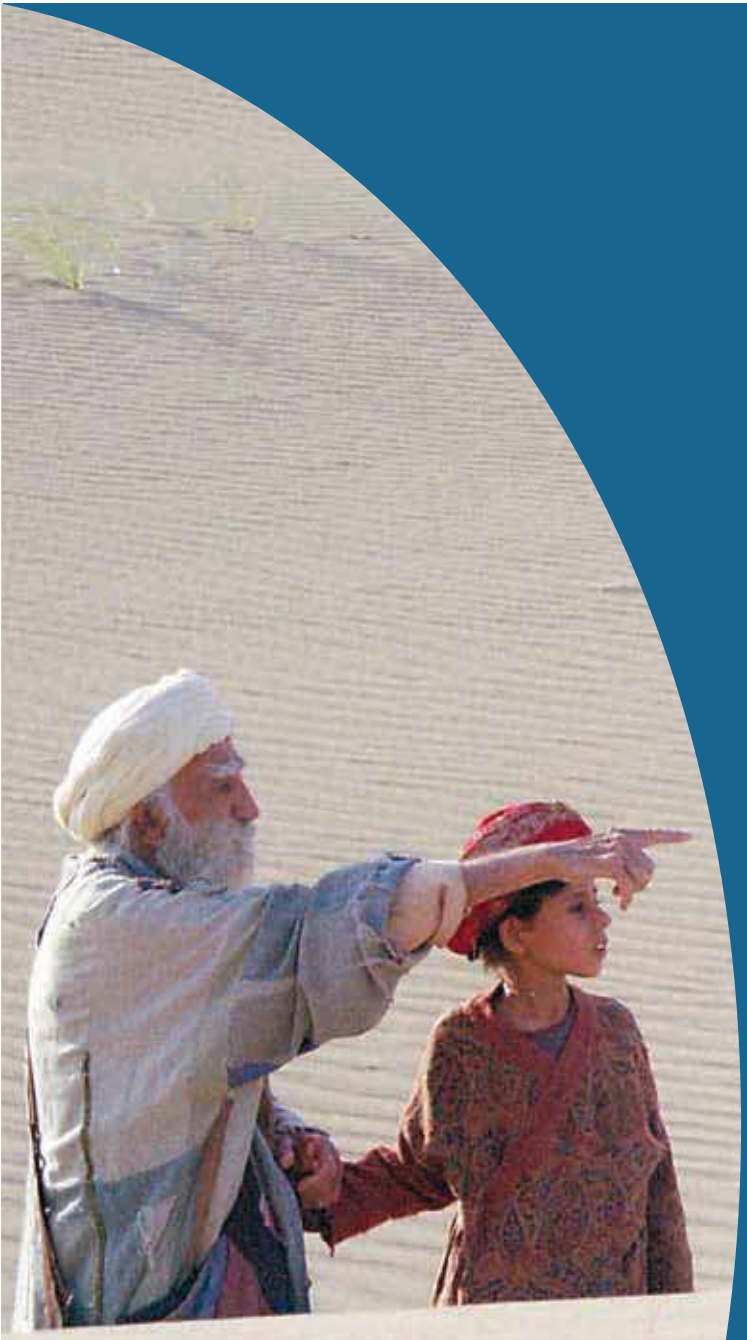

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Acacia raddiana. Sandrine Jauffret.

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Arid and semi-arid regions currently face increasing difficulties. Recurring droughts, overgrazing, resource-greedy agricultural production and population growth cause disruptions and severe degradation leading to impoverishment, hunger and distress. Whatever their principal activities – agriculture, livestock production, gathering, etc. – access and management systems used for centuries by indigenous populations are now proving to be increasingly inadequate. Very often, nomadism, which until recently allowed for regeneration and perpetual use of natural resources, can now no longer support livelihoods. Growing numbers of livestock producers and herds, compounded by climate hazards, are resulting in local conflicts over access to resources. History has shown that such conflicts can unfortunately lead to civil war, with the attendant suffering and massive migration involved.

The United Nations Convention to Combat Desertification (UNCCD) was adopted in Rio de Janeiro in 1992 on the occasion of the U.N. Conference on Environment and Development (UNCED). By including this thematic focus in global environmental governance, along with biodiversity and climate change, the international community gave itself the means to combat desertification and prevent its dramatic consequences. Switzerland ratified the Convention in January 1996.

After 10 years of activity, the UNCCD has progressed through several phases, encouraging affected countries to take account of land degradation in their national planning. Moreover, by drawing particular attention to local knowledge, the UNCCD has increased appreciation of the value of the insights, pragmatism and ingenuity shown by local communities in developing livelihoods in the arid and semi-arid regions where they have been living for centuries. Finally, the UNCCD has succeeded in placing the populations who are the stewards and users of arid ecosystems at the heart of the debate, by insisting on their role and on the means and the power that should be at their disposal. However, one must concede that the interest shown by political and economic actors in desertification is minute by comparison with the interest shown in other global environmental issues – even though desertification affects the basis of subsistence and the very lives of millions of people, particularly among rather poor rural communities. Desertification generates silent distress: it is far from having the potential of a cyclone to arouse media attention.

Conscious of the need to increase public awareness of this issue as well as to remind the international community of the link between desertification and persistent poverty in the regions affected, the General Assembly of the United Nations resolved at its 58th session that 2006 would be the International Year of Deserts and Desertification (IYDD). This Year offers space for reflection on reality in arid regions which, from being last priorities on the international agenda, should instead be supported as habitats for human beings and sources of biodiversity. The IYDD is also an opportunity to give the UNCCD the same importance as the other Rio Conventions.

With a view to joining forces with the world's nations and international institutions, the Swiss Agency for Development and Cooperation (SDC) decided to present some of the ways in which it supports rural communities, local organisations, national technical services, research institutions, and networks and platforms specialised in elaborating the kind of innovation that local populations in arid and semi-arid regions need in dealing with increasingly difficult living conditions. This experience – sometimes based on long-term partnerships – illustrates how numerous the possibilities are of improving living conditions in regions that are more or less severely affected by drought.

Switzerland contributes to the implementation of the UNCCD in countries affected by desertification through rural- and research-oriented development projects and programmes in the amount of approximately CHF 56 million per year, as well as through resources paid into the Global Environmental Fund (GEF).

Walter Fust
Director General, Swiss Agency for
Development and Cooperation (SDC)

Dogon village, Mali.

The very moment you are reading this brochure, somewhere in the world, in a dryland area, a village is awakening.

Dawn: when the shadows emerge from the darkness

A silvery stripe lines the horizon of the clear sky immersed in deep dark blue. The silhouettes of scattered acacias on distant hilltops stand out against the darkness. The first birdsongs ring out from the treetops of the mango trees dispersed around the village, intermingled with the cries of impatient roosters.

The village, still wrapped in cool, is awakening. Doors squeak. Women and men cross the yards of their homes, their pace still hesitant. Heads appear from behind woven panels, only to disappear again to the rhythm of splashing water. Little by little, timid voices intermingle. Preparing the first meal of the day, the women begin to crush millet in heavy wooden mortars. The beat of the pestles gives the day its rhythm.

The first sunbeams light up the sky. Sitting in front of their huts, people hastily down their first meal: manioc and millet porridge with a sauce. Time is pressing. The first rainfalls are long in coming, and in the morning cool, work is less wearisome.

Shouldering their tools, men set off for the fields, urging on their oxen.

Girls rush to the wells to fill their jugs. Awaiting their turn to draw water, they exchange the latest news. In this season, the well takes a long time to fill. At dawn it provides fresh water, then it dries up, even before the herds leave the village. Girls who linger too long are forced to go and search for water in the hollows of the dried-up riverbed, far from the village.

After rounding up goats, sheep and zebus, the boys take them to the pastures.

Those who arrive late at the well will have to wait.

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The morning: when the shadows speak the truth

When the shadows give a true picture of reality, the sun bathes the village in soft light, amplifying contrasts. The old villagers gather under the fig tree and observe the coming and going on the village square. At the same time, the women sweep their yards, chop wood, wash the dishes, sort out the seed for the coming cropping season, and rock their babies. As soon as these household chores are done, they leave their homes, accompanied by their daughters, in search of fuelwood or to work in the fields. People going to the poorly supplied market are rarely to be seen – both products for sale and the money to buy them are scarce.

Noon: when the shadows are deceptive

The sky has become hazy; a sand cloud is hovering over the landscape. The sun is burning like a red-hot iron. The air vibrates while it draws up the last drops of water from the ground. The harmattan, the desert wind, has come back, and with it, the restlessness of the people.

The farmers working the parched land are breathing hard. The plough cuts the soil with difficulty, colliding with roots and stones. The oxen become exhausted, forcing the men to take longer and longer breaks. The empty granaries are a constant cause of worries. If the cropping season is late, the gap to bridge will be long! Contemplating the land, the farmers recall with bitterness the years when young millet, maize and tuber plants wilted because there was no rain. Then, as if getting on with the ploughing could make the rain come, the men resume their work. Sometimes, while they wait for the oxen to recuperate, they collect stones and pile them up in places where the water of a strong rainfall event has washed out a gully and carried away part of the arable soil.

After having criss-crossed the bush countless times in search of forage, the young herders cut branches that carry tough leaves for their hungry animals. The goats, defter than the sheep and zebus, help themselves to the meagre bushes. In the scorching heat, the deep silence lying over the bush is interrupted only now and then by the monotonous buzz of an insect.

A few women, carrying heavy bundles of wood, return to the village. Others, followed by men, come back from the fields. Their faces are tired. A few cups of water will have to be enough to remove the dust and quench the thirst.

1 The beat of the pestles gives the day its rhythm.

2 Herder boys guide their herds through the bush.

3 Goats are deft and know how to graze bushes despite their thorns.

4 Rainfall events are rare but sometimes very intense, causing surface runoff that carries away arable soil.

5 Every year, the harmattan – the desert wind – carries thousands of tons of sand southwards.

6 An approaching sandstorm.

Village life is stifled by the heat. The streets are deserted, dogs trot from place to place in search of a cooler spot. People retreat to their huts for a small snack, if their supplies allow for it. For some hours the village seems abandoned.

Dusk: when the shadows lean towards the east

Less hastily than in the morning, the villagers walk to their gardens on the shore of the pond, which, in this season, is surrounded by a wide strip of cracked soil. It is time for irrigation. But soon the herders are back to water their animals. This regularly causes quarrels among villagers, especially when the animals, attracted by the greenery in the gardens, break through the enclosures and trample the carefully tended vegetable gardens.

On their way back, the children once again carry buckets and jugs of water on their heads. The mortars begin to vibrate again; air and dust slide in between the huts, mixing with the odours rising from the pots where dinner is cooking.

The sun, still blurred by a veil of dust, spreads a diffuse and mysterious light until the moment it disappears behind the horizon. Once again united under the fig tree, the old villagers sip their mint tea. They talk about the return of the harmattan, about conflicts between families over the use of water, and about quarrels with nomadic livestock breeders, but also about young people who leave the village in search of an easier life.

Nightfall: when the shadows melt into the darkness

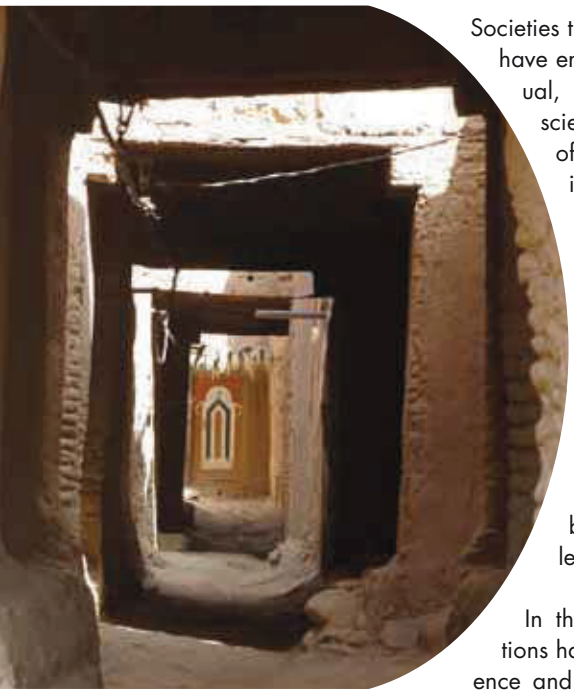
While the earth releases the heat accumulated during the day, families gather for their main meal. The clatter of dishes can be heard along with children's cries, music and conversations.

A group of women and men has come together to watch television at the village workshop. The programme is showing a serial about the misfortunes of a rich family. Their eyes riveted to the screen, the spectators attentively follow the development of the story. Occasionally comments, laughter and applause burst forth.

Later, when people lie down to try and sleep despite the persistent heat, the impressions of the day come back to them, and anxiety mixes with hope and dreams.

The desert: an age-old source of culture

For thousands of years, flourishing civilisations and great mystical traditions developed on the margins of deserts. Today, despite technical progress, we regard the condition of these habitats with dismay, and are incapable of finding the means of breathing new life into them. Are climate change and the degradation of soils and vegetation cover sufficient reasons to explain this incapacity? Or does our uniform, production-oriented vision simply limit our perception to only those aspects of the desert, making us forget that degradation is first and foremost the result of a global evolution, the control of which is now well beyond our means? It is not the purpose of the present publication to try and offer answers to these questions. Nevertheless, it is clear that a world heritage of inestimable value will be lost if human beings are forced to abandon their culture when seeking to survive or adopt a new way of life.



Partially covered street in Tamgroute ksar.

Societies that live at the margins of deserts have enriched the social, cultural, spiritual, economic, technical and even scientific development of the whole of humanity. Numerous historical impulses have emanated from these regions and constitute an important basis for civilisation to this day. Spiritual centres, literary works of art, decorative and expressive designs, architectural masterpieces, models of social organisation – including those related to water use – transport and trade, as well as rich traditional modes of life bear significant witness to this legacy.

In the modern world, these civilisations have lost part of their radiant influence and find themselves increasingly at the margins of global development. Material impoverishment in these societies sometimes entails loss of cultural identity and heritage.

Seen in this light, desertification can no longer be perceived as a purely physical phenomenon: it is also a socio-cultural problem. Arid and semi-arid regions remain living habitats only if human populations identify with them, feel responsible for them, and make sure their balance is maintained. But this is only possible if those who live there benefit from a way of life that meets their needs and suits their values.

The ksour in the Drâa valley (Morocco)

Long ago, the Drâa valley, situated in the south of Morocco, was a flourishing region and an important centre for trans-Saharan trade. In the ksour, i.e. fortified villages surrounded by palm groves, travellers found the necessary solace and provisions to continue their journey. The caravans that linked the important centres in the north to those in the south of the Sahara transported not only precious or necessary merchandise such as salt: they also played a key role as messengers and vehicles of knowledge exchange.

The ksour, made of bricks and clay and built on stone foundations, offered shelter for a cosmopolitan population of Berbers, Jews, Arabs and sub-Saharan Africans. Renowned zaouias developed there, such as Tamgroute Zaouia, one of the oldest in the Maghreb region: these spiritual centres harbour schools and Koranic universities called madrasas, as well as collections of scriptures.

Around the main square situated close to the main entrance were merchants' stalls, and blacksmiths' and goldsmiths' workshops. From this central area, narrow, sometimes covered streets led to the various residential quarters and the other gates of the city.

When the great caravans disappeared, the Drâa valley, despite its immense cultural wealth, lost the fame it had in days of yore. This cultural heritage – still largely unknown – is progressively being abandoned as young people leave for big cities, ways of life change, and poverty increases.

More than 300 ksour have been registered in the Drâa valley, but the current population – i.e. 250,000 inhabitants – mainly live outside these traditional villages and fortified towns. Indeed, as soon as a family has the necessary means to build a new home outside a ksar, they prefer to do so, as houses in the ksar offer only limited comfort and are expensive to maintain. Thus, many ksour fall into ruin and will be irredeemably lost.

"The desert is deserted only when man abandons it!"

Tuareg proverb

1 View of Tissergat and its large palm grove, which offers shade to the gardens and cultivated fields.

2 Rebuilding clay walls. The clay is mixed with straw, then shaped and compacted into a row. Once the clay is dry, the next row is built.

3 Aerial photo of Tissergat. Most of the ksar is inhabited and in good state (brown marking). The main entrance (in yellow) leads directly to the large square, which also features the mosques (in green). Outside the town walls there is new housing (in blue) and threshing areas (in red).

In collaboration with Swiss experts, the Moroccan Ministry of Culture made a detailed and informative inventory of the ksour in the Drâa valley. This inventory serves as a planning instrument for the rehabilitation of buildings. In a second stage, there are plans to develop a form of cultural tourism adapted to local conditions, and thus create new sources of income for the population, who will then be keen to conserve this habitat.

Information on the inventory of all ksour in the Drâa valley: photpc15.epfl.ch/

General information on ksour: dp.mariottini.free.fr/special/maroc/desert/kasbah/kasbah.htm

A nomad pastoral family on the road. The white dromedary carries the carpets (Pakistan).

Carpets: the collective memory of pastoral tribes

For thousands of years, carpet-making has been closely linked to pastoral culture in countries with arid and semi-arid zones. The art of carpet-making expanded from Turkey to Iran, the countries of the Caucasus, and as far as China and Morocco.

Carpets, spread on the ground or hung on the walls, are both everyday objects and works of art constituting an important family patrimony.

Carpets may have various origins: knotted by women in nomadic pastoral or sedentary livestock-producing communities, or manufactured in urban settings. The character of a carpet comes from its source. Thus, carpets made by nomads are rather small and may have distorted patterns. Indeed, the women produce them on small-sized carpet-knotting frames that can easily be transported, and the frames are often dismantled and later re-assembled. This can lead to occasional irregularities that constitute the particular charm of nomad carpets.

The carpets produced by sedentary farmers have finely knotted traditional designs and can be as large as 12 square metres. While nomads only use woollen thread for the warp, sedentary farmers also use cotton fibre.

The abstract motifs of nomad and sedentary carpets often represent scenes of everyday life, animals and plants, and figurative compositions that symbolise vital virtues such as fertility, courage and fidelity: figures that very clearly evoke the natural habitat and the values attached to it. To those capable of interpreting them, the carpets thus reveal stories of the past and constitute an important part of the tribes' and people's collective memory.

Urban manufacture developed as a response to increasing demand from rich local people on the one hand, and from a flourishing transboundary commerce on the other. Works of art with a fabulous degree of perfection and imagination emerge from impressively large looms. The ornamental elements are self-sufficient due to their aesthetic wealth; they underline the owner's power and authority. For decades, the carpet trade has generated a considerable global turnover. Production is ensured by thousands of workshops in which women and children work often under precarious conditions and for shockingly low wages.

The STEP Foundation, supported by the SDC, works to achieve better labour conditions. Its activities – also supported by the employers – cover workplace security, the guarantee of fair wages, and schooling for working children. The STEP label guarantees that the buyer will get a carpet produced according to socially and ecologically friendly criteria.

STEP Foundation: www.step-foundation.ch
Carpet 24: www.carpet24.com

From oral culture to film production

Societies in arid and semi-arid regions have an oral culture with flourishing legends and tales. In the past, storytellers presented these legends and tales very vividly before large audiences. Today, traditional storytellers are rare and audiences prefer to gather in front of a television set.

Other narrators – film-makers – have taken over. They give a voice to people living on the margins of the desert, and present their lives and traditions in an impressive manner. These poetic works of art constitute a new way of expressing the cultural heritage of dryland areas.

In his film "Bab'Aziz: The Prince Who Contemplates His Soul", Nacer Khemir, a Tunisian film-maker, tells the story of a blind grandfather and his granddaughter who try to go to a meeting of dervishes, an event that takes place only every thirty years. Their journey through the desert becomes a quest for the meaning of life.

"Ta Dona", the title of another film, is also the joyous exclamation frequently used in the Bambara language, meaning "fire, fire!". The producer Adama Drabo portrays the geographic, social and mental environment of Mali in the 1990s; he juxtaposes the aspirations of the younger generation and the dictates of everyday reality imposed by politics and particular interests, illustrated here by the repressive rules used to prevent bush fires.

Urgen and his family live in Mongolia. Drought and modern laws make their lives as nomads increasingly difficult. Urgen resists reality and comes into a conflict with his neighbours, the authorities and, finally, with his wife. Through impressive shots, the film "Season of the Horse" by Cai Ning traces the fate of many nomads from all over the world, trapped between tradition and modernity.

"El Entusiasmo", a film produced by the Chilean Ricardo Larrain, focuses on the desert as a place for dreams and speculation. Opposing capitalism, Isabelle and Fernando dream of an independent and communitarian republic. After years of a dictatorial regime, they have an opportunity to create their own tourism agency. Globalisation awakens Fernando's fantasies: he becomes an associate in a multinational enterprise, while Isabelle refuses to follow him on this path. As for Miguel, their son, he preciously conserves in his head the draft project of the independent republic…

The SDC supports the production and distribution of films produced in countries on the margins of deserts by film-makers who come from these regions. The SDC thus enables exchange and the development of better understanding between cultures.

trigon-film – the other dimension of cinema:
www.trigon-film.ch

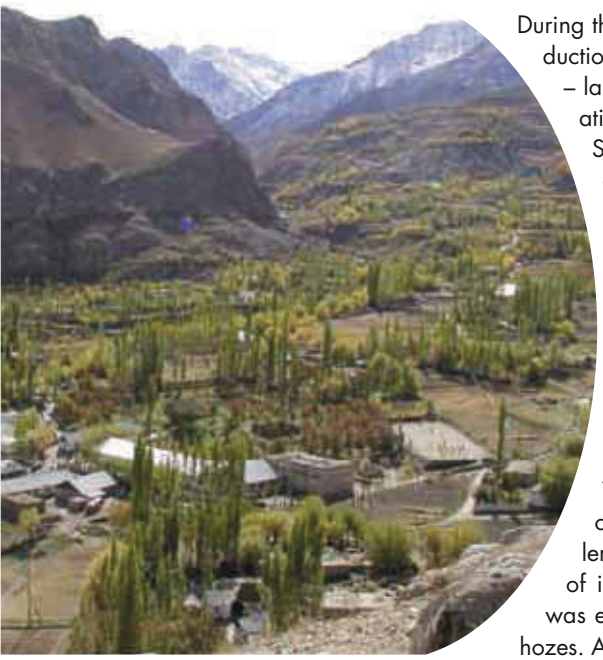
For the SDC's support for cultural development in the countries of the South and East:
www.sdc.admin.ch

4 The dancer and the prince in "Bab'Aziz: The Prince Who Contemplates His Soul".

5 Urgen, a Mongolian nomad oppressed by civilisation, faces the idealised vision of nomadism painted by an urban artist.

Optimising household strategies to better face drought

A household strategy that is adapted to ecological, economic and social conditions enhances the quality of life for household members and at the same time fosters more sustainable use of natural resources. In Kyrgyzstan, household strategies are developed according to existing potentials and promising opportunities. They are oriented towards limiting the risks of a one-sided dependence on water and seek to make use of positive synergies between various activities in order to create substantial added value.



Ten million people live in the semi-arid mountain regions of Central Asia.

During the Soviet era, agricultural production was ensured by kolkhozes – large state-run agricultural operations. After the collapse of the Soviet Union, the means of production were privatised. They are currently in the hands of a multitude of small family operations. Around 70% of all households live from agriculture and livestock production. More than half of them are located in semi-arid areas.

The restructuring of the agricultural sector has led to problems related to the maintenance of irrigation infrastructure, which was established earlier by the kolkhozes. Access to water – the issue most worried about in rural households – has become a delicate subject that often causes conflicts.

Household strategies for managing water dependence

A key strategic aspect for all households trying to ensure their access to water is **their social network.** Families with a large and influential social network are in a better position to negotiate and promote their interests. However, those who solicit a favour today must be able to return it tomorrow. A household that does not respect this rule risks being excluded from the network. Consequently, poor households are often marginalised.

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To secure access to the water they need, households adhere to formal or informal groups that take care of construction and maintenance work on the distribution system. They regulate the allocation of water and defend their interests vis-à-vis other groups and the state organisations that are in charge of water management and irrigation infrastructure upstream from the distribution systems.

Diversification of agropastoral production is another strategic aspect. It helps to minimise the potential risks linked to climatic hazards or economic and social crises. In accordance with their resources, households invest simultaneously in rainfed and irrigated agriculture. Horti-

culture and tree-growing are two further areas of investment. An important role is played by livestock, which includes poultry, small ruminants and, for the wealthier households, cattle and horses. More specialised activities such as bee-keeping are essential for certain households.

The creation of additional sources of income is a strategy that has become increasingly important. The processing and valorisation of farm products, along with crafts, small-scale commerce, tourist accommodation, transport services and seasonal jobs, are the main opportunities that enable households to reduce their dependence on water.

Investments in innovation for rational water use are becoming more and more frequent. Farmers invest modest sums and find appropriate solutions. For example, they use perforated PET bottles filled with water and buried between two plants to supply the roots with water in an economical and targeted manner. Another example consists of adding clay to the soil where trees are planted. This reduces the need for irrigation water.

"A social network, diversification of income and innovation help households to live better under the changing conditions in semi-arid areas."

Research, innovation and exchange of ideas

The Central Asian Mountain Partnership (CAMP) has carried out studies in order to gain a better understanding of the strategies adopted by different types of households. The results serve as a basis for planning support activities. In order to create favourable conditions for the development of a diversity of household strategies, CAMP supports communities in their village planning. A number of villages have formed the Central Asian Mountain Village Alliance, an organisation that facilitates exchange of experiences and helps the communities advocate shared interests.

Organised innovation contests have encouraged farmers to search for solutions that help reduce their dependence on water. The best innovations were presented in television broadcasts.

Testing appropriate strategies

A household strategy simulation game offers participants a fascinating exercise. They form groups representing fictitious households and invest in various activities, thus constructing their strategies. In the course of the game, unexpected events put the chosen strategies to the test. At the end of the fictive year, households that have succeeded in generating sufficient income can make new investments and refine their strategies.

The simulation game makes it possible for participants to learn more about available natural resources and market opportunities and how to make the most of them, as well as how to minimise risk by diversifying production technologies and activities in various sectors. By developing positive synergies between activities, they discover opportunities to generate substantial added value.

The SDC in Kyrgyzstan:
www.swisscoop.kg
Central Asian Mountain Partnership (CAMP):
www.camp.elcat.kg

1 Water users discuss options for rehabilitating an irrigation ditch.

2 Clay added to holes for tree-planting diminishes the need for irrigation water by 40%.

3 Investments in the processing of farm products such as wool generate income and diminish the risk of high dependence on water.

4 The simulation game gives participants an opportunity to test different strategies.

Innovating with dryland pastoralists

The Association for the Promotion of Livestock in the Sahel and the Savannah (Association pour la Promotion de l'Élevage au Sahel et en Savane, APESS)[1] unites livestock producers who are interested in integrating a movement that is innovatory with regard to both pastoral practices and cultural development.

In the societies of the Sahel and Sudan, traditional pastoralists consider their livestock as their partners in life. They respect the animals as beings that have feelings and a soul of their own.

Livestock production in the Sahel and in the savannahs is an activity that has been practised for thousands of years. It is an important sector in 4 Sahelian countries: Burkina Faso, Niger, Mali and Chad – representing between 15 and 30% of the total GDP, or between 40 and 50% of the agricultural GDP and between 10 and 35% of the total value of exports, depending on the country. In semi-arid regions where rainfed agriculture is uncertain, transhumant pastoralism is the only rural activity that can be viably practised, and makes it possible to capitalise on marginal resources that are otherwise unproductive.

However, in the past several decades this sector has been facing great difficulties. Population growth, agricultural expansion and the spreading of the Sahara, especially after the heavy droughts of the 1980s, are reducing the space available for grazing and have created an extremely competitive situation that gives rise to numerous conflicts. The fact that state legislation takes no account of pastoral land tenure also places nomadic pastoralists in an unfavourable position compared to farmers. Traditional pastoralists are experiencing a crisis that is now becoming a long-term condition.

In traditional practice, milk production is limited to the rainy season, when there is enough fresh grass. At the end of this season, the grass withers and rapidly loses its essential nutritional value; just enough, at best, for the cows to survive, it no longer provides a sufficient basis for milk production. In the dry season, transhumant pastoralists traverse great distances in order to ensure sufficient grazing opportunities for their herds, which are often very large (several hundred animals). Their presence among the sedentary population, which has its own livestock, is often perceived as undesirable (e.g. conflicts over watering points).

[1] *Originally APESS worked only with Peul herders; currently, the movement is open to all Sahelian livestock producers.*

The birth of APESS

In 1989, several Burkinabe livestock producers, who had been sensitised by an SDC pilot project on extension for fodder cultivation among livestock producers, took the initiative to create the Association for the Promotion of Livestock in the Sahel and the Savannah (Association pour la Promotion de l'Élevage au Sahel et en Savane, APESS), with the aim of disseminating new ideas and innovations to improve living conditions for Sahelian livestock producers. The challenge was great: transhumant pastoralists had to be convinced to make hay reserves on managed meadows that would be sown with seed and fertilised with animal manure – a practice that is not part of their ancestral tradition.

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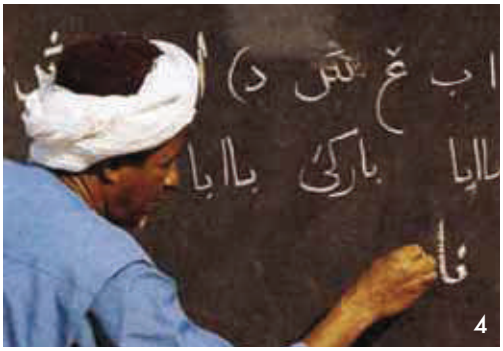

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1 For APESS, the psycho-cultural aspect is the driving force behind development. Every pastoralist community has an intrinsic potential for development, as well as know-how and a vision of life. These constitute their greatest opportunity for improving their lives.

2 Today, the association unites several thousand livestock producers, who have subscribed to the idea of transforming their production system, traditionally productive only during 3–4 months each year, into a system that is productive all year round.

3 A hay shed, built by each producer using his own means, represents his "APESS membership card". It symbolises his boldness to embark on new ventures and his adherence to a solidary international movement.

4 10,000 persons have been taught to read and write since the foundation of APESS in 1989.

The psycho-cultural driving force

APESS puts utmost emphasis on the psycho-cultural aspects of livestock production: "Every Sahelian pastoralist is culturally sensitive to knowledge and beauty. Therefore, if information clothes knowledge in beauty and is presented to livestock producers at their doorstep, they will be touched and will end up reacting to it." According to the persons in charge at APESS, socio-economic problems are not rooted in a shortage of natural resources or in lack of access to new technologies, but in the absence of a psycho-cultural attitude that would allow pastoralists to "take advantage of what is there, acquire what is available elsewhere, and invent what is lacking". Altering patterns of behaviour is a priority for APESS. The organisation encourages livestock producers to claim ownership for their community's development by making better use of the potentials available to them. In doing so, APESS strives to generate among pastoralists attitudes such as courage, perseverance, trust, and consideration for the interests of others, in order to enable them to transform their own culture into a dynamic atmosphere.

"Cultural identity is the driving force behind development among nomadic pastoralists in an environment where ecological, social and economic constraints pose great challenges."

"From the physical and organic point of view, the man is the inseminating principle and the woman the flesh-giving and child-bearing principle. From the psychological and professional point of view, it is the woman who brings the seed and the man who materialises the professional activity of both under the woman's driving and determining influence. When a woman has a dream, she always transforms her husband into a great man." (APESS)

Hay storage and livestock selection

From a technical point of view, APESS advises livestock producers to improve milk production by harvesting hay and storing it in sheds, and by enhancing the quality and productivity of their animals. This enables them to gradually eliminate animals of poor quality and thus reduce the size of their herds. As a result, milk production is possible all year round, improving the food situation and family income, while diminishing the pressure of herds on the natural vegetation.

Protection of the vegetation cover

The protection and enhanced use of natural vegetation are also among the priorities of APESS. The organisation advises livestock producers to protect grass and tree species that have particular qualities, to collect their seeds and to multiply them in favourable areas.

Education and training

Practical research is being carried out on instruments and infrastructure that are technically and economically accessible to pastoralists, and that enable them to better manage water resources. The association also offers courses in reading and writing, along with special training for women that aims to strengthen their role in the development of families and of society as a whole.

Since its creation, APESS has united thousands of livestock producers in 36 "APESS regions" in Burkina Faso, Cameroon, Mali, Niger, Senegal and Chad. Fodder production has become widespread in these countries, practised by several ten thousand pastoralist and agropastoralist families. Particularly Burkina Faso, but also Niger and Mali, have taken up the ideas developed by APESS in their national livestock policies. APESS education and training activities have reached over 5000 men (economics and technology) and 600 women (economics, technology, and role in society).

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APESS was created by Africans according to their criteria and values, and has remained in African hands since. With the aim of preparedness for securing future stakes related to land ownership, APESS intends to create an African Bank for Development and Livestock Production.

The SDC has been providing financial support for APESS training activities and monitoring of the activities carried out by livestock producers:
www.apess.org

5 Education and training for women is an important area of activity for APESS.

6 Annual general assembly in Dori, Burkina Faso. This meeting is a discussion and decision-making forum, a platform for exchange, and a training workshop all at once. But it is also a 7-day cultural event with music and dances.

Protecting the trees of the Sahel: shields against desertification

Forest cover in arid and semi-arid areas is threatened. The main reason for this is inadequate management practices that tend to hinder the regeneration of woody species. The consequences are soil degradation and reduced agropastoral productivity. Improved management of the vegetation cover and adequate regeneration technologies have succeeded in reversing these negative effects. Identifying sources of income that can improve people's living conditions plays a major role as well.

Agroforestry parks are areas where trees are associated with the cultivation of food-crops or cash-crops. They make up around one-third of all cultivated land in the semi-arid parts of the Sahel. In these parks, trees are dispersed, their light shade protecting the soil against dryness and erosion.

For several decades, observations have revealed signs of degradation in the parks. Draught animal cultivation, introduced in the 1970s, has enabled farmers to considerably expand their areas of cultivation. But in order to facilitate fieldwork they cleared vast areas, uprooting an important part of the primary vegetation. However, they spared certain tree species, such as shea, néré and palmyra palm. Today, intensive cultivation, reduced fallow periods and the penning of livestock on fallow plots are preventing the regeneration of these trees. Current observations show not only a reduction in the size and density of agroforestry parks, but also an alarming decrease in the number of young trees. Rising wood prices pose an additional threat. Along with the fact that it takes several decades for the trees to regenerate, all these factors render the outlook for maintaining agroforestry parks very uncertain in the long term.

Protecting the shea tree in Mali and Burkina Faso

While cash-crop cultivation and livestock production tend to be men's activities, the trees in the agroforestry parks generate income that is often reserved for women. 80 to 90% of the harvested shea or shea nuts are consumed locally, particularly in the form of cooking fat – shea butter. The rest of the output is exported for use in the production of chocolate or cosmetic and pharmaceutical products.

Aiming to protect shea parks, a new project in support of farmers' initiatives to promote sustainable management of this resource is working to develop an improved management system and valorise agricultural products. In order to achieve this, the different actors participating in the production chain – farmers, shea butter producers (mostly women), mill owners, carriers, traders and decision-makers at various levels – are involved in project activities. Certain research and training activities, focusing for example on forestry technologies and transforming almonds into high-quality shea butter, supplement activities of a more socio-organisational nature. The "Karité Project" (Shea Project), initiated by a programme entitled "Jèkagnini", supports producers in their search for new and more profitable marketing channels. However, the true challenge of this project lies in the task of getting all stakeholders to take account of women's demands for park management systems that are compatible with the regeneration of the shea trees.

Selling palmyra fruit.

Woman demonstrating how to make high-quality shea butter.

Conservation of palmyra palm groves in Niger

One of the world's largest palmyra palm groves grows in southern Niger, on the banks of the eponymous river. These tree stands colonise the region's semi-arid basins that have a relatively high water table.

The palmyra palm has multiple uses. For craftsmen it is one of the scarce sources of construction wood. Fishermen use its leaves to make their weirs. Livestock producers value its young leaves and fruit as fodder for their animals. Women use young palmyra shoots to make a popular dish called miritchi.

Abundant groundwater, fertile soils and the numerous products made from the palmyra palm make the groves a privileged place for living. However, excessive cutting, along with intensive agriculture and grazing, are preventing the natural regeneration of palmyra palms and jeopardising the very existence of the groves.

In cooperation with Niger's forest service, a project entitled "PADEL" has been working for several years to support establishment by the population of a locally managed system for the palmyra groves. Village associations and the forest service have set up rules for the management and use of palmyra groves. The communities monitor the cutting of palmyra palms and the trade in timber. Revenues are reinvested in the local infrastructure, the maintenance of palmyra nurseries, reading and writing courses for adults, and the development of profitable secondary activities such as the production and sale of arts and crafts.

"Economic valuation of the vegetation cover to the benefit of the local population is an efficient means of conservation."

Rural timber markets in Mali

The vast areas covered by tree or shrub savannah play an essential role in the protection of drought-prone areas. These ecosystems have important ecological functions: they serve as habitats for a diverse fauna and flora, stabilise soils and protect water resources. Moreover, they play a vital socio-cultural and economic role. They are used for grazing. They are the place where healers gather numerous plants for their pharmacopoeia, where herders harvest gum arabic, and where craftsmen find the timber they need to build musical instruments. The savannahs harbour sacred places, homes to the dead and the spirits. These examples are an illustration of the wealth and multifunctionality of savannahs – often considered unproductive areas.

The use of timber for fuelwood and construction is the main threat the savannah faces today. The cities are expanding from year to year, requiring ever more energy, and the vegetation cover around urban centres is thinning at an alarming rate. Armed with a cutting permit, timber traders practise clear cutting and dispatch the timber to the markets without consulting the villagers. Profits only rarely flow back to the rural areas.

Within the context of decentralisation, natural resource management is defined as being within the power of communities and municipalities. In order to confront a timber trade whose profits bypass them, municipal authorities and village communities have joined forces to establish rural timber markets, the supply of which they themselves control. Indeed, those stands that can be harvested are identified by the municipal authorities in collaboration with the forestry service that issues concessions. The villagers themselves use selective felling, making sure to spare trees with multiple uses and trees bearing seeds that ensure the regeneration of the tree population. Part of the revenue remains in the village and is reinvested in the rehabilitation of the areas under use or for other community needs. The establishment of rural timber markets is supported by the SDC, through a mandate attributed to Intercooperation in the Sahel.

The Karité Project:
www.ddc-mali.org.ml

Local Development Support Programme
(Programme d'Appui au Développement Local, PADEL):
www.ddc-niger.org

Village timber markets:
www.ddc-mali.org.ml

1 "Village girls from Nigeria want to marry our sons, because in their home villages all palmyra palms have already been cut."

2 A shea park after harvesting millet. No young plants are to be seen. The regeneration of the shea trees, currently still in good condition, is not ensured.

3 Women selling young palmyra shoots, locally called miritchi – a prosperous market for women.

4 Village women set up piles of wood to be sold along the road.

Sharing water equitably

In developing countries, reliable databases that make realistic planning possible are often lacking. This is all the more alarming because thousands of people depend on the soundness of the solutions envisaged by decision-makers. Arid and semi-arid zones are particularly affected by this near-absence of ecological, economic and social data. The example of Laikipia in Kenya shows how research serves the purposes of governance to contribute to planning for sustainable development.

To draw water, Samburu women are forced to dig holes in the dried-out riverbed of the Ewaso Ng'iro.

Farmers and livestock producers on the Laikipia Plateau and in the Samburu Plains, in the north-east of Mount Kenya, were unanimous: they believed that rainfall had been less abundant for several decades. Extension services and the people in charge of planning did not have the necessary information to verify this assumption. However, research based on an analysis of meteorological data covering the past 50 years did not confirm the local people's account.

Moreover, river flow measurements recorded in the Ewaso Ng'iro river and its tributaries – which provide the region with water – raised another problem. During the 1960s, towards the end of the dry season, river flow was still at 9 m^3/s, even in the plains 140 km from the source. Today, at the same place and in the same season, the river resembles a puddle of water with a discharge rate lower than 1 m^3/s.

What are the causes of this dramatic decrease, which threatens the existence not only of Masai livestock holders and their herds, but also of the farmers on the Plateau?

A demographic analysis showed that the population on the Plateau increased tenfold in the past 40 years, growing from 50,000 to 500,000 inhabitants. Numerous immigrants began cultivating land without knowing about the specificities of farming in semi-arid zones. The demand for irrigation water exploded. In the dry season, 60 to 95% of river water is abstracted illegally to irrigate fields. Tensions and conflicts between water users have arisen, which the authorities find increasingly harder to control.

The presentation of data from the baseline study on water availability in the Mount Kenya region brought some calm back into the debate. The population's awareness of the true status of resources increased, making a more objective approach to the topic possible. During meetings

with water users' associations, a key question soon arose: "What information do we need to be able to establish equitable sharing of water?"

"Reliable basic data are an essential starting point for good governance. They guarantee profitable and sustainable investment."

Research was conducted to quantify and qualify the availability of and the demand for water, as well as to situate them temporally and spatially. The results revealed certain potentials, thus leading to new hope. They showed that only 20 to 30% of rainwater infiltrates the soil before becoming available to

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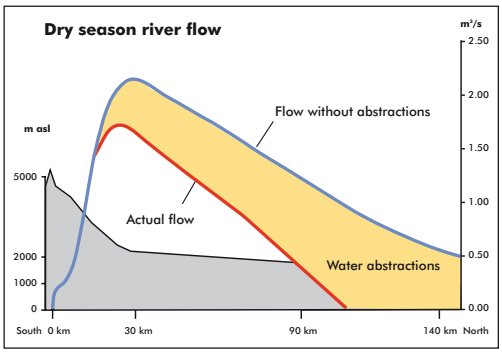

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plants. During abundant rainfall events, most of the water is washed away by surface runoff, causing important erosive damage. Moreover, 40 to 60% of the water that succeeds in infiltrating the soil evaporates almost immediately afterwards. These results clarify a situation that is far more complex in the field, depending on agro-ecological zones, population density and farming practices.

The models developed by the study show a potential for integrated water management. If all the methods tested are applied – e.g. improving soil cover, collecting surface runoff, using more efficient irrigation techniques and applying transparent management – the amount of water needed for irrigation can be reduced by approximately 60 to 80%.

Developing a reliable database, along with regular monitoring aiming to enhance the potential of a whole region, is a long-term investment. Implementing measures such as negotiations between water users' associations or the introduction of conservation techniques requires continuous commitment of the services and agencies involved.

The results transferred to the Laikipia District Development Committee serve as a basis for the planning of regional development. The University of Nairobi and the Centre for Training and Integrated Research in Arid and Semi-arid Lands Development (CETRAD) in Laikipia collaborate to support the authorities in implementing and monitoring recommendations resulting from the research.

The research was conducted jointly by Kenyan and Swiss experts. The SDC contributes funds through the East and Southern African Partnership Programme (ESAPP).

Mitigating conflicts over scarce water resources in the highland–lowland system of Mount Kenya: www.mrd-journal.org/issue.asp?Issue_ID=2
Film DVD: Solving Water Conflicts in Mount Kenya Region, SDC / CDE / swissinfo, 2004.

1 Dry season river flow of the Ewaso Ng'iro in 1999: the blue curve shows discharge without water abstraction for irrigation. 150 km away from the source, a flow of 0.5 m^3/s is still available. The red curve shows flow after abstraction for irrigation. 100 km away from the source, i.e. at the end of the Laikipia Plateau, the river is dry and the Samburu Plains no longer receive any water. (MRD, February 2000)

2 Zero tillage: direct seeding is a technique that helps conserve soil and water. The soil is better protected against erosion, and water loss through surface runoff and evaporation decreases.

Cooperating in a spirit of mutual respect for sustainable watershed management

The Deccan Plateau at the centre of India has a mainly rural population totalling 120 million inhabitants. Rainfed subsistence agriculture is the region's economic mainstay. In a semi-arid climate, infrequent and not very abundant monsoon rains limit agricultural activities to a 4–5-month season. Population pressure accelerates degradation, and natural resources such as soil, vegetation and water are becoming increasingly scarce. In order to ensure a minimum livelihood, people, mainly men, are forced to seek seasonal work in town.

Until the end of the 1980s, the government tried to remedy this increasingly alarming situation by investing significant sums in rural infrastructure. Very large dams to hold back water were built, which meant that whole villages had to be moved and fertile land downstream sacrificed. Moreover, these structures required setting up centralised, expensive and not very transparent management mechanisms that privileged large landowners.

Villagers and technicians jointly plan development measures at the watershed level.

The Watershed Organisation Trust (WOTR) was initiated in the 1990s, with the objective of mobilising the population to establish an alternative strategy. The basic idea was to sensitise and motivate communities through information campaigns and training for soil and water conservation. Today, thanks to these efforts, numerous micro-watershed management initiatives are developing, coordinated by the village committees.

To join the WOTR, communities have to subscribe to certain basic rules such as reduction of herd size and restrictions on the use of particularly threatened areas. They must also commit to community activities for watershed rehabilitation and development such as dam construction, building irrigation and draining channels, or reforestation.

The authorities have recognised the potential and advantages of this approach and have offered their support. Today, with its network of NGOs and local associations, the WOTR has risen to the rank of a privileged partner of the governments of several federal states in India.

Although training in soil and water conservation remains the WOTR's principal activity, this organisation also offers support to communities and NGOs in the fields of micro-credit, social organisation, communication, and diversification of livelihood strategies. The success of this approach is obvious. In Darewedi, for example, as a result of the village's commitment to watershed rehabilitation since 1996, the cropping season now lasts 9 to 10 months instead of being limited to only 3 to 4 months, as it was at the beginning of the 1990s. While millet used to be the dominant crop, today there are about ten different crops in the watershed. The overall number of livestock in the village – which used to produce only very little milk in the past – was reduced by one-third, while the amount of fodder has tripled, leading to total daily milk production of 550 litres.

During the past ten years, the WOTR helped to develop 180,000 hectares of land in watersheds by supporting 86 NGOs and local communities.

"The development of self-empowerment capacity, technical expertise and close collaboration marked by mutual respect between actors at all levels are the main components for greening desertified landscapes."

When asked what they thought were the reasons for this remarkable success, the persons involved underlined three main aspects:

– The acknowledgement by the community that developing a watershed is a common objective which the whole village can help achieve. Commitment reinforces social cohesion beyond the usual social limits and ensures ownership of watershed management.
– Close collaboration between actors of different status generates respect and mutual trust; it also contributes to valorising civil society as an important development actor.
– The development of watersheds leads to significant improvement of incomes and therefore to a higher standard of living, especially for landowners. Poor households remain slightly marginalised. To counterbalance this inequality, it is essential to establish a system of mutual savings banks that enables disadvantaged households to obtain the funds they need to secure better access to land.

For the past 20 years, the SDC has been supporting watershed management projects in several federal states. Through this long-term involvement, the agency has contributed to the development of a sound approach that is also being adopted by organisations in the central government – which are responsible for rural development in semi-arid and arid zones – and by various programmes funded by other development agencies.

The SDC's financial support enables the WOTR to improve and perpetuate its institutional and operational capacity.

Watershed Organisation Trust (WOTR): www.wotr.org


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1 During the monsoon season, rainwater is harvested in a multitude of small reservoirs. Appropriate management also ensures minimal water supply at the end of the dry season.

2 Sediment accumulated above the dam creates new fertile fields.

3 Organic fertilisers improve the soil's water absorption and retention capacity.

4 Watershed development generates additional income for rural families.

Learning from one another in order to improve natural resource management

Around Midsummer's Eve, the summits of Andean mountains – be they Ecuadorian, Peruvian, Bolivian or Argentinean – are visited by groups of farmers who watch the sky for the first appearance of the Pleiades. If the stars in this constellation are all clearly visible, the farming year will be a good one. But if some stars are missing, the farmers know that they will have to expect a dry season with a late onset of the rains.

The Andes are a region with rich and diverse ecosystems, including tropical forest areas as well as semi-arid stretches of land covered by sparse vegetation. These regions are inhabited by a great number of communities who earn an income by using land resources that are increasingly affected by erosion.

For centuries, this farming practice has determined the Andean cropping calendar. This reading of the climate in the brightness of the Pleiades has, moreover, brought an answer to a question that remained a puzzle for scientists for years: why is it that the beginning of the sowing period has always been perfectly synchronised throughout the Andes, although villages are very distant from one another and may have no contact? At a later stage, studies also revealed that the brightness of the Pleiades is directly linked to the El Niño phenomenon, which, when it is active, veils the sky on the west coast of the South American continent.

Increasing livestock production to the detriment of forest cover, lack of rangeland management, inefficient irrigation systems, exaggerated use of chemical fertilisers and pesticides, and technologies that are not adapted to the terrain cause soil degradation and continual loss of productivity and Andean biodiversity.

Pressure on natural resources seriously compromises peasant families' livelihoods, and migration to the cities only increases urban poverty, which is already alarming. However, indigenous communities have an enormous development potential and an ancestral knowledge that guides them and allows them to evolve. Natural resource management is a domain to which each individual can contribute. Mutual learning is an approach that facilitates this process.

At the local level: the kamayoq, counsellors and transmitters of knowledge

In Peru, the kamayoq (a name with an Inca origin that refers to an expert in agriculture and climatology) have great knowledge of agriculture and livestock production; for centuries they have functioned as counsellors to Andean farming communities. During the time of the Inca kingdom, they were the ones destined to climb the summits to predict the year's climate by observing the stars, and define the dates for beginning cultivation. The kamayoq offered their knowledge in exchange for food and land.

Today, their advice is still bartered for local products, though increasingly the exchange is a monetary one. Apart from having extensive agricultural knowledge, the kamayoq are also those best informed about farmers' innovations. Thus, when they visit various communities, they play an important role in transmitting knowledge and local practices.

To support and reinforce kamayoq practices and help farming communities manage their land and natural resources, the MASAL project (Manejo Sostenible de Suelos y Aguas en Laderas) has created a network of kamayoq through which these experts can exchange information, offer their services, as well as receive training in new practices.

At the national level: CAMAREN, a platform for exchange and training

In Ecuador, the CAMAREN consortium (Capacitación para el Manejo Sostenible de Recursos Naturales) is an example of exchange and mutual learning at the provincial and national levels. Through a participatory process on a large scale,

CAMAREN created a platform for discussion, action and raising awareness about sustainable natural resource management.

"Certain elements of indigenous knowledge are disappearing. Training activities and exchange platforms are a good opportunity to collect, enhance and transmit such knowledge."

The exemplary nature and mode of operation of the consortium has made possible the creation of a socio-political trend at the national level. CAMAREN's training component unites 14 institutions that collaborate to offer quality training in the field of natural resources. Since it was created in 1996, 1700 technicians and agricultural leaders have been trained throughout the country. They now use and transmit their knowledge and vision of sustainable natural resource use.

The consortium also supports local organisations whose responsibility it is to analyse problems in their area and force provincial governments to become aware of the importance of promoting environmentally friendly policies. In the Province of Cotopaxi, for example, the provincial authorities offered USD 300,000 to support activities in the field of sustainable natural resource management. Today, CAMAREN is an acknowledged platform that is integrated in national politics. Thus, at the 3rd National Forum on Water Resources in Quito in 2004, 690 representatives of national, provincial and local authorities, of governmental and non-governmental associations, farmers' associations and universities gathered to discuss water concerns and acquire a certain influence on Ecuadorian decision-makers.

MASAL and CAMAREN are projects that are part of an SDC cooperation programme in Peru and Ecuador:
www.masal.org.pe
www.camaren.org

The SDC in Ecuador: www.cosude.org.ec
The SDC in Peru: www.cosude.org.pe

Workshops supporting local innovation:
www.cde.unibe.ch/Tools/AIL_Ts.asp


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1 Kamayoq are acknowledged experts in crop and livestock production and messengers of knowledge. Their vision of development can have an immediate influence on the thinking and activities of a community.

2 Local communities have always innovated to adapt more efficiently to changing external conditions. Workshops to support local innovation bring together farmers and external actors such as technicians and representatives of governmental and non-governmental organisations. They allow local communities to communicate their knowledge and vision of sustainable local development …

3 … and enable external actors to better understand problems as well as potentials at the local level, and acquire capacity in listening and sharing know-how.

4 The scope of the information and exchange platform established by CAMAREN in Ecuador is increasing every year; it now brings together actors from the national political level to the local community level, all of whom are committed to pursuing the common goal of better natural resource management.

Selecting drought-resistant varieties

Repeated droughts and soil degradation seriously endanger food security in many countries. Numerous studies are currently underway to select drought-resistant varieties. This research is not conducted only in laboratories and research stations: it is also based on close collaboration with rural communities. Indeed, they are the ones who test the new varieties and give the green light for further distribution of seeds.

Farmers in Rajasthan know that a drought-resistant species of millet should have the following characteristics: production of numerous shoots at the base of the culm and on the nodes, fine leaves, a thin culm and compact grain panicles.

Maize, a staple food in Southern Africa

Maize represents 70% of cereal consumption among rural families in Southern Africa. Dry years can cause complete loss of maize crops, thrusting households into poverty and famine in the short term, with dramatic socio-economic consequences in the long term.

The New Seed Initiative for Maize in Southern Africa (NSIMA) is a research project aiming to develop drought-resistant maize varieties. The cultivars that are created are not genetically modified organisms. They come from cross-breeding several varieties selected among the thousands of indigenous landraces conserved at the seed-bank of the International Maize and Wheat Improvement Center (CIMMYT) based in Mexico – one of the 15 CGIAR[1] centres.

The maize varieties developed by NSIMA are mainly intended for smallholders, who actively participate in the whole phase of research and development by testing the new varieties and trying them out under real farming conditions after consulting with their community. Participatory research gives farmers the possibility of comparing the different traditional, commercial and experimental varieties sown in their fields, and of choosing with full knowledge of the facts. A determining factor for choosing a variety is its productivity – both in terms of annual and multi-annual yield. Freedom to store part of the crop and sow it again with no loss of productivity – which is impossible with hybrid varieties developed by commercial enterprises – is indeed essential to maintain autonomy and food security.

Schools also participate in the research and in informing families through the children. Moreover, small enterprises have started growing and commercialising seeds and thus contribute to local economic development. It is worth noting that close collaboration between researchers and farmers is only possible thanks to a sound partnership at the institutional level.

Millet in India: part of a complex agricultural system

Millet is the crop par excellence in drylands and constitutes the staple food of numerous rural families in Africa and Asia. This cereal crop is rarely sown as a monoculture, rather in association with other seed species depending on the agroecological zone. In Rajasthan, millet is only one element in a complex agricultural system which includes a dozen other crops such as sesame, water melon, pumpkin, various kinds of beans, mustard, cumin and a great number of wild plants. It is the women who are experts in preparing seed mixtures; they select the seed carefully, in accordance with the soil and the year's climatic conditions. The choice and preparation of seed blends depends on knowledge transmitted from generation to generation within rural families; acquiring this knowledge is essential to survive in a habitat where climatic conditions make it very difficult to farm.

"The use of drought-resistant varieties increases food security. When it is integrated in a process of participatory research, it meets the true needs of rural communities."

In western Rajasthan, near the Thar Desert, rural communities prefer to cultivate indigenous millet varieties called desi, as they find that the modern varieties, called sankar, are not resistant in times of extreme drought. However, small quantities of modern seed are always added to traditional seeds, as they produce higher yields in years with very good climatic conditions, without jeopardising food security in bad (i.e. very dry) years.


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ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) has been conducting participative phytoselection activities for over 10 years to develop drought-resistant millet varieties with local communities in Rajasthan.

In West Africa, the West and Central African Millet Research Network (ROCAFREMI) promotes collaboration among 14 millet-producing African countries (Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Gambia, Ghana, Guinea-Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, Togo) and regional and international institutions (Institut du Sahel, ICRISAT, etc.). ROCAFREMI has also focused a great deal on selection of varieties capable of producing yields under very arid conditions.

The SDC co-finances the southern African NSIMA project, and supported the ROCAFREMI network until 2004:
www.aramis-research.ch

Moreover, the SDC also helps finance the CGIAR research centres that have activities in relation to the theme of arid zones (ICRISAT, ICARDA and CIMMYT):
www.cimmyt.org
www.cgiar.org
www.icarda.cgiar.org
www.icrisat.org

1 Millet is a staple food in central and western Rajasthan, where it is grown on 80% of cultivated land and sown in association with other crops. This grain is very adaptable under environmental conditions submitted to climate stress. It guarantees food security in semi-arid zones with average annual rainfall between 250 and 500 mm.

2 Participatory research has made it possible to better understand the complexity of the Indian agricultural system and target the selection of new varieties.

3 Drought-resistant maize varieties ripen more rapidly. This shortens the "season of hunger", i.e. the period of food shortage between the end of food reserves and the next harvest.

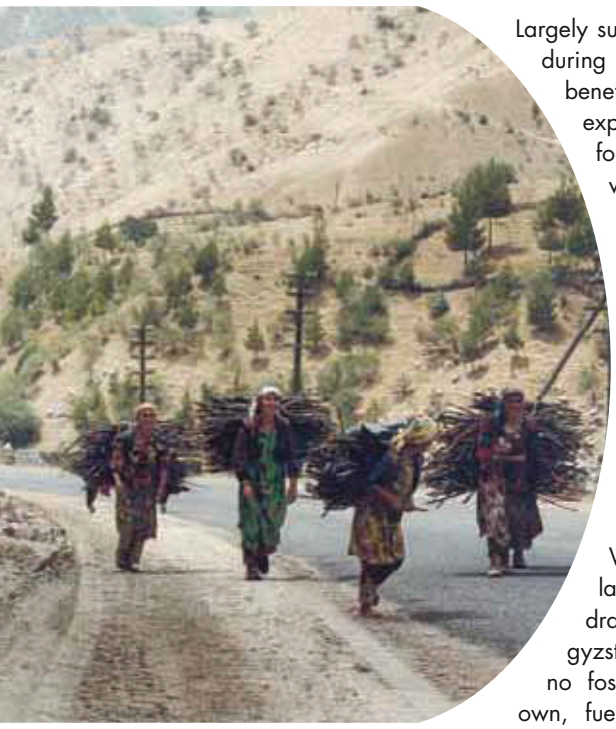
4 In Africa, the farmers who test crops are chosen by their communities. It is also the community that gives the green light to distribution of new varieties on a larger scale.

[1] *Consultative Group on International Agricultural Research*

Improving energy efficiency to protect woody resources

Overexploitation of forest and shrub cover is an increasingly widespread phenomenon in Central Asia. In arid zones, especially in high-altitude regions where vegetation cover is fragile, there is now a considerably higher risk of desertification. The causes of overexploitation are many: on the one hand, continually rising prices for fossil energy and electricity force households to fall back on locally available woody resources. On the other hand, fuel resources are used with regrettable inefficiency due to buildings' lack of insulation and the low efficiency of heating systems.

The Tien Shan, Pamir and related watersheds constitute the water towers of Central Asia. This largely semi-arid mountainous region provides water for approximately 40 million people. Apart from the large urban centres, agriculture and livestock production are the economic mainstay of the population. The vegetation cover is sparse and fragile. Its overexploitation, especially as a result of fuelwood collection and excessive pasturing, is one of the major causes of desertification.



Considerable increases in the price of fossil energy and electricity force households to use locally available woody resources. It often takes several hours a day to collect the necessary firewood.

Largely subsidised by the central state during the Soviet era, households benefited from a reliable and inexpensive energy supply. Therefore, practically no investments were made in measures to reduce energy consumption, such as insulating buildings and increasing the efficiency of heating systems. As a result, a house in Central Asia requires as much energy as a one-family home in Switzerland, but without offering the same degree of comfort.

When the Soviet Union collapsed, the situation changed drastically. In Tajikistan and Kyrgyzstan, two countries that have no fossil energy sources of their own, fuel supplies are increasingly unreliable and prices are constantly rising. This forces families to fall back on alternative sources of energy such as wood and dried dung.

To decrease the population's dependency on resources that are already very scarce, the Central Asian Mountain Partnership (CAMP) has been conducting research and tests with locally available insulation material, and adapting processing and application techniques. Thermal insulation of

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housing is being improved with dried reeds used for covering outside walls and ceilings. Roughcasting made of cement or clay protects this insulation against bad weather and rodents. This helps conserve the heat inside buildings. In addition to insulation work, heating systems are being modified to obtain better storage of the heat produced.

"Insulating buildings and improving the efficiency of heating systems can considerably reduce the use of fuelwood and dried dung."

Depending on the state and the size of a building, the cost of insulation varies from USD 300 to 400. To reduce costs, homeowners can participate in construction work.

Efficient utilisation of energy decreases the use of fuelwood and dried dung, thus reducing the pressure on vegetation cover and leaving dung on pastures as fertiliser. Such measures can also increase the comfort and sanitary conditions of housing.

Moreover, these insulation techniques are simple and easily learned by local craftsmen, who are given basic training in the field. Another positive effect is the emergence of a new kind of entrepreneurship, new jobs and a revitalisation of the local economy achieved through a broad home insulation campaign.

The SDC in Kyrgyzstan:
www.swisscoop.kg
The SDC in Tajikistan:
www.swisscoop.tj
The Central Asian Mountain Partnership (CAMP):
www.camp.elcat.kg/eng/
The Centre for Development and Environment (CDE)
www.cde.unibe.ch/Regions/CAMP_Rs.asp


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1 Fuelwood collected from a forest in an alluvial plain. Forest cover in Tajikistan has diminished by 40% since the 1970s.

2 Teresken is a shrub that takes 20 to 30 years to reach its maximum height of 30 cm. This plant, used as a source of fodder, is now also increasingly cut as a source of fuelwood. 100 hectares of teresken are necessary to cover the energy needs of a single family in a single winter!

3 Several tons of dried dung are necessary to heat one family home for one winter.

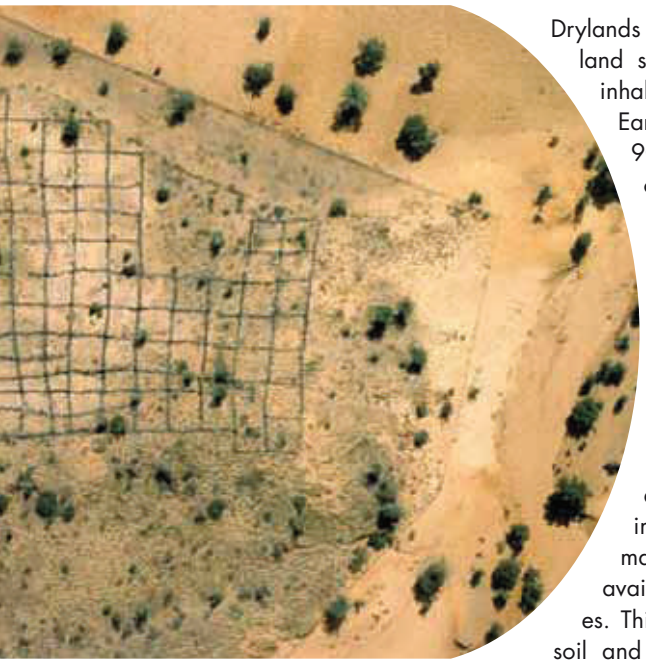
4 Sometimes, nearly half a family's income goes to buy fuel. A household's energy consumption in Central Asia is comparable to that of a Swiss family home. However, in winter, the temperature inside the house hardly ever rises above 10°C. A Kyrgyz home before insulation.

5 Reeds insulate the outside walls of a house in Kyrgyzstan. Good thermal insulation improves energy efficiency by up to 50%.

6 Roughcasting of outside walls with cement and clay in Kyrgyzstan.

Exchanging experiences and knowledge to overcome desertification

Soil and water conservation knowledge generated day after day by farmers and researchers is often fragmented and hard to access. The World Overview of Conservation Approaches and Technologies (WOCAT) collects, assesses and documents applied examples and offers a world overview of experiences in relevant approaches and technologies. With the help of the Internet, various documents and training workshops, these examples are made accessible to people in the field and to various organisations dealing with such issues.



Stabilisation of sand dunes in Niger.

Drylands cover 41% of the world's land surface. These zones are inhabited by one-third of the Earth's population, of whom 90% live in developing countries and mainly depend on agriculture and livestock production. The degradation of soils and vegetation is estimated to have reached 70% in drylands, i.e. 65% of pastureland and 5% of cropland. These sometimes heavily populated areas are affected by an imbalance between the demand for and the actual availability of natural resources. This situation often leads to soil and water degradation and desertification.

The degradation of soils and water resources is closely linked to the overexploitation and destruction of vegetation cover. Bare land ineluctably loses its water absorption and retention capacity. Instead of percolating into the soil and providing roots with water and feeding the groundwater, rainwater becomes surface runoff and washes away the topsoil. Important quantities of water are also lost through evaporation, accelerating the drying up of the earth and leading to a rapid decline in productivity. In the dry season, winds sweep over the land; they remove the topsoil or deposit sand heaps in the fields and the pastures.

Cultivation of hill slopes without terraces on the loess plateau in northern China leads to severe erosion problems and decreasing agricultural productivity. Stair-like horizontal terraces consist of vertical or strongly sloping banks that support the nearly flat terrace-bed, and a bund that holds rainwater back on the terrace. The spreading of animal manure, the cultivation of green manure and the planting of trees and shrubs make this measure even more efficient. But the building of terraces requires top-down interventions and major investments. (A technology documented by the Beijing Ministry of Water Resources.)

"Today's means of communication make it possible to exchange local know-how at the global level. The search for solutions is thus enhanced by experiences garnered in other corners of the world."

For centuries, farmers in arid zones worldwide have been developing approaches, techniques and organisational modes that enable them to limit the risk that soil and water – the very source of life for them – will degrade. These efforts are currently being supported by numerous research centres interested in the same problems.

WOCAT relies on a large, globally distributed network of partners trained to collect and document examples of soil and water conservation. With the help of standardised questionnaires and in close collaboration with the farmers and communities concerned, experiences are described and evaluated.

The examples illustrate reliable techniques as well as forms of community mobilisation and organisation to implement conservation measures. Today, numerous organisations working in the field of soil and water conservation use this reservoir of knowledge and the WOCAT tools to evaluate, improve and disseminate their own experiences.

The SDC is WOCAT's principal donor: www.wocat.net

Land Degradation Assessment in Drylands: lada.virtualcentre.org

In Kyrgyzstan, the level of the groundwater rose in large areas as a result of abandoning drainage systems and massive introduction of irrigation. In the warm season, the water rises due to capillarity and evaporates in large quantities, leading to salinisation of soils. Thousands of hectares of cropland were thus lost in the past few decades. The poplar, a species that is tolerant to high salt content in the soil, helps to lower the level of the groundwater thanks to its high absorption and transpiration capacity. After 5 to 10 years, the fields can be used again for cropping. This phenomenon was observed by the farmers themselves, who then applied it to rehabilitate their land. (A technology documented by the Bishkek Faculty of Agronomy, Kyrgyzstan.)

Participatory approaches in the field of watershed development have experienced a great boom in India in the past 20 years. Procedures vary depending on the institution in charge. Participatory approaches include a series of measures aiming to develop a community's capacities, initiative and decision-making power. The community also develops a sense of responsibility and ownership which enables them to take watershed management into their own hands. (An approach documented by David Gandhi, DANIDA.)

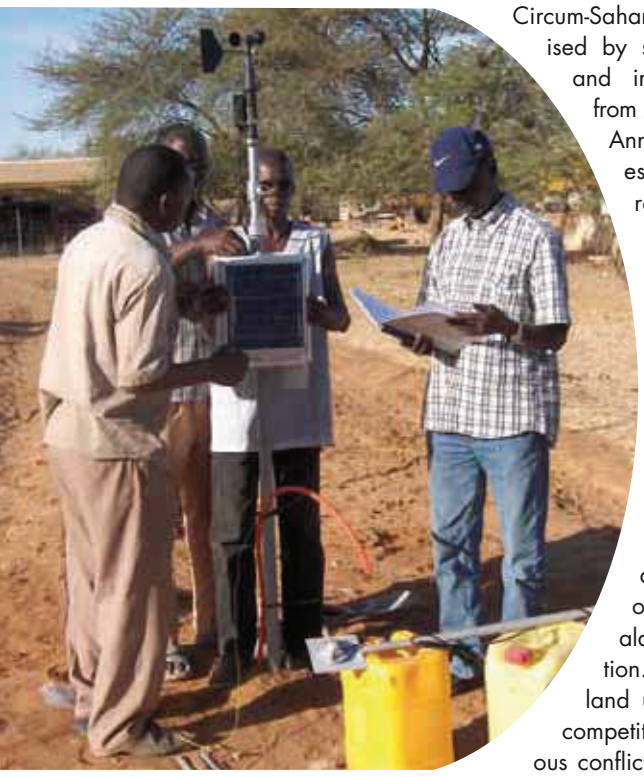
1/2 Hand-made terraces (top) and machine-made terraces (bottom), China.

3 Poplar plantation in Kyrgyzstan: these trees are resistant to salinised soils.

4 Madhy Pradesh, India: community assembly to elaborate a village development plan that integrates soil and water conservation measures.

Observing the evolution of natural resources around the Sahara

Relevant and complete data on the evolution of natural resources in arid and semi-arid environments are a precious source of information for understanding the mechanisms and dynamics of desertification, and initiating prevention and rehabilitation activities in the affected ecosystems. The Long Term Ecological Monitoring Observatories Network (ROSELT) of the Sahara and Sahel Observatory[1] (OSS) is the first regional environmental monitoring network in Africa.



Installing an automatic meteorological station in Senegal. Every day, this station records 250 data on temperature, relative humidity, wind, rainfall amount, solar radiation and evapotranspiration.

Circum-Saharan zones are characterised by strong climatic variations and irregular rainfall varying from 200 to 2500 mm per year. Annual population growth is estimated to be 3%, with a rapid urbanisation rate of 7%. Over half of the workforce is employed in the agricultural and livestock sectors. Herds and cultivated areas are expanding. Production modes oriented towards a global economy tend to substitute traditional and collective modes of land management. Soil and water resources are overexploited and show alarming signs of degradation. Land distribution and land use are subject to strong competition that generates numerous conflicts. Political instability and migration contribute even more to weakening the natural and human environments in this region.

By ratifying the international environmental Conventions, the Sahelian and Saharan countries have committed to equipping themselves with monitoring instruments as well as environmental data management systems, with a view to better interpreting and understanding the evolution of natural resources and thus being able to anticipate necessary measures. Current efforts are still insufficient. Available data show irregular performance of monitoring, are not updated, and lack base maps as well as information on systems dynamics and on demographic evolution and economic activities. Instruments are also lacking: there are few measurement stations, insufficient log tables and incomplete alert bulletins.

Creation of a network for sharing and harmonising data

The need to harmonise the collection and processing of data from OSS member countries led to the idea of creating a network of observatories for environmental issues. For the first time, African countries committed to equipping themselves with a common tool for transboundary global-level monitoring of the circum-Saharan belt by making national, sub-regional and regional interests converge. This is how ROSELT, the Long Term Ecological Monitoring Observatories Network, was created in 1995, with long-term methodological and technical support from the IRD[2].

The network establishes common methods for data collection, processing and dissemination. It has the profile of a platform that can be used by researchers in the different partner countries to exchange information. Synergies thus created enable better comprehension of the complex mechanisms of desertification and lead to products that support decision-making at the national level.

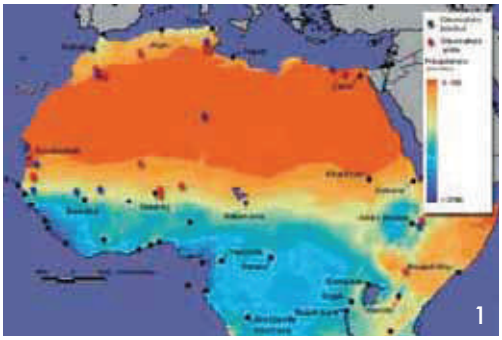
ROSELT can boast significant achievements. The different observatories that are members of the network have started archiving existing national data in order to create a profile of natural resource

dynamics in the past decades. Thus, comparisons between aerial and satellite photographs, questionnaire studies, baseline studies and maps have made it possible to confirm certain hypotheses, such as: the depletion of groundwater and rapid salinisation of soils, the increase in newly cultivated land even in marginal areas, or the reduction of land area through which nomads journey, and the disappearance of their way of life.

"Desertification is a complex mechanism that knows no borders. This is why it is important to create a transboundary context that makes it possible to harmonise and exchange environmental data."

The activities of the network have been integrated in the National Action Programmes to combat desertification (NAPs). National institutions have appropriated the methodologies and the very concept of environmental monitoring. A Charta for the management and dissemination of data has also been drawn up. ROSELT organises regular workshops to make it possible for researchers to meet and exchange experiences.

Since 2004, the new DOSE programme (Device for Observation and Monitoring Desertification in Africa) of the OSS has been supporting ROSELT, among other networks, with regard to the harmonisation of data at the national and transboundary levels and in order to establish an early environmental warning system.



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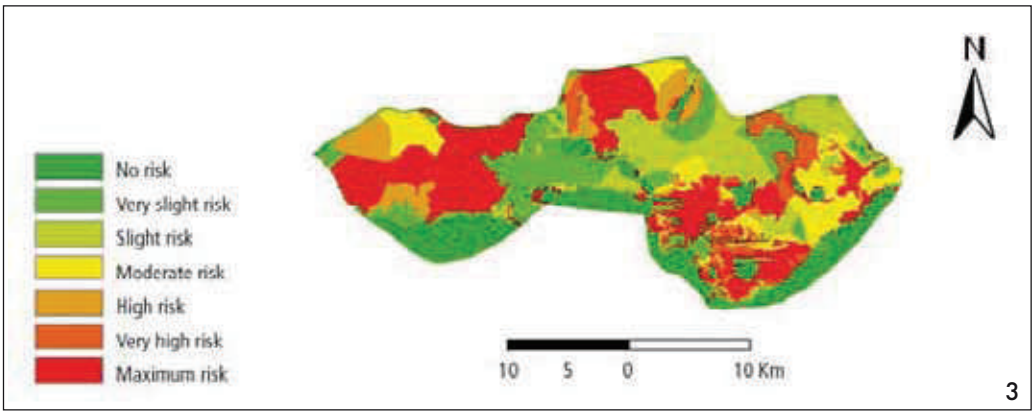

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The SDC has been supporting the OSS by co-funding ROSELT since 1993. In a new phase it is also supporting the DOSE in several countries:
www.unesco.org/oss
www.roselt-oss.org/accueil.php

1 The ROSELT network consists of 11 countries: Morocco, Algeria, Tunisia, Egypt, Mauritania, Mali, Niger, Senegal, Cap Vert, Ethiopia and Kenya. Other countries are currently also joining (Burkina Faso, Chad) or thinking of joining (Uganda, Libya). An ad-hoc Scientific Committee has registered (attributed labels to) 25 observatories, of which 14 (pilot observatories) are completely functional today.

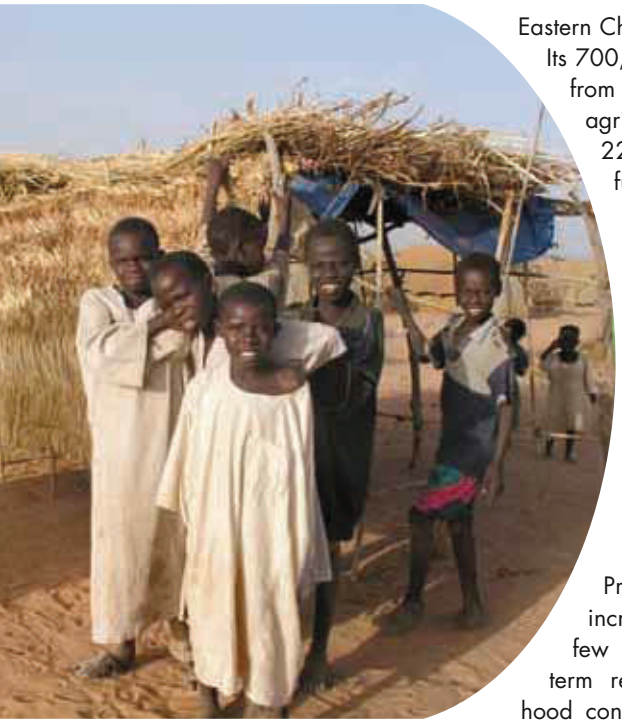
2 Erosion. The countries of the Sahara and the Sahel have to confront major challenges of human development and conservation of natural resources.

3 Risk index for soil degradation due to pastoral activity in Tunisia. Map established by the Menzel Habib observatory. The disappearance of palatable species and an increasing dominance of a spiny type of Astragalus that is only very reluctantly eaten by livestock are indicators of the existence of overgrazing.

[1] *The OSS is an international organisation created in 1991 within UNESCO. It consists of 21 African member groups, 5 OECD countries (France, Germany, Canada, Italy and Switzerland), 4 African organisations, several NGOs and the Secretariat of the UNCCD.*
[2] *Institut de Recherche pour le Développement, Montpellier, France*

Managing natural resources in areas with mass arrivals of refugees in semi-arid regions

When 30,000 Sudanese refugees from Darfur move with their livestock into a refugee camp in a semi-arid area in eastern Chad with an indigenous population of 50,000 people, the demand for water, fuelwood, cropland and pastureland increases manifold from one day to the next. Meeting this demand does not leave the environment unscathed, on the contrary. If no prior plans exist to protect natural resources so that they remain available after the refugees have left, the host population also risks having to abandon its homeland.



From one day to the next, the population in host areas can double, leading to enormous pressure on already scarce natural resources.

Eastern Chad has a semi-arid climate. Its 700,000 inhabitants live mainly from pastoralism and subsistence agriculture. Within two years, 220,000 refugees from Darfur suddenly flocked to the 12 camps established in eastern Chad by the United Nations High Commissioner for Refugees (UNHCR). In several regions, the population more than doubled within a few days, with a corresponding doubling of the demand for water, fuelwood, pastureland and cropland.

Pressure on the environment increased dramatically within a few days, with alarming long-term repercussions on the livelihood conditions of the host population. For ecosystems already weakened by repeated drought, this brutal and massive use of resources can rapidly trigger desertification processes. Moreover, the need to share already scarce resources creates a climate of latent conflict in the host area, where the local population often feels very disadvantaged by the aid offered to the refugees.

Environmental impacts in refugee-hosting zones have become a major concern for the UNHCR. With the help of Swiss Humanitarian Aid, in 2004 the UNHCR integrated an environmental

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chapter in its programme of refugee camp establishment. The persons in charge have to manage negative environmental impacts in the host zones and develop a basis for enabling the transition from humanitarian aid to development cooperation. Indeed, apart from saving the lives of refugees in the short term, it is also essential to ensure the long-term conditions for sustainable livelihoods for the hosting communities.

Thus, environmental assessments must be conducted from the very beginning of setting up refu-

gee camps. Sites are selected according to minimum expected environmental impact. The host population's ways of life and livelihood conditions, as well as potential sources of conflict, are determining factors for the planning of operations. The length of the refugees' stay, the size of their herds and their habits are also elements to be taken into account. Nomads, for example, are one with their livestock and must have sufficient pastureland and some veterinary support.

"For the sake of both the immigrants and the hosting population, it is vital to implement environmental protection and management activities when setting up refugee camps."

A tree for each refugee

In Chad, the UNHCR and its partners have set up an environmental action plan that encompasses activities in the fields of forestry, agriculture, nutrition training and animal health. Together with the local population and the Ministry of Environment and Water, nurseries have been established close to refugee camps. Trees used locally are planted there: fruit trees (mango, lemon, etc.), fodder trees, and acacia trees for fuelwood and timber. Tree planting campaigns are organised, during which everyone – refugees and villagers alike – is invited to plant and tend to their own tree. The local people and the refugees thus work together for a common goal. The trees symbolise continuity and are a means of thanking the local communities for accommodating the refugees.

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Improved woodstoves

To reduce fuelwood consumption, the UNHCR's environmental programme monitors fuelwood collection; at the same time, it tries to introduce improved woodstoves among the local and refugee populations, as well as alternative systems that work with solar energy.

Despite the measures taken in the host areas, it is not possible to avoid depletion of natural resources, as their momentary use simply exceeds their capacity to regenerate. The environmental programme does, however, prevent degradation from being too severe and initiates rapid environmental rehabilitation.

Resource management in the areas to which refugees return

Natural resource management is an important concern not only in refugee camps and host areas, but also in the areas to which refugees return. In Liberia, for example, the UNHCR opened its first environmental centre in Monrovia, to teach former refugees who had come back to their country how to protect and manage natural resources sustainably in an area severely damaged by 14 years of civil war.

The SDC offers financial and professional support to UNHCR programmes:
www.unhcr.org

1 Fuelwood consumption requires strict and preventive measures to prevent this resource from becoming a source of conflict.

2 In arid regions, solar power is an interesting alternative source of energy.

3 Nursery development: every refugee plants a tree and is responsible for it as long as she or he remains in the area. Refugees thus demonstrate their gratitude towards the community that hosts them.

4 Raising the awareness of both refugees and host populations is a key to ensuring sustainable management.

Country	Project name	Current phase	Costs in USD	Costs in CHF
Global	World Overview of Conservation Approaches and Technologies – WOCAT	2005-2007	923,077	1,200,000
Global	Swiss National Centre of Competence in Research (NCCR) North–South	2001-2013	2,307,692	3,000,000
SADC countries	Southern African Drought and Low Soil Fertility Project – SADLF	2005-2007	1,276,923	1,660,000
Southern Africa	Transfrontier Conservation Area	2005-2008	2,153,846	2,800,000
Eastern Africa	Eastern and Southern Africa Partnership Programme – ESAPP	2003-2006	3,430,769	4,460,000
Southern and Central Africa	Pan African Bean Research Alliance – PABRA	2004-2007	2,115,385	2,750,000
Southern and Central Africa	African Highland Initiative	2005-2007	923,077	1,200,000
Tanzania	Reinforcement of Pastoral Civil Society	2005-2006	707,692	920,000
Tanzania	Rural Livelihoods Development Programme – RLDP	2005-2008	9,615,385	12,500,000
Madagascar	Programme d'appui au développement rural – SAHA	2004-2006	14,130,769	18,370,000
Maghreb countries	Contribution au programme environnement de l'Observatoire du Sahara et du Sahel (OSS)	2006-2010	1,907,692	2,480,000
Maghreb countries	Improving the Livelihoods of Rural Communities and Natural Resource Management in the Mountains of the Maghreb Countries	2003-2006	500,000	650,000
Syria, Jordan	Water Harvesting for Combating Desertification	2003-2006	496,923	646,000
West Africa	Integrated Pest Management (IPM) in Peri-Urban Agriculture	2004-2006	603,846	785,000
West Africa	Contributions aux activités de l'APESS (Sénégal-regional)	2005-2008	838,462	1,090,000
West Africa	CILSS: Études de cas de succès dans la GRN au Sahel	2005-2006	238,462	310,000
Burkina Faso	Appui au développement local à l'Est – ADELE	2005-2009	2,307,692	3,000,000
Burkina Faso	Élevage au Burkina Faso (APESS)	2005-2008	807,692	1,050,000
Cameroon	Contributions aux activités de l'APESS	2005-2007	1,217,692	1,583,000
Chad	Réhabilitation de pistes et lutte contre l'érosion – Bilitine / Ennedi	2005-2007	3,665,385	4,765,000
Chad	Développement régional (Bilitine, Batha, Arada et Ennedi, Moyen Chari, Logones, Moussoro)	2004-2007	9,811,538	12,755,000
Mali	Décentralisation, gouvernance et développement local (PAD)	2004-2007	1,907,692	2,480,000
Mali	Appui aux organisations paysannes pour la valorisation des ressources naturelles en région de Sikasso au Mali – JÈKASY	2005-2008	3,153,846	4,100,000
Mali	Promotion des énergies renouvelables	2004-2006	615,385	800,000
Mali, Burkina Faso	Gestion durable des ressources en karité	2006-2007	76,923	100,000
Mali	Programme de renforcement des capacités de la Commission Régionale des Utilisateurs de la Recherche	2006-2008	768,264	998,743
Niger	Fonds de Soutien à l'Investissement Local FSIL Gaya	2004-2006	3,408,462	4,431,000
Niger	Fonds de Soutien à l'Investissement Local FSIL Maradi	2004-2006	3,529,231	4,588,000
Niger	Appui au développement local de Gaya – PADEL	2003-2006	1,184,615	1,540,000
Niger	Appui à l'organisation paysanne "Mooriben"	2003-2006	576,923	750,000
Niger	Développement local Tillabéri (CADELT)	2005-2006	1,392,308	1,810,000

Country	Project name	Current phase	Costs in USD	Costs in CHF
Central America	Sustainable Land Use of Hill Areas – PASOLAC	2004-2007	4,000,000	5,200,000
Bolivia	Agua, tierra campesina – ATICA	2003-2006	4,307,692	5,600,000
Bolivia	Torrenteras Cochabamba – PROMIC	2004-2008	1,038,462	1,350,000
Bolivia	Re-establishment of the Andean High-fields – PROSUKO	2003-2008	884,615	1,150,000
Cuba	Reforestation of degraded areas and use of bamboo for rural housing	2005-2007	369,231	480,000
Ecuador	Capacity Building for Sustainable Management of Natural Renewable Resources – CAMAREN	2004-2007	1,307,692	1,700,000
Ecuador	Irrigation and Rural Development – PENIPE	2003-2005	265,385	345,000
Ecuador	Irrigation and Agricultural Development – LICTO	2004-2006	476,923	620,000
Ecuador	Irrigated and Sustainable Land Use in Ambato Valley – CORICAM	2003-2006	738,462	960,000
Ecuador	Irrigation and Agricultural Development – NABON	2003-2006	2,261,538	2,940,000
Peru	Sustainable soil and water management in mountains (Cuzco, Apurimac) – MASAL	2001-2005	3,192,308	4,150,000
Asia	Regional Collaborative Programme: International Centre for Integrated Mountain Development – ICIMOD	2004-2007	2,076,923	2,700,000
Central Asia and CIS	Central Asia Mountain Partnership Programme – CAMP	2001-2006	1,461,538	1,900,000
Afghanistan	Community-Based Livelihood Programme	2003-2006	692,308	900,000
India	Indo-Swiss Participative Watershed Development Karnataka – ISPWD-K	2000-2006	7,307,692	9,500,000
India	NGO Programme Andhra Pradesh	2004-2005	769,231	1,000,000
India	NGO Programme Karnataka and Tamil Nadu	2003-2005	861,538	1,120,000
India	Cooperation Programme with NGOs through Action Food Production (AFPRO)	2003-2007	1,923,077	2,500,000
India	Society for the Promotion of Wastelands Development (SPWD)	2003-2006	569,231	740,000
India	Eco-restoration with Marginalised Communities in Kutch through a Gender Perspective	2000-2005	3,030,769	3,940,000
India	Watershed Organisation Trust – WOTR	2004-2008	3,230,769	4,200,000
Kyrgyzstan	Kyrgyz–Swiss Agricultural Project	2006-2006	1,353,846	1,760,000
Mongolia	Pasture and Ecosystem Management Programme	2004-2008	3,461,538	4,500,000
Mongolia	Support to Mining Sector in Mongolia	2005-2006	873,077	1,135,000
Nepal	Sustainable Management of Agricultural Soils in the Mid-hills of Nepal	2003-2007	6,230,769	8,100,000
Nepal	Nepal–Swiss Community Forestry Project	2004-2008	6,025,154	7,832,700
Pakistan	Community Based Sustainable Resource Management – CBRM	2003-2006	2,246,154	2,920,000
Pakistan	Farm Forestry Support Project – FFSP	2005-2008	2,346,154	3,050,000
Pakistan	Innovation for Poverty Reduction	2002-2006	1,788,462	2,325,000
Pakistan	Project for Livelihood Improvement (PLI) – Non Formal Education	2003-2006	2,527,692	3,286,000
Vietnam	Support programme for social forestry	2003-2006	6,730,769	8,750,000

Average annual investment **USD 44,415,754 / CHF 57,740,480**

Photos

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“The difference between a garden and a desert isn’t water – it’s human beings.”

Tuareg proverb

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