Sustainable Land Management

Sustainable land management in a Sahelian country

by Hans Hurni and Thomas Koller

1 Background

Eritrea is a new member of the international community of sovereign states. The country gained its independence on May 24th 1993, following a war of liberation with Ethiopia that lasted more than 30 years: Eritrea had previously been the northernmost province of Ethiopia. Almost three times the size of Switzerland, with a total land area of 120,000 square kilometers, Eritrea is among the smallest countries in Africa. The newly independent nation has not been treated favorably by nature, which endowed it with a Sahelian climate. Rainfall is minimal and varies greatly from year to year. Most of Eritrea consists of savannah, steppes, and deserts, particularly in the south-western lowlands and in the east, near the Red Sea. Only the central highlands, where altitudes range between 1500 and 2000 meters above sea level, are somewhat more humid and can be used for agriculture. Most of Eritrea's 3.5 million inhabitants live in this part of the country.

2 A dual challenge: Raising levels of production and maintaining the natural resource base

Like most countries in the South, Eritrea is an overwhelmingly agricultural nation. Approximately 90% of the population is engaged in agriculture, which is dominated by traditional forms of cultivation in smallholder systems. Under these conditions development of the agricultural sector is of central importance, and both the government and the population are making great efforts to foster this development. One aim is to raise overall production levels. This has become an increasingly important political goal as a result of the war with Ethiopia and the strategic importance of greater self-sufficiency (which is currently below 50%).

Maintenance of the natural resource base used for production - especially the land - is also an issue of great importance. The highlands of Eritrea are among the oldest areas cultivated by man and, like

many other such areas, they show signs of overuse. This is evident primarily in the form of severe and widespread soil erosion, the extent of which is inestimable. This is where the Syngenta Foundation intends to make a contribution to development. Our development program in Eritrea is based on the conviction that sustainable improvement of agricultural production - and hence improvement in the living conditions of the rural population - can only be achieved through a combination of development and preservation of the natural resource base.

3 The basic concept of our program is research partnership and project partnership to preserve the resource base and foster sustainable land management

The main goal of the program is to support public authorities and the population in their efforts to maintain the resource base and improve living conditions among the rural population. The program supports sustainable forms of land management based on appropriate use of soil and water - the country's two key resources. Program activities focus on ensuring self-sufficiency among farmers as well as maintaining - and where possible, improving - agricultural productivity.

The program pursues these goals through three lines of activity:

a. It supports research and development in sustainable land management, with a particular focus on questions pertaining to soil and water conservation.
b. It supports specific local and regional development projects and initiatives.
c. It supports and strengthens Eritrean institutions that are active in the area of sustainable land management.

4 The concept of partnership as a program approach

Our program is based on the principles of partnership and participation. It is administered jointly by the Syngenta Foundation and the Center for Development and Environment in the Institute of Geography at the University of Berne (Switzerland). Each program component has an Eritrean partner organization which is responsible for execution and is included in program planning and evaluation. The program will initially run for five years. Program progress is evaluated annually by a steering committee consisting of the most important partners, and procedures for continuation are laid down in a jointly negotiated annual plan.

Previous experience has shown that the concept of development partnership is especially well received in Eritrea. Eritreans want to control their country's development themselves. They especially do not want to be forced to pursue a particular course of development, since they are quite familiar

with the disastrous consequences of development cooperation in Africa, which has all too often been guided by the interests of donors.

5 Program activities

5.1 the afdeyu research station: fostering sustainable management of soil and water - the key resources

The Afdeyu Research Station is located in the barren hills of the central highlands of Eritrea, 30 kilometers north of Asmara, the country's capital. The station's modest external appearance - two simple clay structures surrounded by a few trees and encircled by a stone wall - contrasts with the significance of the data being collected there. Afdeyu is the only place in all of Eritrea for which there are long-term data on sustainable use of soil and water - Eritrea's key resources.

The Afdeyu Research Station was first established in the mid-1980s by the Center for Development and Environment at the University of Berne. In the final phase of the war of liberation between Eritrea and Ethiopia in the early 1990s, contact with Afdeyu was broken off. Surprisingly enough, when it was once again possible to visit the station during a mission to Eritrea in 1994, it was found to be fully functional. The two Eritrean field technicians at the station had continued to compile data with no outside support, and sometimes without receiving their salaries. This impressive commitment by local specialists convinced the Center for Development and Environment to continue operating the station. Moreover, the newly created Ministry of Agriculture of Eritrea was prepared to incorporate the station into its research program

The program of data compilation at Afdeyu includes measurements related to soil erosion and soil conservation, as well as data on rainfall, temperature, land use, and surface runoff. The significance of the program can be illustrated by the two examples below.

Example one: The struggle against soil erosion: experiments reveal that sustainable land use is possible

Although the national government has recognized soil erosion as one of Eritrea's most urgent environmental problems and has undertaken great efforts to combat it in cooperation with farmers, there is no basis for assessing the extent of the problem. Evaluations of measurements made at the Afdeyu Research Station have provided the first such basis. These data reveal that soil erosion on average slopes can be greater than 100 tonnes per hectare per year - a very high figure in terms of international comparison. To put this figure in perspective, it must be borne in mind that soil

regeneration through the formation of new soil takes place at a rate of approximately 10 tonnes per hectare per year - only a fraction of what is lost each year to erosion. Broad areas of the Eritrean highlands can clearly be seen to be composed of very barren landscape. Fertile topsoil has worn extremely thin, and in many places bare rock can be observed. The extensive lack of tree stands and forests intensifies the impression of extensive overuse.

Meanwhile, experiments conducted in Afdeyu have shown that sustainable resource use is definitely possible. This can be seen in the following overview of statistics for the year 1988:

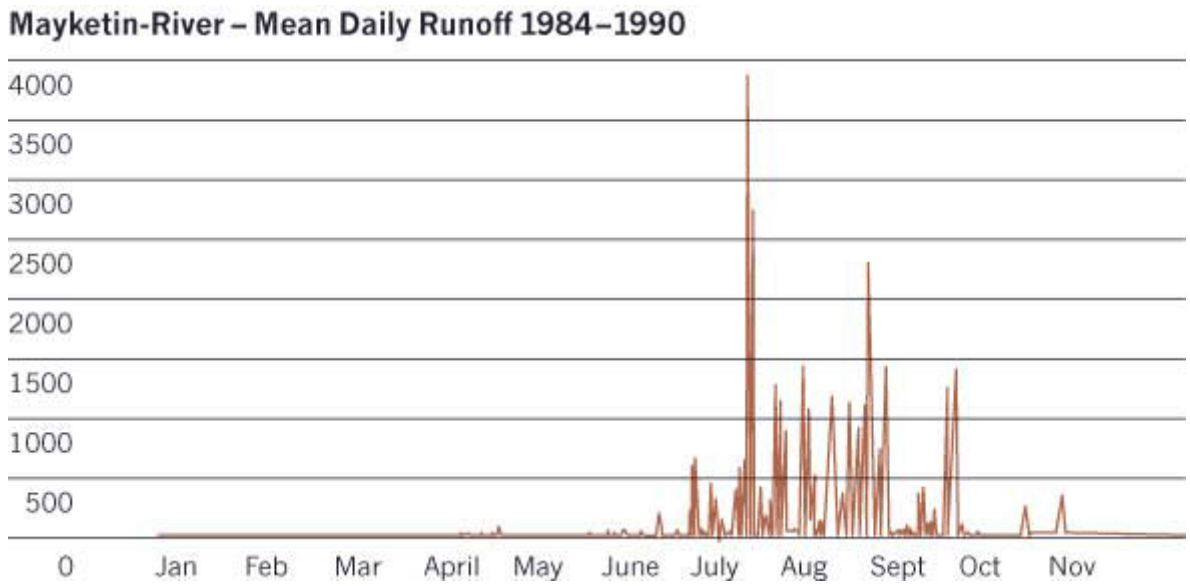
The above table compares soil erosion on terraced plots under conservation with soil loss on plots where there are no conservation measures. Soil loss on the terraced test plots was reduced from 115 tonnes to 20 tonnes per hectare annually, a tolerable level in light of natural soil regeneration. Moreover, the terraces retain rainwater as well as soil. In can be seen from the table that surface runoff of rainwater was cut in half. Rainwater that infiltrates into the ground rather than draining off is available to cultivated plants. This is a crucial and welcome side effect of terracing. Although Afdeyu is one of the most favorable regions for agriculture, thanks to its location in the highlands, the amount of rain needed for cultivation is at critically low levels in many years. In these years the water stored in terraced areas can make the difference between successful cultivation and crop failure.

Our program will continue and intensify its efforts to evaluate data from the Afdeyu Research Station in coming years, in collaboration with Eritrean partners in the agricultural research service (Department of Agricultural Research and Human Resources Development). In addition, the most important findings will be elaborated and disseminated throughout Eritrea in a user-friendly fashion, together with appropriate soil conservation techniques. This process will also include evaluation and consideration of traditional conservation measures employed by farmers. The target public meant to benefit from these efforts includes agricultural extension services, training and research centers, and projects operating in Eritrea.

Example two: optimizing the use of water, Eritrea's scarcest resource

Eritrea's dry climate has disastrous impacts on the water budget. There is only one river in the entire country which contains water throughout the year: the Setit River, which also forms the border with Ethiopia. All other rivers contain water only during the rainy season and are dry for the rest of the year. These are extremely limiting conditions in terms of national development. Hence optimal use of water, Eritrea's scarcest resource, is all the more important. The measurements made at the Afdeyu station provide a basis for optimizing the use of water. This can be illustrated by the example of the Mayketin

River, which flows through the region around Afdeyu. The graph below presents daily runoff values for the Mayketin River compiled by the measuring program at the station. The figures are for the years 1984-1990.



We can see that the Mayketin is not a river at all for most of the year: during the period of measurement, it was without water for an average of 338 days. The graph also shows large amounts of runoff on single days during the rainy season (July to October). The situation is similar for other rivers in the highlands, although there are no data available to illustrate this. Up to now, runoff from these rivers has gone unused and been absorbed by the lowlands. The government of Eritrea recently launched an ambitious development program that aims to make better use of this water. The goal is to construct small local dams to store peak runoff which can be used for irrigation and as drinking water. The runoff measurements that have been carried out in Afdeyu for more than ten years now permit precise estimates of the amount of water available for storage. Dams can thus be constructed in the proper dimensions, and realistic assessments can be made of the potential for irrigation and for water supplies to settlements.

Empirical field data on runoff are important for optimal use of water, which is Eritrea's scarcest resource. Our program aims to make the data compiled at Afdeyu available to public officials and projects, thus providing them with realistic values for use in planning. We are also participating in the planning and financing of a dam in Afdeyu that will be constructed as part of the Eritrean dam construction program The water provided by the dam will be used for drinking water and for small-scale irrigation. The long-term measurements carried out at the Afdeyu Research Station will thus be making a concrete contribution to local development and improvement of the resource base on which the population of Eritrea depends.

5.2 improving the living conditions of rural people: support for concrete local projects and initiatives

Research and development are indispensable to sustainable forms of land management. It would be claiming too much, however, to maintain that the results of research and development bring direct and immediate benefits to rural people in their daily struggle to subsist and survive. Hence we support concrete local projects which aim to make direct improvements in the living conditions of rural people. The example of the commune of Deki Lefay illustrates what has been achieved to date.

Beginning with a development study

The commune of Deki Lefay is located in the southern highlands of Eritrea near the Ethiopian border, at an altitude between 1600 and 2100 meters above sea level. An Eritrean NGO built a primary school here in collaboration with a Swiss partner organization, and planned to build a basic clinic. But there was a lack of both resources and reliable data on which to base further development. Our program became involved at this point. At the request of the organizations involved, a study focusing on the development of the commune was carried out, following which specific activities were funded.

The climate in Deki Lefay is characterized by high temperatures and low rainfall, which occurs primarily in the main rainy season between May and September. The commune has about 1500 inhabitants in 360 households, overwhelmingly composed of smallholder farmers distributed among several villages. The following chart gives an overview of the situation of smallholder households:

The above chart shows that only small amounts of cultivable land are owned - a typical situation in the highlands of Eritrea, where smallholders predominate. The crops grown are also typical, in that they are characterized by a marked resistance to drought (with the exception of maize). This indicates that farmers have adapted to natural conditions - which represents a cultural achievement on the part of the local community. Agriculture is concentrated on subsistence production, i.e. securing basic needs for one's own household. In contrast to widespread belief, surplus production for the market is one of the goals of subsistence production. But in contrast to the industrial agricultural production with which we are familiar in industrialized countries, production for the market does not have priority. Given the realities of small plots and low rainfall, surplus production is possible only in exceptional years.

How many oxen does a household need?

Data on ownership of oxen are of particular interest, as possession of an ox determines the size of the area that can be cultivated, and ultimately the level of production and the well-being of the household.

The chart above shows an average of one ox per household. This corresponds with the assertion of the local administration and the village head that "everyone is equal" in the village of Deki Lefay. This assertion is completely understandable as a political declaration of intent in the context of a state structure that is striving to promote social equality. But a closer look reveals a somewhat different picture: complete equality is not a reality. Only a small minority - 15% of the households - own the two oxen needed for ploughing with an ox yoke. The remaining households must borrow oxen to do their ploughing. Households without oxen pay for the loan of an animal with part of their harvest. Twenty-five per cent of the households are in this situation: they comprise the poor of Deki Lefay. Given this situation, it is not surprising that farmers continually mention ownership of oxen as the most important indicator of well-being.

Knowledge of relative poverty and wealth within a local society does not reflect voyeuristic impulse on the part of external researchers. Rather, it serves as the basis for participatory development activity. It allows a realistic assessment of the contributions a local community is in a position to make on its own within the context of a development project. Our experience indicates that this indigenous capacity is wrongly assessed with regularity, and frequently overestimated.

Wealthy smallholder households in countries of the South usually have more agricultural resources such as land and draft animals, as well as sources of off-farm income. This is also the case in Deki Lefay: more than a dozen households admitted to having family members employed as guest workers in Saudi Arabia, from whom they regularly received support. Hence we encountered the phenomenon of international migration, even in a marginal region of Eritrea which appears untouched by the course of world events. This was surprising, even though it is known that remittances from Eritreans abroad have become one of the country's most important sources of exchange proceeds.

Construction of wells as a concrete output

One of the things evident from the foregoing presentation is that the people of Deki Lefay certainly have clear ideas about local development, improvement of the water supply being chief among them. The situation is precarious in the dry season, as the only source of water in the commune - a well that was constructed during the period of Italian colonization - almost runs dry at this time. Women form long lines at the well to fetch water. In order to get a good place in line, many women set out for the well in the middle of the night so that they have a chance to obtain their ration of water in the early morning, rather than waiting until mid-day or afternoon.

In light of this situation, the development study was useful in helping to promote concrete steps

towards development. The time spent in Deki Lefay by the team that carried out the study, and the participatory and communicative approach used, were very important in this regard. The results were encouraging: the second well desired by the population was constructed with the help of project partners, leading to a considerable reduction in water shortages during the dry season. Particular attention was given to the question of participation by the population, in order to ensure that the commune regarded the project as its own - a crucial point in view of the maintenance work that will be necessary in coming years. The study also revealed that traditional forms of authority still exist in the village - for example, the shimageles (village elders), who assume responsibility and power of execution for such a project. Political and administrative processes were also involved: the local authorities agreed that the existing well should be enlarged, and this has also been done. Thus the population was able to benefit from a markedly improved water supply within a short period.

The overall aim of our program in Deki Lefay is to support concrete development projects that improve the living conditions of the rural population and that conform to the principles of sustainable development. The commitment we have made in Deki Lefay is an encouraging start. In future, we shall continue to commit ourselves to appropriate local projects in close collaboration with Eritrean partners.

The data compiled and the experience gained in the course of this project will serve as the basis for long-term environment monitoring and monitoring of rural society. These data will also be very useful in education and training - for example, in instruction at vocational schools and universities. It is always sobering to realize how little students in a particular country - in this case Eritreans - know about living conditions among the rural population in their own country, and how unfamiliar they are with their environment. Moreover, there are few instructional materials concerned with Eritrean themes. The experience gained and the information collected in Deki Lefay are a start in the direction of rectifying this shortcoming.

5.3 administration, professional associations, and institutions of higher learning: supporting institutions in order to strengthen civil society

Following its thirty-year war of liberation, Eritrea is making great efforts to rebuild its civil institutions. This requires considerable financial resources and will also take time. In particular, the training of experienced and well-educated specialists in both the public and the private sectors can be accelerated only to a limited extent. It is a goal of our development program to provide support to our partners in training their colleagues, in developing infrastructure, and in undertaking specific activities and initiatives.

Our most important local partner, the Department for Agricultural Research and Extension Services in the Ministry of Agriculture, is currently undergoing a process of development. Within this department, we are providing support for a group of experts concerned with soil conservation and irrigation - in particular, with evaluation and processing of data compiled at the Afdeyu Research Station, which is now directed by this group of experts. To date, this collaboration has taken place on an informal basis - Eritreans do not put much emphasis on detailed, formal agreements, perhaps owing to their experiences in the war of liberation. In recent months, however, the Ministry of Agriculture has shown interest in a brief written agreement. A contract will signed along these lines in the near future.

In the area of professional associations - a new factor in the institutional landscape of Eritrea - our development program is supporting the Association of Eritreans in Agricultural Sciences (AEAS), which has an important mission in view of the central significance of the agricultural sector in Eritrea. In response to an appeal from this group, we supported a workshop it held in 1998, which was devoted to the topic of soil erosion and soil conservation. The aim of the workshop was to gather researchers and practitioners in order to exchange and evaluate experience, and to increase general public awareness of the problem of soil erosion. We can envision supporting this organization in the future, but we do not want to preclude anything by making such an offer. First we shall evaluate the experience gained in cooperation during the past year.

We also have established contacts with the University of Asmara, the only university in the country. The faculty of agriculture has included the work of the Afdeyu Research Station in the curriculum in recent years. A considerable number of students have completed their studies by carrying out evaluations of data from the station, and are now working in the areas of public administration, agricultural extension, and research. No contractual basis for cooperation has been formulated to date, as the university wants support at the faculty level (rather than at the institutional level). The university of Asmara hopes that this policy will reduce the number of partnerships and thus keep administrative expenditures to a minimum. The scope of an obligation at the faculty level, however, far exceeds the possibilities of our program In this case, it is necessary to continue dialogue and continue to pursue development, and then try to determine whether the viewpoints of the partners move closer together in time. Our guiding principle is to understand and respect the agenda of our partners, without loosing sight of our own aims.

Among our programs to promote sustainable land management, we aim to include support for institutions that are also active in this area. Sustainable development will only be possible if institutions can also work in a sustainable fashion.