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A SCENARIO OF CHANGES IN SUBSISTENCE LAND USE AND ITS RELEVANCE TO THE TRIBAL AREAS OF ZIMBABWE

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POPULATION PRESSURES, both human and livestock, and widespread land degradation are two major problems in the tribal areas of Zimbabwe, placing severe constraints on development prospects in many regions. Whilst subsistence agriculture forms the foundation of the tribal economy, it is supplemented by an inflow of cash and goods largely derived from migrant workers and in recent years cash cropping and sales of livestock have become increasingly important elements of tribal farming. Therefore external influences have greatly modified the subsistence agriculture in the Tribal Trust Lands, but this has been matched equally by internal influences and in particular increasing population pressure.

There is a great need to improve standards of living in the Tribal Trust Lands but generally attempts to improve agricultural production and conservation practices have experienced varied and sometimes limited success. Various factors have militated against the adoption of more efficient and productive farming methods, including the tribal land tenure system, the socio-economic circumstances of individual farmers and the inherent conservatism of tribal populations faced with increasing numbers of people and conditions of land hunger. Political factors have also played a role in this resistance to change; for example the construction of contour banks, prohibition of cultivation adjacent to streams and compulsory destocking although necessary for conservation and agronomic reasons, have been 'imposed' on tribal farmers and, especially where these have involved time, effort and loss of income, such practices have been resisted strongly.

Land hunger and food production have attracted renewed attention with the changing political circumstances in this country. The present dual farming economy with commercial and subsistence sectors is unlikely to change substantially over the next few years, but there is already great pressure to take over apparently 'under-utilized' commercial farmlands for the resettlement of African families from congested tribal areas. In the recent Five Year Plan for Rural Development (Ministry of Finance, 1978) areas of highest population pressure and lowest per capita incomes in the Tribal Trust Lands have been designated as 'Intensive Rural Development Areas' (IRDAs). Concerted efforts to develop these IRDAs are likely to

be hampered by a lack of funds, personnel and the low agricultural potential of the tribal regions (Whitlow, 1980a). However, this does represent a positive move to improve agriculture and general economic conditions within the Tribal Trust Lands and if combined with controlled resettlement schemes should achieve a reasonable level of success.

Since population - resource relationships and land use are major issues in many development projects it is perhaps timely to review the present status of agriculture within the tribal areas, especially as this has a bearing both on resettlement schemes and development prospects. There is an extensive literature on tribal agriculture, and so, to avoid tedious repetition, the present paper will attempt to synthesize the various elements of the current situation by using a scenario of changes in subsistence land use under population pressure. Before this is presented and its relevance to the tribal areas is evaluated, it is necessary to describe some of the general characteristics of the Tribal Trust Lands.

GENERAL BACKGROUND

Crop and livestock production in this country are greatly influenced by the amount and variability of rainfall. The Agro-Ecological Survey (Conex, 1976), defines five natural regions on the basis of rainfall; conditions become increasingly marginal for agriculture from Region I to Region V as the amount and reliability of rainfall decrease. Commercial dryland cropping is not considered a feasible proposition in Regions IV and V, these areas being utilized largely for livestock and game ranching in the commercial sector. However, the tribal farmer is forced by circumstance to attempt to grow crops in these low rainfall regions.

Table I

DISTRIBUTION OF LAND AND CULTIVATION ACCORDING TO AGRO-ECOLOGICAL REGIONS (1977)

	Agro-Ecological Region					
	I	*II*	*III*	*IV*	*V*	
A. PERCENTAGE OF LAND						*Total*
Tribal Trust Lands	0,5	8,9	16,4	44,4	29,8	100,0
Commercial Farming Areas*	2,9	26,8	22,1	24,8	23,4	100,0
Zimbabwe	1,8	15,4	18,5	37,4	26,9	100,0
B. PERCENTAGE CULTIVATED AND FALLOW						*Average*
Tribal Trust Lands	38,4	42,2	33,1	23,1	17,1	24,7
Commercial Farming Areas	7,0	29,3	10,6	4,5	2,8	12,2
Zimbabwe	12,6	32,7	20,0	16,8	11,2	16,4

Source: Whitlow (1979a)

* Former Intensive Conservation Areas

The figures in Table I indicate the present situation with regard to the distribution of land of varying quality and the proportions of cultivated land. For comparative purposes the data on commercial farming areas and national averages are presented; a comprehensive discussion of the data is presented elsewhere (Whitlow, 1979a).

For present purposes it is necessary to note the following. Firstly, nearly 75 per cent of the tribal areas occur in Natural Regions IV and V, which are marginal for agricultural production; and secondly, there is an extremely high proportion of the land under the plough in the tribal areas even in regions not suited to cropping. The implications of these two facts in relation to agricultural development are self-evident. Moreover, the high proportion of land under cultivation is symptomatic of land hunger and population pressure. Kay (1975) has described 57 per cent of the tribal areas as being over-populated or grossly over-populated. This assessment was based on the 1969 census when the population of the Tribal Trust Lands was estimated to be about three million; the current estimate of tribal population is approaching four million people, and so conditions have probably deteriorated considerably since 1969. High population densities can be sustained in the tribal areas but the consequences include recurrent food shortages after poor rainy seasons and extensive land degradation (Kay, 1976). Obviously one objective of general development in the tribal areas should be to relieve pressure on the land as a means of improving standards of living and also to prevent further environmental deterioration.

Against this general background the scenario on subsistence land use which is relevant to the situation in the Tribal Trust Lands can be presented.

SCENARIO OF SUBSISTENCE LAND USE

Descriptive scenarios of the type present in Figure 1, whilst having certain limitations, have the advantages of:

providing a useful framework for discussion;
identifying key problem areas within the broader context of a land use system;
incorporating important concepts on population - resource relationships;
being applicable to individual resources and at varying scales from a regional to a local level.

Whilst 'scenario analysis' can be used to predict possible future changes in a given system (e.g. Meadows, Meadows, Randers and Behrens, 1972), the present scenario is restricted more to the four elements mentioned above. It is based largely on experience in Central Africa (Kay, 1979), although it is relevant to subsistence land use systems in general.

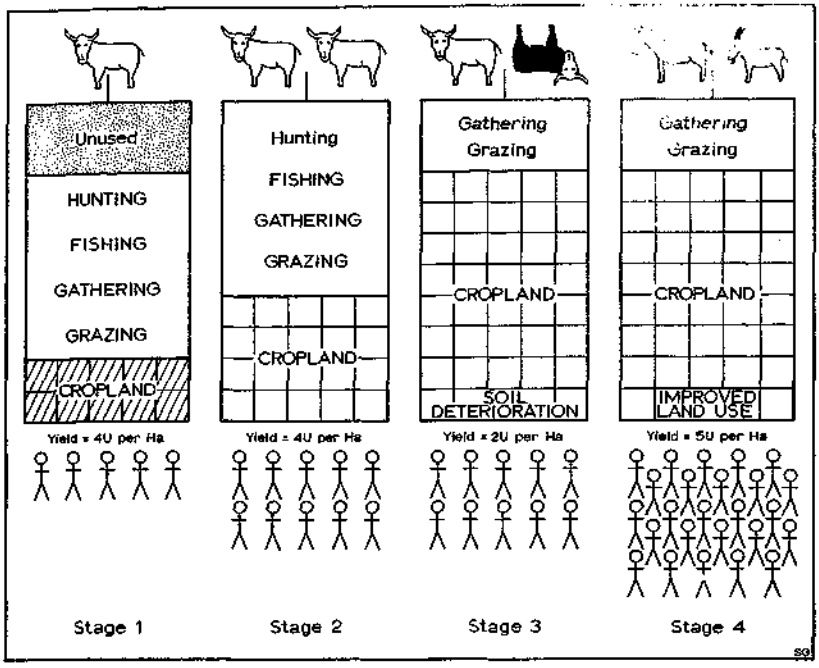

Figure 1: A SCENARIO OF A SUBSISTENCE LAND USE SYSTEM PLACED UNDER POPULATION PRESSURE (after G. Kay, 1979, personal communication)

An integral part of the scenario is the concept of *carrying capacity* which can be stated as follows:

> any area of land will support in perpetuity only a limited number of people [and livestock] . . . if this limit is exceeded, without a compensating change in the system of land use, then a cycle of degenerative changes is set in motion, which must result in deterioration or destruction of the land and ultimately in hunger and reduction of the population (Allan, 1949, p.1).

The concept has been commented on by various authors and different methods have been proposed as a means of assessing carrying capacity (e.g. Allan, 1949; Street, 1969; Ricci, 1978). In subsistence cultivation systems there is a strong correlation between increasing population pressure and increasing agricultural intensity (Turner, Hanham and Portararo, 1977); for example, there is a reduction in the crop - fallow ratio as pressure on the land increases. Carrying capacity is generally expressed in terms of a given number of people or livestock per square kilometre and depends in part on land quality; thus higher quality land can support greater numbers of people and livestock than poor quality land. Optimum densities or safe carrying capacities can be identified and related to actual densities to

determine the extent to which carrying capacity is exceeded or not yet reached. If the critical densities are exceeded then the land degradation processes mentioned by Allan (1949) are initiated and these can substantially lower the carrying capacity of the land thereby reducing the populations that can be effectively supported in a given area.

There are four stages in the subsistence land use scenario proposed by Kay (1979) and shown in Figure 1. Whilst these are presented as discrete stages it should be born in mind that in reality they form a continuum. The four stages are as follows:

Stage 1: this is characterized by low population densities and no pressure on the land. Areas which are not cropped provide a variety of foodstuffs and materials which contribute significantly to the upkeep of subsistence households, especially during the 'hungry months' and drought periods (Puzo, 1978). Also there are areas which are not utilized at all since the small populations can be supported on a limited area of land.

Stage 2: as the human population increases so the area under cultivation is extended to produce more food. Numbers of livestock also increase, but the extension of cropland has not reduced the area available for grazing and food supplies can still be supplemented by fishing and hunting. However, there is no unutilized land remaining and whilst crop production levels have been maintained, soil fertility has declined as a result of leaching, soil erosion and crop removals. The critical thresholds in the physical environment have been reached and a cycle of degenerative changes is set in motion. In the early stages this will have very little impact on human and livestock populations, but changes in natural systems tend to be closely inter-related and reinforcing (Chorley and Kennedy, 1979); therefore it is now just a question of time before declining land quality affects these populations.

Stage 3: prolonged cultivation has resulted in declining yields, and so to maintain production levels the area under cropping is extended at the expense of the grazing lands. The areas taken over for cropping at this stage are likely to be characterized by less fertile soils and steeper slopes, that is marginal lands; therefore yields from these croplands are unlikely to be high. Although there has been no increase in human populations, the early symptoms of pressure are present. These include the following:

Fishing and hunting no longer form a significant part of the subsistence economy; thus certain dietary deficiencies may be initiated amongst the human population.

Gathering of foodstuffs and materials such as woodfuel from the indigenous vegetation is less affected, except in so far as it requires more time and effort to obtain these commodities than before (Whitlow, 1979b).

The main impact of exceeding the carrying capacity is manifested

> amongst the livestock and the grazing lands; over-grazing and selective removal of palatable species reduces the number of livestock that can be effectively supported on a more restricted area of grazing lands. This stage can be referred to as 'subsistence carrying capacity' (Dasmann, Milton and Freeman, 1973) and the livestock experience starvation, malnutrition and mortality levels, which, especially in drought periods, are extremely high.

Stage 4: this final stage has been described by Kay (personal communication, 1979) as follows:

> improvements in the use of cropland to gain increased returns from a given area can support an increase in population, *but* this adds further pressure to the non-cropland leading to a greater scarcity of all resources derived directly from the biosphere . . . also donkeys and goats tend to replace cattle on degenerate scrub grazing which is still one stage before livestock are pushed out altogether, and man is reduced to a vegetarian being surviving on a narrow range of crops.

Elements of this scenario would seem to apply not only to the tribal areas of Zimbabwe, but also to other developing countries in the tropics where the F.A.O. (1967, p.53) have reported that 'increases in agricultural production over the years have been accomplished more by expanding the areas cultivated than by raising productivity'. The extension of cultivation has been one of the main factors contributing to widespread global deforestation (Eckholm, 1977) and has been described as 'merely "buying time" against the land hunger problem which must be solved rather through agrarian reform and informed land use policy' (F.A.O., 1967, p.54). This statement is particularly relevant to Zimbabwe at the present time since the resettlement schemes which may become operational over the next few years can only be a temporary panacea for the sensitive political issue of land hunger.

APPLICATION OF SCENARIO TO TRIBAL TRUST LANDS

The relevance of the subsistence land use scenario to the tribal areas can now be evaluated. Discussion will be carried out under the following:

1. Changes in cultivated areas
2. Utilization of woodland resources
3. Livestock in the tribal areas.

There are other factors which could be examined which provide further evidence of population pressure. For example, unbalanced sex ratios amongst the tribal population could provide an index of the degree of pressure (Hunter, 1966); hence areas experiencing severe pressure would be more likely to lose active males through rural - urban migration than areas where there was little or no pressure on the land. Kay (1972) has described how selective migration has 'leached' the tribal areas of Zimbabwe of their most

capable workers — a fact which has important implications for rural development programmes. However, to date, the structure of rural populations has not been used as an index of population pressure in individual tribal areas.

1. Changes in cultivated area: Nearly 25 per cent of the Tribal Trust Lands are at present under cultivation or fallow and in 17 per cent of areas the proportion of cultivation exceeds half of the available land (Whitlow, 1979a). Moreover, there is a strong (and not unexpected) correlation between the areas of greatest population pressure and areas with a high proportion of cropland (Whitlow, 1980b). Increases in area under cultivation within the Tribal Trust Lands can be seen as a response to the following:

(a) increases in population, from about 500,000 people in 1900 to nearly 4,000,000 in 1977;
(b) declining productivity of croplands necessitating extension of cultivation to maintain and increase production levels.

Another factor which has resulted in the extension of cultivation is the introduction of cash crops such as cotton and groundnuts. The tendency has been to continue growing the staple food crops, with additional areas being used for cash crops. Moreover, crops such as cotton constitute soil erosion hazards since they provide only limited ground cover during the early growing season when intensive rains are common (Stocking and Elwell, 1976); this would result in a further decline in productivity and exacerbate the pressure on cultivated lands. Estimates of the changes in cultivated land from 1900 to 1977 are presented in Table II. Although these figures are undoubtedly subject to errors they provide an indication of the general magnitudes of changes in area under cropping. The author's estimates are based on the sampling of over 8,000 aerial photographs for the period 1972 - 7; a range is given for these estimates corresponding with values of 35 per cent and 45 per cent fallow for the higher and lower estimates of cropland respectively (Whitlow, 1979d).

Table II

CHANGES IN CULTIVATED LANDS IN THE TRIBAL AREAS, 1900 - 1977

Year	*Cultivated Area Per Person (ha)*	*Total Area Under Cultivation (ha)*	*Source*
1900	0,43	215 000	Kay (1970)
1945	0,48	480 000	Kay (1970)
1962	0,52	1 134 600	Stubbs (1979)
1975	0,60	1 800 000	Walker (1975)
1972 - 7	0,55 - 0,65	2 304 700 - 2 584 000	My Calculation

Using the estimates presented in Table II it is possible to calculate the percentage changes in cultivated land from 1900 to 1977 and to relate these to the population increase over the same period (Table III). The higher values of my estimates are taken as more realistic for 1977, since Walker (1975) suggests that his estimate of cultivation is a conservative one and also the aerial photography covering the more densely settled areas of the Tribal Trust Lands was taken during 1972 - 5; one might therefore expect that there had been a slight increase in area under cultivation by 1977.

Table III

PERCENTAGE CHANGES IN CULTIVATED LAND AND POPULATION IN THE TRIBAL AREAS, 1900 - 1977

Year	*Cultivated Area Per Person (ha)*	*Total Area Under Cultivation (ha)*	*Tribal Population*
1900	0,43	215 000	500 000*
1977	0,65	2 594 000	4 000 000
% increase	50	1 100	700

*relates to total population in the country since no figures relevant to the present tribal areas were available for 1900.

Evidently there has been a considerable extension in the area under cultivation since 1900; but, more significantly, this has involved an increase in area of land cropped per person, a feature which is symptomatic of a subsistence cultivation system under pressure and attempting to maintain production levels in the face of declining soil fertility. Thus an increase of 700 per cent in population over the survey period is considerably less than the 1 100 per cent increase in the area under the plough. This trend conforms with the changes suggested in the scenario on land use in Figure 1. In addition, nearly 25 per cent of the tribal areas are characterized by domed inselberg or 'dwala' terrain which greatly limits the potential for further extension of cultivated lands since up to 35 per cent of these regions may be occupied by rock outcrops (Whitlow, 1980b). Such areas, unfortunately, coincide with some of the most densely populated Tribal Trust Lands in this country. This means that the final stage of Kay's scenario may already be found in certain areas but these may still be lacking the 'improvements in the use of cropland' necessary to sustain further increases in population. This, combined with the disruption of medical facilities caused by the present war, may result in widespread human suffering and possibly mortalities in these regions.

2. Utilization of woodland resources: An important element of the subsistence land use scenario is the gathering of foodstuffs and materials from the

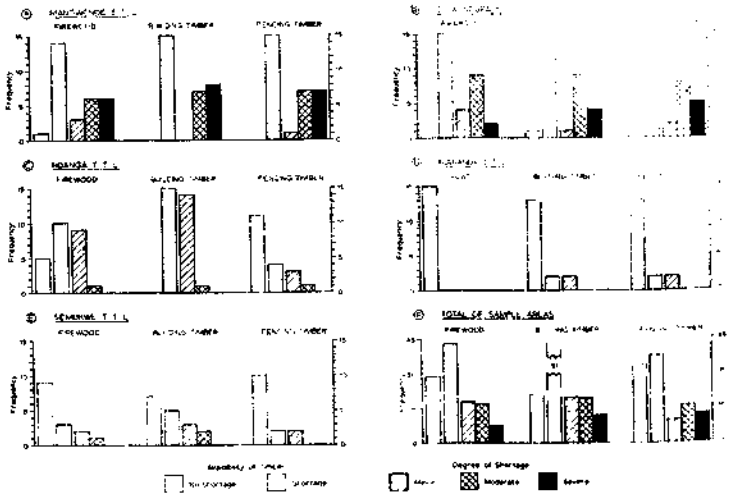

Figure 2: SHORTAGES OF WOOD IN FIVE TRIBAL AREAS IN ZIMBABWE

indigenous vegetation. As the population increases and the cultivated area extends at the expense of woodlands, so increasing pressure is placed on the diminishing resources of the biosphere. A recent pilot questionnaire survey on the use of woodland resources in five tribal areas has revealed some significant population - resource relationships with respect to the shortages of timber for firewood, building and fencing (Fig. 2). The details of the five tribal areas sampled are given in Table IV. Although the total number of households sampled was small (72), there were distinct differences between the five areas which suggested varying degrees of pressure on the woodlands. Shortages of timber were assessed on a qualitative scale of 'minor', 'moderate' and 'severe'.

Table IV

POPULATION DENSITY IN TRIBAL TRUST LANDS

Sample Area	*Density of Population/km²* *(1977 estimate)*		*Number of Households Sampled*
	Human	*Livestock*	
Mangwende	50	42	15
Chiwundura	59	89	15
Ndanga	54	76	15
Maranda	24	32	15
Semukwe	22	86	12

Source: Whitlow (1979b), p.5.

The trends in Figure 2 are a function of not only population pressure, but also the characteristics of the local woodlands and the availability of preferred species (Whitlow, 1979b). In general it would seem that there are shortages of all three commodities of firewood, building and fencing timber in the tribal areas (Fig. 2,F). The shortage of building timber is most acute followed by firewood and then fencing timber. There are however marked differences in the degrees of shortages of these commodities between the five sample areas. The most severe shortages occur in Mangwende and Chiwundura tribal areas which have extremely high population densities (Table IV). Shortages of timber especially for building are beginning to be felt in Ndanga which also has a high population density; a more recent survey suggests that the shortages in this area are more acute than revealed in the pilot study (Munzwa, 1979). The tribal areas with the low population densities, Maranda and Semukwe, seem to experience only limited pressure on their woodland resources, although the early stages of shortages are already present in Semukwe. In both Chiwundura and Mangwende Tribal Trust Lands it was discovered that shortages of timber had resulted in the supplementing of firewood with maize and paraffin and that about 50 per cent of dwellings were made of brick, partly because of the shortages of more traditional materials. This is a clear symptom of pressure on the the woodland resources which can be noted in other densely populated tribal areas. Such a situation would occur in Stage 3 of the subsistence land use scenario.

Critical areas of woodland shortages have been identified provisionally by Whitlow (1979c). These areas constitute about 20 per cent of the Tribal Trust Lands and correspond mainly with areas described by Kay (1975) as being over-populated or grossly over-populated. In many of these areas there are only remnants of woodlands surviving on the steep and inaccessible slopes; one suspects that in the absence of steep-sided hills these regions would be completely stripped of their woody vegetation. However, whilst it is relatively easy to identify areas where extensive destruction of the woody vegetation has already taken place, it is more difficult to identify symptoms of shortages in regions which still have considerable areas of woodland remaining. Shortages may well occur in these areas especially since there are definite preferences for different species related to their suitability for different purposes in the rural households (Whitlow, 1979b). However, these shortages are unlikely to be as severe as in the over-populated regions — perhaps representing a phase between Stages 2 and 3 of the land use scenario.

3. Livestock in the tribal areas: Livestock, especially cattle, have a multi-purpose role in the subsistence agriculture of the tribal areas. This varied role includes provision of draught power, maintenance of soil fertility, food production and, finally, a cultural need (Le Roux, Stubbs and Donnelly,

1978). There are in fact very good arguments for increasing the numbers of livestock in the tribal areas, but given the current situation of 'overstocking' this is not a practicable proposition at present. The problems and prospects of livestock in the tribal areas have been discussed by numerous authors (e.g. Prescott, 1961; Hornby, 1968; West, 1968; Barnes, 1978). The present discussion will be confined to the following:

(a) consequences of exceeding carrying capacity on range lands;
(b) present distribution of livestock and changes in composition;
(c) status of grazing in tribal areas.

In terms of the subsistence land use scenario (Fig. 1), Kay (1975, p.8) has stated that 'the extensions of cultivated area bring increasing scarcity in the grazing lands, and acute effects of over-population and over-stocking are first evident amongst livestock and in the grazing areas'. Since livestock and grazing conditions provide the early symptoms of population pressure, these will be discussed in greater detail.

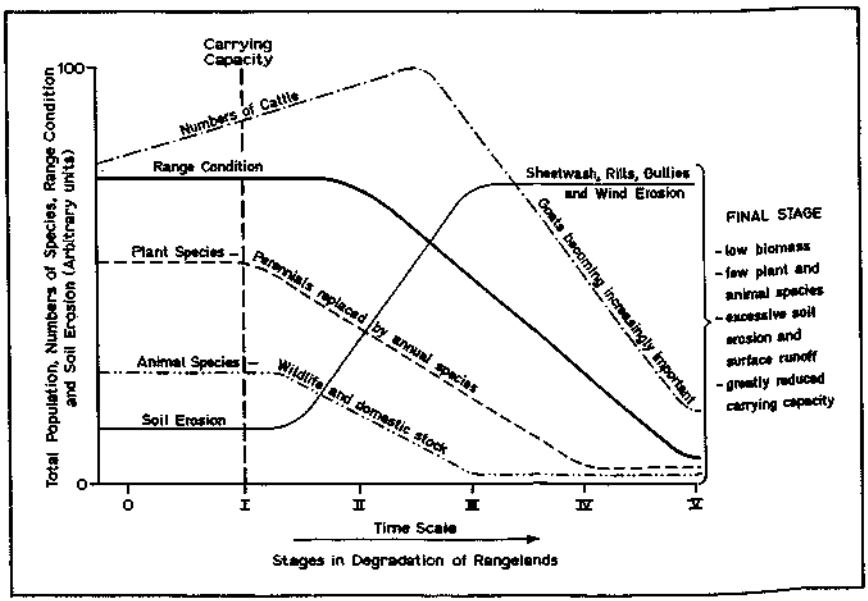

Figure 3: CONSEQUENCES OF EXCEEDING CARRYING CAPACITY ON RANGELANDS (after Savory, 1969)

(a) *Consequences of exceeding carrying capacity on range lands:*
Some of the ecological aspects of overstocking and degradation on range lands applicable to the tribal areas are shown in Figure 3. This was adapted from a scheme described by Savory (1969) with reference to game populations and applies particularly to the lower rainfall regions. The six stages

in the sequence of range land deterioration are as follows.

Stage 0: carrying capacity has not yet been exceeded and there is 'apparent' stability within the system, with a variety of plant and animal species and stable soil-water conditions. Natural erosion is at a low level.

Stage I: critical thresholds in the system are exceeded as the numbers of livestock increase beyond the carrying capacity. Selective foraging by the cattle results in the palatable perennial grasses giving way to less favoured annual grasses, weeds and shrubs. Decreasing plant cover promotes an increase in soil erosion and the general degradation of the habitat reduces the number of wild animals that can be supported.

Stage II: environmental deterioration continues with degradation processes being closely inter-related and reinforcing. The cattle population is, however, still increasing but is surviving at a subsistence level (Dasmann, Milton and Freeman, 1973). This places further pressure on the range lands and so promotes further degradation.

Stage III: a critical stage is reached where land degradation is so far advanced that starvation, malnutrition and mortalities of livestock are commonplace especially during dry periods. Bush encroachment may become a major problem in semi-arid areas, greatly reducing the effective carrying capacity for cattle, but favouring browsing stock.

Stage IV: considerable areas of the range lands have now been stripped of their protective plant cover and goats replace cattle on degraded pastures. Erosion rates continue at a high level but by this time much of the topsoil will have been removed. Poor infiltration and high run-off result in increasing aridity and this, combined with soil erosion, makes regeneration of the range lands extremely difficult.

Stage V: this represents the final stage in the degradation of the range lands which in ecological terms may constitute the 'point of no return'. From being a reasonably balanced and productive system, the final stages of degradation are characterized by: low biomass; few plant and animal species; excessive soil erosion and surface run-off; and a greatly reduced carrying capacity.

Whilst the individual details of this scheme may vary from one tribal area to another the general pattern is the same. For example, with reference to a tribal area in the south-east lowveld, Kelly and Walker (1976, p.581) state that 'intensive utilization was resulting in a change of dominance from perennial to annual grasses, with increasing year to year fluctuations in seasonal production, a large proportion of bare soil and increasing run-off of rain water'. Describing general conditions in the tribal areas of Natural Region IV and V, a scientific sub-committee (1969, p.12) stated that:

> while grazing during the dry season is relatively harmless, severe over-grazing during the growing season, coupled with the poverty of the water regime, has led to perennial grasses giving way to annual grasses and weeds. This general reduction in plant cover and the compaction of the exposed soil surface, has enhanced run-off so that the effectiveness of an already erratic rainfall is further reduced..

Rainfall amount and variability have been identified as key 'limiting factors' influencing the carrying capacity of range land particularly in low rainfall regions (Condon, 1968). Hence carrying capacities decrease with decreasing rainfall, and natural pastures are even more susceptible to serious deterioration through overstocking. Moreover, the reclamation of degraded grazing lands in semi-arid and arid areas is likely to be an extremely costly and slow process requiring a combination of destocking (i.e. removal of cause of degradation) and changes in pasture management (Barnes, 1978). Since nearly 75 per cent of the Tribal Trust Lands are in low rainfall regions which have inherently low carrying capacities, it is not unexpected that many of these areas exhibit elements of Stages III and IV of the scheme presented in Figure 3.

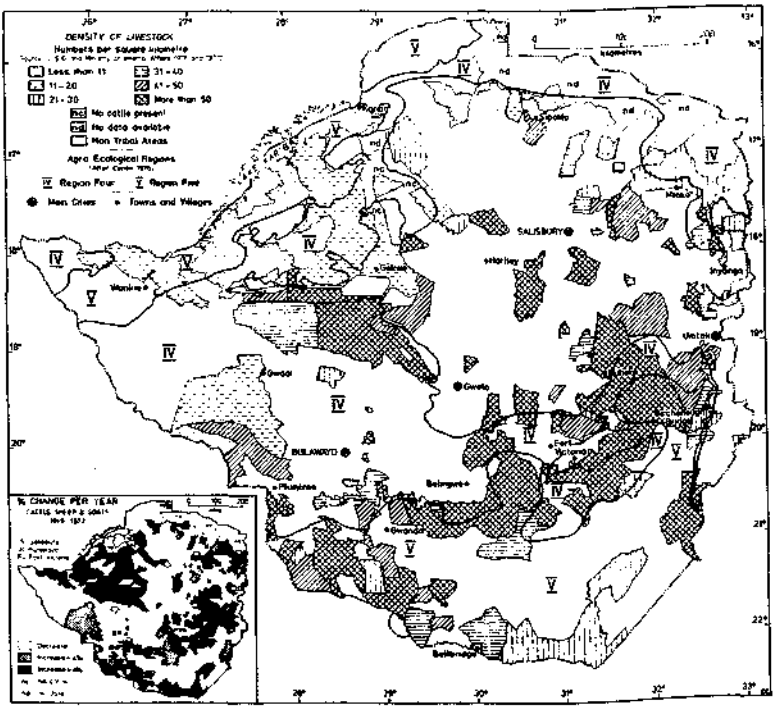

Figure 4: DENSITY OF CATTLE, SHEEP AND GOATS IN THE TRIBAL TRUST LANDS (1977).

(b) *Present distribution of livestock and changes in composition:*
The present distribution (1977) of cattle, sheep and goats is shown in Figure 4 and the relevant statistics are summarized in Table V. Although areas in the extreme north-west and north of the country are indicated as

having low densities of livestock (i.e. where data were available), it is unlikely that cattle occur in these regions because of tsetse fly infestation (Fig. 4). The highest densities of livestock, over 50 animals per square kilometre, occur in an arc of tribal areas extending from Plumtree through to Belingwe and up to Buhera. Other high density areas include the Tribal Trust Lands south of Gokwe and around Salisbury and Hartley. These constitute 39 per cent of the Tribal Trust Lands (Table V). In the more arid regions in the south of the country, densities of more than 30 animals per square kilometre are not uncommon. These densities must, however, be compared with the assessed carrying capacities of the different natural regions. Figures based on Conex estimates and the original agro-ecological survey of Vincent and Thomas (1960) are given in Table VI (Coleman, 1979).

Table V

DENSITIES OF CATTLE, SHEEP AND GOATS IN THE TRIBAL AREAS, 1977

Animals/km²	*Percentage of Tribal Area*			
	Cattle	*Sheep*	*Goats*	*Total**
under 11	27,3	88,0	49,0	8,0
11 - 20	18,1	11,8	26,0	21,0
21 - 30	16,2	0,2	11,0	10,0
31 - 40	25,1	—	13,3	10,0
41 - 50	8,8	—	0,7	12,0
over 50	4,5	—	—	39,0
TOTAL	100,0	100,0	100,0	100,0

* cattle, sheep and goats.
Source: derived from Ministry of Internal Affairs, Livestock Returns, 1977.

Table VI

ESTIMATED CARRYING CAPACITIES OF CATTLE ACCORDING TO NATURAL REGIONS

Naural Region (Conex, 1976)	*Carrying Capacity (L.S.U.*/ha)*	*Critical Densities (cattle/km²)*
I	1 : 4 ha	25
II	1 : 4 ha	25
III	1 : 6 ha	17
IV	1 : 8 ha	12
V	1 :12 ha	8

* L.S.U. = Livestock Unit (1 mature beast or 5 small livestock such as sheep and goats).

Comparing these assessed carrying capacities with the actual densities in Table V, one can appreciate that with respect to cattle alone, well over 50 per cent of the tribal areas are experiencing varying degrees of overstocking. In the more arid regions carrying capacities have been exceeded up to three times the safe stocking levels. These figures certainly suggest that the overstocking rates given by Cross (1977) are under-estimates, especially when the extensions of cultivation described earlier are taken into account. Also shown in Figure 4 as an inset map is the rate of increase of livestock populations for the period 1969 - 77. This indicates that the areas of highest densities generally correspond with those experiencing a greater than 4 per cent increase in livestock per annum. It is unlikely that such high rates of population growth can be sustained in these regions for much longer given the present state of land degradation and the current breakdown of dipping services, which has resulted in the outbreaks of various tick-borne diseases (Norval, 1978). However, the high rates of increase in the tribal areas of Victoria province and southern Matabeleland, where carrying capacities are extremely low, are cause for concern. The scenario on land use changes (Fig. 1) suggests that an important symptom of pressure on the grazing lands is a change in the composition of the livestock herd. Thus goats replace cattle on degraded pastures, especially where bush encroachment is taking place, since they can browse on the woody species and are generally hardier animals. There has certainly been an overall trend of more rapid increases of goats and, to a lesser extent, sheep in the tribal areas (Table VII). Over the period 1964 - 77 there was over a 200 per cent increase in the goat population compared with about 160 per cent for sheep and less than 90 per cent for cattle. Over the same period the human population in the tribal areas increased by about 50 per cent (Central Statistical Office, October 1978, Table 1), which is considerably less than the livestock increases!

Table VII

CHANGES IN LIVESTOCK
IN THE TRIBAL AREAS, 1964 - 1977

		Cattle	*Sheep*	*Goats*	*Total*
1964	Number	1 916 000	186 000	579 000	2 681 000
	Percentage	71,5	6,9	21,6	100,0
1977	Number	3 592 000	486 000	1 787 000	5 865 000
	Percentage	61,2	8,3	30,5	100,0
Percentage increase 1964 to 1977		87,5	161,3	208,6	118,8

Source: Central Statistical Office, October, 1978, Table 18.

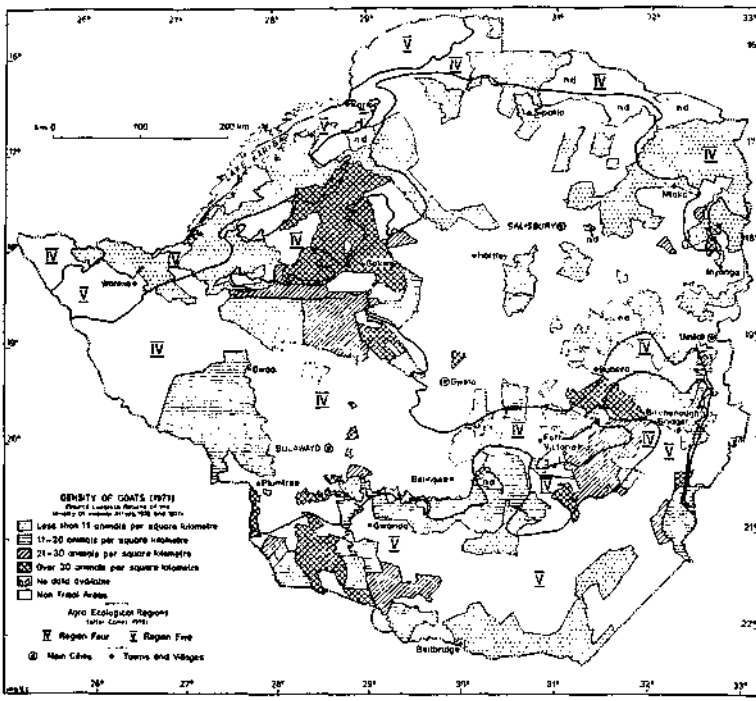

Figure 5: DENSITY OF GOATS IN THE TRIBAL TRUST LANDS (1977).

Also the proportion of goats as a percentage of the total livestock (cattle, sheep and goats) has risen from just over 20 per cent in 1964 to about 30 per cent by 1977. The present distribution (1977) of goats is shown in Figure 5. From this it can be observed that the higher densities of goats (over 20/km²) occur in three main areas: east of Fort Victoria, south of Bulawayo and in the Gokwe region. With the exception of Gokwe, these areas have been described as bare to very overgrazed by Cleghorn (1966). In these regions it is not uncommon for up to 25 per cent of the cattle to die during severe droughts such as occurred in the 1963 - 4 and 1965 - 6 seasons. This critical situation is characteristic of a well advanced Stage 3 of the subsistence land use scenario.

(c) *Status of grazing in the tribal areas:*

A survey of grazing conditions was carried out in the early 1960s and is reported on by Cleghorn (1966). In this survey the veld condition was described according to four classes as follows:

Bare: almost entirely devoid of grass cover for most of the year;

Very overgrazed: grass constituents low in the plant succession and affording a sparse ground cover. Dry season forage is in short supply;

Moderate: the plant succession may have been put back but the veld is still in a productive state and is not over grazed to the extent that forage is short every dry season; and

Good: ungrazed or grazed within its carrying capacity so that the veld remains vigorous and productive. Dry season forage is sufficient except during extremely severe droughts.

The results of this survey are presented in Figure 6 and the statistical data are summarized in Table VIII according to the natural regions defined by Vincent and Thomas (1960). In examining this data it should be noted that whilst a given area may be described as predominantly 'bare' or 'overgrazed' there may be localized areas of better grazing. Invariably the pattern of grazing within the tribal areas is one of 'pressure points' around water holes and night kraals with the result that extensive areas of veld may be under-utilized; more efficient pasture management is certainly one method of overcoming pressure on the land and increasing livestock production (Barnes and Clatworthy, 1976). Also the status of the grazing lands is dynamic with the result that areas described as 'moderate' in the early 1960s may have become overgrazed since then as a result of increases in livestock population. Similarly a 'bare' region might have experienced a succession of droughts thus resulting in a reduction of livestock; consequently in better rainy seasons the condition of the grazing lands might have improved, although processes of regeneration are generally slower than rates of degradation.

Table VIII

CONDITIONS OF GRAZING LANDS IN THE TRIBAL AREAS

Natural	*Percentage of land*					
*Region**	*Bare*	*Very Overgrazed*	*Moderate*	*Good*	*Total*	*Percentage*
I	—	21,4	76,7	1,9	100,0	1
II	—	65,5	18,0	16,5	100,0	7
III	—	68,2	12,9	18,9	100,0	14
IV	4,8	29,7	16,6	48,9	100,0	52
V	39,1	26,3	9,8	24,8	100,0	26
AVERAGE	13,0	36,4	14,8	35,8	100,0	100,0

Source: Cleghorn (1966).
* Based on Vincent and Thomas (1960).

From Figure 6 and Table VIII it can be appreciated that over 50 per cent of the tribal areas are overgrazed or bare and that these degraded pastures occur mainly in the low rainfall zones of the south-west and south-east of the country. A comparison of Figure 6 with previous maps showing the varying densities of livestock indicates that there is a strong correlation

between high livestock densities and poor grazing conditions. The only areas where grazing lands are still in good condition are those in the extreme north-west and north of the country, where tsetse fly in effect have protected the veld through preventing or limiting the raising of livestock.

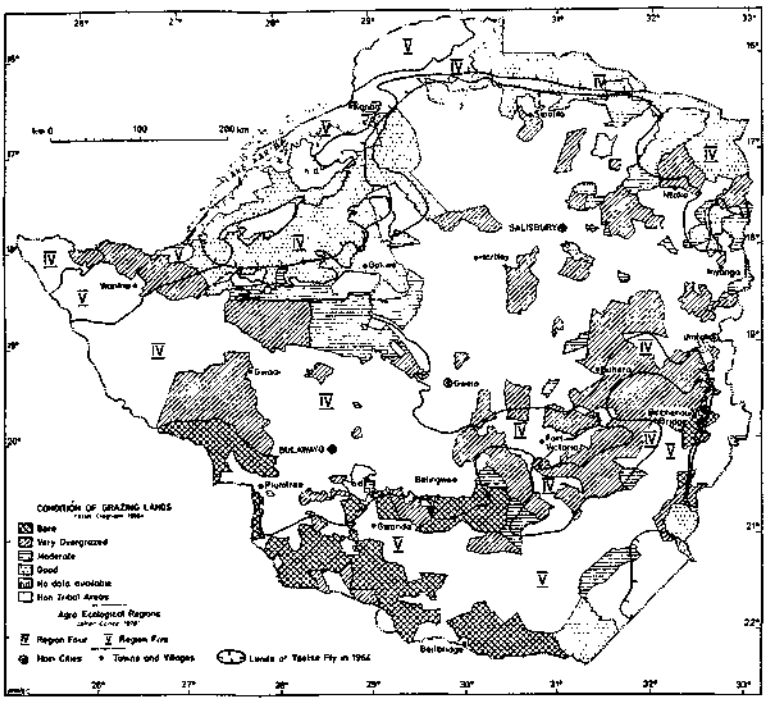

Figure 6: CONDITION OF GRAZING LANDS IN THE TRIBAL AREAS (1964).

CONCLUSION

A scenario of a subsistence land use system placed under increasing population pressure has been described. Elements of the scenario have been evaluated with respect to the status of cultivated lands, woodland resources, livestock and grazing areas in the Tribal Trust Lands. From the evidence presented it can be concluded that there is extreme pressure on the land with many areas falling into Stage 3 of the scenario, especially in the arc of tribal areas extending from Belingwe through to Buhera. Also there is some evidence for elements of Stage 4 of Kay's scenario operating in certain tribal areas, but *without* the compensating changes in land use necessary to sustain higher population densities (Kay, 1979; Allan, 1949). The prospects for development in these regions, and the Tribal Trust Land as a whole, are likely to be limited by both human and livestock population pressures

which already have resulted in extensive land degradation and serious depletion of resources. The subsistence land use scenario presented in this article has the advantage of providing a holistic framework within which the present problems of the Tribal Trust Lands can be evaluated and suitable solutions formulated.

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