UNIVERSITY OF THE WITWATERSRAND

A F R I C A N S T U D I E S I N S T I T U T E

African Studies Seminar Paper
to be presented in RW
4.00pm MARCH 1980

Title: Agricultural Production in the African Reserves of South Africa, 1918-1969.

by: C E W Simkins

No. 090

UNIVERSITY OF THE WITWATERSRAND

A F R I C A N S T U D I E S I N S T I T U T E

African Studies Seminar Paper to be
presented at Seminar in RW 319 at
4.00 p.m. on Monday 24 March 1980

AGRICULTURAL PRODUCTION IN THE AFRICAN RESERVES OF SOUTH AFRICA, 1918-1969

C.E.W. Simkins

Agricultural Production in the African Reserves[1] of South Africa, 1918-1969

Introduction:

Among scholars who would disagree on the interpretation of many aspects of South African society there appears to be a considerable measure of consensus on the course of agricultural production in the reserves during the twentieth century. Thus M. Wilson writes:

'From one (peasant) community after another, however, there is evidence of a fall in productivity after a period of early prosperity. The tale is one of increasing pressure of population on deteriorating land, and the fall was not only in productivity per head, but in the total crop produced ... The date at which the decline began varied with the area ... in the Ciskei, it began before the end of the nineteenth century; in the Transkei it was conspicuous after 1930 ... Crops were shrinking owing to erosion and the fall in fertility. Between 1921 and 1930, 640 million pounds of mealies were produced by Africans, and between 1931 and 1939, this fell to 490 million pounds ...[2]

And Wolpe has a parallel passage:

'By the 1920s attention was already being drawn to the deterioration of the situation in the African areas and in 1932 the Native Economic Commission Report (1930-2) commented at length on the extremely low productivity of farming on the Reserves, on the increasing malnutrition and on the real danger of the irreversible destruction of the land through soil erosion. Every subsequent Government Commission dealing with the Reserves reiterated these points and drew attention to the decline in output. Report No. 9 of the Social and Economic Planning Council (1946) showed, for example, the decline in production of the staple crops - maize and kaffircorn - during the period 1934 to 1939. Thus maize production dropped from 3.7 million bags in 1934 to 1.2 million in 1936 and then rose slowly to 3.0 million in 1939. Kaffircorn likewise declined from 1.2 million bags in 1934 to 0.5 million in 1936, rising to 0.7 million in 1939.

The above-mentioned reports and numerous other studies bear witness to the ever-increasing total and irredeemable destruction, through soil erosion, of vast tracts of land, to the decline of production and to the impoverishment of the people ...'[3]

The purpose of this study is to submit Wilson's and Wolpe's propositions about agricultural production to critical scrutiny and to offer a fuller, more systematic account of its evolution from 1918 to 1969. The temporal limits of the study were determined by the following factors:

(i) 1918 was the first year in which a Union Agricultural Census was taken; these Censuses are crucial sources for the analysis which follows.

(ii) this study implicitly assumes that agriculture is virtually the only form of economic activity within the reserves. During the late sixties the reserve economies started to undergo substantial restructuring and this assumption cease to hold.

The time series analysis:

Agricultural production in the reserves can be grouped under seven heads:

A - Cereals: Maize, sorghum and wheat
B - Pulse and Millet: Cowpeas, dried beans, dried peas, lentils, millet and lucerne hay
C - Cash Crops: Tobacco, sugarcane and groundnuts
D - Vegetables: Potatoes and sweet potatoes
E - Cattle: Dead cattle (consumed), hides, milk, cattle slaughtered
F - Small stock: Dead sheep and goats (consumed), skins, sheep and goats slaughtered, wool and mohair
G - Pigs and poultry products

Other items (other winter cereals, sisal, phormium tenax, cotton, sunflowers, other vegetables, fruit and forestry products) are mentioned in various valuations of reserve output but few or no observations of output under these heads exist, so they have been left out of account. They would add up to perhaps 5% to the calculated production totals.[4] In addition, Agricultural Censuses are likely to underenumerate production somewhat;[5] both factors would make the estimates which follow too low, a factor which should be borne in mind when interpreting comparisons of

Table 1 - VALUE OF AGRICULTURAL PRODUCTION, 1918-1969

(Million pounds - current prices)

Date	A-Cereals	B-Pulse etc.	C-Cash crops	D-Vege-tables	E-Cattle	F-Small stock	G-Pigs & Poultry	TOTAL	Percentage pastoral (5-year
1918	2.702	0.132	0.088	0.193	1.345	1.673	0.250	6.383	
1921	4.667	0.132	0.135	0.154	2.422	1.059	0.219	8.788	
1923	3.291	0.132	0.080	0.125	1.929	1.298	0.236	7.091	
1924	2.065	0.132	0.074	0.110	2.257	1.544	0.240	6.422	
1925	2.939	0.132	0.073	0.094	2.181	1.659	0.261	7.339	59.3
1926	1.607	0.132	0.071	0.077	2.647	1.409	0.255	6.198	63.0
1927	2.497	0.132	0.099	0.067	2.410	1.422	0.261	6.888	62.8
1928	2.045	0.132	0.080	0.049	2.739	1.693	0.266	7.004	63.0
1929	2.607	0.132	0.073	0.046	2.927	1.431	0.270	7.486	
1930	2.601	0.132	0.067	0.044	2.412	1.115	0.273	6.644	
1934	2.763	0.132	0.055	0.040	2.174	0.935	0.242	6.341	
1935	1.120	0.132	0.054	0.040	2.164	0.748	0.252	4.510	
1936	0.817	0.132	0.054	0.041	2.188	0.868	0.268	4.368	66.9
1937	2.216	0.132	0.056	0.042	2.357	1.127	0.291	6.221	69.7
1938	1.465	0.132	0.059	0.044	3.837	0.899	0.321	6.757	
1939	1.856	0.132	0.062	0.045	3.026	0.851	0.358	6.330	
1946	2.988	0.494	0.117	0.072	5.866	1.393	0.806	11.736	
1947	5.841	0.492	0.164	0.068	5.676	1.638	0.879	14.758	
1948	6.303	0.501	0.207	0.067	5.722	2.248	0.947	15.995	63.2
1949	3.505	0.520	0.245	0.068	6.191	2.698	1.010	14.237	63.7
1950	4.307	0.549	0.279	0.071	6.302	3.043	1.067	15.618	67.0
1951	3.523	0.588	0.308	0.077	6.425	3.499	1.119	15.539	68.6
1952	3.658	0.638	0.332	0.084	7.117	3.867	1.167	16.863	67.5
1953	6.638	0.698	0.352	0.095	8.245	4.270	1.209	21.507	66.7
1954	6.292	0.768	0.367	0.107	7.900	4.158	1.245	20.837	67.0
1955	5.866	0.848	0.378	0.122	7.279	3.687	1.277	19.457	65.4
1956	3.908	0.781	0.425	0.223	8.362	3.816	1.631	19.146	67.2

Date	A-Cereals	B-Pulse etc.	C-Cash crops	D-Vege-tables	E-Cattle	F-Small stock	G-Pigs & Poultry	TOTAL	Percenta pastora (5 year
1957	6.603	0.737	0.470	0.321	8.939	3.865	1.913	22.848	68.0
1958	4.127	0.716	0.516	0.415	9.553	3.701	2.124	21.152	68.5
1959	5.208	0.717	0.561	0.507	9.327	3.312	2.263	21.895	66.8
1960	5.021	0.740	0.605	0.595	7.730	3.046	2.331	20.068	67.5
1961	6.236	0.786	0.649	0.680	9.082	3.165	2.327	22.925	66.2
1962	4.286	0.854	0.692	0.762	8.476	3.048	2.251	20.369	65.9
1963	4.785	0.945	0.734	0.841	8.798	2.740	2.104	20.497	66.8
1964	4.577	1.059	0.777	0.917	9.249	3.225	2.145	21.949	67.6
1965	3.624	1.195	0.818	0.990	9.585	3.548	1.973	21.733	67.4
1966	4.330	1.280	0.582	1.426	10.150	3.570	2.161	23.499	68.8
1967	4.481	1.062	1.262	1.834	11.066	3.921	2.300	25.926	69.2
1968	2.971	0.786	1.618	1.128	11.547	4.366	2.390	24.806	
1969	4.278	1.062	1.418	1.498	11.044	4.454	2.431	26.185	

Note: 1. No Agricultural Censuses were taken in the Reserves in 1919-20 and 1922 or at all in 1931-3 or 1939-45

2. Some of these figures are interpolated. For details see Appendix I.

production with subsistence requirements. On the other hand, trends should be unaffected, apart from an additional source of random error, making them harder to detect.

Appendix I contains notes on the sources of price and quantity data used to arrive at Table 1, which presents agricultural production (under each head and totals) in current prices for years between 1918 and 1969. Table 1 shows that pastoral production has made up the greater part (in value terms) of total production, averaging around 62 percent of the latter in the twenties and around 67 percent since the mid-thirties. Table 2 compares these valuations with those made by other researchers since 1918.

In summary, my estimates are a little below that of Lehfeldt, considerably below those of the NUC Department of Economics, slightly above those of Thirion, Tomlinson and Retief and nearly the same as those of BENBO. Given that there are methodological inconsistencies between all the estimates, one can hope for little better than that one's own valuation series (internally consistent) for a diversity of reasons steers a via media between these. This it does.

Table 2 - Comparison of Estimates of Agricultural Production in the Reserves 1918-196

A. Lehfeldt 1918: Lehfeldt values agricultural production at £3.83 million (mine £3.12 million) and pastoral production at £3.20 million (mine £3.26 million). His total of £7.03 million exceeds mine of £6.38 million by about 9%. No indication of his method of calculation is given.

(Source: R. Lehfeldt, The National Resources of South Africa, University of Witwatersrand, 1922, p 73)

B. Natal University College, Department of Economics, 1930, 1936 and 1939

The Department made estimates of production by a family of 5 in 1930, 1936 and 1939 (based on the Transkei and Ciskei). Knowing reserve population sizes in those years one can raise these estimates to estimates for the reserves as a whole:

Date	Family of 5 (£)	Reserve production (£m)	My estimates (£m)
1930	17.24	9.775	6.644
1936	14.13	8.407	4.368
1939	14.55	8.977	6.330

Table 2 continued

My estimates are respectively 32, 48 and 29 percent below theirs. The discrepancy in 1939 is largely to be explained by differences in maize quantities (413390 tons vs 295795) in 1939 and prices (£7.50/ton vs £4.46/ton) and cattle consumed, (quantities 460 000 vs 300 000).

(Source: NUC, Department of Economics, The National Income and the Non-European, in E. Hellman (ed), Handbook on Race Relations in South Africa, OUP, 1949, p. 315)

C. Thirion 1947 and 1950: Thirion's estimates compare as follows with mine:

	1947 (£m)		1950	
	Thirion	Simkins	Thirion	Simkins
Agriculture	5.326	6.565	5.683	5.206
Pastoral	5.795	8.193	7.103	10.412
	11.121	14.758	12.786	15.618

My estimates exceed Thirion's by 33 and 22 percent in 1947 and 1950. The greater part of the difference lies in the valuation of pastoral products - my estimates of the value of nearly all of these are greater than his. (Often Thirion uses 'reserve producer prices' lower than national producer prices).

(Source: S.F. Thirion, Die Indeling van die Volksinkome van die Unie volgens Rassegroepe vir die Jaar 1946/7 - 'n Metodiese Studie, M. Com. Dissertation, Pretoria, 1954, pp 29,42)

D. Tomlinson Commission, 1937, 1946, 1947, 1949 and 1951 The 'low estimates' of the value of reserve production produced by Tomlinson do not include allowances for the meat of dead stock. I therefore deduct these items from my estimates for the purposes of comparison.

Date	Tomlinson estimate (£m)	Simkins estimate (£m)
1937	4.480	5.321
1946	9.244	8.945
1947	9.731	12.466
1949	11.095	11.740
1951	11.542	12.827

Table 2 continued

My estimates are still greater than his on the whole (+19%, -3%, +28%, +6%, +11%) The reasons for this cannot be deduced from the published report.

(The Tomlinson Commission also produced 'high' estimates which, however, included items like valuation of veldkos consumed and also some non-agricultural activities. These are less comparable with my estimates than the low estimates).

(Source: Tomlinson Commission Report, Chapter 9, Appendix 1)

E. Retief 1954-9: Retief's estimates are compared with mine below:

(£m)

	1954		1955		1956		1957		1958		1959	
	R	S	R	S	R	S	R	S	R	S	R	S
Agricultural:	7.629	7.534	8.945	7.214	6.959	5.337	8.843	8.131	7.531	5.774	7.651	6.99
Pastoral:	11.202	13.303	9.225	12.243	10.246	13.809	11.376	14.717	11.414	15.378	10.989	14.90
	18.831	20.837	18.170	19.457	17.205	19.146	20.219	22.848	18.945	21.152	18.640	21.895
		(+11%)		(+7%)		(+11%)		(+13%)		(+12%)		(+17%

My estimates are above Retief's on the pastoral side; Retief does not value hides and skins and takes 25% off slaughter stock value for its being in the reserves.

(Source: A.J. Retief, Die Verdeling van die Volksinkome van die Unie volgens Ras 1956/7, M. Comm. dissertation, Stellenbosch, 1960, p. 12)

Table 2 continued

F. BENBO 1968-9: BENBO's estimates of total production (excl. fruit and forestry) for 1968 and 1969 are compared with mine:

	1968		1969	
	B	S	B	S
Agriculture	6.344	6.503	9.393	8.256
Pastoral	17.501	18.303	18.759	17.929
	23.845	24.806 (+4%)	28.152	26.185 (-7%)

These are as close as can be expected.

(Source: BENBO, Black Development, Pretoria, 1976, table B.9.4)

In order to assimilate the meaning of the agricultural production totals, one needs to adjust these for price changes. Table 3 shows total agricultural production and production per head valued at 1946 prices. From the total output columns of Table 3 one may draw the first main conclusion of this study: Total agricultural production (valued at constant prices) did not fall over the period 1918-1965. On the contrary, one may detect a slight rise after the war, production fluctuating around an index (1946=100) of 91 up to 1939 and of 99 after 1946.

Given a more or less static level of production and a rising reserve population, it comes as no surprise to find that agricultural output per head of reserve population dropped between the beginning and the end of the period. It is of interest to note the pattern of the drop; indexing 1946 production per head as 100, production per head drops from 111 in the mid-twenties to 99 in the mid-thirties and late-forties and to 67 towards the mid-sixties. This reflects in inverted fashion population growth rates of 1,37% p.a. between 1916 and 1936; 0,72% p.a. between 1936 and 1951 and 4,01% p.a. between 1951 and 1970 (some of this latter growth is, of course, to be accounted for by the incorporation of African urban areas in the 'homelands' in the late sixties). The second main conclusion of this study follows: One must locate the really dramatic decline in production per capita in the period after 1948 rather than in the period before that date.

Table 3 - VALUE OF AGRICULTURAL OUTPUT AND OUTPUT PER HEAD, 1918-1965

(1946 prices)

Date	(£m) Output	5-year average index (1946=100)	(m) Population	Output per head (£)	5-year average index (1946=10
1918	9.955		2.269	3.701	
1921	10.356		2.463	4.205	
1923	11.264		2.537	4.440	
1924	9.809		2.574	3.811	
1925	11.149	89.2	2.610	4.272	111.6
1926	9.490	88.4	2.645	3.588	109.0
1927	10.643	91.4	2.680	3.971	111.2
1928	10.776	93.3	2.715	3.969	112.0
1929	11.574		2.749	4.210	
1930	12.292		2.783	4.417	
1934	12.015		2.914	4.123	
1935	10.016		2.945	3.401	
1936	9.313	91.4	2.976	3.129	100.0
1937	11.191	90.8	3.007	3.722	98.2
1938	11.002		3.037	3.623	
1939	11.665		3.066	3.805	
1946	11.736		3.261	3.599	
1947	12.199		3.277	3.723	
1948	13.278	102.9	3.290	4.036	102.1
1949	11.379	100.7	3.301	3.447	99.6
1950	11.784	97.1	3.310	3.560	95.7
1951	10.482	95.1	3.316	3.161	93.4
1952	10.063	95.9	3.324	3.027	93.6
1953	12.110	94.8	3.353	3.612	91.6
1954	11.845	95.4	3.402	3.482	91.0

Date	(£m) Output	5-year average index (1946=100)	(m) Population	Output per head (£)	5-year average index (1946=100)
1955	11.132	100.4	3.473	3.205	93.7
1956	10.843	100.3	3.563	3.043	90.9
1957	12.959	101.1	3.675	3.526	89.2
1958	11.774	101.3	3.807	3.093	86.5
1959	12.621	104.4	3.960	3.187	85.9
1960	11.228	101.9	4.133	2.717	80.4
1961	12.707	101.9	4.327	2.937	76.9
1962	11.490	100.1	4.542	2.530	71.9
1963	11.738	98.2	4.777	2.457	67.4
1964	11.553		5.033	2.295	
1965	10.159		5.310	1.913	

Notes:
1. 1916 population figure from the Beaumont Commission Report: 1936, 1946, 1951, 1960 and 1970 figures from Population Censuses as reported in BENBO, Black Development. Intervening year figures obtained by second-order Lagrangian interpolation.
2. Calculations for 1966-1969 were not carried our for this series. They would show a continuation of the trends already identified.

How did total agricultural production compare with the subsistence requirements of the reserve population between 1918 and 1969? The search for a 'perfect' bundle of subsistence goods is a vain one if only because conceptions of subsistence change over time. Nonetheless, the subsistence bundle for a family of five worked out by the Witwatersrand Mine Natives' Wages Commission in 1943 (discussed in Appendix II) will serve as a useful reference. This bundle offers two advantages over its potential competitors:

(i) it was worked out at the middle of the period under consideration and represents a compromise between a smaller bundle that would have been calculated in 1918 and a larger one necessary in 1969;

(ii) it is fairly easy to value for all years of interest.

Reserve agricultural production has been expressed as a percentage of total reserve subsistence requirements and of the food component of these requirements. The results of these calculations are presented in Figure 1. The five-year moving average of production as a proportion of food requirements fluctuated between 45 and 50 percent between 1925 and 1953; this average exceeded 45 percent again once in 1955 and then declined continuously to 26 percent in 1967. The picture is similar in the case of production as a proportion of total subsistence requirements; the moving average fluctuates between 28 and 32 percent between 1923 and 1957. Again there is a continuous decline from 1955 (30 percent) to 1967 (17 percent).

The third main conclusion of this study follows: Taking the reserves as a whole, one finds that their inhabitants were far from able to provide for their subsistence requirements from agricultural production as early as 1918. However, the proportion of requirements they were able to meet remained substantially constant between 1918 and 1955, declining rapidly only after that date.

The decline in agricultural production per head was earlier dated from the late forties; the decline in production as a proportion of total subsistence requirements starts in the mid-fifties. How is this possible? Table 4 provides the answer. The terms of trade (price level of agricultural output divided by the price level of the subsistence bundle) improved in favour of reserve agriculture between the mid-forties and mid-fifties. If we leave the 1947 peak out of account the terms of trade index improved from 100 in 1946 to 107 in the late forties (1948-50) to 113 in the early fifties (1951-55). This improvement

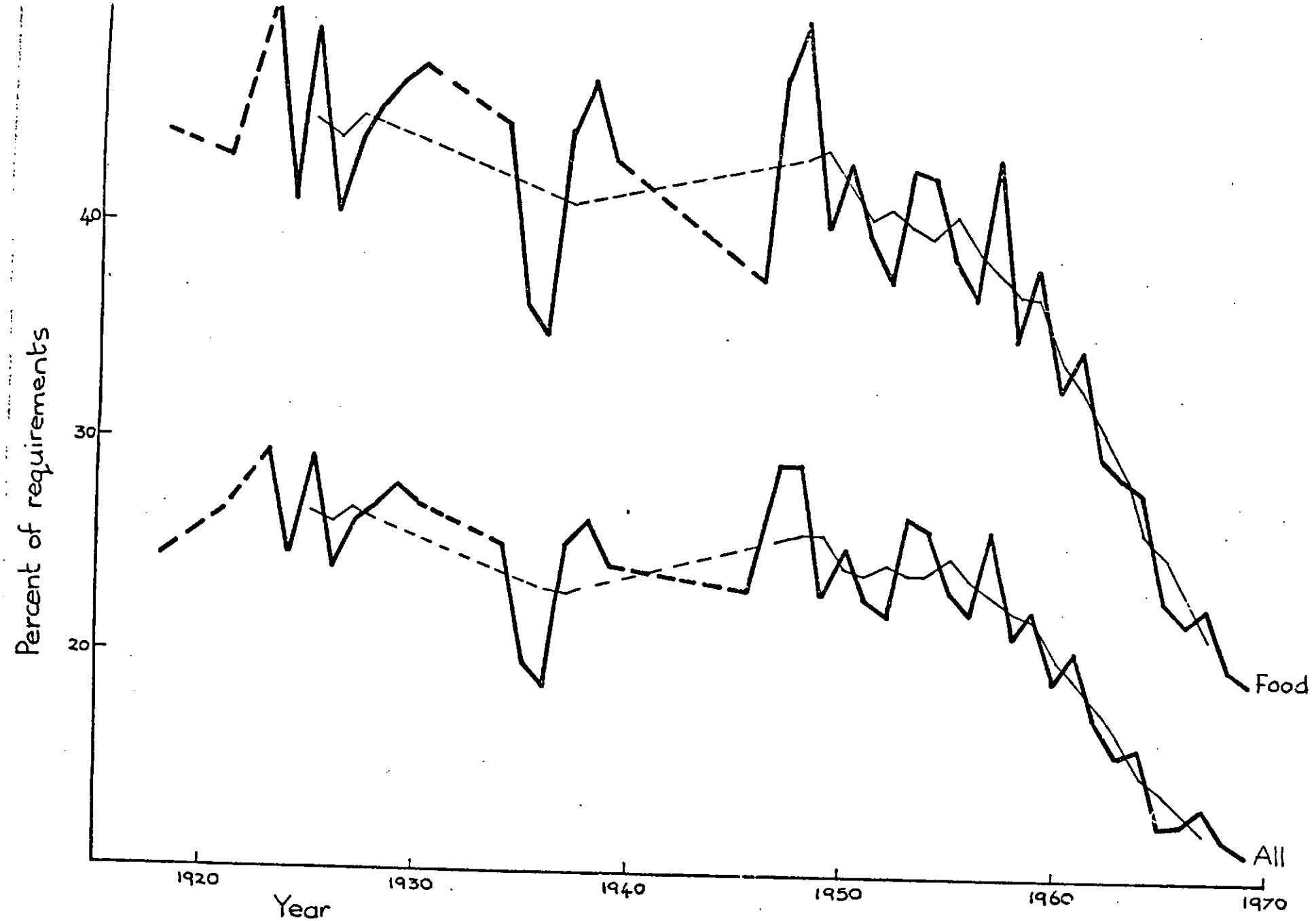

Figure 1 – AGRICULTURAL PRODUCTION AS A PROPORTION OF SUBSISTENCE REQUIREMENTS, 1918 – 1969

Table 4 - 'TERMS OF TRADE' FOR RESERVE AGRICULTURE 1946-1960

Date	Price index -output (1946=100)	Price index -subsistence (1946=100)	Index Output/Subsistence	Date	Price index - output (1946=100)	Price index -subsistence (1946=100)	Index Output/Subsistence
1946	100,0	100,0	100	1954	175,9	154,4	114
1947	121,0	103,9	116	1955	174,8	155,4	112
1948	120,5	111,7	108	1956	176,6	155,9	113
1949	125,1	120,8	104	1957	176,3	156,5	113
1950	132,5	122,8	108	1958	179,7	166,2	108
1951	148,2	132,2	112	1959	173,5	156,6	111
1952	167,6	146,2	115	1960	178,7	158,3	113
1953	177,6	158,2	112				

offset the decline in product per head up until 1955.

It is worth observing at this stage that the discussion of agricultural production in relation to subsistence requirements implicitly assumes that agricultural produce not forming part of the subsistence bundle of goods could be traded for subsistence goods at the prices used in the calculations. It is likely, in fact, that reserve farmers had to sell agricultural products at below country-wide producer prices and buy subsistence goods at above country-wide retail prices. This would make their production worth less in terms of subsistence requirements than reported here. However, unless the terms of trade in the reserves deteriorated consistently over the period discussed, the shape of the curves and the main conclusions of the analysis remain approximately the same.

The cross-section analysis:

Total agricultural production remained more or less constant over the period 1946-1969. Reserve population increased rapidly, however. Does this indicate a marginal productivity of labour of zero in reserve agriculture?

Drawing such a conclusion from a time series would be hazardous; too many important variables are correlated with time. Cross-sectional production function analysis is a necessary complement of work done so far. The production function used is a simple Cobb-Douglas function with people (P) and land (L) as factors

of production. Q(total output) for any area is given by

$$Q = kP^{\alpha} L^{1-\alpha} \quad \text{-----} \quad (1)$$

or, equivalently $\ln \left(\frac{Q}{P}\right) = \ln k - (1-\alpha) \ln \left(\frac{P}{L}\right)$ ----- (2)

α lies between 0 and 1; at the one extreme (α=0) Q depends only on land (the zero marginal productivity of labour case), while at the other Q depends only on labour (marginal product of labour equal to average product i.e. product per head shows no tendency to decline). To estimate α, one uses equation (2) and regressesthe logarithm of product per head on the logarithm of population density. Product per head (in 1946 prices) and population density was estimated for each magisterial district in which there was a reserve of any size in 1916 in each of four years - 1927, 1937, 1950 and 1960.[6] Product per head in 1927 and 1960 in each district is mapped on Figures 2 and 3. In 1927 clearly the most nearly self-sufficient (in food) region is the Transkei, followed by Zululand. The Ciskei, Northern Cape, Transvaal and Orange Free State reserves make up an intermediate category with a majority of areas producing 25-50% of food requirements. Worst was Natal where a number of districts produced less than 25% of requirements. Comparison of Figure 2 with Figure 3 shows the decline between 1927 and 1960 clearly enough. The Transkei was still the best region but now more than half its districtsproduced less than 50% of food requirements. Zululand had declined a little, as had Natal. All the Northern Transvaal districts and all the Ciskei districts bar one in each case produced less than 25% of food requirements. Pretoria, Rustenburg and Harrismith declined but the rest of the Western Transvaal, Northern Cape and Orange Free State held its ground or improved slightly.

It proved possible to run satisfactory regressions only on the Ciskei, Transkei, Natal and Zululand data. Other reserve districtswere too heterogenous (with too few districts in each category); in addition, the Northern Transvaal reserves were restructured over the period under consideration. The regressions obtained were dealt with in the following way:

(1) Test the hypothesis $\alpha = 1$ in each case. If it is accepted (marginal product equals average product i.e. population density has no influence on average product) carry out step (2). If not carry out step (3)

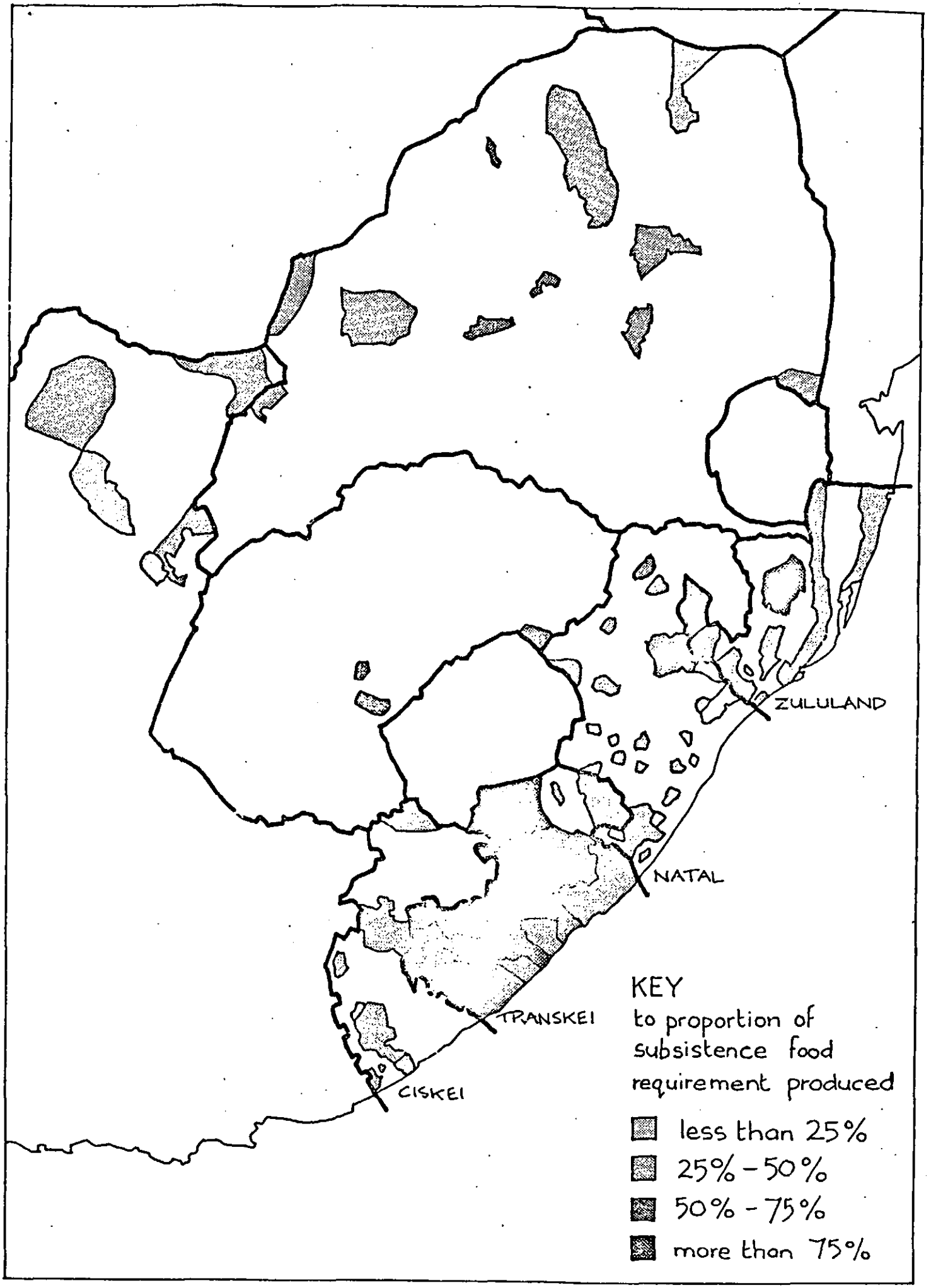

Figure 2 - AGRICULTURAL OUTPUT PER HEAD IN THE RESERVES, 1927

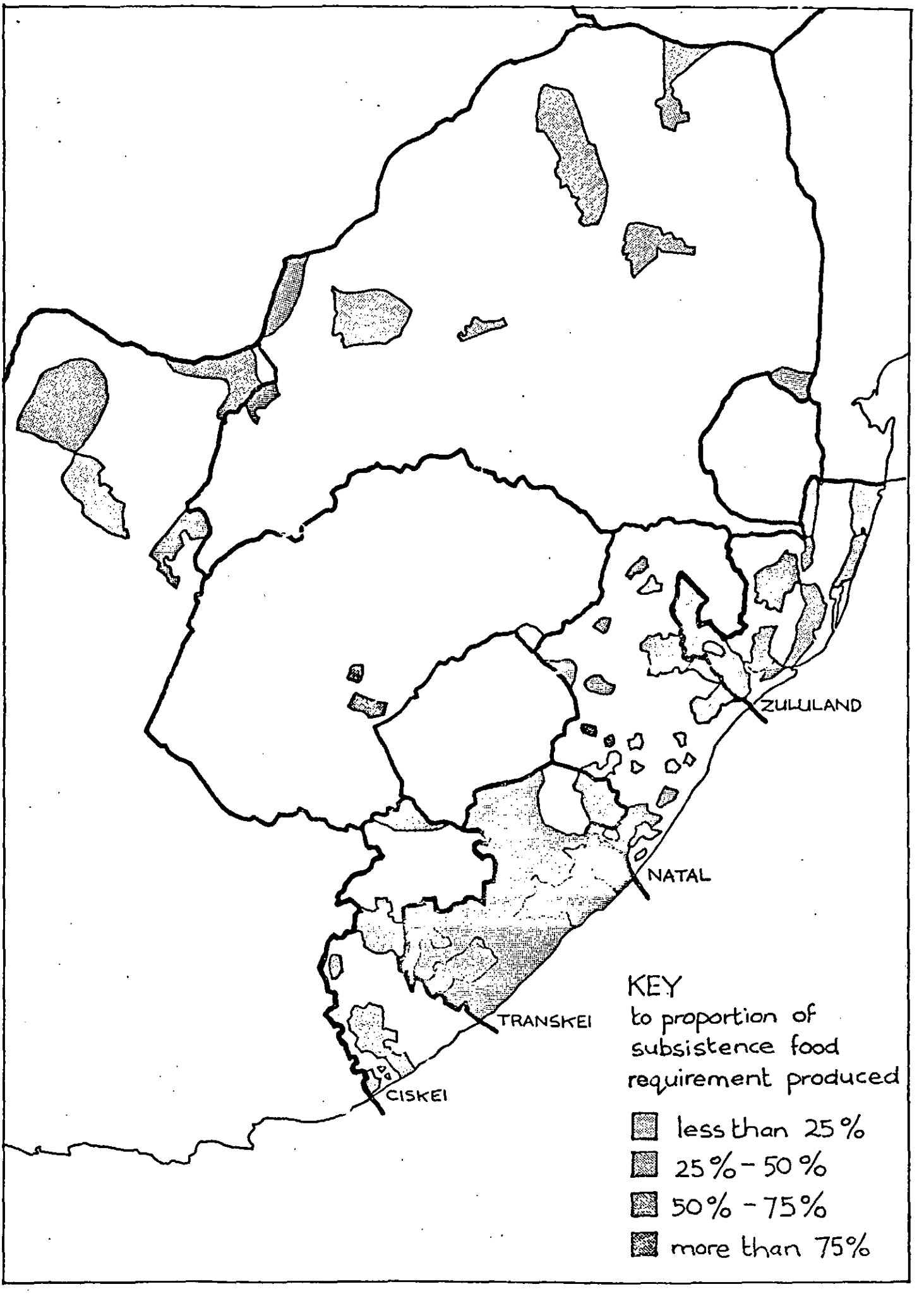

Figure 3 – AGRICULTURAL OUTPUT PER HEAD IN THE RESERVES, 1960

(2) Analysis of variance: Submit the four sets of $\ln(\frac{Q}{P})$ to an analysis of variance to determine whether or not there are significant differences between means. If there are not, pool the sets of data and calculate an overall mean.

(3) Analysis of covariance: Submit the four regressions to an analysis of covarian to determine whether or not there are significant differences between them. If not, pool the sets of data and calculate an overall regression.

The results of this procedure are represented in Figure 4. At a given population density (say, 100 people per square mile) expected output per head varies across regions and in time (in this case from £1.88 in the Ciskei of 1960 to £5.42 in the Transkei of 1927). The relationship between output per head and population density also varies across regions. In the case of Zululand (step 1; step 2 - all observations pooled), no significant decline in output per head can be detected either across regions or over time. In the case of Natal (step 1; step 3 - all observations pooled), a single regression line sums up the experience of 1927-60: more intensive use of the land with growing total output but diminishing output per head. Where one gets shifts in the relationship over time, this can be accounted for (ruling out technical change) by changes in the efficiency (or even application) of the factors of production. In both the Ciskei (step 1; step 3 - 1927, 1937, 1950 pooled, 1960 separate) and the Transkei (step 1; step 2 - no pooling) the shift is downward, pointing to either land degradation or a growing landless class (in which case measured P overestimates the farming labour input) or both. The Transkei, like Zululand, showed no tendency for output per head to drop with increasing population density over the period 1927-60; the Ciskei, like Natal did. In no case, did a marginal productivity of labour of zero emerge at any time.

Conclusions: The period 1918-1969 can be divided into two distinct subperiods:
A. The period of 'fragile productivity maintenance' : 1918-1954: In this period, despite a tendency suggested by the cross-sectional analysis for agricultural output per head to drop (both because of land degradation and increasing population density) the proportion of reserve subsistence requirements met by reserve agricultural production remained roughly constant. This could only be achieved by

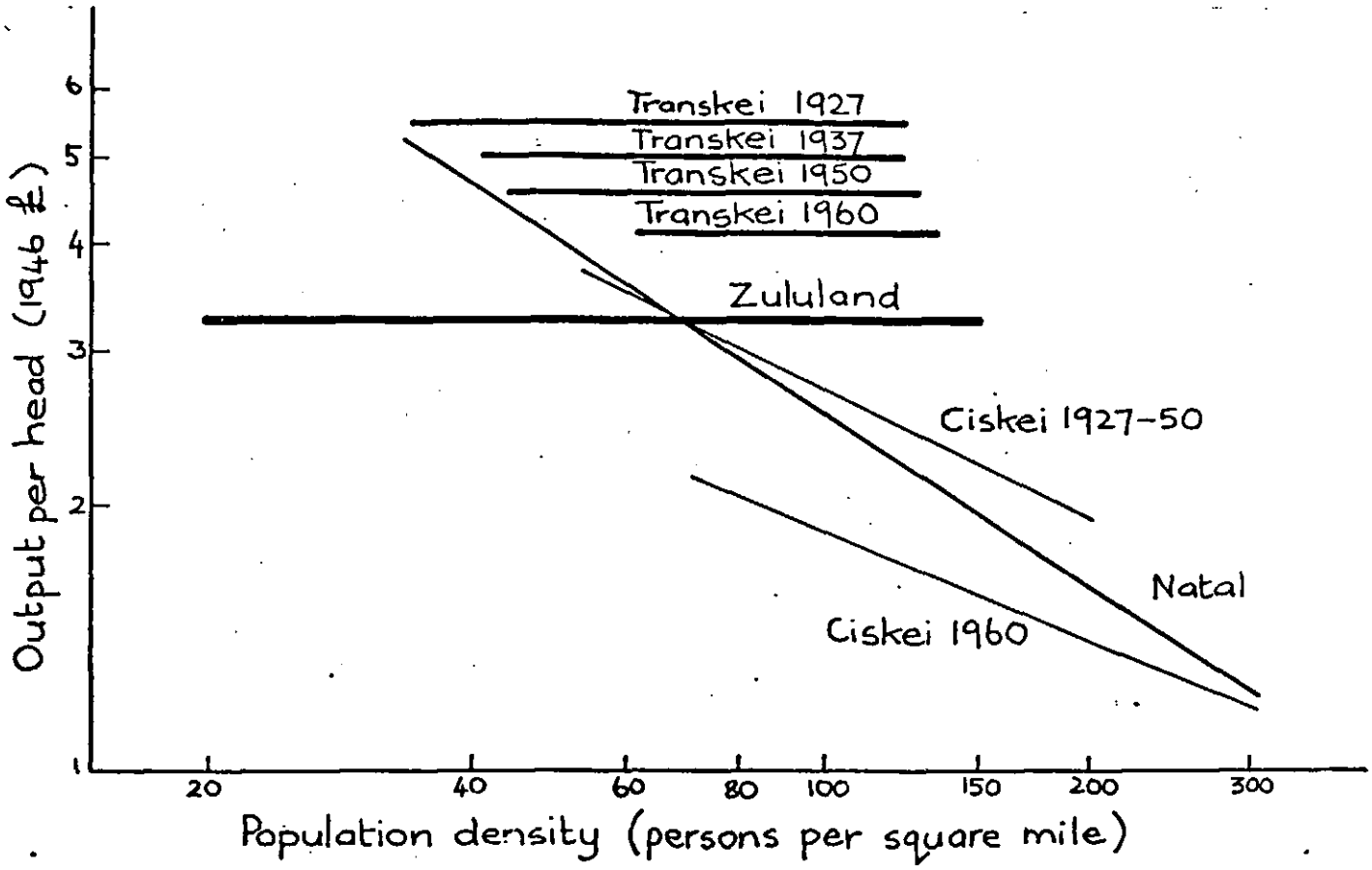

Figure 4- EXPECTED OUTPUTS PER HEAD vs POPULATION DENSITY- CISKEI, TRANSKEI, NATAL AND ZULULAND, 1927-1960

a high rate of emigration from the reserves which can be regarded as the primary 'productivity maintenance mechanism.' The situation was helped by small additions of land to the reserves which meant that population density rose less rapidly than population. Indeed, population density, already over 50 persons per square mile in 1918 did not reach 60 persons per square mile until 1955 (see Figure 5). It was also helped by an improvement in the terms of trade between reserve agricultural production and subsistence requirements between 1946 and 1954. One can also point to an equilibrium of another sort: if one takes the ratio of the average wage for Africans in 'private industry' (manufacturing, electricity, gas and steam,construction and laundry and dry-cleaning)[7] to the reserve agricultural product per 5 persons, one finds that the moving average rises from just above 3 in the twenties to just below 5 in the thirties. It remains at just below 5 until 1955 (see Figure 5). This observation further justifies the view of emigration as an equilibrating mechanism.

From the perspective of this study, the sharp dip in agricultural (as opposed to pastoral) production in the mid-thirties appears as a short-term deviation rather than the onset of a substantial decline in the productivity of the reserves as is quite often suggested in the literature.

B. The period of rapid decline: 1955-1969. An immediate consequence of the modernisation and extension of influx control in the early fifties was the end of counteraction by emigration of tendencies towards decline. Average population density rose from 60 persons per square mile in 1955 to 110 in 1969. Production per head plummeted, production as a proportion of subsistence requirements in the late sixties being less than two-thirds of the 1955 level. And the private industry wage/agricultural product ratio rose from 5 in 1955 to 11 in 1965 ushering in the contemporary disequilibrium between urban and rural African incomes. Increasing dependency of the reserves on remittances from the modern sector was the inevitable result.

Indeed, it may not be fanciful to see the state's 'homeland development' programme (seriously started in the late sixties) as a response to a crisis it had precipitated fifteen years earlier. The effect of the response will need to be assessed when the contemporary phase of reserve history comes to be studied.

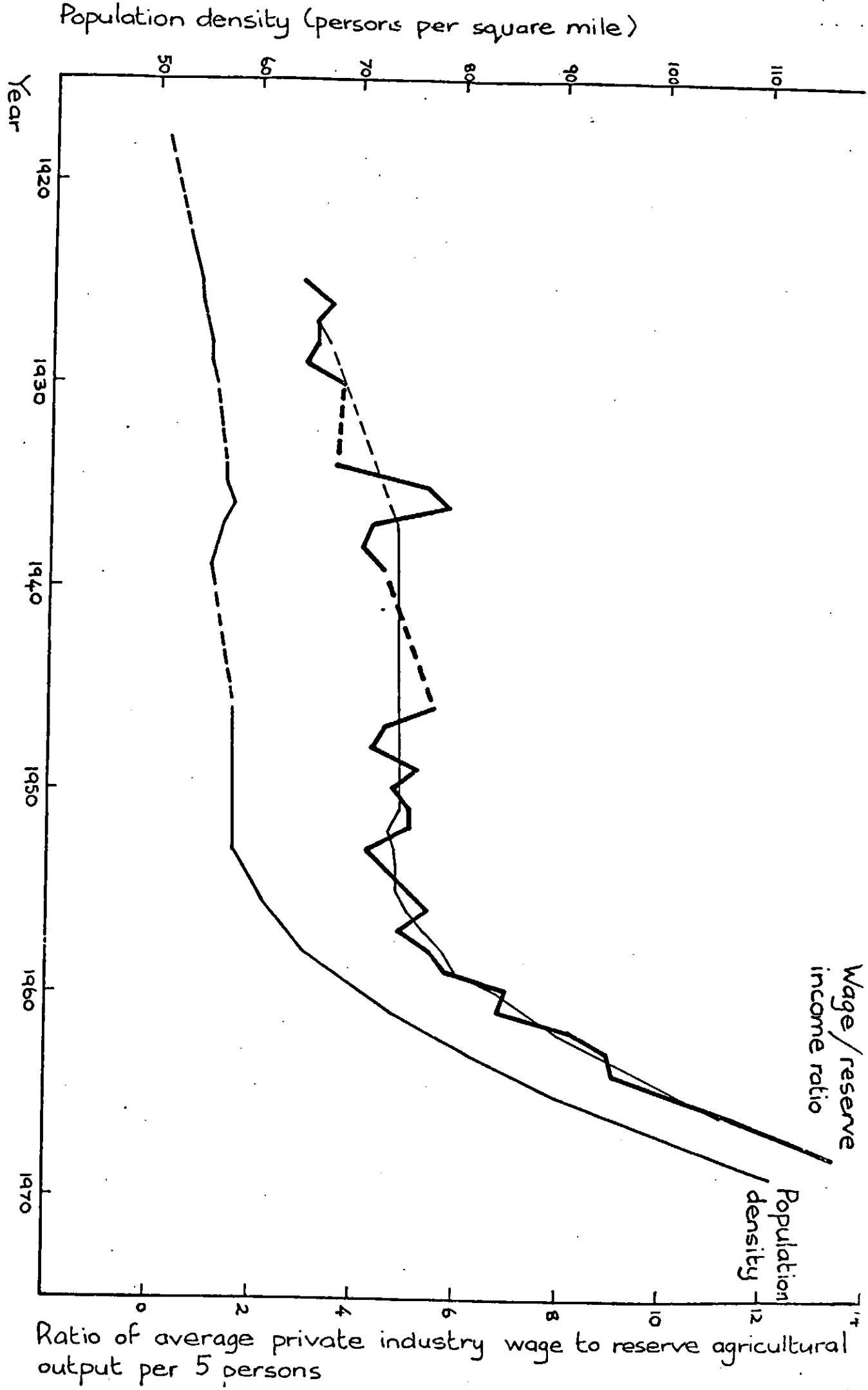

Figure 5 - RESERVE POPULATION DENSITY AND WAGE/RESERVE INCOME RATIO, 1918-1969

Notes

1 African reserves include: Crown/State Reserves or Locations
Mission Reserves or Stations
Tribally owned farms
African-owned farms
Crown/State lands occupied by Africans
Trust Lands purchased after 1936

2 M. Wilson, The Growth of Peasant Communities, in M. Wilson and L. Thompson (ed), The Oxford History of Southern Africa, vol. II, OUP, 1971 pp. 55-56.

3 H. Wolpe, Capitalism and Cheap Labour-Power in South Africa: from Segregation to Apartheid, Economy and Society I(4), 1972, pp. 440-441.

4 This is most readily seen by considering the composition of agricultural production in 1968 as reported by BENBO, Black Development in South Africa, Table B.9.4. The differences between the BENBO estimates and mine where there is a difference in coverage is

Fruit	R0.743 million
Forestry	R1.186 million
Cash crops and vegetables	R0.211 million
	R2.140 million i.e. 4,3% of the total as reported by BENBO.

In addition one must take into account 'other winter cereals' but a glance at the 1960 Agricultural Census shows that production of these in the reserves is very small.

5 On this, see J.J. Stadler, Die Bruto Binnelandse Produk van Suid-Afrika 1911-1959, Unpublished D. Com. thesis, University of Pretoria, 1962.

6 Population figures and land areas of the reserves in each magisterial district under consideration are given for 1916 and 1936 (and land areas only for 1939) on pp. 8-9 in Social and Economic Planning Council, Report no. 9, The Native Reserves and their Place in the Economy of the Union of South Africa, UG 32/46, Pretoria, 1946. Population and land areas for 1927 were taken as the mean of those for 1916 and 1936, for 1937 as for 1936. Land areas for 1950 and 1960 were taken as being the same as in 1939 (total reserve land area rose less than 5% between 1939 and 1973 and the greater part of that rise probably took place after 1960); reserve populations by district were not reported in the 1951 and 1960 Population Censuses so these were interpolated according to the formula

$$X_i = X_{36} + (X_{70} - X_{36}) \cdot \frac{P_i - P_{36}}{P_{70} - P_{36}} \qquad i = 51,60$$

X standing for district populations, P for reserve population as a whole.

7 Source notes for wage/agricultural production ratio

Wage bill: 1925-56: (1) p G - 20, 1957-62 (2) pp. H-47, H-54, H-55; 1963-8 (2) pp. 7.39; 7.43; 7.44; 7.51.

Employment: 1925-56 (1) p G - 7; 1957-62 (2) pp. H-25, H-32, H-33, H-39 1963-8 (2) pp. 7.7, 7.12, 7.29.

Appendix I

Notes on the sources of price and quantity data used in calculating agricultural production totals

Source codes

(1) Union of South Africa, Bureau for Census and Statistics, Union Statistics for Fifty Years, Pretoria, 1960
(2) Republic of South Africa, Department of Statistics, South African Statistics 1974, Pretoria, 1974.
(3) Republic of South Africa, Department of Statistics, South African Statistics 1978, Pretoria, 1978
(4) Republic of South Africa, Handbook of Agricultural Statistics 1904-50
(5) Union of South Africa, Bureau for Census and Statistics, Handbook of Agricultural Statistics 1904-50, Pretoria, 1960
(6) Republic of South Africa, Department of Statistics, Statistical Yearbook 1964, Pretoria, 1964

A- Cereals

Maize: Quantity: 1918-57 (1) p I-11; 1958-9 (2) p 9.15; 1960-9 (3) p. 9.10
Price (Producer): 1918-55 (4) p. 183; 1956-62 (5) p.I-14; 1963-9 (2) p 8.23
(from 1956 on, summer cereal producer price index applied to 1955 prices)

Sorghum: As Maize

Wheat: As Maize, except pre-1955 quantities from (1) p I-12
Linear interpolation used to supply missing values of wheat production

B - Pulse etc.

All values calculated directly for 1937, 1946, 1950, 1955, 1960 and 1965.
All quantities: 1937 (1) p I-16; 1946-65 (2) p 9.23

Prices: Cowpeas 1950-60 Wholesale prices from Crops and Markets. Other years, apply the producer price index for 'other agricultural'; to 1950 price; see (1) pH-29; (4) pI-14; (2) p 8.23

Dried beans: As Cowpeas

Dried peas: 1950 Wholesale price from Crops and Markets. Other years, as cowpeas.

Dried lentils: As dried peas

Millet: Sorghum price used

Lucerne hay: 1946-55 producer price from (4) p.184; 1960, 1965 as for cowpeas except index based on 1955 price.

All pre-war values of this subtotal assumed to be the same as in 1937. Post-war missing values up to 1965 supplied by second-order Lagrangian interpolation. After 1965 values supplied by applying an index derived from Table B.9.4 in Bureau for Economic Research re Bantu Development, Black Development in South Africa, Pretoria, 1976.

C - Cash crops

Tobacco: Values calculated for 1918, 1921, 1923-8, 1937, 1960 and 1965
Quantity: 1918-37 (1) p I-14; 1960 + 5: Agricultural Censuses
Price: 1923-54 Producer price from (4) p.184: 1918-21 from 'other agricultural' index based on 1923 (see (1) p H-29); 1960 + 5 from index ('other agricultural') based on 1954 (see (5) p I-14; (2) p 8.23)

Sugarcane: Values calculated for 1918, 1921, 1946, 1950, 1955 and 1960
Quantity: As Tobacco
Price: 1946-55 Producer price from (4) p 184; 1918-21 from 'other agricultural' index based on 1946 (see (1) p H-29); 1960 from 'other agricultural' index based on 1955 (see (5) p I-14)

Groundnuts: Values calculated for 1918, 1921, 1923-8, 1937, 1946, 1950, 1955, 1960 and 1965
Quantity: As tobacco
Price: 1928-55 Producer price from (4) p 184; 1918-21 from 'other agricultural' index based on 1928 (see (1) p H-29); 1960 + 5 from 'other agricultural' index based on 1955 (see (5) p I-14; (2) p 8.23)

Tobacco values for 1946, 1950, 1955 and Sugarcane values for 1923-8, 1937 supplied by second-order Lagrangian interpolation. 1965 sugarcane value taken to be 50% higher than 1960 values. Cash crop subtotals were then found and missing values were supplied by second-order Lagrangian interpolation. Post 1965 values found as under B.

D - Vegetables

Values calculated directly for 1918, 1921, 1926-8, 1937, 1946, 1950, 1955, 1960 and 1965

Quantities: Potatoes: 1918-55 (1) p I-13; 1960, 5: Agricultural Censuses
Sweet potatoes: 1946-55 (1) p I-13; 1960, 5 Agricultural Censuses

Prices: Potatoes: Wholesale prices 1918-55 (1) p H-6; 1960 (5) p I-9; 1965 (2) p 8.17
Sweet potatoes: Wholesale prices 1946-55 (1) p H.6; 1960 (5) p I-9; 1965 (2) p 8.17

Value of sweet potatoes taken at 2.5 value of potatoes (average post-war proportion for 1918, 1921, 1926-8, 1937. Vegetable subtotals were then found and missing value were supplied by second-order Lagrangian interpolation. Post 1965 values found as under 3.

E - Cattle

Meat of cattle lost: Cattle lost: 1918-57 (1) p I-10; 1958-63 (2) p 9.12
Value of meat per head: Assume each head yields 500 lb of meat and value 'dead meat' at 1/3 of slaughtered stock. Producer price of beef: 1918-55 (4) p 183;1956-60 (5) p I-14 (from 'slaughtered meat' index based on 1955); 1961-9 (2) p 8.23)
Missing values for 1934-6, 1938-9 supplied by second-order Lagrangian interpolation
Cattle lost in 1961-2; 1964-9 assumed to be 324,000 (1955-60, 63 average)

Hides: Number: 1918, 1921, 1926, 1930, 1937, 1946, 1950, 1955, 1960, 1965 from relevant Agricultural Censuses

Price: 1939; 8/- per hide as in Union of South Africa, Report of the Commission into Native Reserves, Pretoria, 1946. 1926-55: Apply 'hides and skins' index from (1) p H-29; 1918-21 Apply 'pastoral products' index to 1926 price; 1960: Apply 'hides and skins' index to 1955 price (see (5) p I-14) 1965: Apply 'other pastoral' index (see (2) p 8.23)
Missing values supplied by second-order Lagrangian interpolation.

Milk: Size of reserve herd: 1918-57 (1) p I-4; 1958-69 (2) p 9.6.

Milk output: Assume 1/4 of the herd produce 25 gallons of milk per year.
Price: Producer price 1938-55 (4) p 183; 1918-37 and 1956-69 apply 'dairy product' index to 1938 and 1955 prices.
Slaughtered meat: Assume 2½% of the reserve herd slaughtered each year.
Size of herd found as under milk. Price of beef found as under meat of cattle lost.

F - Small Stock

Meat of sheep and goats lost:

Sheep and goats lost: 1918-57 (1) p I-10; 1958-60 (5) p J-8; 1963 (2) p 9.12

Value of meat per head: Assume each head yields 40lb of meat and value 'dead meat' at 1/3 of slaughtered stock. Producer price of mutton 1918-55 (4) p 183, 1956-63 (5) p I-14 using 'slaughter stock index' based on 1955.
Missing values supplied as in the case of cattle, the 1955-60, 63 average here being 645,000.

Skins: As Hides under E, but with the 1939 value of a skin being 1/-

Slaughtered meat:

Size of reserve herd: 1918-57: (1) pp I-5 and I-7 1958-61: (5) pp J-5 and J-6 1962-9: (2) p 9.7

Assume 4% of the reserve herd slaughtered each year. Price of meat found as outlined above.

Wool: Quantity: 1918; 1921; 1923-30; 1934-39; 1946, 1950, 1955, 1960 and 1965 from relevant Agricultural Censuses

Price: 1918-55 (4) p 183; 1960 (5) p I-14 using 'wool/mohair' index 1965 (2) p 8.23 using 'livestock products' index

Mohair: Quantity: As Wool

Price: 1918-50 (4) p 1983; 1955/60 (5) p I-14 using 'wool/mohair' index 1965 (2) p 8.23 using 'livestock products' index.

Wool and mohair subtotals found; missing values supplied by second-order Lagrangian interpolation. Post 1965 values found as under B.

G - Pigs and Poultry

Pigs: Size of reserve herd and size of national herd: 1918, 1921, 1923-30, 1937, 1946, 1950, 1955; (1) p I-8 1960; 1963-5; 1968-9: (2) p 9.12

Value of pig products (national): 1918-55 (1) p I-25; 1960-9 (2) p 9.32

Value of pig products (reserve) taken as $1/4 \times \frac{\text{size of reserve herd}}{\text{size of national herd}} \times$ value of pig products (national)

Poultry: Size of reserve flock and size of national flock: 1926; 1930; 1937; 1946; 1950, 1955 (1) p I-8 1960; 1964-5; 1968-9; (2) p 9.12.

Value of poultry products (national) and (reserve) as pigs, mutatis mutandis.

Appendix II

Notes on the subsistence requirements of every five people in the reserves

The subsistence bundle is calculated for a family of 5 (man, women and three children) and consists of (per annum):

Food:	Maize and mealie meal	10.7 bags
	Dry beans	355 lb
	Meat	298 lb
	Fat	85 lb
	Coffee	12 lb
	Sugar	55 lb
	Vegetables	425 lb
	Salt	37 lb
	Milk	85 gallons

Consumption is assumed in the proportions of 1.0, 0.85, 0.75, 0.60 and 0.50 for the man, women and first, second and third children respectively.

Household requirements:	Soap	12 bars	
	Paraffin	8 gallons	
	Matches	6 packets	
	Candles	12 lb	
Clothing: (1939 prices)	Man	£2.425	
	Women	£2.150	
	Children	£2.350	
		£6.925	

Other: Allowance for cotton, needles, beads, household utensils, implements, kraal upkeep, taxes, stock rates, church and school fees, school books, doctor's expenses, medicines, funerals etc. £5.85 (1939 prices)

Sources used in valuation: (Source codes as Appendix I)

Maize and mealie meal: Maize producer price (see Appendix I)

Dry beans: Dried beans producer price (see Appendix I)

Meat: Producer price for beef (see Appendix I)

Fat: 1918-59 Wholesale price of lard from (1) p H-6; 1960-3 Retail price of lard fitted to 1959 wholesale price((5) p I-8); 1964-9 (2) p 8.16

Coffee: 1918-58 Retail price from (1) p H-20;1959-63 (5) p I-10; 1964-9 (2) p 8.17

Sugar: 1918-59 Retail price from (1) p H-20; 1960-63 (5) p I-10; 1964-9 (2) p 8.1

Vegetables: 1918-59 Wholesale potato price from (1) p H-6; 1960-3 retail price fitted to 1959 wholesale price ((5) p I-8); 1964-9 fitted retail price ((2) p 8.17)

Salt: 1921-59 Retail price from (1) p H-21; 1918 as 1921; 1960-3 (5) p I-10; 1964-9 (2) p 8.18

Milk: Producer price (see Appendix 1)

Soap: 1935-59 Retail price from (1) H-21; 1918-34 Wholesale price of yellow soap fitted to 1935 retail price ((1) p H-9); 1960-3 (5) p I-11; 1964-9 (2) p 8.18

Paraffin: 1918-59 Retail price from (1) p H-21; 1960-3 (5) p I-11; 1964-9 (2) p 8.1

Matches: 1938-59 Retail price from (1) p H-21; 1960-3 (5) p I-11; 1964-9 (2) p 8.18

1918-37 Apply retail price index to 1938 price (see (1) p H-23)

Clothing: 1939: £6.925; 1918-37 apply retail price index ((1) p H-23) to 1938 price. 1938-57 apply clothing price index to 1939 estimate (see (1) p H-23); 1960-3 (5) p I-11; 1964-9 (2) p 8.20

Other: 1939: £5.65, 1918-59 apply retail price index (1) p 4-23; 1960-3 (5) p I-11 1964-9 (2) p 8.21

The costs of the total subsistence bundle and of its food component for a family of five are reported below:

Date	Total cost (£)	Food cost (£)	Date	Total cost (£)	Food cost (£)	Date	Total cost (£)	Food cost (£)
1918	43.13	27.76	1936	31.29	18.48	1954	98.42	64.64
1921	56.37	37.36	1937	34.16	21.07	1955	99.07	64.74
1923	40.61	25.40	1938	35.43	21.50	1956	99.34	64.66
1924	42.36	27.19	1939	35.40	21.47	1957	99.77	64.59
1925	41.30	26.18	1946	63.74	42.30	1958	105.94	70.23
1926	40.62	25.71	1947	66.23	43.30	1959	99.79	64.07
1927	41.34	26.42	1948	71.19	44.66	1960	100.89	64.83
1928	40.50	25.61	1949	77.01	48.33	1961	103.56	67.26
1929	41.39	26.52	1950	78.25	48.90	1962	101.36	64.89
1930	37.42	22.90	1951	84.26	52.62	1963	100.18	63.79
1934	34.72	21.91	1952	93.19	59.89	1964	103.24	66.39
1935	31.28	18.53	1953	100.81	67.44	1965	111.06	73.42
						1966	116.70	78.34
						1967	118.15	79.18
						1968	119.42	79.94
						1969	122.26	82.25

The ratio of one man to one woman to three children is not an accurate reflection of the demography as a whole. It is possible to estimate roughly a correction to the cost of subsistence per 5 people assuming a more accurate age-sex distribution.

Assume that the dependency ratio (ratio of children 0-14 to men 15-64) is 3.00
Assume that the absenteeism coefficient (men absent divided by total men) is 25%
and 8% of the men over 15 are over 64. Then for 175 people in the reserves:

	M	F
0-14	40,6	54,1
15-64	31,6	45,9
65 +	2,8	
	75	100

i.e. M:F:children = 0.197: 0.262: 0.541
i.e. there are more women and fewer children in each set of 5 persons

On the assumptions spelt out above, this implies an increase in food requirements of 1,8% and in clothing of 5,8%. These increases imply an increase of 2,2% in the 1939 subsistence bundle. It has not seemed worthwhile to make an adjustment of this order of magnitude to the figures reported.