
THE CONSEQUENCES OF STRUCTURAL ADJUSTMENT AND DEBT FOR DESERTIFICATION AND FOOD SECURITY IN AFRICA - A LITERATURE REVIEW AND DISCUSSION

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Abstract

Africa is facing declining per capita agricultural output. Food imports to Sub-Saharan Africa rose from US\$1.1 billion in 1970 to US\$ 5.3 billion in 1985 contributing to raising external debt from US\$5.4 billion to US\$58.8 billion during the same time period. In 1998, external debt stood at US\$230 billion. Since the 1980's global recession and introduction of Structural Adjustment Programs (SAPs), Africa's debt burden has grown from 30% of GNP to currently over a 100%.

The links between the supra-national/national economic policies, and the natural resource base of implementing countries have not sufficiently been made in past policy formulation. This paper discusses the possible effects of higher scale macro-economic policies on land use decisions (on the farm) that ultimately affect land degradation and desertification. To what extent macro-economic policy, namely SAPs, have been complimentary to the goals of Convention to Combat Desertification (CCD) National Action Programmes are explored.

Various long and short-term scenarios of the micro-level effects of SAPs and their resultant debt are discussed. Effects on terms of trade, yields, and on farmers' decisions on whether to sustainably intensify or extensify land-use are presented within an overall framework of assessing multiple-scale effects of economic policy on land degradation and desertification. The paper argues that multidisciplinary and multi-scale land degradation problems should be addressed through inter-institutional cooperation and by systematically combining natural and

social science in research and policy formulation to tackle land degradation leading desertification in Sub-Saharan Africa.

PROBLEM

Africa is facing declining per capita agricultural output (Delgado and Mellor, 1984). As demand for food increases, so does demand for land. This has led to declining fallow periods and increased monocropping (ICIHI, 1986). Pastoral livestock agriculture has suffered from the combination of denuded rangeland and crowding out from native land as population growth and other factors have caused marginal lands to come under cultivation (Dixon et al 1989). All these factors can contribute to desertification.

Desertification is defined by the Convention to Combat Desertification (CCD) as land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities. The Latin root of 'degradation' is 'reduced to a lower rank'. So land degradation (I) refers to the reduction in the rank (or quality) of a parcel of land; so actual or potential use of that land is reduced. It affects 70 percent (3.6 billion hectares) of the 5.2 billion hectares of drylands areas (UN Interim Secretary for the CCD, 1998), or a quarter of the global land area of 13.07 billion hectares (FAO, 1990). More than half of the countries with a low Human Development Index-HDI (II) are the most vulnerable to desertification, and the poorest people within them are the most affected (UNDP, 1995). A disproportionate number of these countries lie in Africa, where over a billion hectares, or 73 percent of its drylands, are affected by desertification (UN Interim Secretary for the CCD, 1998).

To deal with the impeding food security problems and the occurrence of desertification throughout the world, and especially in Africa, the CCD (III) was adopted on June 17, 1994 and has been ratified, accepted, or acceded by 174 nations to date. The CCD is a legally binding document that includes concrete National Action Plans (NAP-Appendix 10 of the Convention) which must be based on local-level input and participation, and involve all levels of government and civic institutions in determining sustainable land use strategies. According to the Convention, NAPs must seek to eradicate poverty in their effort to combat desertification by

encouraging alternative livelihoods that are not highly reliant on primary agricultural production. The treaty stresses the importance of international, regional, sub-regional, and inter-governmental cooperation.

The links between the supra-national and national economic policies, and the natural environment of implementing countries have not been made sufficiently. The most influential macro-economic policies in Africa during the 1980's and 1990's originated from the World Bank. Collectively they were labeled Structural Adjustment Programs (SAPs). They have had mixed results in achieving higher growth and a better standard of living for Africans. Various scenarios on how SAPs, and foreign debts have had direct or in-direct effects on desertification are discussed in this paper. To what extent macro-economic policy, namely SAPs and high debt burden, have been complementary to the aims of CCD NAPs are explored.

BACKGROUND

THE COLONIAL PERIOD

A discussion on current land use practices cannot over-look the colonial period's influence in shaping the political and ecological economy of Africa. Blaikie and Brookfield (1987: pp. 106) state: "It seems fairly clear that the massive disruptions of society brought about under colonialism in Africa must bear the major share of any explanation of deteriorating quality of land management." The breakdown of social structures and crowding out of humans and animal, and the exploitation of natural resources is documented in various literature (for example see Polanyi, 1944; Darkoh, 1980).

Blaikie and Brookfield (1987: pp. 106) state, "There is little doubt that there has been a large increase in degradation during and since the colonial period." They cite three main causes of degradation associated with colonialism: the loss of land, labor extraction, and the commercialization of agriculture that began during the colonial era. Throughout much of Africa colonialism took the best lands and geared them towards the production of cash crops-which is generally not inter or relay cropped (Blaikie and Brookfield, 1987).

In the drylands the main crops were groundnuts, cotton and tobacco.

In more temperate regions of East Africa, large tea and coffee plantations are a feature of the landscape. Today the export of commercial crops is a feature of African economies south of the Sahara. What is the extent of this historical export bias today, and how does it affect the level of desertification? The answer is a function of many variables and will vary from country and region, but in many cases national governments have tended to neglect investment on staple food crops in favor of cash crops.

INDEPENDENCE TO PRESENT

After the independence of many African nations in the 1960's the continent was a net exporter of food, but the initial optimism began to fade as undemocratic and dogmatic regimes emerged during the cold war. Development scheme of various political origins failed to bring the post colonial dream of growth and self-sufficiency. Led by the Berg report, the World Bank attributed Africa's problems on ineffective domestic policies that featured over-valued exchange rates, heavy taxation, and subsidized state industries (World Bank, 1981). Africa nations put the blame on the external policies of North countries.

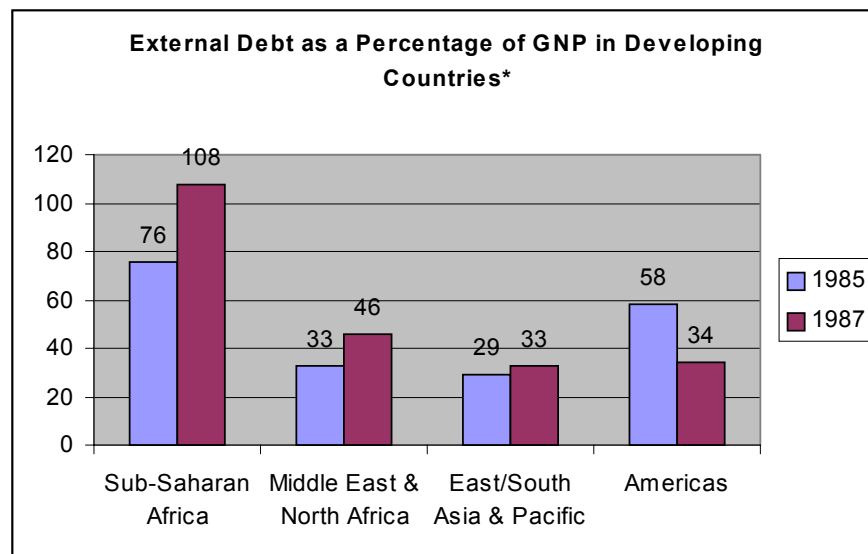
Beginning in the early 1980's, global macro-economic policy centered around free trade and SAPs as a way to rid African economies of distortions and inefficiency. SAPs had mixed results, but were largely inaccurate when predicting that economic growth would follow shortly after adjustment. Eicher and Staatz (1998: pp. 518) describe the World Bank's own assessment as follows.

“Africa's structural adjustment experience has humbled the World Bank. The juxtaposition of the dreams of the Berg report and the reality of Africa's development experience in the 1980's and 1990's helps explain why the World Bank recently declared that effective institutions matter as much as sensible policies in development (World Bank, 1997 cited in *ibid*). The second round of structural adjustment lending is now being broadened to include institutional reform, rebuilding of human capital, fiscal decentralization and broader participation of civil society in the economy”.

The inclusion of civil society and the coordination of various institutions is also advocated by the CCD, and follows a trend of multi-dimensional, or

holistic, engagement of problems. The assumption being that problems cross disciplines and institutions, and therefore solutions that forge a path to growth and development should do the same. If coordination is not in place, one policy measures may actively work to negate the long term goals of another well-intentioned policy measure. The ineffectuality of SAPs from not considering non-economic factors and institutions has been recognized, so what effects have SAPs had on environmental concerns such as desertification?

Food imports to sub-Saharan Africa rose from US\$ 1.1 billion in 1970 to US\$5.3 billion in 1985 (McNamara, 1985) helping to raise external debt from US\$ 5.4 billion to US\$58.8 billion during the same time period (Biswas, 1986). Since the time of the global recession of 1981-82, and the introduction of SAPs, Sub-Saharan Africa's debt burden has grown just 30% of GNP to over 100% (excluding South Africa). Seventy-five percent of the work force in Sub-Saharan Africa are employed in agriculture thus exportable cash crops is the principal means by which these nations are able to repay the debt. (A discussion on debt will follow later in the paper). In 1998, external debt for Sub-Saharan Africa stood at over US\$230 billion. (World Bank, 2000).



***Excluding South Africa**

(UNICEF, 1999)

It should be foreseeable that macro-economic decision made by a national ministry of finance, or the World Bank can have effects on the micro-scale (affecting the decision of one farmer). Effects of macro policy, in this case higher debt, may cause emphasis on the production of cash crops for export. Many similar actions can be aggregated by adding all the farmers that made a particular farming decision. A key question is: "How have the macro-economic decisions on a higher scale affected land use decisions on the farm?"

Lambing (1992) stresses the importance of recognizing spatial scales in identifying the causes of desertification since desertification is detected on the continental, or sub continental scale, that this results from the accumulation of individual local land-use decisions. According to Blaikie and Brookfield (1987), these decisions are made by locals on the perception of their immediate area which does not recognize the desertification that is observed on a higher (continental) spatial-scale, thus measures to combat desertification will not be adopted by locals if they do not see a link to problems they perceive. Lambin (1992) farther discusses the concept of spatial externalities; in the case of SAPs, benefits such as increased agricultural output is attributed to policy or policy-makers while the resulting degradation is shared among the local (producing) population.

DISCUSSION

DEFINING DESERTIFICATION

The occurrence of desertification depends on the farming methods employed and the level of on-farm investment that accompanies intensification to meet raising food and capital needs in Sub-Saharan Africa. This can be affected by government policies. These policies can include adjustment measures that reduce fertilizer subsidies and require reduction in expenditure on agricultural extension and other civil services. These two measures may well decrease responsible management of land. Most of Africa is under-utilizing commercial fertilizer, so farther reduction in fertilizer use will result in soil mining which leads to desertification. In policy formulation it is necessary to make these generalizations, but

accounting for the heterogeneous nature of desertification arising from varying agroecological zones and land-use patterns are crucial.

It must be noted that this discussion is based on neo-classical economics assumptions of the behavior of farmers, and neo-classical development economics which postulates that per capita increases in food production is required to drive industrial growth. This approach should be accepted for what it is; a snap-shot of the economic picture that does not consider political and ecological history. The farmer is an agent in the interaction between economy and ecology where historical and power contexts are not considered sufficiently.

Desertification occurs when unsustainable intensification occurs. That is, planting more on the same land without a corresponding increase in measures that conserve soil and water resources such as investment in wind-breaks and catchment basins (see Blaikie and Brookfield, 1987; and Boserup, 1965). Sub-Saharan Africa is not as densely populated as compared to other regions of the world, but population growth is relatively high, 2.8% from 1990 to 1996 (UN, 1996) and a primary reason why food need is increasing.

Clearly population growth is an underlying and not a proximate cause of land degradation: "The role of population factors in land degradation processes obviously occurs in the context of the underlying causes. Population pressures operates through giving rise to land shortages, and through other mechanisms as well" (Marcoux, 1998, pp. 19). To what extent macro-economic policies are related to these 'other mechanisms' that create land shortage and push people into the land frontier (the point where it is not possible to practice shifting cultivation) must be examined critically.

The emergence of the land frontier is documented by various literature (for example Reardon and Shaikh, 1995; and Mellor, 1988). The frontier is the point where abandoning exploited land for new and more fertile lands is no longer possible and farmers are forced to increase production, so there is a need for them to attain higher yield from the same amount of land. Remembering that improvement to land is required to prevent land from being degraded when intensifying, the farmer must put

something back into the land if more (higher productivity) is expected from it.

MICROECONOMIC ASPECTS

Fallow periods have declined, in all but some land rich countries in south-central Africa (Binswanger and Pingali, 1988), as African agriculture pushes into, and meets the land frontier. Population and other factors have put considerable pressure on land resources. Farmers have tended to survive by adopting extensification measures (by bringing pastoral or forested lands under cultivation) instead of sustainably intensifying by employing a higher level of labor and capital intensive techniques.

Research by Barbier (1998) in the sub-humid region of Burkina Faso found that higher returns to labor are found by extensifying through clearing new lands than by following the fallow system and intensifying production on existing crop-lands. Extensification was found to be more lucrative even when the lands are marginal. Thus, in this case, the most effective way to maintain productivity per worker is to abandon overused areas to clear and cultivate new lands. It is predicted that intensification through migration to less populated areas will work until the land frontier is reached, but then rapid desertification will occur after a few decades (ibid). This degradation would be perceived by the farmer even later (see Lambin, 1992) if land improving investments are not made.

High levels of desertification are already occurring in high population density areas such as Rwanda and the Ethiopian Highlands. Soil erosion of up to 200 ton/hectare/year, deforestation, and nutrient depletion is documented by Desta et al (2000) for the Highlands Amhara region of Ethiopia; average farm size there is about one hectare and extensification is not feasible. Existing crop-lands are used more intensively and the aggregate of land becomes degraded when land improving techniques and investments are not made.

Adjustment policies have had mixed effects on farmers' incomes and on land degradation. Cash-crop farmers and those who produce for the urban market will get higher prices for their produce as a result of SAPs because subsidies introduced to pay farmers less and satisfy urban constituents are reduced. Thus they will have incentives to intensify and/or

crop a greater area. In the case of land constrained Rwanda, farmers are reducing fallow period and increasing plant density (Clay et al, 1998) without putting as much nutrients back into the soil as they remove. This leads to degradation, particularly on food-crop areas which receive little price incentives in the output market for land improving investment.

Reduction in subsidies has a positive impact on the environment since expensive capital intensive farm implements are no longer subsidized. Heavy agricultural equipment encourages the clearing of marginal lands, compacts to soil, increases the use of fossil fuels, and encourages the farmer to substitute against labor in favor of capital. Besides being economically inefficient, this decreases agricultural employment and encourages encroachment on forest lands, or urban migration (Panyotou, 1992).

According to Lewis' 1954 Nobel Prize theory of linkages between agriculture and manufacturing, agriculture is desired, as it is a necessary for the agricultural productivity to grow along with the manufacturing sector in order for people to be free to move out of agriculture and into 'value-added' employment (i.e. the manufacturing sector) in a process of industrialization. This would fall squarely under the CCD's call for diversification of livelihoods that are less reliant on agriculture and land use. Unfortunately for the African farmer, productivity does not increase because intensification is not accompanied with necessary increases in farm capital which can be defined as 'chemical inputs, organic matter, equipment, and land-conservation infrastructure' (Reardon, 1998).

One objective of SAPs is to reduce public expenditure. This involves the reduction of agricultural extension (rural credit, education, input provisions, and output distribution) and the elimination of fertilizer subsidies. There is also an additional increase in the cost of imported inputs including fertilizer (because of currency devaluation). Devaluation will increase demand especially for exportable cash crops; a higher price will be realized by the farmer because of the increased demand, but without conducive national and local sustainable agriculture policy even these farmers may not automatically increase farm capital or labor inputs. When the government role is reduced, the private sector must provide needed capital for farm capital investment.

"Promoting Sustainable Intensification and Productivity Growth in Sahel Agriculture After Macro-economic Policy Reform" can be used as a case study (Reardon et al, 1997). In the 1980's, Senegal removed fertilized subsidies and it became unprofitable for farmers to apply as much fertilizer as they had been accustomed. They also faced reduced access to inputs with the elimination of government parastatals that supplied fertilizer. Farmers responded by increasing seeding density to twice the recommended level; this led to soil mining, and also reduced seed quality over time. On the positive side, the report mentions some increases in net returns as a result of devaluation. This happens when a crop faces an elastic demand, for example, irrigated rice and cotton, maize, and sorghum in Mali. Here the government passed on price rises to the farmer (ibid). Chances for sustainable intensification are possible when there is some government investment in infrastructure such as irrigation, and with price 'pass through' policies beneficial to the farmer, and with vertical agricultural support coordination (i.e. provision of credit and marketing programs).

Even with the devaluation of the CFA in 1994, and the subsequent increase in the demand for peanuts, it was still unprofitable for Senegalese farmers to apply sufficient levels of fertilizer, so they were forced to increase seed density to compensate for decreased yield. This mines the soil and further erodes the soils potential to attain higher yields. Thus there is some evidence of a 'downward spiral' of poverty and environmental degradation in Sub-Saharan Africa as a result of higher scale macro-economic adjustment.

MACROECONOMIC ASPECTS

Devaluation can raise the price of tradables (i.e. export crops) because of an increased demand from abroad. The price increase must be more than the increase in the tradable portion of input cost of production for a *real* price increase to be realized by the farmer. In other words, the price increase must be greater than the increase in the price of inputs bought with hard currency. This leads to higher profits which increase the chance for land improving investment to occur. Even when this happens, there are other consequences of adjustment that reduce the potential for sustainable intensification. Price variability, instability, and perceived risk all increase with the introduction of adjustment (Krueger et al, 1988). The farmer is risk averse (as postulated by Neo-classical economics) so this instability in

the market (variability in the input and output prices) may lead to postponing of any capital investments.

Higher risk makes necessary capital investment unlikely which increase the potential for desertification. Under uncertainty, innovation is also curtailed because there is little desire to adopt new technologies that may enhance productivity. Thus the speed at which technology is diffused is decreased (Kin et al, 1992). The level at which input and output price variability is affected depends on the market structure associated with any one commodity.

During the growing season, when the farmer needs to apply fertilizer, only the price of this input is known. The farmer has expectations about output price, but when adjustment and devaluation come along, these time tested skilled of predicting the season-end prices are disrupted. Dembele and Savadogo (1996: pp. 3) describe this process: "Even when labor-intensive capital in the form of water and conservation infrastructure and the use of manure has created an agronomic potential for fertilizer use, unstable output market prices have prevented the conversion of this potential into effective demand (Sanders et al, cited in *ibid*)."

Price instability caused by adjustment is dependent on the type of market structure and market for a particular commodity. The market structure can be defined by several conditions. These may include concentration of the commerce sector, crop specific price elasticity, entry barriers to the market, and physical conditions (i.e. agroecological zone or a particular crop's physiology). Reardon et al (1998) find that in most rural African setting, concentration and market entry barriers are high and tend to produce large price instability with economic liberalization. Thus the effects of devaluation on farm profitability are difficult to predict.

In the past, output prices were stabilized by parastatal organizations. These organizations have been scaled back, or eliminated, with SAPs. They used price fixing and buffer stocks, among other measures, to stabilize prices. As these state supported institutions decline, so they have their costs and also their benefits. The services of these organizations are needed to provide marketing services and to create an environment that lead farmers to make safe investments in their agricultural enterprises. The added uncertainty, coupled with the absence of commodity boards and services

such as rural credit, cause farmers to postpone necessary investment in wind-breaks, terracing, or budding that would mitigate desertification.

After devaluation there is the propensity for the local currency to be overvalued again. This occurs because local inflation rate is generally higher than the inflation level of hard currency (inflation rises as foreign capital inflow increase in from abroad). Also, local currency loses value because devaluation causes price increases even of non-imported goods; for example a local bread seller, who uses locally grown grain, will need to mark-up the loaves in order to afford imported items for the home or business.

Devaluation will raise prices on imported food items, so there will be an increased demand for local crops as a currency is devalued and other SAP measures are implemented. Locally consumed agricultural products will be relatively cheaper to import substitutes, say local Malian rice versus imported rice, thus raising local demand. Cash crops will see a large magnitude in demand increase since they are directly tied in with the exchange rate values. Again, the implications for desertification depends on the level of land improving investments that are made.

Devaluation will cause prices to rise since supply, or output, is initially at pre-devaluation levels, but acreage/output will increase to meet demand and an equilibrium will be reached. As this equilibrium is attained it is certain to bring prices back down, perhaps not to pre-devaluation levels, but enough so that the real price received per unit is less because the local currency has lost value through the devaluation process, and because of inflation (as a side effect of adjustment programs) which causes local money-value to drop. The inflationary effect works to re-overvalue the currency, in turn, reducing prices and demand of agricultural products. Is this a likely scenario that leads to a loss in terms-of-trade?

DECLINING TERMS OF TRADE

Changes in Land Use and Land Cover: A Global Perspective (Sage, 1995), suggests that the global economy and the concept of comparative advantage impedes the poorest countries to achieve economic growth. Holding productivity constant, the same amount of land has produced less

hard currency over time. This leads to increased acreage of commercial cash crops for the foreign market.

On the INCD (IV) information sharing segment found on the CCD web page, Ahmed (1993) stated that between 1980 and 1988 the real price of non-fuel commodities from the Third World countries declined by 40%. The North countries' inelasticity of demand for foodstuffs, subsidization of agricultural producers, protectionism, slow growth of income, lack of technical innovation in the South countries, and the lack of diversification are cited as causes for this decline. Furthermore, most Sub-Saharan countries are dependent on the export of just a few crops, these countries are forced to increase exports (and thus increase acreage and intensity of cropping) to maintain incomes as prices fall for these commodities. At the same time these countries face a higher debt burden which requires increased production of cash crops to repay. Earnings from food exports have increased since 1970 primarily because of volume exported (ibid). The role of SAPs on the process of desertification is described as follows (ibid: pp. 9):

"The effect of such programmes on the sustainability of agriculture and rural livelihoods is not fully understood and may be country specific. The removal of irrational distortions, by improving allocative efficiency and allowing prices to reflect resource scarcity, can improve resource management, but it may also have negative effect, especially when stabilization policies and safety nets are not pursued. However, in the short term at least, liberalization policies can adversely affect the ability of governments to invest in dry land areas, reinforcing existing biases."

The increased incentives for export and urban production has a negative effect on loss management strategies (ibid). These strategies includes a mix of crops for risk reduction and a catalog of responses to low crop yields because of unexpected changes in climate or price. In years of 'want' farmers will sell off resource equity (i.e. livestock, forest, and grain reserves) gained in years of plenty. Emphasis in mono-cropping for increased urban and foreign demand results in the lack of environmental and economic diversification making farmers prone to pest infestation as biological diversity is decreased, and they become overly reliant on the

price of one or two commodities thereby decreasing food security in the face of biological, climatic and economic variability.

Declining terms of trade is represented by a 10%-17% annual decline in real export prices of agricultural commodities (FAO, 1984). The Ecologist (Vol. 23 No.6, 1993) explains how the General Agreement on Trade and Tariffs (GATT) will farther reduce the terms of trade for Third World nations. In most cases, processing industries in the North countries are protected, and complying with GATT rules (e.g. customs and standards) can be very costly.

YIELDS

Increased food needs are not met because of low yields, and in some cases high levels of cash crop production. This leads to low investment in local food production, keeping productivity low, which encourage food imports which in-turn requires increases in cash crops receipts. What emerges is macro-economic policy having adverse effects on the micro-scale-effectively reducing the farmers, (and society as a whole) ability to adapt. Compensating for the effects of desertification through improved land management strategies (as written about by Fairhead and Leach, 1996; and Amanor, 1994) are effectively ruled out.

In Sub-Saharan Africa, soil mining is coupled with the low yields to agriculture. FAO data (1986) indicate that the average yield for sorghum in Niger is 300 kg/ha compared to the 4000 kg/ha in the US. In Sudan maize yields 800 kg/ha while the US is able to produce 7,500 kg/ha. While these comparisons arise out of diverse farming systems and varied ecologic and economic conditions that exist between North America and Africa, they display the relative commercial inefficiency of African agriculture, and may be indicative of a landscape with an inherent potential for degradation.

Ahmed et al (2000) find that higher yield for improved varieties of dryland crops, sorghum and millet, are only realized when complimented with fertilizer use and improved irrigation. They find that use of these complimentary inputs have been the exception in Africa (largely confined to cases in South Africa) and not the rule-thus yields are below potential. Low crop yields in Sub-Saharan Africa is the reason forcing the region to continue to importing large quantities of grain.

An endogenous factor affecting production is the poor quality of soil. African soils are relatively nutrient deficient and prone to degradation because they are geologically mature and highly weathered. "The Green Revolution of the mid-1960's in Asia occurred because of the use of improved varieties and often with irrigation on fertile land. In comparison most African soils are marginal uplands. Improving yields on marginal uplands requires appropriate resource management strategies" Ratten (1990: pp. 444).

Meanwhile little research and development on food crops to improve low yields in drylands is occurring. Research funds tend to favor crops that are consumed outside of the region. The implication for drylands is lack of improved yields in millet and sorghum, which are staples in 13, mostly dryland countries, with a population of 200 million. Crops which receive most of the research funds (rice, wheat, and maize) are consumed by 3.5 million people in 80 countries (FAO, 1984). There has been no significant breakthrough in the genetic improvement of rainfed millet and sorghum, which are grown in low rainfall areas, including 80% of the cultivated land in the Sahel (World Bank, 1984). Also, if SAPs are not accompanied with specifically targeted research funds, they put a squeeze on already poorly funded local research.

As a result of little research and low yields, there is a tendency for these countries to import a large percentage of their food needs. Most Third World countries are dependent on one or two commodity for hard currency to pay for imports. ICIHI (1986) gives examples of how these countries are prone to desertification because of the export orientation of their agricultural economy. Senegal is dependent on peanuts, and Chad receives three-fourths of its foreign currency from cotton (ibid).

THE ROLE OF DEBT

Borrowed funds, when not spent on the social sector (i.e. agriculture, health services, social services, and education) can be especially harmful to the poorest citizens of Africa when their governments implement SAPs, because, typically, debt service takes monies from such programs. Some past SAP policies have cut government spending on the

social sector, while requiring increased levels of debt repayment (Bradshaw and Wallace, 1996).

President Blaise Compaore of Burkina Faso stated that debt is causing desertification (at the World Conservation Union meeting in France on 4 November 1998). According to the president, countries in the Sahel are not able to meet the basic needs of the population because of the need to service debt. His argument is that impoverished (and growing) populations in Africa over-exploit resources in order to meet their basic food capital needs which are exacerbated by the need to repay foreign debt.

NGOs at the World Summit for Social Development of March 1995, demanded in the Copenhagen Alternative Declaration, that all foreign debt should be immediately canceled. The NGO Debt treaty of June 10, 1992, coinciding with UNCED (VI), stated that "foreign debt is the most recent mechanism of exploitation of Southern peoples and environment by the North." *Grassroot Indicators for Desertification: Experience and Perspectives from Eastern and Southern Africa* (Krugmann, 1996) calls for incremental reduction in foreign debt, coupled with policies that create an enabling environments for sustainable resource use.

On the INCD (IV) information sharing segment document found on the CCD web page (Yakowitz, 1993: pp.4) states that, "...external debt service of the poorest countries which had been falling since 1989, rose in 1992 as a result of expanding multilateral service payments." Furthermore, the report to the UN Secretary General arising from the October 1991 meeting on the Implementation of the Plan of Action to Combat Desertification calls for reduction of external debt.

It is evident that groups of varying agenda's, including the World Bank, view debt as a debilitating agent to the fruitful development of African societies, and partial cause of desertification. Blaikie and Brookfield (1987:pp. 107) present their views on the consequences of commercial agriculture needed to repay such debt.

"There have been many successful adaptations based on the introduction of commercial crops (Richards, P 1985 and IFAD, 1985 cited in *ibid*). However, there are also contrary examples, where reduction in fallow periods, monoculture with soil-exhaustive crops,

overstocking, planting in rows and sometimes mechanization have had seriously degrading consequences. These consequences have arisen because *compensating adjustments either were not or could not be made* (italics added)."

CONCLUSION

As Sub-Saharan African countries work to meet their increasing foreign currency needs, they devote more land to cash crops, shorten fallow periods and expand agriculture onto marginal areas (ICIHI, 1986). The effects of SAPs and foreign debt are not always clear-cut though. For example, a currency devaluation will raise export demand, and have the short-run effect of increasing output of cash crops thereby causing increased acreage of a commercial crop or intensifying use of currently occupied land (the decision on whether to intensify or extensify is highly dependent on the level of population pressure).

Both these responses may have consequences for desertification. In the long-run, a devaluation will increase hard currency inflows and investment in the industrial sector-reducing dependence on agricultural based livelihoods. Thus economic policy must capture spatial variation and also be temporally sensitive.

The possible negative effects of SAPs on land management can be grouped into four areas: 1) Policies that reduce or eliminate social service (most critical for desertification is when agricultural extension and infrastructure are not exempt). 2) Lack of considering population growth, and the increased demand for food and land that requires sustainable intensification. 3) High inelasticity of supply response of farmers (which does not allow for intended response to macro-economic policy measures). 4) High levels of borrowing that require increased levels of cash crop receipts to repay, often at the expense of resources used for food crop production.

Whatever the effect, it is the *poor* residents of cities and rural areas alike that are least prepared to withstand the shocks of adjustment and debt. SAPs will spur agricultural demand by eliminating urban bias in the economy caused by currency overvaluation and high agricultural taxes, and will promote import substitution because imports become relatively

expensive with devaluation. As a result, urban residents will witness the greatest increase in their cost of living. The welfare of rural residents is also affected (as are food security and land management). This is exemplified by the peanut sector in Senegal; increased demand and price spurred by devaluation amounted to very little for the farmer because it was canceled-out by fertilizer price increase as subsidies were lifted and currency devaluated (Reardon, et al, 1997). Most commercial fertilizer in Sub-Saharan Africa is imported, and thus directly affected by exchange rates.

The negative effects of SAPs do not happen universally. They occur with the absence of affirmative measures to sustain productivity. A combination of technological and institutional innovation, sound economic policy, and the political will to pursue these measures are needed (Eicher and Kupfuma, 1998). Such measures could include SAPs that 'get prices right' and remove urban bias *while* maintaining or even building agricultural infrastructure such as credit and extension. Key in the environment, economics, and desertification debate is equity and land tenure issues that provide incentives for technology adoption, and investment in soil and water conservation, and restoration of degraded land.

Such positive environmental benefits or externalities have thus far occurred serendipitously as a result of SAPs. Panayotou (1992) points out that, ideally, pesticides should be taxed according to their negative externalities, and IPM and organic fertilizers subsidized in proportion to their positive environmental externalities. This represents an affirmative tax measure that also achieves food security and sustainability goals by creating incentives for investment in land improving, or conservation measures.

Fundamental structural change to current global political and macro-economic structures (e.g. World Trade Organization Rules) that permits subsidies and investment in sustainable agricultural intensification in Africa are required for anything close to a Green Revolution to occur in Africa. The current global macro-economic policies for Third World countries, SAPs, demand that these nations reduce subsidies, strive to eliminate commodity groups, devalue currencies, require the treatment of foreign investors as locals, and a number of other measures. Policy measures that aim to induce growth while sustaining the resource base should be included into borrowing criteria of lending countries.

The environmental consequences of SAPs, and unprecedented levels of debt burden of Sub-Saharan African countries, have not been considered sufficiently in past policy formulation. The reasons pertaining to this are partly rooted in historically accepted axioms of the disciplines. The environment is seldom mentioned in original works of classical economics (capital and labor factor constraints are discussed while the resource base was ignored or assumed to be infinite), so there should be no surprise that the environment is neglected in past macro-economic policy debate.

The intellectual and philosophical traditions of classical economics do not deal with preserving natural resources for long term sustainability. The past economics literature on the economics of environmental degradation jumps from cause (usually cited as population growth) to a Boserupian view of adjusting to these changes through management and technological changes. This approach does not adequately address how populations are affected by macro-economic, political, and institutional structures, and how these structures affect (micro-level) farmer decisions.

The level at which SAPs affect the level of desertification depends on a variety of factors. Structural adjustment policies remove urban bias in the economy and allow for price incentives to be created for agriculture. Long run agricultural productivity will fall if SAPs do not create incentives for sustainable intensification. 'Debt-for-nature' swaps have been instituted to preserve natural forests and create national parks in parts of the Third World, but this is not what Sub-Saharan Africa needs to address its food security problem; 'debt-for-conservation measures' swaps are more appropriate, and a way to simultaneously address the desertification and debt problems.

One broad approach that accounts for global and local political structures, and is space and time sensitive, is termed 'political ecology.' It "...encompasses the constantly shifting dialectic between society and land resources and also with class and groups within society itself" (Blaikie and Brookfield, 1987: pp. 17). Campbell and Olson (1991) operationalize the political ecology approach using a 'Kite' model with political, socio-cultural, economic, and environment representing the four corners of a kite. According to this approach, desertification can be identified by category and described through important variables within them. Interactions

between these four thematic areas can then be made in relation to four variables: scale, space, power relations, and time. This would permit an evaluation of the impacts of an economic policy measure on the total system over time-through feedback loops (that permit re-evaluation).

“The functional integration of technological options, farm household behavior and market mechanisms into a single analytical framework that recognizes interactions and feedback procedures offers promise in bridging the gaps between different academic disciplines and between scientists and policy makers” (Ruben et al, 2001: pp. 132). Dixon et al (1989) also emphasize monitoring and feedback in assessing multiple scale effects of economic policy on desertification.

Blaikie and Brookfield (1987) give several reasons for the lack of progress in combating desertification. The primary one being an inability of the *social* sciences to combine *natural* science research in studying the process of desertification which they characterized as ‘blocks’. “Land degradation and society, because of its complex and multidisciplinary nature, and its theoretical and practical elements, encounters most of these blocks” (ibid: pp. 25). The CCD explicitly recognizes that vertical and horizontal integration of various organizations and development policies is the only way to systematically assess and reverse the process of desertification.

This ‘block’ is particularly evident when formulating macro-economic policy that accounts for resource sustainability. There is also a dearth of empirical work on the (micro) economics of land and water conservation, but there are some exceptions of location specific analysis of conservation and restoration techniques (see Dixon et al, 1990, 1989; and Chisholm and Dumsday, 1987).

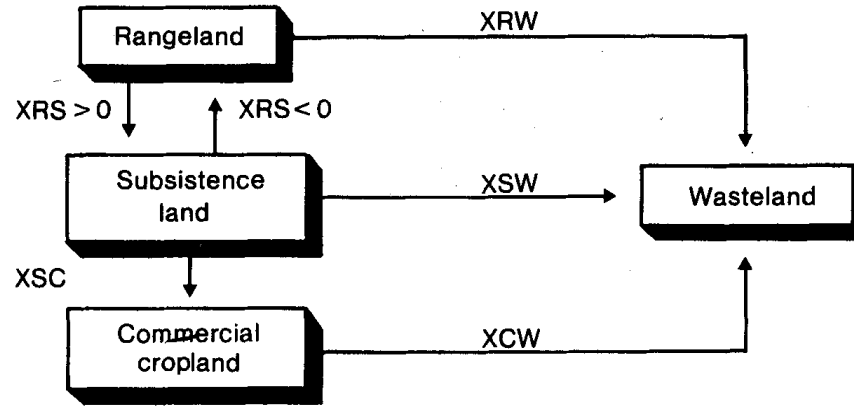
The multidisciplinary nature of desertification is widely recognized. Thus it is crucial to understand the interaction of agro-ecological and socio-economic driving forces. Bioeconomic modeling attempts to explain such multidisciplinary phenomenon.

“While economic models are able to identify the behavioral *reasons* for crop and technology choice, agro-ecological models are used to select feasible technologies and cropping options for specific

agroecological conditions and to assess their *consequences* in terms of the sustainability of the resource base. Combining both approaches into a single analytical framework would assist policy making” (Ruben, 1998: pp. 332).

Bioeconomic models should be constructed from the relevant scale of where degradation, or implicit decision to degrade is occurring (i.e. household, village, or community) based on representative survey questionnaires of households or communities. For relevant macro policy formulation the results would have to be aggregated for similar eco-regions (Ruben et al, 2001).

One such computer macro model utilized by UNEP is the SARUM-AREAM (Systems Analysis Research Unit Model). It simulates the environmental effects of free trade, trade preference and restriction policies, and foreign aid. Below is the Graphical User Interface for ‘land types and transformation rate’ (for a detailed description see “Global Modeling of Dryland Degradation” in Dixon et al, 1990).



XRS Transformation rate for rangeland to subsistence land; positive (rangeland is converted to subsistence land) if a shortage of the subsistence commodity exists; negative otherwise.

XSC Transformation rate for subsistence land to commercial agricultural land.

XRW Degradation rate for rangeland to wasteland; depends on the amount of rangeland vegetation cover.

XSW Degradation rate for subsistence cropland to wasteland; depends on capital intensity of production in subsistence land.

XCW Degradation rate for commercial cropland to wasteland.

At the the micro-level, an Integrated Nutrient Management (NUTMON) model operationalizes a multidisciplinary intervention approach to land degradation by combining farmer knowledge, socio-economic sciences, and biophysical sciences to determine nutrient balances and economic performance at the farm level (de Jager et al, 1998). It was possible to determine the best combination of available nutrient management practices for three sites in Kenya by using indicators such as gross margins and net cash flows, soil tests (to determine NPK balances), satellite photos, and detailed farmer interview among others (ibid).

Because of the multifaceted approaches required to address desertification, policy to reverse land degradation in Sub-Saharan Africa will not occur until there is cooperation and coordination with all levels of

government, NGOs, and civil society. This is explicitly recognized in the CCD. Government NGO coordinating bodies should be involved with disseminating information on the Convention to all concerned governmental and non-governmental institutions.

Cooperation among international organizations would have a synergistic effect, and serve as an example for African countries to follow. Cooperation that creates an enabling policy environment for long term food security is urgently required.

NOTES

I Desertification occurs as a result of and degradation; the terms are used interchangeably in this paper.

II HDI is UNDP's broad indicator of quality of life that includes measures of life expectancy, and GNP per capital among others.

III The full name of the convention is the United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa.

IV United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil, 4-9 June 1992.

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