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**FAIRNESS, STEWARDSHIP, AND SUSTAINABLE
DEVELOPMENT**

by

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Christopher B. Barrett

ABSTRACT

The welfare economic concept of fairness offers an attractive, axiomatic foundation for the popular notion of stewardship. Fairness emphasizes the *ex ante* equal standing of all persons, across and within generations. This highlights the inextricability of poverty alleviation and environmental sustainability, especially in the agrarian tropics where biodiversity loss, deforestation, and desertification are growing global concerns.

FAIRNESS, STEWARDSHIP, AND SUSTAINABLE DEVELOPMENT*

Stewardship is an unorthodox concept to economists, yet it is central to the welfare economics of sustainable development. The unorthodoxy of the concept of stewardship stems from its subordination of alienable property rights, which are central to market-based valuation and to neoclassical economic concepts of efficiency. Yet when one sets aside the concept of *ownership* for that of *stewardship*, an intuitive concept of sustainability emerges, one more consistent with the intergenerational and intragenerational equity on which sustainable development depends than is the traditional property rights perspective of neoclassical economics. Moreover, the concept of stewardship highlights the issues of interpersonal and transnational coordination that we, as scientists and as citizens, must solve to advance sustainable development.

Allow me a brief digression to situate my viewpoint. I am an economist with primary research interests in agricultural development and rural poverty alleviation in low-income societies, especially those of sub-Saharan Africa. Thus the environmental issues of greatest concern to me are those of peasant farmers: human overexploitation of renewable forest, soil, water, and wildlife resources. I do not deny the importance of CO₂ emissions, toxic waste disposal, acid rain, the exhaustion of nonrenewable fuels and minerals, or other serious environmental concerns largely specific to the rich world. I just have little to contribute to discussions of those topics and so concentrate on the issues about which I perhaps have some comparative advantage. I am also a Christian, a characteristic central to my normative view of the world. A Christian ethic and a professional background in agricultural development combine

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to stimulate my view of sustainable development as an issue of stewardship that highlights the primacy of *intergenerational* and *intragenerational* equity.

The plan for the rest of the paper is as follows. In the next section I highlight the important distinction between stewardship and alienable property rights in the analysis of sustainable development. This is followed by a discussion of principles of welfare economics, in particular the concept of fairness as a complement to efficiency. I then highlight the interconnectedness of poverty alleviation and environmentally sustainable development before concluding with some of the vexing issues of operationalizing the concepts of stewardship and fairness in a world tainted by original sin.

Stewardship and Renewable Resources

What do I mean by "stewardship"? Dictionary definitions center on "the careful and responsible management of something entrusted to one's care" (Merriam-Webster's Collegiate Dictionary, Tenth Edition, 1993). Under stewardship one has the right to enjoy the fruits of creation, but is enjoined from destruction or disposal. Stewardship thus conveys only usufructure rights, not the full set of alienable property rights to which we westerners are accustomed. Stewardship associates responsibilities for care with the rights of harvest.¹

Stewardship is surely an acceptable concept to a Christian, and to most other religious traditions as well. Theologically, creation is not "ours" in the sense of alienable rights of

¹ Although some might see an overlap between the concepts of common property and stewardship, they are quite distinct notions. Most fundamentally, common property belongs to all present; stewarded property belongs to no one present.

ownership but solely in the sense of stewardship (DeWitt). The ideology of stewardship is equally commonplace in the traditional, polytheistic religious practices of many poor agrarian societies, as an enormous ethnographic literature attests. So even though stewardship may be an uncommon formal principle in modern economics, it is familiar in the spirituality of most peoples.

As applied to renewable resources, such as forests, soils, water and wildlife, the responsibilities of stewardship prohibit *excessive* use leading to irreversible depletion or destruction. In this context, excessive use is that beyond the resource's naturally given regeneration rate. A central problem in environmental economics is that the gains of excessive use are enjoyed privately while the costs are borne more broadly. Conversely, the (opportunity) costs of resource conservation are borne privately while the gains are enjoyed globally. Economists use the term *externalities* to describe divergent accrual of benefits and costs, such as from renewable resource exploitation and conservation. Externalities generate socially undesirable inefficiencies and have thus been the subject of a vast literature.

Economists' views on externalities have been heavily influenced by the work of Nobel Laureate Ronald Coase. Coase's theorem states that externalities do not give rise to a misallocation of resources provided there are no transactions costs and that alienable property rights are well defined and enforceable. Under such conditions the producers and consumers of an externality have an incentive to negotiate a mutually beneficial trade, *i.e.*, to internalize the externality. Furthermore, the externality will be resolved identically no matter who holds the property rights in the resource. This theorem fuels environmental economists' present obsession with alienable property rights, as manifest in immense global efforts at land titling, the rise of

tradeable pollution permits, water rights, grazing rights, fishing rights, etc.

Among the many problems with Coase's celebrated theorem, the most serious for our purposes is the illusion of a world without transactions costs. Externality problems due to overexploitation of renewable resources — e.g., biodiversity loss, deforestation, desertification, groundwater contamination, soil erosion — transcend national boundaries and generations. It is generally quite costly and difficult to negotiate cross-culturally and usually impossible to do so with persons not yet or no longer living. So property rights or no, the transboundary and transgeneration effects of overexploitation cannot be internalized through market exchange no matter the potential gross gains from trade. Arguments for alienable property rights are thus a siren's call that draws us off course in the search for a sustainable development path. I return to this point in the next section.

It is not usufructure rights but stewardship constraints that need emphasis. Alienable property rights appeal to many because they permit efficient unilateral action. But the transboundary and transgenerational nature of environmental problems renders unilateral measures suboptimal. Multilateral mechanisms combining carrots and sticks are necessary to ensure sustainability. Here the emerging economics literature on penal codes (Abreu)² and mechanism design (Maskin; Moore; Palfrey and Srivastava)³ show tremendous promise,

² The literature on penal codes indicates that the only way to maintain a cooperative equilibrium is through the credible threat by all that transgressors will be punished, and not only by injured parties.

³ Mechanism design concerns the elicitation of individual preferences and performances that are not publicly observable, so as to achieve socially desirable outcomes that will not occur in the absence of coordination.

although applications to environmental economics remain in their infancy (Batabyal). The challenge of sustainable use of renewable resources is one of coordination among spatially and temporally dispersed peoples living under potentially radically different living conditions.

In defining stewardship at the outset of this section I took care not to focus on environmental resources too quickly, as is customary in the literature on sustainable development. Human life is a central, glorious part of creation, at least as much as the earth's forests, soils, water and wildlife. I claim that if one accepts the principal of stewardship as applied to nature, one must logically and spiritually accept its application to humankind as well. While we are free to enjoy the fruits of human inventiveness and labor, we are simultaneously enjoined from irreversibly damaging life. Note that damage can be due to inactivity as much as to infliction; indeed the former is presently the greatest threat globally.

Herein lies the core challenge of sustainable development. Overexploitation of renewable resources in poor agrarian societies occurs in large measure because of peoples' day-in, day-out struggle to preserve human life and that struggle is intensified by resource degradation. Poverty alleviation and environmental sustainability are inextricably linked. We cannot be good stewards of the planet without practicing stewardship of its people, and vice versa. Unfortunately, the inhabitants of much of the agrarian tropics are ill-equipped economically and politically, although not morally or spiritually, to serve as stewards to both humankind and nature. If we who are so equipped wish to preserve the environment of the agrarian tropics, we must enable locals to expand their stewardship activities, as most agrarian cultures are wont.

A Welfare Economic Perspective on Sustainable Development

One prominent text defines "welfare economics" as "an investigation of methods of obtaining a *social ordering* over alternative possible *states of the world*" (Boadway and Bruce, p.1, emphasis in original). Welfare economics is all about the ranking of different allocations of resources across people differently situated in space and time. Thus it is the natural subdiscipline of economics through which to investigate questions of sustainable development. Whenever one attempts to rank different feasible social states, value judgements are implicit. Economists try to adhere to a standard of normative analysis based on *explicitly* stated ethical criteria, since there is no uniquely, universally preferable criterion.⁴ Welfare economics provides those normative tools to the economics discipline. Below I spell out normative criteria which are entirely, perhaps uniquely consistent with Christian ethics, and which lead directly to my claim of the inextricability of intergenerational and intragenerational equity in sustainable development.

"Sustainable development" typically focuses on intergenerational equity in the distribution of gains from development activities. The Brundtland Commission report, for example, defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, p.43). An ethic of sustainability constrains contemporary decision-makers' use of renewable resources so as to ensure that future generations have the resources necessary to replicate the standards of living we can enjoy now. Sustainability is thus a very specific area of welfare economics concerning the ethics of intergenerational welfare.

⁴ This disciplinary standard of explicitness in valuation methods is a major reason other social scientists deride economists, for we open ourselves to attack by broadcasting inherently disputable value systems. Unfortunately, that derision has feedback effects, and the classic approach to normative economics is becoming more rare.

Economists follow a strong, perhaps excessive tradition of methodological individualism (Arrow). Thus we proclaim as *Pareto efficient* any social position from which it is impossible to make even one person better off by altering patterns of exchange or production without making someone else worse off. Pareto efficiency is the core of most welfare economic inquiry, especially within the neoclassical tradition currently dominant within the discipline. Indeed, economists are often reluctant to step beyond the Pareto principle in normative analysis. Unfortunately, Pareto efficiency is severely limiting in that it really only identifies a social possibility frontier mapped over the space of all individuals, present and future. It offers no criterion by which to choose a finite number of points, much less a unique social solution, from that infinite locus.

Economists customarily identify a unique, efficient social allocation by assuming a full set of alienable property rights over all scarce resources and no transactions costs (sound familiar?), and then exploiting heterogeneous individual interests and the nonsatiation of individual desires to exhaust all potential Pareto improving exchanges. Thus all competitive market equilibria are Pareto efficient and vice versa under the first and second theorems of welfare economics.

Recognize, however, that if all resources are owned by the present generation (and we presently have no practical means to convey ownership to unborn generations), Pareto efficiency dictates the overexploitation, even the exhaustion (depending on assumptions about marginal costs and benefits of exploitation) of renewable resources.⁵ The Coasian, alienable property

⁵ Even with bequest motives, a perfect intertemporal competitive equilibrium does not lead to sustainability (Asheim). To get around this conclusion, one has to invoke altruism. This may yet prove a fruitful path, but it remains quite underdeveloped in economics.

rights approach to environmental economics is thus inherently insufficient for, perhaps even incompatible with sustainability. The concept of stewardship, on the other hand, ensures intergenerational equity by construction and does not do violence to the reality of nontrivial transactions costs in economic exchange across continents and centuries.

In the absence of a complete set of alienable property rights, Pareto efficiency again yields an infinite set of socially acceptable distributions. Fortunately, there are paths to restrict attention to a subset of Pareto efficient points. One of the most promising paths is the concept of *fairness*, which embodies the biblical principles of compassion by employing as its equilibrium concept the absence of envy (Rawls; Feldman and Kirman; Varian; Pazner; Thomson; Baumol; Chavas).⁶ A fairness criterion treats all persons equally, although it does not dictate an equal division of resources. Different people are endowed with different abilities and preferences. Envy in this formulation indicates not only that one would prefer another's consumption choice set but also that one would be willing to produce the other's output, given own abilities. Envy is thus the willingness to exchange circumstances with another, holding natural endowments constant.

Two implications emerge from the fairness criterion as a complement to Pareto optimality. First, fairness is entirely consistent with the constraints imposed by the concept of stewardship. If future generations would envy our standard of living, then we must transfer to them a larger stock of natural or manmade capital, i.e., we must invest more and consume less. Fairness imposes a responsibility not to overexploit renewable resources. Conversely, if we anticipate envying future generations' standards of living, we should make fuller use of our usufructure

⁶ To be more precise, I rely on "fairness-equivalence," a refinement due to Pazner that ensures the existence of at least one allocation that is both Pareto efficient and fair(-equivalent).

rights to the fruits of the earth.⁷

It is important to distinguish between conservation and preservation. Stewardship does not mandate preservation, defined as maintenance of nature in an unaltered state. It does impose a standard of conservation, which requires safeguarding the total stock of resources. Nobel Laureate Robert Solow (p.15) writes, "a sustainable path for the economy is thus not necessarily one that conserves every single thing or any single thing. It is one that replaces whatever it takes from its inherited natural and produced endowment, its material and intellectual endowment. What matters is not the particular form that the replacement takes, but only its capacity to produce the things that posterity will enjoy. Those depletion and investment decisions are the proper focus." The next section considers the microeconomics of depletion and investment decisions and how they can be influenced by the fairness principle.

The second implication concerns the interpersonal division of the benefits and costs of stewardship. Chavas and Coggins demonstrate that a fair-equivalent and Pareto efficient allocation leads to a maximin criterion defined in terms of individual ex-ante willingness to pay. If individuals' preferences are heterogeneous then they benefit differentially from public goods and should pay disproportionately for the cost of providing public goods. Environmental sustainability has important public goods characteristics. Use below resources' naturally-given regenerative rate is nonrival, and the benefits of a sustainable resource path are both nonexcludable and nonrival.

⁷ Note that distributional fairness is an *ex ante* concept. Precautionary savings in the face of uncertainty and downside risk suggest that standards of living will *not* be identical across generations *ex post*. Indeed, precautionary savings suggests standards of living will trend upward over time.

The notion that benefits and costs accrue disproportionately suggests a central place for transfers. These can occur within or across generations. The mass of studies of individuals' demand for environmental quality show that wealthy persons place greater monetary value on environmental amenities and quality than do the poor, so there should be disproportionately large contributions from the relatively wealthy in contemporary society toward the pursuit of sustainability. Furthermore, assuming continued technological progress, future generations will be richer than we if given the same endowment of resources. This suggests future generations will place even greater value on environmental amenities. Thus they *de facto* transfer to the present generation nonrenewable resources that can be replaced by synthetics.

The fairness criterion permits us to focus on a finite, perhaps even unique, Pareto efficient social equilibrium that holds across space and time. Surely this is the objective of sustainable development. Moreover, fairness suggest some actionable remedies to what appear to be unsustainable present patterns of renewable resource use.

The Interconnectedness of Poverty Alleviation and Sustainable Development

One of the central claims of this paper is that greater intragenerational equity is central to intergenerational equity, thus that stewardship for the environment is inextricably linked to stewardship for the poor. This conclusion stems partly from the environmentally destructive responses of agricultural populations to poverty. Alleviation of the poverty persistently infecting the agrarian tropics promises endogenous, positive effects on the environment by relieving pressure on renewable resources. This clearly benefits future generations, who depend on the present generation's bequests. It also benefits the wealthy in contemporary society, who as a

group evince high non-use valuation of environmental amenities, attributable chiefly to the high income elasticity of demand for environmental quality (Ruttan; Antle and Heidebrink).⁸ As the World Bank (p. 1) asserts, "there are strong 'win-win' opportunities that remain unexploited. The most important of these relates to poverty reduction; not only is attacking poverty a moral imperative, but it is also essential for environmental stewardship."

Discussions about sustainability, such as Solow's quote in the previous section, frequently focus on the intergenerational implications of present decisions regarding resource depletion and investment. Two fundamental laws of economics are that investment equals savings and that the marginal propensity to save increases with income. That is, the wealthy can and do save more than the poor. Just as the wealthy value environmental quality more than the poor, so do the wealthy have greater ability to invest in environmental protection. Thus if we wish to invest in resource conservation and restoration in the tropics, where the threats of biodiversity loss, deforestation, desertification, etc. appear especially great, we must identify and employ some means to apply the savings of today's wealthy to conservation in the neighborhood of today's poor.

There are two ways to do this: (i) direct investment in environmental conservation and (ii) transfers to the poor to facilitate conservation through development. The past decade or two has witnessed unprecedented growth in the former method, with vast sums now flowing to environmentally-oriented nongovernmental organizations. Many international conservation groups are making notable progress in stemming the depletion of forests, soils, water and

⁸ The income elasticity of demand measures the percent change in demand relative to a one percent change in income. It measures the slope of the expansion path of demand.

wildlife in the tropics. Some attempt simultaneously to attend to the tangible development needs of poor communities on the periphery of protected areas, often through *integrated conservation-development projects* (ICDPs), which have attracted hundreds of millions of dollars in funding in the past decade (Barrett and Arcese).

But even given rapidly increasing international flows of funds for conservation efforts, environmental protection in most of the tropics involves considerable foregone present income for local populations. For instance, Kenya alone sacrifices an estimated \$200 million annually, or 2.8 percent of GDP to conserve biodiversity through protected parks, forests and nature reserves, the benefits from which accrue globally. Norton-Griffiths and Southey (pp.136-137) argue, "the global benefits from Kenya's conservation efforts are certainly worth the cost, but the fact that so much of the cost is born by Kenya is quite inappropriate. ... If the developed world expects a country like Kenya to maintain conservation estate on its behalf, then it must be prepared to contribute substantially toward these costs until such time as Kenya can afford to carry the burden itself." Their estimates are buttressed by survey data showing that Kenyans living in close proximity to parks overwhelmingly express negative attitudes toward protected areas and believe such lands should be degazetted for agricultural production (Akama, Lant and Burnett). Despite their own reverence for nature, many Africans see environmentalism as the 21st century face of colonialism, in which their homes are to be relegated to botanical gardens and zoos for the benefit of wealthy foreigners. The distribution of the benefits and costs of conservation is central to direct efforts at environmental conservation, and the present distribution is surely unsustainable.

Note, moreover, that direct investment in environmental conservation and restoration is only

partly consistent with the fairness criterion; it attends only to intergenerational distribution issues. Furthermore, despite their present popularity, ICDPs are not yet analytically or empirically sound approaches. They proceed from untested biological and economic assumptions, many of which are likely to prove false (Barrett and Arcese). Prohibitions against resource overexploitation are futile in the face of persistent, dire poverty, as the massive failure of the traditional "fences and fines" approach to wildlife conservation around the world clearly demonstrates (Barrett and Arcese). A starving peasant will voluntarily chance illegal poaching if he has no other recourse to find protein for his family. The current flurry of direct environmental investment is both financially and ethically incomplete, and is likely ultimately ineffective in stemming resource overexploitation in the agrarian tropics.

While direct investment by high-income nations in tropical environmental conservation has boomed, indirect investment through transfers to the poor is lagging, even declining for many parts of the world, particularly sub-Saharan Africa. Government-to-government foreign aid is under attack, in the US Congress and many northern governments, and for some good reasons. However, pessimism surrounding the efficacy of bilateral official aid in relieving poverty in the agrarian tropics is poisoning the atmosphere for development assistance more generally. This must be recognized and challenged as a serious threat to sustainability.

A growing literature finds poverty alleviation induces endogenous behavioral changes in fertility, cropping patterns, energy use, etc., with considerable positive effects on the environment (Perrings; World Bank; Karshenas). These changes advance the welfare of both the present rich, because of their positive non-use valuation of environmental amenities and quality, and future generations, due to a larger stock of bequeathed resources. The inter- and

intra-generational welfare frontier thus expands as poverty alleviation reduces the negative externalities of resource overexploitation. Let's consider a few examples of the mechanisms by which these feedback effects occur.

Most poor people in the agrarian tropics depend heavily on the natural resource base for their livelihood. As Karshenas (p. 743) puts it, "their man-made capital stock is meagre and technologically they are well behind the advanced countries. They suffer from massive unemployment and underemployment of labour, which is more the result of a shortage of man-made capital and complementary resources than a cyclical phenomenon or one related to high rates of automation. Environmental degradation in many instances is related to economic backwardness and slow economic growth rather than being a matter of a growing economy pressing against the limits of the natural resource base." In the absence of alternative means of subsistence, stewardship for human life depends directly on natural resource exploitation.

Many environmental economists point to irreversibility and temporal uncertainty as generating quasi-option value in favor of environmental conservation (Arrow and Fisher; Fisher and Hanemann). However, when one admits the irreversibility of death and the inherent uncertainty of crop yields, food prices, wages, employment and the other means of survival in the agrarian tropics, it becomes clear that irreversibility and uncertainty also produce environmental degradation.⁹

⁹ A subtle but important point concerns the hierarchy of knowledge about irreversibilities. Miracles notwithstanding, we know for certain the irreversibility of human death. We know a great deal, albeit with somewhat less certainty, about the irreversible developmental damage caused by childhood malnutrition and morbidity. We know still less about the degree to which environmental calamities are irreversible, simply because ecosystem dynamics have not been studied as long and carefully as human health or mortality.

Stewardship for human life too often conflicts with stewardship for renewable environmental resources in the agrarian tropics. Food insecurity induces agricultural extensification on unsuitable terrain (e.g., steeply-sloped, erosion prone hillsides or rainforest floors with minimal subsurface nutrient content), discourages adoption of new, land-conserving and land-augmenting technologies and induces shortened fallowing cycles in swidden cultivation regimes. It also generates high discount rates,¹⁰ by decreasing life expectancy and increasing the probability of death due to accident, illness or starvation at any given point in time.

The threat of irreversible destruction, of human life or renewable resources, and the uncertainty of such events point toward adoption of a "safe minimum standards" approach (Bishop 1978, 1993) which considers the benefits of development relative to the benefits of conservation. The problem, of course, is that we remain quite ignorant of the benefits and costs of either. What is more, we still know the least about the places in which we have the greatest humanitarian and environmental concerns. Economic and environmental data from the low-income world remains thin in both quality and quantity. Remedying this shortage must be an area of primary emphasis for contemporary scientists.

Where the natural resource base of the agrarian tropics once could carry its dependent human populations while still regenerating itself, this is no longer the case in much of the world. The nonstationary process of human food, fuel, fiber and water demand is overtaking the stationary process of natural resource regeneration. It is tempting to thus focus on population policy as

¹⁰ An unusually high discount rate indicates that poor people tend to discount future benefits more than do wealthy people, thereby discouraging self-interested resource conservation.

central to stemming resource overexploitation, but this thinking is largely misguided.

First, we know there exists a strong negative relationship between women's total fertility rates and their incomes, and at a societal level between population growth rates and the growth rate of per capita income. Children are (i) a source of valuable labor in agrarian societies characterized by seasonal labor shortages, even if the average panseasonal unemployment rate is quite high, (ii) a means of diversifying household income risk through off-farm labor, whether locally or through migration, and (iii) a quasi-pension in economies lacking capital markets for retirement investment or government- or firm-funded pensions (remember smallholders are self-employed).

Second, population growth is not inconsistent with environmental conservation and recovery, as a detailed recent study of Machakos District in Kenya indicates (Tiffen, Mortimore and Gichuki). It is not the rate of population growth per se so much as its interaction with an inequitable distribution of land and other productive assets and access to working capital that forces human colonization of the forest, depletion of soils, and predation of wildlife. Note that labor shortages are aggravated by environmental destruction. As desertification and deforestation move water and wood sources, respectively, farther from the homestead, it takes more time to gather necessary materials. There is thus a destructive spiral as environmental degradation increases the demand for labor time and thus for children, which in turn further stresses the environment. Indeed, I hypothesize that the positive association between population growth and environmental deterioration is attributable chiefly to their joint causation by structural determinants of poverty, although this is not a claim I can support empirically at present. This is an important reason why population control efforts have generally proved

unsuccessful among poor agrarian populations in the absence of severe state controls (e.g., mainland China).

Poverty is both cause and consequence of environmental degradation (Perrings; World Bank; Karshenas). It is important therefore to search for fundamental exogenous causes of poverty. Chief amongst these are, as already suggested, insufficient man-made capital, appropriate technologies and employment opportunities. These are the arenas in which rich-to-poor transfers, whether in the form of charitable contributions, foreign aid or foreign investment, can most usefully address the inextricable problems of rural poverty and unsustainable patterns of resource use.

What might residents of high-income nations do? Food production and distribution systems in the agrarian tropics are especially key issues. Roughly half the world's poor, or more than half a billion people, live in environmentally fragile rural areas (World Bank) and rely almost entirely on natural resources for day-to-day survival. Quantum leaps in crop production technologies and massive investment in rural communications, financial and transportation networks in the 1960s and 1970s relieved agriculture-based environmental pressures in much of Asia. Unfortunately, the Green Revolution had far less impact in Latin America and effectively bypassed the entirety of the African continent. Indeed, now we are discovering to our astonishment that a sizable proportion of food producers in African countries are net purchasers of the very crops they cultivate (Weber et al.; Barrett and Dorosh). Microeconomic behavior, in response to changing incomes, prices or risk exposure, varies enormously depending upon whether one is a net buyer or net seller of a product. The large proportion of the world's small farmers unable to self-provision in food haven't land enough, given the production technologies accessible to them, or

they haven't appropriate technologies, given their land endowments. The more appropriate of these two ways to view the problem depends on the scope for social remediation.

In a place like Madagascar, where less than five percent of cultivated land is held by farms of ten or more hectares but perhaps two-thirds of Malagasy rice farming households buy more rice than they sell, land redistribution is unlikely to accomplish much. In such places the problems of farmers' failure to be food self-sufficient are multifaceted. Chief among these are insufficient availability of yield-increasing, risk-reducing production technologies, anemic rural financial systems that fail to provide credit for purchased modern inputs or to insure against temporary calamity, and underdeveloped marketing systems on which peasants cannot depend for affordable food during the pre-harvest hungry season nor for timely crop evacuation and remunerative prices post-harvest. The developed world, largely through philanthropic foundations, invested heavily in these areas a generation ago, but interest and funding are waning today despite mounting evidence that revitalizing local research, extension, finance and marketing systems is key to placing much of low-income agriculture on a sustainable development path.¹¹

Meanwhile, in a place like Panama a highly inequitable, bimodal land distribution prevails, and large mean farm sizes suggest room for considerable land redistribution from large to small

¹¹Most empirical evidence continues to point to very high marginal rates of return to agricultural research. For example, Byerlee and Traxler estimate a 37-48% internal rate of return to international wheat improvement research. Despite these high returns, real international agricultural research, budgets are falling, in some cases quite rapidly.

farms to turn all into net sellers.¹² Yet although the United States government has been willing to commit several hundred million dollars to the invasion and occupation of Panama to depose an uncivil political leader, we have been unwilling to commit a fraction of those financial and political resources to redressing the gross imbalances that continue to disfigure Panama's social fabric, its economy and its lovely forests and hillsides. Conjunctural moments of dramatic social change are uncommon opportunities for necessary land reform efforts in places like Panama, Haiti, and South Africa.

Upland shifting fallow cultivation patterns in Africa are breaking down, largely due to rates of technological advancement insufficient to overcome population pressures toward the parcelization of land and the expansion of cultivation to marginal lands, at great cost in terms of soil exhaustion, deforestation and loss of biodiversity. At the same time, lowland cultivation has not expanded sufficiently to take the pressures off fragile uplands. For instance, of the 40 million cultivable hectares of inland valleys in west and central Africa, only about 8 percent are cultivated. Water, disease and pest management are key obstacles to sustainable inland valley development that might take pressure off the rapidly degrading highlands. But little concerted effort has been made in this direction. Even after tsetse fly eradication in some east African valleys, populations have remained reluctant to occupy the land permanently because of water control problems, bilharzia and schistosomiasis.

¹² Using FAO census data from the 1980s, I estimate average farm size in Madagascar at 1.20 hectares with a Gini coefficient of .408. Panama, by contrast had an average farm size of 14.74 hectares and a Gini coefficient of .844. A hectare is approximately 2½ acres. A Gini coefficient is an index of equality, with a lower bound of zero (perfect equality) and an upper bound of one (perfect inequality).

Household energy use is another area requiring concerted development efforts to advance environmental stewardship. The poor of the agrarian tropics rely heavily on biomass sources — e.g., fuelwood, charcoal, straw and dung — for cooking and heating. These are inefficient energy sources and can have significant adverse health effects, through indoor smoke inhalation, as well as environmental effects through deforestation and failure to replenish soil nutrients through organic fertilization. Yet only quite recently have western scientists turned attention toward providing more fuel-efficient, cleaner-burning stoves and cost-effective, micro-level hydroelectric and solar power sources. Household energy use has become especially problematic during prolonged economic decline in Africa because biomass fuels are an inferior good, meaning demand for them increases as people's incomes decrease. This follows from the greater expense of more efficient, cleaner-burning fuels (e.g., electricity, kerosene) and the working capital constraints faced by cash-starved rural folk with direct access to biomass fuel sources.

Another area warranting attention is the immigration laws of wealthy countries. There is perhaps no clearer behavioral expression of envy than migration, which reveals the migrant's preference to apply his skills in another land to enjoy the fruits available from labor in the host setting. Prohibitions against immigration for economic reasons are clear violations of the principle of fairness. Moreover, immigration restrictions impede sustainable use of renewable resources by restricting the capacity of poor populations to move to areas where there is less pressure on the land. Liberal immigration laws facilitate the flow of people from overpopulated ecosystems to underpopulated ones. Driving through the vast uninhabited tracts of Utah that surround my home I have no doubt that population pressures threatening tropical forests and the endemic species therein could easily be released and the living standards of many impoverished

peoples improved by voluntary (not forced) migration without overtaxing Utah land managers.

Finally, social chasms, within poor countries as well as between rich and poor countries, contribute enormously to environmental problems. Highly uneven growth patterns, as in Brazil or the Philippines, lead to colonization of marginal lands and unusually rapid rates of environmental degradation. Closing social chasms is not just a matter of top-down transfers but instead of community empowerment. Where communities have been given authority and responsibility to define the problems they face, and the financial and technical resources necessary to address these and evaluate the resulting efforts, great progress is often made. The CAMPFIRE schemes in Zimbabwe (Barrett and Arcese) and the Iringa projects of Tanzania (Barrett and Csete) attest to this. Poverty alleviation and socio-political empowerment of the disenfranchised majority of most low-income societies is central to the project of sustainable development. As Boyce (p.6) succinctly argues, "all else equal, greater inequalities of power and wealth lead to more environmental degradation." Contemporary efforts to improve the accountability of governments to their constituents and innovations in participatory development project design, implementation and evaluation show promise and deserve reinforcement by western technocrats (World Bank).

Conclusions

A fairer world is a more sustainable world. We need to relieve the food security pressures that rationally induce smallholders to overexploit forests, soils, water and wildlife. Supply side pressures on the environment are largely the rational, endogenous responses of an impoverished population growing in both absolute and relative terms. High total fertility rates leading to

dangerously high human population growth rates, low rates of adoption of environment-friendly technologies, inefficient energy use based on fuelwood and charcoal, and wildlife predation through poaching and habitat encroachment are substantially by-products of the rural poor's desperate attempts to survive. Their commendable stewardship for human life, including the survival of their heirs, conflicts fundamentally with stewardship for the renewable resources on which future generations descendent from all peoples will depend. We must do more — notably through advances in food production and distribution systems, improved household energy sources, liberalized immigration laws, and increased local participation in policy and project formulation — to empower the poor of the agrarian tropics. Direct investment by foreign elites in environmental conservation in the agrarian tropics does not hold much promise, either ethically or practically.

Even if we successfully combat rural poverty, serious obstacles nonetheless remain. Stewardship implies that the rightful "owner" of resources must be able to exercise control over the distribution of usufruct rights and the enforcement of stewardship responsibilities. Although the faithful may unanimously endorse the concept of stewardship of God's creation, the idea is difficult in the real world. Except in a handful of theocracies, God's word is not public and law, but must be perceived, interpreted and acted upon individually. Trust in governments (perhaps especially modern theocracies) to act in the interests of all persons within and across generations has ebbed and will likely remain low for some time. Nor are there credible supranational environmental authorities, despite the launching of the Global Environmental Facility (GEF) within the World Bank and the existence of the United Nations Environment Program (UNEP). There are thus substantial coordination problems involved in implementing

the concept of stewardship.

The coordination problem is one to which economists, especially those working in the game theoretic arena of mechanism design, are increasingly turning. Transnational coordination is necessary to resolve the inextricable problems of environmental sustainability and poverty alleviation. In seeking ways to advance the objective of sustainable development, we must seek to develop and strengthen mechanisms for redistribution within and across generations. Sustainability is ultimately a question of resource distribution.

Improved coordination mechanisms are equally necessary at the local level. The design of institutions that can overcome free rider and moral hazard problems through community-level organizations for joint investment in land improvements (e.g., contouring, bunding, ridging, terracing), afforestation, political action, and crop marketing is a growing focus in development circles. Successful examples of community banking schemes (e.g., the Grameen Bank in Bangladesh) suggest this is a feasible goal in the coming decade or two.

Overcoming the poverty and sociopolitical marginalization of rural populations of the agrarian tropics remains a daunting task for contemporary society, just as does the establishment and maintenance of sustainable resource use patterns. These tasks are inextricably linked in the development of poor agrarian societies. Stewardship for nature cannot proceed in the absence of stewardship for our fellow humans, both are imperative if we are to seek a fair and efficient world.

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Fairness,

STEWARDSHIP, AND SUSTAINABLE DEVELOPMENT

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Fairview

STEWARDSHIP AND SUSTAINABLE DEVELOPMENT

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STEWARDSHIP AND SUSTAINABLE DEVELOPMENT

Stewardship is an unorthodox concept to economists, yet it is central to the welfare economics of sustainable development. The unorthodoxy of the concept of stewardship stems from its subordination of alienable property rights, which are central to market-based valuation and to neoclassical economic concepts of efficiency. Yet when one sets aside the concept of *ownership* for that of *stewardship*, an intuitive concept of sustainability emerges, one more consistent with the intergenerational and intragenerational equity on which sustainable development depends than is the traditional property rights perspective of neoclassical economics. Moreover, the concept of stewardship highlights the issues of interpersonal and transnational coordination that we, as scientists and as citizens, must solve to advance sustainable development.

Allow me a brief digression to situate my viewpoint. I am an economist with primary research interests in agricultural development and rural poverty alleviation in low-income societies, especially those of sub-Saharan Africa. Thus the environmental issues of greatest concern to me are those of peasant farmers: human overexploitation of renewable forest, soil, water and wildlife resources. I do not deny the importance of CO₂ emissions, toxic waste disposal, acid rain, the exhaustion of nonrenewable fuels and minerals, or other serious environmental concerns largely specific to the rich world. I just have little to contribute to discussions of those topics and so concentrate on the issues about which I perhaps have some comparative advantage. I am also a Christian, a characteristic central to my normative view of the world. A Christian ethic and a professional background in agricultural development combine

¹⁵
Subject: Fw: ERI 95-11 title

Date: Thu, 26 Sep 1996 11:11:19 -0600

From: "Ray Anderson" <Ray@b202.usu.edu>

To: "Ruby Vazquez" <RVazquez@b202.usu.edu>

Ruby,

Here's the word on the ERI95-11 title.

> From: Chris Barrett <cbarrett@B202.USU.EDU>
> To: Ray Anderson <Ray@b202.usu.edu>
> Subject: Re: ERI 95-11 title ¹⁵
> Date: Thursday, September 26, 1996 5:03 AM
>
> Ray:
>
> The published paper (forthcoming in Ecological Economics) has the
> title:
>
> Fairness, stewardship and sustainable development
>
> Please change the title of the ERISP paper accordingly. Thanks and

> good catch!
>
> CBB
>
>

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