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## ECONOMICS OF LAND DEGRADATION IN SOUTH Africa

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With attention focussed on environmental issues, soil degradation in South Africa<sup>2</sup> in the agricultural sector is under increased public scrutiny. While soil degradation is of concern in many parts of the white farming areas the most serious problems occur in the homelands.<sup>3</sup> Although several economic theories of land degradation<sup>4</sup> have been advanced, common property has been the most popular theory used to explain degradation in the homelands while the whole market intervention leading to distorted production patterns in the white farming areas is often blamed. While these various theories contribute to an understanding of the economic causes of land degradation, none constitute a complete analysis while they offer little in terms of predicting future interventions by the market or state in terms of technological or institutional innovations. What is needed is a broader economic framework that is able to incorporate past occurrences and future social dynamics that exert a strong influence on land use patterns.

Under ideal conditions land users will invest in soil usage patterns and technologies that are optimal from both a private and social point of view. Under these circumstances there is said to be no institutional or market failure. Where a complete set of markets exist and consumers of the environment demand different quality levels this will effect the technology chosen by producers as willingness to pay will be fully reflected in market prices. In the case of market failure, consumers' land use preferences will not be fully reflected in market prices and producers will base their production decisions on distorted prices resulting in a discrepancy between private and social optima. If the market cannot fully reconcile the claims made by producers and consumers, an incentive will exist to reach a non-market signaling mechanism. The range of institutional alternatives could range from local associations including community or local government to central government regulations or incentives, whichever is more

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1. *Development Bank of Southern Africa. Views expressed are not necessarily supported by the Development Bank of Southern Africa.*
  2. *South Africa includes the self governing and independent states for the purposes of this paper.*
  3. *The homelands refer to the self governing and independent states.*
  4. *Land degradation includes anything that reduces the usefulness of land eg. soil erosion, invasion of undesirable plant species, irreversible veld deterioration, salinity, etc.*

attractive. If institutional innovation was not forthcoming at the local or community level, it would be the responsibility of central government to support the market in reconciling private and social differences in times of market failure. There thus arises three possibilities for institutional or government failure. Firstly, failure to provide institutions in place of missing markets, secondly, the provision of incorrect institutions that unwittingly lead to an even less optimal pattern of resource usage and thirdly the provision of institutions that deliberately distort the allocation of resources to favour certain interest groups. These failures will be referred to as government failures type I, II and III respectively.

/Table 1/

If perfect conditions as mentioned above existed in South Africa, cross sectional production patterns would be largely determined by natural production potential and distance from markets while the rate of soil usage would be socially acceptable. In South Africa it appears that the more marginal areas are most highly cropped (Table 1). This is concerning from the environmental point of view as economically irrational land usage patterns could lead to irreversibility of veld quality and excessive soil losses. In many parts of South Africa the rate of soil erosion seems to be socially unacceptable. Du Plessis (1986) estimates that the average soil loss on white owned land is in the region of 3 tons per hectares or 33 million tons per annum. This is approximately ten times higher than the natural rate of soil formation. Official sources estimate 2,2 million hectares in the Winter Rainfall, Highveld and Orange Free State regions are subject to serious wind erosion (Du Plessis 1986). Schoeman and Scotney (1987) estimate wind erosion is a serious problem on 30% of the cultivated lands in the Highveld. According to Scotney (1988) nearly all studies reflect that excessive stocking rates together with poor veld management is the major cause of widespread degradation. It is estimated that as much as 60 percent of veld is in poor condition due to overstocking (Bruwer cited by Scotney 1988). Soil erosion from overgrazed veld was found to be approximately double that of veld in good condition in the south eastern Transvaal (McPhee cited by Schoeman and Scotney 1987).

Soil erosion seems even more serious in certain parts of Ciskei, Transkei and KwaZulu. Particularly bad water erosion has occurred in the steep river catchments, on erosive duplex soils in the foothills of the Drakensberg and on Peddie shales prevalent in Ciskei. In the drier homelands wind erosion and invader plant species present a problem. Northern Gazankulu and central Venda are experiencing problems with Lantana while Sekal Bos poses a problem in the bushveld areas of Lebowa and the northern borders of Bophuthatswana. The western portion of Bophuthatswana is subject to Swarthaak encroachment while the

maize producing areas near Lichtenburg are subject to wind erosion. Over ninety percent of the commons are overgrazed in Lebowa with three quarters overstocked in excess of 150 percent; of the recommended carrying capacities (Vink and Kassier 1987).

### Government failures contributing to land degradation

Government failure type III has had the largest institutional impact on geographic land use patterns in South Africa and has been a contributing factor to the degradation tracts of high potential soils in the homelands. The failure manifests itself largely in the 1913 Land Act and the 1936 Native Trust and Land Act which apportioned 13 percent of the total surface area to the African peoples and other legislation (influx control and job reservation) which effectively denied African peoples access to markets and income streams in order to distribute wealth in favour of certain interest groups. Not only did this cause gross maldistribution of land causing severe population pressure (Table 2), but the Act also placed certain homelands in areas sensitive to soil erosion<sup>5</sup>. It is commonly argued that large portions of arable lands are not cultivated in the black farming areas (Tapson 1985:237; Lenta and Maasdorp 1988:275). There is however much evidence to suggest that the land formally allocated for cultivation purposes is not arable due to inadequate rainfall, excessive slope, poor soils or excessive erosion. Weiner et al (1989) conclude that the homelands are grossly short of arable land relative to existing population levels, regardless of the levels of technology employed.

#### /Table 2/

Environmental degradation in the homelands most commonly attributed to common property rights. The well known 'Tragedy of the commons' centers around the idea that the individual gains the benefit of an additional animal while the costs are shared by society, there is thus a minor cost to the individual, but large potential gain. This results in a much higher stocking rate than would have occurred under private tenure thus leading to degradation. While there may be less incentive to conserve the land as the bundle of rights received by the user are reduced, it must be remembered that open access is no problem if land is relatively abundant to population.

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5. According to an overview of the erosion hazard in South Africa (Scotney 1987), it is evident that many parts of the homelands (Transkei, Kwazulu, Kangwane, Lebowa, Venda) fall in areas subject to high rainfall erosivity. Although KwaZulu and Transkei are commonly regarded as high potential regions (fall in high rainfall potential areas), steep terrain reduces the amount of arable area and obviously increases the scope for water erosion. Most of KwaZulu falls in the steep catchment areas of the Umzimkulu, Umkomaas, Umgeni, Tugela and Umfolosi rivers.

Theoretically as population pressure rises, then adherence to social rules may limit exploitation. Group action is only likely to succeed in maintaining the land if the group is small. If the group become too large or if the value of the produce rises or if interest groups become too powerful, community sanctions may fail (Ruttan and Hayami 1984).

The above-mentioned land acts have undoubtedly placed severe pressure on the land and communal tenure systems, however no effective institutional innovation relating to land degradation has been forthcoming from either community or homeland governments. If the theories of induced institutional innovation are correct (Ruttan and Hayami 1984; Runge 1987), this indicates one or more of the following:

The demands of members in a particular society are not being fully reflected in the market, including the political market.

The political cost of supplying environmental innovations incurred by leaders exceeds the political benefit.

Lastly, members of society do not have an incentive to demand change in farmers' land use patterns.

Runge (1987) argues the marginal willingness to pay for environmental quality increases with income and is thus a superior good. Runge points out two important implications follow from this principle.

Firstly, that the demand for food decreases relative to other commodities as income increases (Engles Law) this means that demand for environmental quality relative to food production will be low in the relatively poor homelands. Vink and Kassier (1988), argue that the most common scenario is one of high adherence to social rules combined with a high level of overgrazing. If this is the case, it suggests that social rules pertaining to long run land quality do not exist. They support the idea that there is a low incentive to demand changes in land use patterns that result in degradation in the homelands.

Secondly, any demand for environmental quality would only emanate from relatively few in the higher income groups in the homelands. The fact that a substantial number of these elite are members or connected with the various local and homeland governments suggests that the political cost of supplying environmental institutional innovations may also exceed the political benefits. Consequently any existing regulations that are in place may not be tightly enforced.

If environmental quality is indeed a superior, good policies that have deliberately led to highly skew distributions of income would not only have had a detrimental effect on the demand for environmental quality in the past, but will continue to do so into the foreseeable future.

Irreversible veld deterioration and the cultivation of environmentally sensitive areas (steep slopes, vlei's, shallow soils, etc.) in white farming areas is often attributed to agricultural subsidization and pricing policies leading to a type II government failure. Government sanctioned interference into the market is usually justified due to the presence of market failures such as imperfect information, unequal bargaining power between buyers and sellers and price fluctuations due to environmental risk. It is the opinion of many however that these particular institutional responses have resulted in skewed crop production patterns and induced an increased social cost to society. (Nieuwoudt and Frank 1987: maize, wheat, sorghum, sunflower, peanuts; Van Zyl 1988: maize, wheat, sunflower, sorghum, peanuts). Frank and Nieuwoudt estimate that land under crop production would decrease by about 7 percent under a free market and approximately 330 000 hectares would revert back to livestock production. This however is the nett effect. Van Zyl's study (1989) indicates there would be shifts in production between regions. Assuming that all the potentially non arable land being cultivated at present (some 600 000 hectares, Table 1), was severely degraded and that the damage was irreversible, this would only represent 0,75 percent of the available grazing land in the white farming areas.

Generally it would seem that the effects of pricing policies on geographical cropping patterns may be overemphasized although it is not clear what effect policies would have on technologies employed. Of far greater concern is the effect of policies on farmers' perceptions of future price patterns and the effect they have on discount rates applied by producers relative to the rest of society. It appears little quantitative research has been done in this regard.

#### Market failures contributing towards soil degradation

While government failure type I and I have been identified as contributors to environmental degradation, it would be naive to assume that degradation problems would be fully cured if they were rectified. Market failures arguably are the greatest contributing factor towards soil degradation.

Major sources of market failure with regard to land use include an imperfect and skew distribution of information, imperfect capital markets, intergenerational equity issues and "free riding".

A skew distribution of information between society and land users results in different perceptions of costs and returns to land use practices between and within groups in society.

Imperfect capital markets reflect the difference in the perceived value of present and future consumption between land users in society. Generally it is assumed that discount rates applied by land users exceed those which society would apply.

This effectively results in production decisions based on a short term planning horizon.

Intergenerational equity issues are the result of conflicting opinions as to the extent which future generations have a right to share in consumption and the risks and benefits of present investments.

Lastly, the "free rider" problem exists as land users have the ability to externalize or impose their production costs upon other members of society i.e. such as polluting the air or rivers due to a lack of investment in erosion control. This ability to externalize costs often results in over consumption of resources from a societal point of view. The market however does not provide compensation for the effected members of society.

As previously mentioned, community correction is possible under certain localized situations of market failure. The community can use a combination of land use ethics, peer pressure, informal rules and education to counter the causes of market failure and reduce discrepancies between private and social goals with regard to land use. This however is only likely to occur in smaller areas where community cohesion and co-operation is strong. Over widespread areas monitoring and community correction is likely to fail. Under these circumstances government correction might be appropriate if the benefits to society are shown to exceed the costs.

Broadly there are three policy instruments available to governments. Firstly government can legislate for the adoption of suitable land use strategies. Secondly it can provide incentives through financial assistance or penalties. Thirdly it can provide education and support services in order to cultivate a desirable land use ethic amongst land users. The policy options differ with regard to economic efficiency and income distribution effects.

The difference between economic incentives (taxes, subsidies and transferable rights) and regulations is that the former operate on relative prices while the latter involve direct manipulation of relative quantities. Economists generally advocate the former as incentives make use of scarce information. Legislative regulations often require non-existent information in order to formulate targets. This often results in unrealistic targets being set, high administrative, monitoring and enforcement costs. Regulations are also known to create conditions that tend to inhibit the adoption of new technologies. In short, the law is often a guardian of established interest and an obstacle to progressive forces. Experience in RSA and other countries seems to indicate that legislative measures are generally difficult to enforce.



## Future trends and implications for land use

Demand for environmental quality was argued to be a superior good. Population pressure and low incomes aggravated by the 1913 and 1936 land acts imposed upon tradition tenure systems were also identified as major government failures that have contributed to land degradation in the homelands. Although government failures type II were acknowledged to contribute to land degradation problems, the impact of crop policies are probably overemphasized while market failures are likely to be more important with regard to land degradation.

With the above in mind, it would appear that policies that reduced population pressure on the land, increased incomes either through growth or redistribution of wealth, allocated more land rights to producers, led to cross sectional land use patterns that reflected the natural production potentials, or provided appropriate institutions in place of missing markets, would reduce the rate of land degradation in South Africa.

Several current trends in South Africa are relevant.

With poor growth prospects in South Africa under the present local and international political constraints, demand for environmental quality is unlikely to be as buoyant as in high income countries such as the United States, Canada and Western Europe. If incomes decline significantly, there will be less incentive to institute new environmental controls or enforce existing regulations. Within the poorer homelands it is likely environmental concerns will take the back seat relative to demands for food production. Rewards will go to technologies and institutional innovations that increase food production rather than those that are conservation oriented. Environmental quality will thus increasingly be the concern of higher income groups (mostly residing in the white areas of South Africa).

Calls for redistributive land reform and the abolishment of legal barriers instituted on a racial basis that restrict land transactions whether it be outright purchase, leasing or share cropping will have important consequences with regard to land degradation in South Africa. Theoretically land markets require use rights to be fully transferable and contractually enforceable in order to function efficiently (Vink 1989). Calls for the abolishment of unnecessary restrictions to land use and transactions could theoretically increase efficiency and contribute to greater incentive to conserve the land. However as Vink (1989) points out, we have highly skewed distribution of income and wealth not only between white and black farming areas, but within the black farming areas themselves. A blanket policy of freehold tenure which would enable the wealthy (mostly whites) to buy communal lands thus dispossessing potentially large numbers of people who have no access to other income streams will not be popular. The demand will thus probably be to allow blacks freehold tenure in white areas, but

not visa versa. While this could reduce pressure in the homelands and be beneficial both from an equity and growth point of view, the environmental impact would probably be relatively small.

Of far greater impact would be the demand for more land rights by producers in the homelands. According to the theory of induced institutional innovation (Ruttan and Hayami 1984), growth induced by changes in technology, factor endowments or product demand not only give rise to demands for institutional change, but also create opportunities for political entrepreneurs and leaders to organize collective action to bring about institutional change.

Development actions such as farmer support programs in the homelands that are successful in generating growth and increased incomes are not only likely to induce changes in land tenure arrangements (research indicates that farmers seek more security with increased commercialization (Cobbet 1982), but also increase the demand for environmental quality.

Redistribution of land can be environmentally disastrous if similar pressures of population, low incomes and inappropriate tenure systems are placed on the land, as evident on many of the tribal trust lands in Zimbabwe and South Africa. According to Cobbet (1986) although the historically unequal distribution of land has created a highly emotional issue which would have to be addressed by any post apartheid government, the need of the majority of households in the homelands is to strengthen their ties with urban and metropolitan areas rather than rural areas. Even with this in mind there is likely to be political incentive to have some form of land distribution in a post-apartheid government due to critical land shortages in the homelands (Weiner et al 1989; Cobbet 1986). An abundance of unoccupied or unutilised land provided a relatively easy and cost effective means of redistribution of land in Zimbabwe. Redistribution of land in South Africa is likely to be more costly and difficult as there is very little unutilised arable land in South Africa, possibly with the north of Natal and the eastern Transvaal (Weiner et al 1989). Any redistribution of agricultural land that does occur would however have to be accompanied by a full set of technological and institutional support elements in order to be economically and environmentally sound.

Lastly, the trend towards a freer market within the agricultural industry might lead to more environmentally sound production patterns in South Africa. Of more importance however is the need for appropriate institutions in order to provide for market failures caused by missing markets.

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Table 1: Agricultural land use in white farming areas -1981

Development Region	Total potentially Arable area Fallow	Total Cropped Area including %	Cropping Intensity
A	1 494 800	2 043 795	1,36
B	454 465	551 162	1,21
C	4 193 633	3 424 992	0,81
D	643 501	564 213	0,87
E	2 152 016	1 101 856	0,51
F	3 058 910	1 573 347	0,51
G	1 327 362	555 738	0,41
H	847 321	472 566	0,55
J	1 755 190	1 370 637	0,78

Source: Weiner et al, 1989

Table 2: Arable land potential in South Africa's Homelands

Homeland	Total Arable (Hectares)	Total Arable per Household <sup>6</sup> (Hectares)
Bophuthatswana	495 389	2,04
Ciskei	66 539	0,84
Gazankulu	82 159	0,34
Kangwane	112 444	1,98
Kwandebele	41 357	0,90
KwaZulu	435 079	0,84
Lebowa	335 845	1,20
Qwa Qwa	6 947	0,08
Transkei	763 000	1,74
Venda	74 655	1,02

Source: Weiner et al, 1989

6. Rural household is assumed to consist of 6 members.

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