

## PROBLEMS AND PROSPECTS OF INCREASED PASTORAL PRODUCTION IN THE TRIBAL TRUST LANDS\*

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THE ENVIRONMENT in the Tribal Trust Lands differs radically from that in the commercial agricultural sector. Accordingly, it is pointless to consider the technical feasibility of increasing pastoral production in the Trust Lands without taking into account the relevant demographic, sociological, economic and ecological facts. As they apply overall, these can be summarized as follows:

In most Trust Lands the pressures of the human and livestock populations are intense and are increasing. Overstocking is widespread, and stock losses from poverty exceed 100 000 livestock head in seasons of poor rainfall. In fact, in many areas the position has been reached where there are heavy stock losses even in favourable seasons. Large areas of veld are severely degraded, especially in the medium and low rainfall areas. Because vegetative cover has been drastically reduced, run-off is increased and dry environments have been made yet drier.

Whereas there is individual ownership of livestock, grazing land is used communally on the basis of tribal, family or kinship groups. Many tribespeople hold strong beliefs relating to tribal and ancestral spirits and the association of these with land and livestock. Generally speaking, there is no control of numbers of livestock.

Only about one-quarter of Tribal Trust Land is situated in areas of moderate to high agricultural potential, that is Natural Regions I, II and III (Vincent and Thomas, 1957); also about one-quarter falls within the area presently infested by tsetse. Production systems are largely of a subsistence nature and land use is commonly exploitive, without regard to renewal of resources. Capital formation is negligible, and, in the absence of collateral, credit is rarely available.

Sociologically, there is often pressure on the individual to conform to the views of the majority. The outlook is generally conservative and, in the circumstances, is understandably oriented towards security in terms of

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basic needs at subsistence level. There is a traditional obligation for individuals to distribute surpluses among the more needy members of the community.

The infrastructure is poorly developed and is pegged to the prevailing subsistence economy. The land use pattern, and the siting of services and facilities, is commonly haphazard and without regard to well-established principles of land classification. Many adult males leave to work in the commercial sector, and consequently the rural population comprises a relatively high proportion of old people, women and children. Because of their economic status and the national land tenure policy, most of the Africans employed outside the Trust Lands have been forced to look to the Trust Lands for security of domicile and for the means of providing subsistence for their families, and, when necessary, themselves. Large areas of arable land are cultivated merely to maintain tenure rights. The standard of husbandry on such lands is especially poor, productivity is low, and the problem of depletion of fertility is greatly aggravated.

### LIVESTOCK IN THE TRIBAL ECONOMY

Apart from any religious connotations, livestock and cattle, in particular, have special significance in the tribal economy. In all but the exceptionally dry areas, they are not kept primarily for the production of meat or milk, but as essential components of the subsistence production systems on arable land. Danckwerts (1974), for example, estimated from a socio-economic study in Victoria Province that of the total gross output from cattle, draught for ploughing and manure (arable inputs) comprised 49.2 per cent, milk and meat for home consumption 33.2 per cent, and sales of livestock 17.6 per cent.

Extensive areas of inherently infertile sandy soils in the Tribal Trust Lands have been severely depleted by exploitive cropping. It is now well established that the rehabilitation of these soils, as well as the maintenance of productivity, is difficult, if not impossible, without the application of composted manure (a well-rotted mixture of dung, urine and dry plant material) as well as fertilizer (Grant, 1976); inorganic fertilizers alone are not effective. Experiments indicate that the desirable average annual dressing of manure for satisfactory results is about ten tonnes per hectare, and that to obtain this amount six metric livestock units (one livestock unit = 500 kg live body mass) are needed (Rodel and Hopley, 1973).

Because of the present imbalance between numbers of livestock and the area of land cultivated, applications of manure fall far short of the desirable level, and yields are only about one-third of those attainable with this application. Numbers of draught animals are also inadequate. In consequence, land preparation is often sub-standard, crops are planted late, and the transport of such manure as is available is difficult. These factors contribute further to low crop yields.

With increasing population pressure and with declining yields, the cultivated area is increasing with a corresponding decrease in the area of grazing land. It is imperative that this trend be reversed by raising the productivity of the arable land; it is imperative also that the right balance be struck between the number of stock which can be carried, and the area of land cultivated. The aim should be to carry six livestock units for every hectare of cropland, and livestock should be so distributed and managed that the making of composted manure and its application to cropland is facilitated. The realization of this aim would make it possible to reduce the area presently cultivated by two-thirds.

In the drier environments of Natural Regions IV and V rainfall is exceedingly variable, both within and between seasons. In such circumstances, the tribesmen cultivate relatively large areas of land in an attempt to produce their food grain requirements. Crop failures due to drought are common and in drought years livestock are sold to cover cash needs and in order to buy grain.

Hence, livestock play a vital role in tribal agriculture in both the high and low rainfall areas. Their rational management and the adoption of measures aimed at increasing carrying capacity and production are key features in a programme of rural development. This implies not only the intensification of production, but also the reclamation of the large areas of grazing land which is presently degraded as a result of overstocking, or which, having been depleted of fertility by exploitive cropping, has been abandoned.

## RECLAMATION AND INTENSIFICATION

Reclamation can be regarded as a particular form of intensification, which in turn can be defined as the production of more and better quality feed, and arranging for its efficient use by livestock. In practice, intensification involves some or all of the following factors:

1. Restoration of the plant cover to the appropriate level for a given environment, and changing its botanical composition to that characteristic of sound veld in the area.
2. Elimination of undesirable plants and their replacement with plants which are inherently more productive.
3. Increasing the supply of nitrogen to the plant, and eliminating deficiencies of nutrients other than nitrogen.
4. Improvement of plant soil-water relations.
5. Application of efficient grazing procedures, and, where necessary, the provision of suitable mineral and protein-rich supplements for livestock.

The manipulative possibilities and the level of intensification which

is feasible are determined by the physical environment, particularly the rainfall, and by economic considerations. A high level of intensification is exemplified by an irrigated grass pasture, heavily fertilized with nitrogen and such other elements as are required. At a low level, intensification might involve merely the provision of water points in low rainfall areas and the application of grazing procedures designed to maintain the grazing resource. From the one extreme to the other, the difference in output might be one-hundred fold or more.

Pastures can therefore be regarded as falling on a gradient of productivity. The position of pasture on the gradient largely depends on the degree of manipulation of the environment, and the level of capital input. Normally high production is not possible without appreciable manipulation and appreciable capital input.

Of the complex of factors militating against reclamation and intensification of veld and pasture production in the Trust Lands, three stand out as being of overriding importance:

1. The imbalance between the numbers of people using the land and its productive potential under reasonably intensive management.
2. The prevailing system in which the number of livestock is not controlled and ownership of livestock is divorced from responsibility for the grazing resource.
3. The lack of capital and poor credit-worthiness of the tribespeople.

Apart from the obvious need to reduce the growth rate of population, the solution to all three problems depends on a vigorous and comprehensive national programme involving both urbanization and rural reform: urbanization as a means of drawing off the surplus population, and rural reform as a means of rationalizing land use patterns, increasing subsistence production per unit area and increasing production of cash crops and livestock products.

As mentioned earlier, large numbers of people who are employed outside the Trust Lands cultivate land merely to retain the right to use it. Population pressures are such that little progress in rationalizing land use is possible unless these 'non-farmers' and their families are provided with alternative social security, security of domicile and the means of permanently earning a living. This involves a national commitment, and its successful application would pave the way for the rational use of land by full-time farmers under a system of land tenure conducive to such use.

At the very least, the terms of occupancy should be such as to not inhibit the desire by groups of people, or, where appropriate, individuals, to improve and develop the land. It should be absolutely clear to the occupants that they will be able to reap the benefits flowing from such activities and that their rights cannot be rescinded.

In the tribal context, attempts to motivate individuals to change have been largely unsuccessful. In general, the tribesman does not make decisions as an individual but as part of a community. Moreover, individual ownership

of 'farmlets', incorporating both arable and grazing land, is impracticable in the Trust Lands.

There is a need, therefore, to foster sound land use by communities. To this end the 'grazing scheme' approach, which proved successful in promoting rational land use, notably in Victoria Province, is of interest. In these schemes, specific communities, with the consent of the greater majority of individuals comprising it, and of the neighbouring communities, assumed responsibility for a defined area of land. Using standard farm-planning techniques, arable and grazing land were demarcated. Arable holdings were allocated to individual families. The grazing land was divided into paddocks (or beacons areas equivalent to paddocks). The livestock owned by individuals were combined in a single herd which was run on veld during the growing season, using a short duration grazing procedure. The schemes were administered by elected committees who were given special training in administrative procedure and the principles of agricultural production.

Rationalization of land use in this manner would provide a basis for movement towards more intensive profit-oriented farming. In addition, it would provide for the maintenance of soil productivity through the integration of livestock into production systems. Because it is not a radical departure from tribal custom it should be sociologically acceptable, and the credit-worthiness of an organized community of this nature is likely to be enhanced.

### MATCHING INTENSIFICATION TO NEEDS

Intensification invariably involves capital inputs, and these must naturally be set against the value of the increased returns. In the tribal situation, with the strong emphasis on subsistence, the economics of intensification must be appraised with particular care. Practices which would be profitable and quite feasible on commercial farms might not be so in the tribal context; conceivably, the reverse may apply. In considering pastoral production it is especially necessary to take into account the inter-dependence of livestock and crop production in the tribal areas. For example, expenditure which increases livestock-carrying capacity may in part be recouped indirectly in the draught and fertility inputs on arable land.

Because of the uncertainties inevitably attending intensification of tribal production systems and because of the limited skills of the tribespeople, sophisticated production systems and high-cost intensification are generally inappropriate. Rather, the aim should be to increase efficiency and output and to ensure maximum return, particularly in terms of carrying capacity, per unit of capital invested.

Discounting improvement in animal management as such, there appear to be but four feasible ways of intensifying livestock production from veld and pastures in tribal areas:

1. The development of adequate stock-watering facilities and the adoption of rotational grazing.
2. The selective thinning of trees and shrubs in woodland veld.
3. The use of goats and sheep in combination with cattle on a rational basis.
4. The use of legume-based pastures, and especially the introduction of tropical pasture legumes into the veld.

In all cases, however, successful intensification would require that stock numbers are in keeping with the carrying capacity of the land. Over-stocking so common at present, would be disastrous.

### STOCK-WATERING AND ROTATIONAL GRAZING

Over large areas of the Trust Lands in the drier parts of Rhodesia lack of drinking water for stock precludes the efficient use of the available grazing. In addition, poor distribution of water supplies leads to over-use and trampling, and hence to severe degradation in the vicinity of the more permanent water supplies.

With uncontrolled grazing and the prevailing high stocking rates, there is over-use of certain favoured areas and more palatable constituents of the vegetation. In the drier areas this leads to destruction of the grass cover and, in some cases, to an increase in unpalatable and useless species.

Undoubtedly, the planned development of water supplies, the application of rotational grazing, and the control of stock numbers would allow for increased production and would favour the reclamation of degraded veld as well as the conservation of sound veld. Nevertheless, recent claims that the use of large numbers of paddocks per herd and a short duration grazing procedure will result in very large increases in carrying capacity (Nicholas, 1976) are not supported by the results of critical studies of rotational grazing on veld (Gammon, 1976; Denny and Steyn, 1977; Denny and Barnes, 1977).

### SELECTIVE THINKING OF TREES AND SHRUBS

It is well established that in many woodland types in Rhodesia the clearing of trees and shrubs results in large increases in yields of grass and, therefore, carrying capacity. Except in heavily populated areas on the highveld, which have been all but denuded of trees, the Tribal Trust Lands carry a moderate to dense cover of trees and shrubs. Timber is used in large quantities by tribesmen and current consumption for local use in the tribal areas has been set at 2.7 million cubic metres each year (Wiltshire, 1977). There is much indiscriminate felling of trees and this often leads to the development of thicket vegetation, in which the understorey of grass is suppressed. Such vegetation has a low carrying capacity, especially where the trees and shrubs have little browse value.

Timber and fuel are essential commodities in the economy of the tribal areas, and in considering the improvement of grazing land by means of thinning and clearing of trees, this must be taken into account. However, there is a strong case for a rational approach to the exploitation of timber in the Trust Land. In suitable areas, the establishment and controlled exploitation of plantations of exotics, notably *Eucalypts*, is indicated, often as a matter of urgency. There is a need also to replace indiscriminate cutting with controlled felling or stumping and mattocking, bearing in mind timber and fuel requirements as well as the improvement of grazing land. In some areas useless shrubs such as *Lopholaena coriifolia* and *Helichrysum kraussii* abound. These are relatively easy to remove by mattocking, or simply hand pulling.

In the lower rainfall areas many of the trees provide palatable browse, and in the more heavily stocked tribal areas, livestock subsist for long periods on browse, even in seasons when rainfall is adequate for good grass growth. Nevertheless, there is compelling evidence that selective thinning of trees, leaving the useful species, would under controlled stocking lead to a marked increase in livestock production. In addition, there is evidence that the amount and availability of browse may be increased by lopping or felling selected species.

#### RATIONAL USE OF GOATS AND SHEEP

The size of the small stock herd in the tribal areas is not definitely known, but Cross (1974) stated that unofficial estimates set it at about 3.5 million head, and that evidence from the sale of goat skins indicates that current slaughtering in the tribal areas may exceed 600 000 head a year.

It has been shown, for example, that, in the mopane (*Colophospermum mopane*) dominant woodland of the lowveld (Kelly, Schwim and Barnes, 1975), in the teak (*Baikiaea plurijuga*) forest on the Kalahari sands (R. P. Denny, personal communication, 1976), and in *Acacia veld* (Oates, 1956; Du Toit, 1972), that browse comprises an appreciable portion of the diet of goats. Likewise, the results of a trial reported by Ward and Cleghorn (1970) indicate that the coppice of trees of musasa (*Brachystegia spiciformis*) and munhondo (*Julbernardia globiflora*) in woodland at medium altitudes is extensively browsed by sheep, but strangely enough, not by goats. There is evidence also that, provided adequate amounts of herbaceous material are available, cattle spend very little time browsing (Kelly *et al.*, 1975).

At the appropriate stocking rate, goats or sheep can be used in conjunction with cattle to make more efficient use of the available feed in many woodland types. Moreover, by feeding on the woody vegetation, they tend to maintain a more favourable tree-grass balance. There is, however, a need for further research to establish criteria on which to base stocking rates for small stock and cattle in different vegetation types, and to determine the

management procedures which will give high production and prevent damage to the browse component of the vegetation.

Contrary to popular opinion, goats, and to a lesser extent sheep, may, in the appropriate environment, be regarded as veld improvers rather than veld destroyers. There is a clear case for rational management and exploitation of this resource in the tribal areas.

### LEGUME-BASED PASTURES

There is abundant evidence that the major limitation to pasture production is the supply of nitrogen to the plant. Accordingly, any practice which increases the amount of available nitrogen in the plant-soil system leads to large increases in production, even in relatively dry areas.

In the higher rainfall areas grass pastures fertilized with inorganic nitrogen supported by superphosphate are a potent means of intensification of pasture production. For example, dryland Star grass pastures fertilized with 350 kg of nitrogen per hectare per season have a carrying capacity of about six livestock units per hectare during the growing season. This is between ten and twelve times the carrying capacity of cleared veld in the same areas.

Although nitrogen-fertilized pastures may be profitable in commercial farming, and may well be used in tribal areas in the future, it is difficult at present to envisage their use in tribal farming. However, the use of pasture legumes, thus harnessing atmospheric nitrogen, does seem to be a feasible means of intensification, and is applicable in the medium as well as the higher rainfall areas.

In tribal practice livestock are grazed on veld or reverted land during the rainy season and early dry season, and on crop residues during the mid and late dry season. In suitable areas, the practice of fattening cattle (usually old oxen) in pens using crop residues and bought concentrate food has gained increasing acceptance in recent years. Apart from the sale of small stock, sales of cattle finished in this way provide the only important cash return from livestock. With fattening, conventional comparison of return from sales and cost of production provides an adequate assessment of profitability. However, in the case of the total herd, returns on capital outlay must be sought mainly in the 'hidden' items, draught and manure.

In the tribal environment, pasture legumes could conceivably be used in two main ways: for veld improvement, with the primary object of increasing carrying capacity during the growing season; and for the production of high-protein roughage for use in fattening rations.

For the former purpose legumes are established in disced strips covering one-third to one-half of the area, and these are fertilized with single superphosphate at rates of 100-200 kg/ha before seeding. Two legumes appear to be particularly valuable for veld improvement, the Oxley fine-stem cultivar



of *Stylosanthes guianensis* and the Siratro cultivar of *Macroptilium atropurpureum*. The former is an erect plant rather similar in habit to lucerne, while the latter has a trailing habit and develops stolons which root at the nodes. Both are perennials and are readily established from seed. They have been found in screening trials to have a wide range of adaptation. Where the rainfall is adequate, Oxley fine-stem stylo (to use the common name) would be generally more suitable than Siratro, for it withstands heavy grazing, whereas Siratro is weakened, and in extreme cases killed, by over-use. The requirements of single superphosphate for the maintenance of stands is not definitely known, but present indications are that the required rate is unlikely to exceed 50 kg/ha/year and might be less. With proper management, the intervening unseeded areas are colonized by seedlings over the years.

Experimental evidence suggests that the carrying capacity of veld, in which Oxley fine-stem stylo has been sown in strips covering half the total area, is about 50 per cent higher than that of untreated veld. With year-round grazing, production per unit area in well-established stands is about doubled (Clatworthy, 1977), the increase being due partly to the increase in carrying capacity and partly to the increase in gain per animal. Differences in animal performance between improved and unimproved veld occur mainly during the dry season — a time when in the tribal situation, stock are normally carried on crop residues. Hence, the full benefit of the legume might not be realized.

Costs of veld improvement should be regarded as part of the input costs on arable land, for the increase in carrying capacity will allow for the production of more composted manure and for an increase in the number of draught animals.

Pasture legumes established for the production of high-protein roughages could be grown on or near cropland, where they would be protected from grazing during the rainy season. The most suitable legumes for this purpose are probably the twining legumes Archer macro (*Macrotyloma axillare*) and Siratro. However, in suitable circumstances, consideration could be given to the use of Silverleaf desmodium (*Desmodium uncinatum*) a trailing legume, and the shrub Vi Vi (*Leucaena leucocephala*). All are perennials and can be established from seed.

Unlike lucerne, for example, they can, without undue loss of quality, be left to grow for most of the growing season before harvest, a particularly useful attribute in the context of tribal agriculture. However, some advantage would be gained, especially in terms of quality, by harvesting twice in the season — a procedure well within the capacity of the more skilled tribal farmer. Yields of Vi Vi under local conditions are not known, but satisfactorily stands of the other legumes could be expected to yield from two to four tonnes per hectare with a crude protein content of about 20 per cent of the dry matter. Good stands might yield as much as eight tonnes per hectare.

## CONCLUSION

The continuing misuse of land in the tribal areas and the attendant high rate of population growth is a matter of great concern, and, if not checked, will destroy the nation, or, at very least, reduce it to penury. There is an urgent need for a vigorous programme of rural reform in the Tribal Trust Lands, based on sound land use and increased agricultural production.

Success in such a programme will depend in part on the implementation of a national programme of urbanization as well as measures which will provide financial security and security of domicile for urban Africans. Only then will it be possible to introduce reforms involving the residual population in the tribal areas.

Socio-economic conditions in the tribal areas are such that individual ownership of 'farmlets', as they would of necessity be, appears impracticable, even if they were sociologically acceptable. However, it does seem feasible to rationalize land use by means of the 'grazing scheme' approach, in which specific communities assume responsibility for specific areas of land, which could then be planned in accordance with sound principles of land use.

Such changes in the pattern of land tenure will set the stage for the intensification of pastoral production. On the medium and high rainfall areas this will provide an essential basis for the rehabilitation and conservation of extensive areas of depleted cropland by means of adequate applications of manure in combination with fertilizer. In the low rainfall areas it will make possible the rationalization of animal production systems, thus increasing cash income and halting the despoilation of land which occurs at present.

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