POLICY FORUM: ECOLOGY

Can Protected Areas Be Expanded in Africa?

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Soulé and Sanjayan (*1*) have warned that the mainstream conservation target of 10 to 12% of the total land area will not be sufficient for protecting global biodiversity. They suggested that about 50% of the total land area is needed. Although this figure is based on very few studies, it is important because it takes the need to protect all present biodiversity as a starting point, rather than the political feasibility of the target. In doing so, it reflects a common opinion that all further degradation of nature should be stopped immediately. In their opinion, "Instead of investing most of their biodiversity funds in questionable sustainable development experiments, it would be more prudent if agencies were to redouble their efforts to expand and strengthen the global system of protected areas." However, is the ambitious goal of setting aside 50% of all land area ever to be achieved without also aiming at sustainable development, especially in Africa? We don't think so.

At present, setting aside large areas for nature conservation seems possible for all continents (*2*) (Table 1). Agriculture uses only 38% of the world's land area and, although land is also needed for other human activities—such as habitation, wood production, and mining—approximately 50% of the land on almost all continents shows little human disturbance. These opportunities for nature conservation contrast strongly with local experiences in Africa (*3*). For example, in the Great Lakes Region in Central and Eastern Africa, 125,000 square kilometers of farmland was found inside protected areas (*4*). In Tanzania, half of the protected areas have been impacted by people moving in or using land for agricultural purposes (*5*). These present problems raise the question: Won't the pressure on protected areas grow along with a growing population?

For an answer, we return to the continental level of scale and present some simple calculations. Using the most recent medium scenario population growth estimates from the United Nations, which take the effects of AIDS into consideration (*6*), we determined the expected human population in 2050 for each continent. To visualize potential land use conflicts, we formulated four nature conservation scenarios that are characterized by the amount of land to be set aside for nature: 1, 5, 10, and 50%. These percentages represent, respectively, an arbitrary minimum claim, the total area reserved for nature conservation in the beginning of the 1990s (Table 1), the mainstream nature conservation recommendation (*1, 7, 8*), and the recommendation of Soulé and Sanjayan (*1*).

On the basis of a combination of the present agricultural area per capita [permanent pastures and crop land from (*2*)] and the expected population in 2050 (*6*), we calculated the agricultural area predicted to be needed in 2050 and added the area to be set aside for nature conservation. Table 2 gives the potential spatial conflicts for each scenario, expressed as relative deficits in area for each continent. Because not all land area is suitable for agriculture, we used suitability estimations for grass and crops from (*9*) to calculate the deficits. If 50% of the total area is protected, deficits can be expected in all continents. The 1, 5, and 10% scenarios also might result in area deficits in Africa, Asia, and Oceania. From this it is clear that agricultural efficiency must be improved in any nature conservation scenario in Africa, Asia, and Oceania. How much efficiency improvement will be needed?

Let's focus on the Soulé and Sanjayan recommendation of 50%. To analyze this target, we assume that the low human disturbance area cannot decrease and the area for agriculture can no longer be expanded. In other words, land use will remain as depicted in Table 1. In that scenario, all growth in agricultural productivity must be achieved within current agricultural areas. Furthermore, we assumed that present food availability per capita should not decrease. With these provisions, we calculated a minimum food productivity growth rate per hectare needed to feed the 2050 medium population (Fig. 1). If one agrees that all people should be able to eat the same amount of proteins as someone in a developed country, the required food productivity growth rate will be larger than the current one in most continents. We multiplied present

LAND USE VERSUS LAND AREA

	Total area (Mha)	Domestic. land (%)	Protected area (%)	Low disturb. area (%)
World	13041	37.0	6.1	48.0
Africa	2964	36.0	4.7	49.0
L. America & Caribbean	2053	36.6	11.3	56.2
N. America	1839	27.4	8.0	58.6
Asia	2679	45.0	4.5	30.0
Europe	2662	28.9	2.6	49.5
Oceania	845	57.0	10.1	61.0

Table 1. Domesticated area, protected area, and low disturbance area as percentage of total land area in 1989–91, based on (*2*).

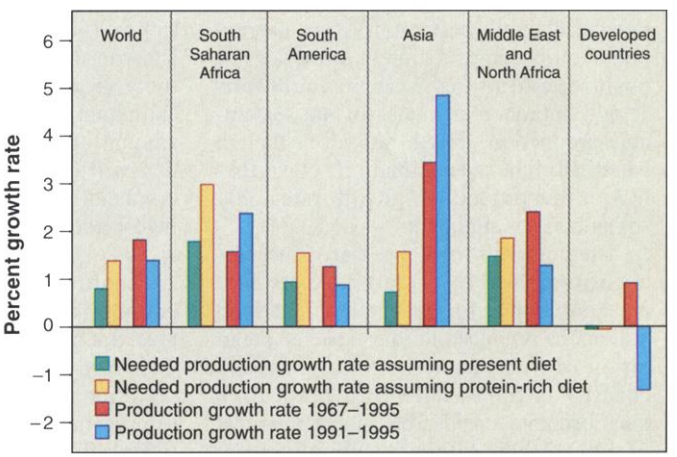

Fig. 1. Agricultural production growth rates needed to feed a medium population in 2050 compared with historic production growth rates. The needed production growth rate is either based on present diet or on a protein-rich diet as in developed countries. Actual production growth rate per year is regarded as being the difference in production per hectare between two subsequent years expressed as a percentage of the production of the first of the 2 years. Production per hectare is defined as FAO agricultural production of a year divided by the total of FAO arable land plus FAO permanent crops of that year. Based on (*6*) and (*10*).

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food availability by a factor equal to the proportion of proteins in the present diets to find this extra growth rate needed. This results in a minimum and maximum estimate of the needed production growth rate of, respectively, 1.8 and 3.0% per year over the 1995–2050 period in Sub-Saharan Africa (Fig. 1).

These growth rates can be compared with the actual growth rates calculated from recent data generated by the Food and Agriculture Organization of the United Nations (FAO) (*10*): the average yearly growth rate of 1967–1995 (1.6% in Sub-Saharan Africa) and the average yearly growth rate of the last 5 years of that period, 1991–1995 (2.4% in Sub-Saharan Africa) (Fig. 1). We excluded pasture land from these growth rate calculations, because in Africa overexploitation becomes manifest in the loss of pasture land (*4, 10*). Our calculations should approach estimates of the sustainable production growth rate, even though we still might overestimate it. Nevertheless, lower production growth rates only strengthen our argument.

The comparison shows that if the productivity growth of the last 30 years does not continue or improve, sufficient food will not be produced for the expected population of Sub-Saharan Africa. To reach equality in food availability, production must become considerably higher than that of 1991–1995. Although this might not seem impossible, it can only be achieved by continued technological progress, which requires financial and political support (*11*). Economic development will be a key factor (*11*), also reducing population growth.

We conclude, therefore, that without any serious and long-lasting investment in economic development, a 50% nature conservation scheme doesn't have a chance in Africa. At the continental level of scale and over the long term, nature conservation and economic development are not in conflict. Economic development is a condition sine qua non for ambitious nature conservation projects in Africa (*12*).

The conflicts between, on the one hand, nature conservation and, on the other, poverty and food scarcity, should also be addressed at the community level (*13*). Over the short term (5 to 10 years) and at the local level of scale, there exist huge conflicts between nature conservation and economic development. First, it cannot be assumed that the population growth rate will be constant over time. As a matter of fact, in the short term, population growth rate will be higher than in the long term (50 to 100 years) (*6*). Consequently, the short-term need for agricultural productivity growth will be higher than the one estimated here. The same is true for the amount of financial and political support that will be needed. Second, not all governments in Africa are able or prepared to invest adequately in managing protected areas (*14*). Furthermore, local people who are confronting the harsh rules of market economics and needing to make ends meet are more likely to give top priority to their own survival instead of nature conservation and biodiversity (*15*). Aversion to protected areas often also reflects attitudes against governments. National authorities frequently mandate land use and establish protection areas without taking into consideration earlier arrangements or the interests of local communities. They even deploy soldiers for land and wildlife protection (*15*). These types of problems cry out for local solutions that try to combine economic development and nature conservation, which are acceptable to the local people involved and supported by them. This has led to many "community-based conservation" projects (*16*). These projects tend to be expensive and many of them are not very successful (*14*). Therefore, we plead for local, sustainable development projects, preferably in presently domesticated areas (*17*). Such projects should not focus on nature conservation while compensating for economic losses (*8*), neither should their objective be to maximize economic growth (*18*). Optimal solutions should be sought by carefully considering economic, social, and ecological side effects of potential developments (*17*). If successful, these projects will lead to developments that no longer require external financial support. The African Development Foundation claims that such projects were realized in several African countries (*19*). What is needed now are investments in researching the prospects of such projects (*18, 20*).

PROJECTED LAND USE NEEDS AND SUITABILITY FOR AGRICULTURE OR CONSERVATION IN 2050

	Population (M)		Area (Mha)		Area surplus (% of total area)			
	1995	2050	Present grass and crop land	Suitable for grass and crop land	Nature conservation scenario: 1%	5%	10%	50%
World	5666	8909	4798	8307	5.2	2.7	–0.5	–26.0
Africa	697	1766	1081	2269	–16.6	–19.7	–23.5	–54.1
L. America & Caribbean	480	809	741	1650	18.7	15.5	11.5	–20.6
N. America	297	392	501	1030	19.5	17.2	14.4	–8.0
Asia	3437	5259	1216	1536	–12.7	–15.0	–17.8	–40.8
Europe	728	628	777	1173	18.4	16.7	14.5	–3.2
Oceania	28	46	481	649	–17.5	–20.6	–24.4	–55.1

Table 2. The difference between area suitable for grass and crop land [average suitability for grass land from (*10*)] and area needed for agriculture (grass and crop land) plus nature conservation (according to four nature conservation scenarios, see text) in 2050 as percentage of total area (Table 1). Positive numbers are surpluses, negative numbers are deficits. Medium population growth, no agricultural production growth, and equal distribution of protected areas are assumed. Based on (*2*), (*6*), and (*9*).

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