CHAPTER 5

POVERTY, LAND CONSERVATION AND INTERGENERATIONAL EQUITY

Will the least developed countries benefit from agricultural trade liberalization?

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INTRODUCTION

The current negotiations on agriculture within the World Trade Organization (WTO) may lead to some degrees of liberalization in world agriculture. Many of the developing countries, and chiefly among them the poorest, rely heavily on agriculture for their livelihoods. A question is whether the change in the rules of trade will affect these poor countries in a positive way.

For neoclassical trade theory, free trade has unambiguous beneficial effects for all trading partners through the working of static comparative advantage. This prediction is intended to apply to all commodities, including agricultural, and to all countries, highly or less developed. If successful, sustained WTO negotiations on the liberalization of agricultural trade will produce a free trade situation where farmers compete against farmers in a global setting, replacing the old situation where countries competed against other countries through the use of agricultural trade policies and where farmers were shielded from the direct competition from other farmers. Such a new setting, according to neoclassical argument, will be beneficial to farmers in the least developed countries (LDCs) essentially through the more favourable prices of exported products that will result.

Two objections against this conclusion have been raised in the literature: (1) the presence of second round effects, such as the changing farm wages and/or production basket mix resulting from the changing prices, and (2) the existence of structural factors that may limit farmers' responses to positive price changes, such as

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weak market integration, and credit constraints (Narayanan and Gulati 2002). A third, and less frequently discussed, complication is the intergenerational tragedy of the commons in natural resource management that is caused by extreme poverty. In dealing with land conservation issues, land is normally treated in the literature as a pure private good, thus precluding any justification for public intervention. However, we will argue that in a context of extreme poverty, investing in natural resources such as land faces a problem of free riding when looked at across generations. That is, in the context of budget restraints, successive generations may tend to use whatever fertility is left on the land, without investing in land regeneration. If pervasive, this problem of inadequate level of private investment in land will imply that farmers may not be prepared to take full advantage of trade liberalization. We propose policies to tackle this eventuality, including a role for the international community.

In section "*Extent of land degradation*" below, we indicate the extent of land degradation in developing countries, especially in Sub-Saharan Africa. In section "*Land degradation and sub-optimal private response in an intergenerational context*", we develop a conceptual argument that explains the inadequacy of private choices in land fertility restoration. In section "*Land regeneration in the LDCs: the role of prices and incomes*", the links between land degradation, prices, income and public policy are discussed and illustrated with factual evidence from Burkina Faso. Section "*Implications for price and trade policies*" considers the role of active price and trade policies in securing benefits from liberalization for the LDCs. Section "*Summary and conclusion*" offers some conclusions.

EXTENT OF LAND DEGRADATION

Land degradation has different definitions, but one that is sufficiently comprehensive says that it is “the aggregate diminution of the productive potential of the land, including its major uses (rainfed, irrigated, rangeland, forest), its farming systems (e.g. smallholder subsistence) and its value as economic resource” (Stocking and Murnaghan 2001). Gretton and Salma (1997) add that degradation has to be caused by human activity. Desertification due to natural climate changes would not be regarded as degradation while desert-like conditions due to overgrazing would.

For soil scientists, land degradation has a significant aspect of irreversibility (Eswaran et al. 2001). Lost soil cannot be fully recovered. Besides, non-linearities in soil–crop interactions often lead to dual equilibrium situations. For example, land degradation may cause high leaching and bad rooting, which lowers the nutrient recovery rate of plants. As a consequence, the application of fertilizer has less effect, which reduces the returns on investment aimed at regenerating the soil.

An estimated 1.9 billion hectares of land worldwide are affected by degradation (El-Beltagy 1997). Dregne and Chou (1992) estimated that 70% of the land in dry areas in the world was degraded in the 1990s. In Africa, this proportion was 73%. The rate of degradation is estimated at 21 million hectares per year, with 6 million hectares of land permanently lost for crop production. The problem of land

degradation is an important global issue because of its adverse impact on agricultural productivity and the environment, as well as its effect on food. Projections suggest that if the negative trends were to continue, the future food security of poor countries is threatened (El-Beltagy 1997; Eswaran et al. 2001).

Sub-Saharan Africa is a geologically old region with many poor and fragile soils. Nutrient depletion is a major form of land degradation and has severe economic impact. In a sample of 38 African countries, including 26 LDCs, average annual per hectare losses of nutrients were estimated at 22 kg of nitrogen, 3 kg of phosphorus and 15 kg of potassium (Holden 1997).

The impact of soil degradation on agricultural productivity has also been assessed. The productivity of some lands in Africa has declined by 50% due to soil erosion and desertification (Dregne 1990). Lal (1995) estimated that yield losses due to erosion in Africa ranged from 2 to 40%, with a mean loss of 8.2%. Projections show that yield reductions might be as high as 16.5% by 2020, suggesting that the land could practically lose all its productive potential if soil degradation continues unabated. Admittedly, it is difficult to obtain a non-ambiguous cause-and-effect relationship between land degradation and productivity at the micro (plot) level. Data from China and Thailand failed to provide any evidence of a negative relationship between cumulative soil loss and yield per hectare. More insight is needed into the precise nature of processes involved at the soil–plant–atmosphere continuum (Eswaran et al. 2001). Nevertheless, there is increasing evidence that the economic effects of land degradation are serious. Poor people mainly rely on agriculture, and negative changes have detrimental effects on them in the form of food insecurity, malnutrition and child mortality.

LAND DEGRADATION AND SUB-OPTIMAL PRIVATE RESPONSE IN AN INTERGENERATIONAL CONTEXT

The simple neoclassical model predicts that free market forces will lead to a Pareto-optimal situation. However, this conclusion presupposes the absence of external effects and public-good problems. One justification for public intervention in environmental protection is externalities *sensu stricto*. For example, land erosion from untended fields may lead to the silting of rivers downstream, the contamination of drinking water by agrochemicals, and loss of habitat (Scherr and Yadav 1997), causing negative externalities for all users. In this paper we follow an alternative path by stressing intertemporal externalities between individuals who use the same piece of land successively without intervention of a market. Our argument is that in the presence of extensive poverty, land that is passed on to family members of a new generation may become a common pool resource in an intergenerational sense. This is so, even when the land itself is a private (or semi-private, collectively inherited) good, provided that the land is bequeathed with little role being played by the market, as commonly occurs in African LDCs.

A common pool resource is defined as a depletable good from the consumption of which other individuals cannot be excluded. The fish in the sea is an example. The non-excludability is normally seen as space-related, not time-related; the

definition stresses the simultaneous use of the good. We extend this definition to the case where investment in land has a time aspect, through the intergenerational linkages binding individuals exploiting pieces of land bequeathed through inheritance. Non-excludability in this extension means that an individual at time *t* cannot exclude other individuals at *t-1* or *t+1* from using the resource.

Poverty is the major factor that may cause an intergenerational tragedy of the commons. The standard 'tragedy of the commons' model presupposes impersonal relationships between the individuals that are using the common resource. However, the individuals who are successively exploiting a piece of family land are connected through kinship relations. The utility function of a farmer normally includes the utility of his sons or other heirs. Their future well-being is a consideration in his investment decisions, so that a tragedy of the commons will not normally arise. However, if poverty causes high individual discount rates, farmers will not only heavily discount their own future well-being, but that of their heirs as well. Moreover, insofar as care for relatives has the nature of a luxury good, poverty will reduce the weight of the heirs' well-being in a farmer's budget-constrained utility function. As a consequence, heirs of poor farmers may find themselves being treated like strangers. Their parents may choose to free ride by exploiting the land that is the common resource of successive generations without replacing the amount of nutrients that they deplete. Such intergenerational free riding is rendered possible by the fact that the productive potential of land can be 'stretched' to some extent, unlike other productive assets such as nitrogen fertilizer, which are depleted in one season.

In this way, intergenerational equity issues may become a serious concern. A Sahelian farmer now in his forties could reflect on the discourse on land degradation and rehabilitation during the Sahel drought spell of 1968-74. He would recall that it was said then, as he was a little boy, that in the next thirty years or so, failing to invest in land improvement techniques would be tantamount to suicide for the rural population, or that the countries would become dependent on the rest of the world for their food. Sitting today in his degraded gravel-laden field, such a farmer would say to himself: "I am living with this terrible natural resource deficit now because my parents failed to take my welfare into account when planning on their own needs, as I was growing up". This intergenerational memory looping, through which it is possible to look back in time, uncovers the reality of an intergenerational tragedy of the commons on privately bequeathed land[1].

One might object that because the well-being of the son is an element of the utility function of the father, and the discounting out of it follows from the latter maximizing his utility, the exhaustion of the land – no matter how inequitable for the son – is not an external effect and therefore not inefficient. However, there is no sense in which a change can be said to be efficiency improving if the losers are not compensated. That the hypothetical compensation criterion would be enough to establish an actual efficiency gain is a misunderstanding (see, e.g., Jongeneel and Koning 1999).

Poverty trap

An intergenerational tragedy of the commons implies that investment to restore land by individual farmers will be below the socially optimal level, i.e. one that would take into account the welfare of future generations. The ensuing problems can become intractable because of the poverty trap. Various conditions, not uncommon in the less developed countries, can give rise to this. One, already referred to above, is the high time preference typical of poverty, which makes poor people deplete their land. Another is the indivisibility of land conservation investment, which typically comes in packages. Anything less than the minimum package will have little effect, but the poor may be unable to afford this package. Still another condition is high production risk (weather, pests) that limits poor people's ventures into successful land conservation technologies such as the use of costly commercial fertilizers. Finally, there is the dual equilibrium nature of many soil–crop systems that makes it costly to return to the higher-level equilibrium once a low-level equilibrium has established itself. These various conditions ensure that poor farmers are trapped in poverty. They inherit degraded land that they cannot restore, and as a consequence remain poor and pass on an even more degraded land to their offspring. The market in such a situation would produce some equilibrium, but it would be a low-level equilibrium, penalizing the society as a whole by allowing non-efficient allocation of resources by part of its members.

In this situation, both rises and declines in prices may lead to further land degradation. When prices go down, the poor will tend to cultivate more land to maintain their income level. When prices rise, the poor, at least in the short run, will tend to use natural resources more extensively without adjusting their land management techniques in order to maximize income (as has occurred in cotton in the Sahel and cocoa in Ivory Coast). Either way, the land may be penalized by the survival strategies of farmers. It is only when the poverty cycle is broken, that higher prices may lead to more sustainable intensification of production through the use of productivity enhancing inputs like fertilizers and pesticides[2].

LAND REGENERATION IN THE LDCS: THE ROLE OF PRICES AND INCOMES

When the agriculture of a country is locked into an intergenerational tragedy of the commons, the idea that liberal market policies lead to optimal welfare no longer holds. Supportive policies become needed to induce farmers to invest in their land so that the higher-level equilibrium can be restored. In this respect, one can learn from history by looking at the developed countries. Historically, the developed industrialized countries with a strong agricultural sector have recognized the need to supplement private investment in the maintenance of land resources through direct public intervention. For the United States, Johnson and co-authors (Johnson and Timmons 1944; Johnson et al. 1947a; 1947b) argue in favour of the use of public works to improve rural livelihoods, including public investment on private-land conservation under the conditions of not providing windfall profits to private

landowners. Their argument hinges on (i) equity (there were large differences between rural and urban access to social services such as education, health, water and sanitation, and general infrastructure); (ii) the provision of employment to the rural sector; and (iii) the linkages between the rural economy and the rest of the national economy, through, for example, the migration of a more qualified rural workforce to the cities. In the United States, the focus on conservation was motivated by concern over future generations, and the externalities from soil loss were viewed as contrary to the public interest. Early Acts passed by Congress in 1936 and 1956, and the more recent Food Security Act in 1985, enabled farmers to receive soil conservation payments tied to commodity supply management (Rausser 1992).

While the successful government intervention for land conservation in the industrialized countries mainly assumed the form of public investment, a typical LDC government lacks this capacity. In line with this, the literature emphasizes the importance of prices in the case of the least developed countries. Coxhead et al. (2001) argue that policy making in land use issues in the LDCs has paid too little attention to prices and markets rather than direct intervention through technology transfer, institutional innovations and other household-level actions. In their case study of the Philippines, they show that upland rice farmers in remote areas are price takers and that price shocks at the national level as well as macroeconomic instability are transmitted to them, causing alteration of land use patterns. Barbier (1990) shows that in the absence of appropriate economic incentives upland farmers on Java (Indonesia) do not adopt soil conservation practices in lieu of their traditional methods. Access to cheaper medium-term credit would make investment in terracing profitable and induce farmers to adopt these techniques, while fertilizer subsidies would encourage the cultivation of even the severely degraded soils. A time control model used by the author predicts that increasing the discount rate would enhance the use of traditional productivity boosting inputs at the expense of soil conservation inputs, while increasing the relative price of the traditionally cultivated commodities could lead to a drastic decline in soil quality over time.

In an analysis of the relation of land degradation to poverty, Grepperud (1997) delineates three kinds of production processes: (i) processes that enhance current production at the expense of long-run conservation; (ii) processes that slow down current and future degradation but at the expense of current productivity; and (iii) processes that both enhance current production and secure the environment. He shows that governments' pricing and trade policies may influence which production model is adopted.

In their study of the determinants of land conservation investment in Rwanda, Clay et al. (1998) have illustrated the key role played by prices and household wealth and liquidity. They found that non-farm income, a source of liquidity, positively affects households' conservation decisions. They also found that more stable output prices promote the use of inputs that enhance soil fertility.

In summary, the empirical evidence in the literature supports the hypothesis that a mixture of price incentives and income generation schemes could help farmers in LDCs to invest in land conservation.

Illustration from a Sahel case study

We now draw on recent results from the Sahel to give empirical support to the points raised above. The Sahel is one of the regions where land degradation poses a major threat to the future of agriculture. Burkina Faso is the Sahelian country where soil degradation seems to be the most serious. An estimated 75% of the country is suffering from important to severe degradation (Niemeijer and Mazzucato 2002). The country comprises three agro-ecological zones: the Sahelian to the north, the Sudano-sahelian in the centre, and the Sudano-guinean zone to the south-west. The first two are characterized by low agricultural potential, the third by higher potential. Annual rainfall decreases as one moves from south to north, from over 1000 mm to less than 600 mm. Moreover, the erratic nature of rainfall poses serious constraints to farmers in planning what and when to plant.

While water is the most visible constraint for agricultural production in this semi-arid setting, the condition of soils appears to be an even more limiting factor (Van Keulen and Breman 1990). The depletion of soil fertility in Burkina has been evidenced by research, through the measurement of mineral and organic balances of the soils in various zones of the country (Bikienga and Lompo 1996; Bikienga and Coulibaly 1995). Most soils are characterized by negative balances of organic matter and of the major minerals (phosphorus, nitrogen and potassium) and by a rapid deterioration of the physical structure of soils. These characteristics are typical of soils in the Sudanian zone of West Africa (Owusu-Bemoah et al. 1991). The negative mineral balances are essentially due to two factors: (i) soil erosion, which washes off soil nutrients, and (ii) the intensive and continuous cultivation of the same plots that leads to the mining of the nutrients. Nutrient mining in Burkina was estimated at 30 kg/ha of the major minerals (nitrogen, phosphorus and potassium).

Farmers try to combat soil degradation by adopting various soil conservation and improvement practices. Some of these techniques are more labour-intensive, while others are more capital-intensive. Among the latter are the commercial mineral fertilizers (NPK for example). Labour-intensive techniques commonly used in Burkina include *diguettes* (small dikes), *zaï* and mulching. Diguettes are 10-100 m long, 10-50 cm high rock barriers that collect water and hold it in the fields, prevent erosion and increase the land's water absorption capacity. Rocks are the choice materials because the bunds must be semi-permeable to prevent them from breaking under the water pressure. This labour-intensive technique (it requires 200 man-hours per hectare) is widely used in the populated semi-arid zone of Burkina. Zaï are holes of 20-30 cm in diameter and 15-20 cm deep that act as water catchments. With a spacing of 100 cm between holes, the number of holes is estimated at 20,000-25,000 per hectare of millet or sorghum field. The simple zaï can be improved by adding manure or compost in the hole, resulting in doubling or increasing yields by 50% in the short run in some regions (Ministère de l'Action Coopérative Paysanne 1990). Mulching is a simple technique of applying crop or plant residues on the land. These residues help to retain soil moisture following rainfall, and to keep temperatures down. Because of competing needs of crop residues between livestock, energy and other human uses, the technology faces a constraint in available material.

Using household survey data collected over the May-June 2004 period in 60 villages of Burkina Faso, regressions were run to assess the impacts of income on adopting these different conservation technologies and the commercial chemical fertilizers. Two sets of interesting results can be highlighted[3].

Adoption of labour-intensive, water conservation technologies. The results show that income has a positive and significant effect on the adoption of zaï in all zones, and that the relation is stronger in the Sudano-Sahelian than in the Sudano-Guinean zone. Income is also a strong determinant of the adoption of diguettes in the Sudano-Sahelian zone, but not in the Sudano-Guinean zone. Mulching, a typically cheap technology, is likewise positively related to income in the Sudano-Sahelian zone. In other terms, income is a limiting factor in all three zones for zaï, and in the Sudano-Sahelian zone for diguettes and mulching. These findings mean that if household income could be increased, investment in soil conservation could increase, especially in the degraded Sudano-Sahelian zone. However, if the hypothesis of the poverty trap is verified, households cannot undertake this additional investment because income cannot increase endogenously. This means that policy has to play a role. In the 1980s, learning lessons from the 1973 and 1984 Sahel droughts, the government in Burkina initiated actions to increase the use of soil conservation technologies in the Central plateau. Through the *Fonds de l'Eau et de l'Équipement Rural* (FEER) and other projects, equipment and food (which is a form of income in kind) were provided to village organizations to build diguettes. This contributed to boost the area covered by this erosion control technology.

Adoption of capital-intensive soil fertility management. When the use of the technology is modelled as a zero–one variable, the results suggest that income has a positive and significant effect in the Sudano-Sahelian zone, and a positive but not significant effect in the Sudano-Guinean zone. In contrast, when technology use is modelled by using household expenditure on the technology as the dependent variable, the effect of income becomes significant in the Sudano-Guinean zone and insignificant in the Sudano-Sahelian zone. These switching results have an interesting intuitive interpretation. In the Sudano-Sahelian zone, farmers are well aware of the benefits of commercial chemical fertilizer on the soil and on yields. They attempt to use it (and hence the significance of the binary variable approach), but the quantities used are so small that the relationship between expenditure and income is blurred. In contrast, farmers in the Sudano-Guinean zone are not only aware of the beneficial effect of chemical fertilizer, but they also have the means to invest in it, and richer households there spend considerable sums on fertilizer. The credit scheme provided by the cotton parastatal in this zone is a key factor in the high prevalence and level of fertilizer use. The results thus suggest that where public policy is effective, investment in land conservation may respond positively, and where incomes are low and policy is absent, there may be a potential but unmet demand for technology.

IMPLICATIONS FOR PRICE AND TRADE POLICIES

The simple neoclassical model of trade predicts that free trade provides the best environment for all trading countries, as each would be maximizing its welfare through the working of comparative advantage. Each country would be facing a given, undistorted world price that would reflect the opportunity costs of resources used in the production process. If each country then domestically tailors its own production to its own opportunity costs, given the world price, it will be exporting goods in which it enjoys a relative advantage and importing the goods for which it has relative disadvantage. The resulting situation is the maximization of total world welfare together with each individual country's welfare. The implication of this framework is that if one starts from a situation where prices are distorted by pervasive government intervention, the removal of these distortions would improve overall welfare. Each country involved in trade would benefit from the liberalization.

In spite of the resurgence of the open trade paradigm since the 1980s, many economists would accept that there are reasons why LDCs should not be exposed to a fully liberalized trade regime overnight. Some of these countries still suffer from the effects from past policies of taxing their agricultural sectors, while the developed countries were subsidizing theirs (Krueger et al. 1988). Besides, countries such as South Korea have been preparing for a liberalized trade for over three decades, while most LDCs have not. Moreover, there has been some evolution of trade theory. Non-constant returns to scale, non-homogeneous products and imperfect competition (Helpman and Krugman 1989) can be reasons for strategic government intervention, which was the path followed by a country like South Korea. Furthermore, the welfare effects indicated by most model studies of trade liberalization are only first order effects. Second order effects and long-term dynamic effects could change the conclusions significantly.

These observations suggest that LDCs should adopt a set of policies that may make them WTO-ready. This paper adds to these arguments by highlighting the intergenerational tragedy of the commons in natural resource conservation under extreme poverty. As a consequence, agricultural trade liberalization may fail to produce the intended effects for LDCs. Increased import competition as a result of trade liberalization may make domestic net sellers in these countries worse off, thereby reinforcing the poverty trap that leads to underinvestment in land. In export crops, liberalization may accelerate the over-exploitation of natural resources that is already being seen in cotton in the Sahel and cocoa in Ivory Coast. Both effects may undermine the already fragile natural resource base, compromising intergenerational equity. Policies that would induce farmers to invest in their land are needed if they are to be successful players in a liberalized global environment. Some argue (e.g. Schoenbaum 1992) that there is no conflict between free trade and domestic environmental policies, but this is only true where governments are able to protect the environment by public investment. We have already argued that LDC governments lack this capacity so that natural resource regeneration should be

pursued by policies that influence markets and prices. Below we discuss possibilities for this in trade and price policies.

Trade policies

We see four areas where the LDCs may concentrate their efforts to mitigate the potential negative short-run impacts of liberalization, given their weak natural-resource base, and prepare for gains in competitiveness in the long run. These areas pertain to trading area, product choices, choice of multilateral agreements, and domestic policies.

Increasing intra-regional trade. A common phenomenon during the current wave of globalization is the emergence of regional preferential trading arrangements (PTAs). This has occurred or is occurring in all continents. Rather than being a threat to a worldwide liberalization of trade, these new schemes can be seen as permissive conditions to increased global trade. As noted by Mansfield and Milner (1999), the novelty of the new regionalism is that it involves even the most influential country in the global system, the United States[4]. These authors see the new form of regionalism as fostering liberal trade and democracy. For Perroni and Whalley (2000), the regional units can be viewed as insurance arrangements, through which the smaller countries of the units would gain access to larger, international markets that would have remained remote under bilateral trading mode.

The LDCs could reinforce their regional PTAs while remaining open to the rest of the world. For instance, many countries in Africa possess a comparative advantage in commodities imported by other African countries, and these products are often friendlier to natural resources than the products currently exported to the rest of the world. By emphasizing intra-regional trade, LDCs can alleviate the short-term negative impact stemming from the poorer quality of their natural resources, and generate income through a less aggressive use of the environment. This income could partly be reinvested in land conservation in preparation for their fuller implication in global trade.

Developing niche markets. Beyond the traditional exports (coffee, cocoa, tea, cotton), the developing world can tap into non-traditional exports that carry a higher added value and may lead to better environmental practices. These include flowers, vegetables, fruits, sesame and some processed foods. Finding niche markets in the developed countries may help poor LDCs to alleviate the disadvantage they would face due to their higher production costs of the traditional products. There are concerns however that niche market products will not benefit the small farmer. Domestic accompanying policies will be required to be tailored to the needs of the poor segments of the populations.

Entering in agreements with shared responsibility. The LDCs should favour reciprocity-based agreements in lieu of the unreciprocated agreements of the type

that bind the African-Caribbean-Pacific (ACP) countries to the European Union. Although the ACP countries are lured by the short-run benefits of this type of agreement, in the long run it does not help them to become competitive on a more global scale. Promoting shared responsibility is tantamount to incorporating the full cost of PTAs in national decision making.

Domestic accompanying policies. Despite the resurgence of the paradigm of open trade from the 1980s, there is disagreement among economists as to the direct contribution of trade liberalization to economic performance. Sachs (1987) argues that the export performance of the East-Asian countries was in large part due to an active role of government in promoting exports and maintaining restrictions on imports. The example of Korea illustrates the case where a strong growth of exports (at an average annual rate of 23% between 1963 and 1990) was concomitant with a highly repressed economy characterized by substantial import tariffs and quantitative restrictions (Edwards 1993). Korea also resorted to export promotion and exchange rate policies as part of its trade liberalization strategy. For Taylor (1991), there are "no great benefits (plus some loss) in following open trade and capital market strategies". He argues therefore that internally based development policies will be the best choice for developing countries.

Price policies

Agricultural prices will play a major role if LDCs are to draw sustainable benefits from global liberalization. These countries are in large majorities composed of farm households whose incomes mostly depend for 50% or more on agriculture. As argued above, income is directly correlated with investment in land conservation. Because the latter is a major determinant of productivity and agricultural income is the product of prices and quantities (less costs), prices have an important influence on agricultural productivity. Using data on 18 developing countries, Fulginiti and Perrin (1993) have established a significant positive relationship between past prices and current productivity levels of agricultural resources. Although these are somewhat outdated, the relationship is probably still relevant.

A common practice that has shaped the past of the developing countries has been the taxation of agriculture, in particular export crops[5]. Fulginiti and Perrin (1993) estimated that taxation of agriculture had caused a 26% loss in productivity in the countries they studied. Although the bulk of agricultural taxation has been eliminated during the 1980s and 1990s in most LDCs following the implementation of adjustment programs, implicit or explicit taxes on some export crops and fertilizer still remain in some African countries. This is the case of the integrated cotton production approach in some of the French-speaking franc zone countries, with large cotton companies acting as intermediaries in input supply and product purchase through contractual arrangements and exchange rate overvaluation as a source of implicit taxation. At the turn of the present millennium, it was estimated that as little as 35% of a price increase on the international market of cotton was passed on to the producer in Burkina Faso (Sirima and Savadogo 2001). Townsend (1999) assessed

the price policies of African countries in the areas of export crops, food crops, fertilizer and macroeconomic policy for the period 1996-97. For export crops, Burkina Faso, Benin, Ghana, Togo and Mali ranked very poorly, with the transmission of international price changes below the expected levels.

Producer prices of agricultural products in some LDCs are also low because of structural factors, including poor roads that hinder market integration. The high transaction costs that result from poor transport systems lead to prices being low in surplus production areas and high in deficit areas. This situation acts as an indirect tax on producers. Countries need to integrate infrastructural investment as part of a policy package toward a liberalized agriculture.

Finally, there is a role for the international community. Depressed international prices may accelerate natural resource exploitation in the LDCs as argued above. A positive discrimination towards the LDCs (without, however, the non-reciprocal arrangement of the EU-ACP type) would be a solution. As Resnick (2004) shows on the basis of World Bank data for 2003, in the United States alone, the subsidies under the Farm Bill total $15-20 billion per year, more than the value of Africa's total annual agricultural export. One also notes that the share of official development assistance to Africa from the European Union and the United States that is allocated to agriculture has been on a steady decline, from 14-16% in 1990 to 6-8% in 2002. A reactivation of external assistance under some form that would act as a subsidy to the small farmers in the poorest of the LDCs should be considered.

SUMMARY AND CONCLUSION

The objective of this paper was to draw attention to limitations to the neoclassical tenet that trade liberalization in agriculture will benefit all trading partners. The paper looked at the particular case of investing in land regeneration and argued that this investment possessed some public good characteristics when looked at from an intergenerational standpoint and in the context of widespread and deep poverty. As a consequence, private investment in regeneration may lie below the socially optimal level. Without proper intervention, farmers in LDCs will be facing a weak resource base and fail to be competitive in a global trade environment.

Three sets of conclusions may be drawn. First, LDCs will need to enact appropriate trade policies in order to (i) prevent the potential negative impact of a liberalized global trade on natural resources, and (ii) to ensure that they can stand to benefit from liberalization in the long run. Such policies include the formation of regional PTAs, the tapping of niche markets, the abandonment of unreciprocated international arrangements for reciprocity-based agreements, and a set of domestic policies friendly to trade. Second, LDCs will need to reconsider their price policies. The implicit taxation of agricultural output prices that still prevails in some countries needs to be discontinued. Structural development (e.g., better road infrastructure) is also needed to lower the high transaction costs in trade that tend to depress producer prices. Finally, the international community will need to develop special programs to assist the small farmer in the poorest countries.

NOTES

[1] Intertemporal externalities are similar to spatial externalities as both involve the motion from one point to another. The difference is that space is reversible while time is not, but memory looping allows simulating time reversibility.

[2] Unsustainable expansion of cultivation as a response to price rises is the consequence of a situation of poverty and has a short-run nature. If, through some policy, the poverty cycle can be broken, then the rational and expected response of high international prices will be the intensification of production through the use of productivity-enhancing inputs (fertilizers, pesticides). However, many cash-crop producers in the poorer countries still have very small operating sizes. For the particular case of Burkina Faso, a small country but a large cotton producer on the African scale, the mean farm size among cotton producers in 2003 is only 8.4 ha, the median is 6.3 ha, while the largest farm is 37.7 ha (sample data from the Bâle province, a major cotton-producing zone of Burkina (Bambio 2006)). About half of the total farm is allocated to cotton. At such levels, most internationally traded cash-crop producers barely escape poverty, and as long as people remain poor, the expected rational response will appear to be a long shot.

[3] For details on the model and data, see Savadogo (2004).

[4] The North American Free Trade Agreement (NAFTA) includes the United States, Canada and Mexico.

[5] In the sample used by Fulginiti and Perrin, the nominal protection rates varied from -13% (Brazil) to -53% (Ivory Coast, Egypt and Zambia). The data covered the period of the 1960s to the early 1980s. South Korea was part of the sample and had a positive protection rate of +16%.

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