadequate for the purposes of achieving social and economic advancement. A low level equilibrium could be said to have existed during the period.

The policies pursued by the British government, moreover, did not recognize political and economic development as an objective. Financial assistance, when it was provided, was given only to enable a minimally acceptable level of essential public services to be maintained. It was a passive period, devoted to the avoidance of involvement, to the maintenance of a status quo.

The best that can be said of this seventy-year period is that the British Government did resist pressures for the incorporation of Bechuanaland into a larger South Africa. Botswana survived. It is also true that, if little effort was made to achieve progress, measures were at least taken to prevent the collapse of the traditional economy. Livestock diseases were checked; tribal conflict was avoided; law and order were maintained." (Hermans, 1974, p.108)

This picture is not altogether an accurate one, however. The period after 1955 was indeed one of substantially greater development activity in the livestock, agricultural and water supply sectors. Nonetheless, the pre-1955 period was far from static. There was some major activity, and it has been outlined above; more important, though, the structure of the rural economy was then being developed and institutionalized. The train followed tracks laid long before.

From very early on, there was built into the Protectorate economy especially its agricultural sector, a series of contradictory dynamics, the most important of which were:

- Because agriculture was subsistence based, labor migrated out into employment with higher returns; this loss of labor inputs led to low productivity in agriculture which reinforced the subsistence mode.
- When children went to school continuously, agriculture and livestock management at times suffered; when they were working in these sectors during the school term, their education suffered.

- Higher grain production reduced the necessity to sell cattle and the resulting lower offtake meant greater grazing pressure at water points. A grain shortage, however, increased the need to acquire and hold cattle, thereby increasing the overgrazing potential.
- Substantially greater investment in livestock than in agriculture vis-a-vis innovation, research and funding increasingly enhanced the livestock sector's comparative advantage, leaving agriculture with less and less attractive returns to investment.
- The livestock sector was subsidized, first by atrophying local industry and then through government funds which favored livestock development over agriculture, namely, the large-scale programs for sinking rural water supplies. Had the livestock sector borne the full cost of its development, investment in agriculture might well have looked more appealing.

Other contradictions confronted the non-livestock sectors in the Protectorate, but they too revolved around one constant: not only did these sectors bear some of the cost of the commercialization and expansion of the livestock sector, but progress in these sectors often meant retarding advances in the livestock industry. The post-1955 events--especially the operation of the Lobatse Abattoir and the unparalleled drilling program, both of which served to make livestock all the more attractive as an investment--merely reinforced this pattern of responses between the livestock and non-livestock sectors.

Independence saw an agricultural sector that had not really altered in some 40 years. Yields and production methods remained virtually unchanged for the vast majority of Botswana. But this was not because subsistence agriculture had failed. For something to fail, it must first have a chance of success.

APPENDIX: NOTES ON TABLES AND DATA SOURCES.

Figures for the tables are drawn from a variety of sources and, in some cases, these sources quote different figures for the same observation. Where this occurs, parentheses are used (except in Table 3 where parentheses indicate negative values). The convention of using the latest figures quoted in various annual reports is followed.

* = observation in question has been confirmed from more than one source

-- = nothing was produced in the year examined

blank = observation was not available from the sources used to compile the table

The reason for shifting from "1928/29" to "1929" in many of the tables' year columns arises because the Protectorate's Annual Reports shifted from a financial to a calendar year at that time.

The sources used for compiling the tables are as follows:

- a. Great Britain, Annual Report on the Bechuanaland Protectorate, covering the years: 1905/06, 1906/07, 1907/08, 1910/11, 1911/12, 1912/13, 1913/14, 1915/16, 1916/17, 1918/19, 1919/20, 1920/21, 1921/22, 1922/23, 1923/24, 1924/25, 1925/26, 1926/27, 1927/28, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1946, 1947, 1948, 1949, 1950, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961-62, 1963, 1964, 1965.
- b. Great Britain, Financial and Economic Position of the Bechuanaland Protectorate, ("Pim Report"), March 1933, HMSO, London: pp. 160-182 (Appendices II-XX), covering the years 1900-1932.
- c. I. Schapera, Native Land Tenure in the Bechuanaland Protectorate, The Lovedale Press, 1943: passim, covering the period up to 1941.
- d. Union of South Africa, Official Yearbook of the Union and of Basutoland, the Bechuanaland Protectorate and Swaziland, Government Printer, Pretoria: various years between 1910 and 1955.
- e. Great Britain, Colonial Office, An Economic Survey of the Colonial Territories (1951), Colonial Report No. 281 (I), HMSO, 1952.
- f. Bechuanaland Protectorate Government, Veterinary Department, Annual Report, Mofeking, covering the following years: 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958/59, 1960/61, 1962/63, 1964, 1965.
- g. Great Britain, Basutoland, Bechuanaland Protectorate and Swaziland: report of an Economic Survey Mission, ("Morse Report") HMSO, 1960: pp. 169-198, appendices roughly covering the period 1946-1959.
- h. D. Randall, Factors of Economic Development in the Okovongo Delta, University of Chicago Press, 1957: Table 2, p. 146 (covering period 1942-1954) and Table 9, p. 254 (covering period 1932/33 - 1954/55).
- i. S. Sandford, Dealing With Drought and Livestock in Botswana, May 1977: Table 3.3, p. 25 (covering period 1959-1975).

j. S. Ettinger, "South Africa's Weight Restrictions on Cattle Exports from Bechuanaland, 1924-41," Botswana Notes and Records, pp. 21-29: covers period from 1910 to 1946.

k. I. Schapera, Migrant Labor and Tribal Life, Oxford University Press, 1947: covers period up to 1944.

l. Union of South Africa, Union Statistics for Fifty Years, Bureau of Census and Statistics, 1960.

m. Great Britain, Statistical Abstract for the Several British Overseas Dominions and Protectorates in Each Year from 1903 to 1919, 54th Number, HMSO, 1920, Cmd.664.

n. H.C. Biggs, Report on the Marketing of Agricultural Produce and Some Aspects of the Marketing of Livestock in Bechuanaland, London, 1966.

o. G.C. Ryan, Report to the Bechuanaland Protectorate Government on the Livestock Industry of the Protectorate, 1958.

p. Republic of Botswana, Statistical Abstract 1966, CSO, Ministry of Finance.

q. C.W. Stahl, "Organization of Migrant Labor in Southern Africa," unpublished, p. 6.

r. F. Wilson, Labor in the South African Mines 1911-1969, Cambridge University Press, 1972, p.46.

s. A.C. Campbell, "The 1960's Drought in Botswana," in Symposium on Drought in Botswana, p. 102.

t. Bechuanaland Protectorate Government, Director of Geological Survey, Savingram no. WS. 2111, 26th September, 1959.

u. S.G. Wynne, "A Preliminary Report on Borehole Drilling Data For The Kweneng District," dated 7th July, 1979.

v. E.M. Roe, "Borehole Summary for the Southern District," January 31, 1975.

Sources for Tables 1 - 7

<u>Table 1.</u>	<u>Column</u>	<u>Sources</u>
	1	a,b,c,d,e,f,g,h,j,n,o,p
	2	a,b,c,d,e,f,g,h,j,n,o
	3	--
	4	j,1
	5	a,g,d,b,n
	6	1

The cattle export figures do not include condemnations. The cattle price index has been deflated by a retail price index for all commodities (see Ettinger article); similar price indices are not available beyond 1960.

Table 2. Sources: a,b,c,e,f,g,h,k,d

Import-export figures for "Chief African Livestock Revenue" excluded: value of skin from wild animals; sale of pigs and poultry; value of dairy production; sales from companion animals and abattoir by-products. As such, the figures under this heading are conservative ones.

"Principal African Taxes" excluded graded taxes. The taxes are given for the financial year, while cattle and grain crops are given for the calendar year after 1929. In the BPARs, the tax year was aligned with the calendar year as follows: 1954/55 tax + 1955 trade figures. Table 3 alters this alignment to "1954/55 tax + 1955 trade figures" in order to capture a 9 month overlap rather than a 3 month one. A conversion rate of R2 = h1 was used.

Reliable grain production figures for 1961-1965 were unavailable at the time of writing this report.

Table 3. Sources: various tables given in Great Britain's yearly Government Accounts for "Colonial Development and Welfare Acts, Returns to Schemes..."

Table 4. Sources: s,g,t

Table 5. Sources: u,v

Table 6. Sources: a, Table 3

Table 7. Sources: Table 1, q,r

Finally, in the subsection "A Chronology of Major Events in the Construction of Groundwater Supplies, 1895-1965," figures are given for the number of Government drilled boreholes during selected years. A slightly different set of figures is provided below, as drawn from Table 72 of C.M.H. Jennings' The Hydrogeology of Botswana (p.559):

STATISTICS ON BOREHOLES DRILLED BY DRILLING DEPARTMENT, 1929-1965

<u>Year</u>	<u>Number</u>
1929	2
1930	9
1931	19
1932	2
1934	5
1935	3
1936	16
1937	24
1938	37
1939	35
1940	30
-----The Second World War-----	
1947-48	30
1949	50
1950	51
1951	65
1952	63
1953	68
1954	83
1955	75
1956	83
1957	146
1958	150
1959	120
1960	114
1961	95
1962	71
1963	89
1964	98
1965	153

While somewhat different, these figures also confirm the trend of increased borehole drilling during the 1930s and 1950s.

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