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for Economic Cooperation
and Development



25 years of soil rehabilitation and conservation in the Sahel region

Supporting the efforts of the rural population in Niger

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List of Acronyms

3NI	Nigeriens Nourish Nigeriens Initiative	PASP	Project for the Integrated Protection of Agricultural, Forest and Rangeland Resources
ADPRS	Accelerated Development and Poverty Reduction Strategy	PDES	Economic and Social Development Plan
BMZ	German Federal Ministry for Economic Cooperation and Development	PDRT	Tahoua Rural Development Project
CGTV	Village land management committees	PED	Dynamic economic growth poles
CMS	Supreme Military Council	PISA	Small-scale irrigation and food security programme
CNEDD	National Environmental Council for Sustainable Development	PMAE	Programme for Erosion Control Measures
CSA	Climate-smart agriculture	PNEDD	National Environmental Plan for Sustainable Development
DED	German Development Service (now part of GIZ)	PNN	Northern Niger Programme
EIG	Economic interest group	PromAP	Promotion of Productive Agriculture Programme
FC	Financial cooperation	PRS	Poverty Reduction Strategy
FICOD	Investment Fund for Local Authorities	RDS	Rural Development Strategy
GIS	Geographic information system	RGPH	General population and housing census
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	SWC/SPR	Soil and water conservation/soil protection and restoration
LUCOP	Rural Poverty Reduction Programme	TC	Technical cooperation
MDGs	Millennium Development Goals	TLU	Tropical Livestock Unit
M&E	Monitoring and evaluation	UNCCD	United Nations Convention to Combat Desertification
NEPAD	New Partnership for Africa's Development	WFP	World Food Programme

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From left to right: Grazing of plateaus, stone bunds on slopes, gully erosion

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Summary



The Governments of Germany and Niger are among the signatories of the United Nations Convention to Combat Desertification (UNCCD), which commits member countries to *'combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa.'* The two Governments therefore began in the early 1980s to take action to combat the degradation of land and natural resources mainly in the regions of Tillabéri Nord and Tahoua in Niger. The Tahoua Rural Development Project (PDRT) started work in 1985, and the Project for the Integrated Protection of Agricultural, Forest and Rangeland Resources (PASP) commenced its pilot phase in the region of Tillabéri-Nord in 1986. From 2004 to the end of 2011, the activities of the two initial projects were continued under the Rural Poverty Reduction Programme (LUCOP). Funded by the German Federal Ministry for Economic Cooperation and Development (BMZ), these activities were carried out by the agencies responsible for technical cooperation (GIZ) and financial cooperation (KfW) and by the German Development Service (DED). Some of the work is currently still being continued.

During 25 years of work, the programme has developed, tested and applied a number of soil and water conservation approaches. The most important ones were:

- A long-term strategy defined the surface area to be rehabilitated until desertification is stopped and the required time to carry out the work. The clear objective helped in retaining support from the donor.
- The long duration of the programme made it possible to pursue these approaches with a high degree of efficiency and to achieve broad impact.
- The participatory approach aimed at creating ownership and encouraging self-help among the local people by setting up well-organised producer groups who actively participate in all the activities.
- The programme provided a clearly limited period of support according to a seven-year rolling plan, consisting of a start-up phase, an intensive work phase and a pull-out phase during which the villages become progressively self-reliant.
- The programme used simple methods with rapid and visible impact.
- An extension and advisory services system with practical training provided by local extension agents who live in the communities was combined with self-evaluation to successively improve the methods used.
- Local conventions that record the jointly negotiated arrangements for the management of the collective sites.
- The programme's gender approach actively promoted women's participation in the village management committees and facilitated access of women to land.
- The use of donkey carts in addition to lorry transport allowed increasing the capacity to transport stones used for soil conservation and restoration measures, while at the same time reducing transportation costs.
- By giving up the 'food-for-work' approach, efforts were refocused on villages really interested in soil conservation and restoration work. Although giving up this approach did lead to a significant temporary drop in participation and the work carried out, this decline was fortunately only for one year.
- The programme had a system for monitoring the work achieved and its impact, which showed the proven benefits of the activities and helped to justify expenditure as well as documenting good practices for other programmes.

On a technical level, the programme developed soil and water conservation/soil protection and restoration (SWC/SPR) methods adapted to forest and rangeland on plateaux, slopes, cropland and valley bottoms. Overall, the SWC/SPR measures covered 354,294 hectares of cropland, 165,743 hectares of forest and rangeland and 8,132 hec-



Water spreading weirs are different types of use

tares of valley bottoms. Some 700,000 people have benefited directly from the measures and tens of thousands of people have received training.

Monitoring shows that the average millet yield has more than doubled. The annual additional grain yield of 210 kg per hectare corresponds roughly to one person's annual cereal requirement. The extra grain produced each year amounts to approximately 74,000 tonnes, enough to feed around 350,000 people. Added to this is an extra 759 kg/ha of millet straw, which corresponds to an annual production of 268,910 tonnes of straw. Even in dry years, the improved land still provides a harvest that is close to that of an untreated field in an ordinary year.

On plateaux where forest and rangeland measures have been taken (163,743 hectares), herbaceous biomass (fodder) amounts to 778 kg/ha on average. Without these measures, production is less than 100 kg/ha. In terms of water and ecological considerations, regeneration of the vegetation on the plateaux protects the downhill fields against water erosion and helps to diversify the flora and fauna. While the structures installed in the fields are easy to maintain, maintenance of the communal areas on the plateaux calls for good organisation. Of the improved plateaux, 32 per cent have not been adequately maintained and have subsequently degenerated, 26 per cent are quite well maintained and 42 per cent are well maintained.

The water-spreading weirs built across the valley bottoms multiply production by 5.8 in the rainy season. This is due to the combined effect of an increased yield per hectare and the extension of the cultivable surface area. Added to this is market-gardening production in the off-season, which is almost four times higher. The weirs also raise the water level by several metres, facilitating access to water by people and animals.

From 1986 to 2011, German cooperation invested around EUR 92.5 million in the programme, a figure which does not take into account the significant participation of the local people in terms of time and physical labour. Almost all the techniques used are cost-effective, although the measures in the fields are more profitable than the forest and rangeland measures on the plateaux and slopes.

The programme also met with a number of challenges. Changes in policies and political priorities, constraints in coordination between different agencies and attempts to reorient the underlying concepts threatened the continuity of the programme.

Soil rehabilitation therefore calls for firm and steadfast commitment from national government and from international actors if highly efficient and large-scale implementation is the objective. Under these conditions, and with the large-scale mobilisation of the people, the improvement of large surface areas is perfectly feasible and has enormous potential for improving food insecurity and reducing poverty.

The German Government has under the Special Unit 'One World – No Hunger' increased its activities focused on soils with a global programme on soils, as well as numerous activities to sensitize other international partners of the importance of the topic during the International Year of Soils 2015. This initiative offers an opportunity to continue soil rehabilitation measures in several countries where the wealth of experience gained in Niger can be further disseminated.

This study has been undertaken on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ).

1 Introduction



The percentage of severely degraded land increased on a global scale from 15 per cent of land in 1991 to 25 per cent in 2011. While erosion and degradation problems are global phenomena, arid regions are the most vulnerable. If soil degradation progresses at the same rate over the next 25 years, agricultural production will drop by 12 per cent, which will cause the price of certain foods to rise by 30 per cent. This will take place in a context of increasing demography, where higher incomes and changes in consumption patterns will push up demand for food by 50 per cent between now and 2030.¹

Soil degradation directly affects around 1.5 billion people, with poor people, women and children being hardest hit. It aggravates food insecurity and makes populations more vulnerable to the impacts of climate change. It reduces the economic value and ecological functions of cropland, forests and rangeland and accelerates climate change due to the greenhouse gas effect.

The Governments of Germany and Niger are among the signatories of the United Nations Convention to Combat Desertification (UNCCD), which was adopted in 1994. It commits member countries to *'combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa.'* (Article 2).

The German Federal Ministry for Economic Cooperation and Development (BMZ) supports the achievement of UNCCD objectives by providing direct support to the Convention and its secretariat, as a party to the Convention, and through bilateral cooperation activities such as those conducted with Niger. In all, this involves funding for more than 1,000 projects that offer technical solutions designed to rehabilitate soils and natural resources, to introduce climate-smart agriculture, to improve overall

legal and political conditions, to support the participation of local people and to promote capacity development.² With the cooperation of the Government of Niger, German cooperation has been implementing its largest soil rehabilitation project in Niger for the last 25 years.

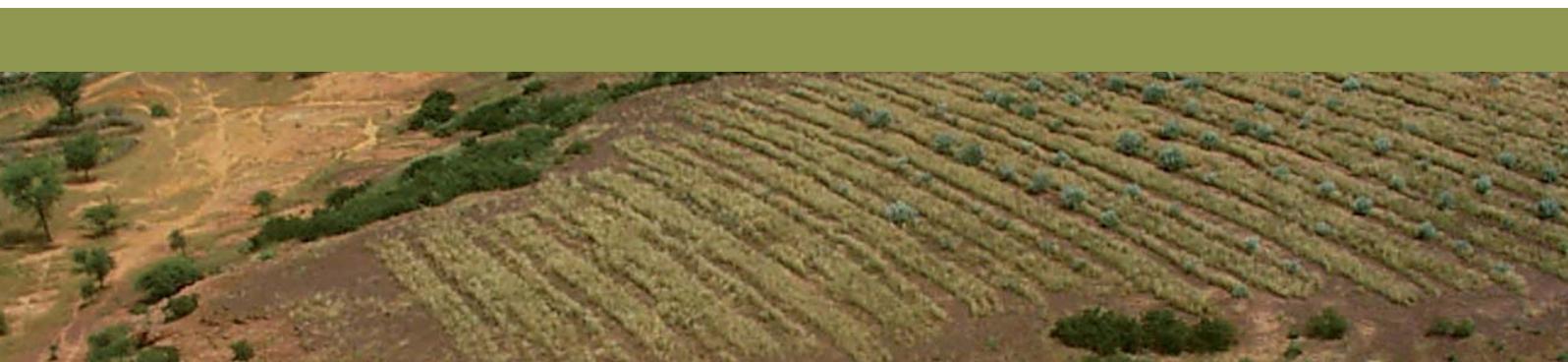
The Government of Niger began to attach greater importance to sustainable development and environmental protection following the droughts in the 1970s. It therefore made efforts to take a number of different measures designed to enhance production potential and protect the environment, which were enshrined in successive five-year plans, and launched the 'Re-greening the Sahel' initiative. This orientation was reinforced after the Maradi debate in 1984, which aimed to promote environmental rehabilitation and agricultural development by introducing integrated projects. Various initiatives were carried out as part of the fight against desertification. However, there was no effective strategic and institutional framework in place to ensure the overall coherence of the activities.

In 1995, Niger launched the process to draw up the National Environmental Plan for Sustainable Development (PNEDD), which culminated in April 1998 in the national forum held to validate the PNEDD. This forum was organised by the Executive Secretariat of the National Environmental Council for Sustainable Development (CNEDD), which was set up to pilot the post-Rio conventions. Niger has six priority programmes, including the National Programme of Action to Combat Desertification and for Natural Resources Management.

In connection with the Millennium Development Goals (MDGs) movement, Niger began to draw up its first long-term strategic framework. This led in 2002 to the adoption of the Poverty Reduction Strategy (PRS) document which serves as a frame of reference for development actions.

¹ UNCCD Secretariat 2013 and IFPRI 2012 at the UNCCD Secretariat 2013

² BMZ 2011



Plateau after rehabilitation with Nardi Vallerani trenches and ripping

The PRS was revised in 2007–2008 to adjust it to new requirements and was renamed the Accelerated Development and Poverty Reduction Strategy (ADPRS).

Having noticed a number of deficiencies in the PRS, especially in the field of rural development, the Government of Niger drew up a Rural Development Strategy (RDS) which was integrated into the PRS. This became a driver of economic growth in Niger and served as the sole frame of reference for economic and social policy in the rural sector. The PRS establishes three strategic areas, one of which

focuses on risk prevention, the improvement of food security and the sustainable management of natural resources in order to safeguard the population's livelihoods.

When the authorities of the 7th Republic came into power, Niger began to draw up its Economic and Social Development Plan (PDES). As with the PRS, the Government of Niger put in place a specific rural development strategy in April 2012, which it called the strategy for food security and sustainable agricultural development, also known as the Nigeriens Nourish Nigeriens Initiative (3NI).

History of the German-Nigerien soil rehabilitation programme

Projects to combat desertification and rehabilitate soils in Niger were put in place in response to the drastic impact of the great droughts in the 1970s and 1980s. Instead of emergency aid, there was a trend towards long-term activities that enable the people to feed themselves through their own efforts by rehabilitating soils and using sustainable farming methods.

Thus, since the early 1980s, the Governments of Niger and Germany have been taking action to combat the degradation of natural resources and to rehabilitate degraded land areas. Within this framework, support was provided to the *Tahoua Productivity Project*, leading to the design of the Tahoua Department Rural Development Project (PDRT) in 1988. The project, which ran until August 1995, was followed by the *Tahoua District Rural Development Project*, which continued up to December 2003.

Parallel to this, the *Project for the Integrated Protection of Agricultural, Forest and Rangeland Resources* (PASP) commenced its pilot phase in 1986 as a project designed to provide institutional support to technical services in the region of Tillabéri-Nord (Filingué, Tillabéri Téra and Oualam). This phase consisted in testing integrated agricultural, forest and rangeland concepts. The second phase, from 1991 to 1995, developed and consolidated a participatory approach to community land management and the development of techniques to protect and manage natural resources.

To achieve this, in addition to technical cooperation interventions (GTZ) and the secondment of development advisors (DED), the German Government strengthened PASP and PDRT by allocating financial cooperation funds (KfW). This led in January 1991 to the Programme for Erosion Control Measures (PMAE) in the two departments – Tahoua and Tillabéri-Nord – to support the required investments in the field of natural resources management. The third phase of PASP/PMAE served to carry out large-scale SWC/SPR measures from 1995 to 1999. The fourth phase, which ended in August 2003, focused on the development and management of natural resources, on capitalising on the experience gained and its impacts and on empowering local natural resource management organisations.

During the intergovernmental consultations between Germany and Niger held in March 2002, the Niger-German partnership strategy document was adopted and a new pledge was made determining the German contribution to the implementation of the Poverty Reduction Strategy (PRS) from 2004 onwards. The two governments agreed to realign the natural resources management portfolio and to create a new programme, the Rural Poverty Reduction Programme in the regions of Tillabéri and Tahoua Nord (LUCOP). This new programme took into account the work done so far on natural resource management by PASP/PMAE Tillabéri, by PDRT/PMAE Tahoua and also by the *Northern Niger Programme* (PNN) in the Agadez region.

LUCOP, a joint intervention by financial (KfW) and technical cooperation (GTZ), got properly underway in January 2004. The programme had at its disposal the Investment Fund for Local Municipalities (FICOD) to finance infrastructure in the new municipalities, investments in erosion control measures in the Tillabéri Nord region and the water-spreading weirs in the Tahoua and Agadez regions. Decentralisation in 2001 saw the creation of municipalities. The second phase of LUCOP was implemented from June 2007 to December 2011.

It should be noted that DED was involved in all these programmes and projects via its development advisors.

2 The programme's working zone



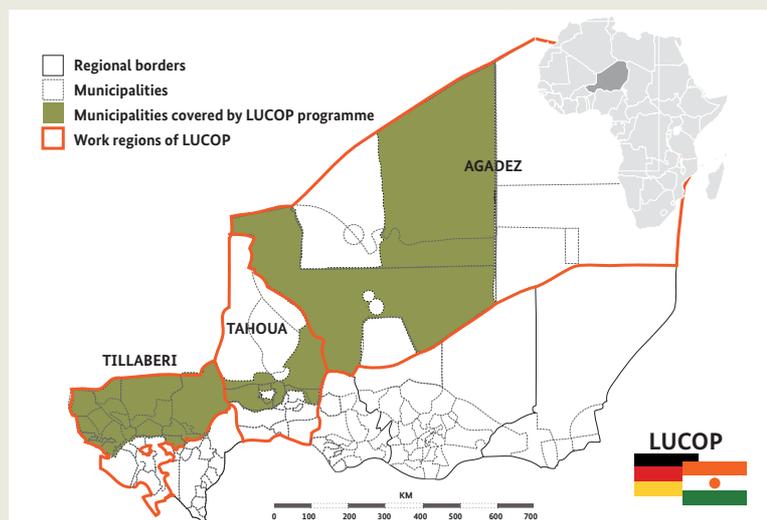
Soil rehabilitation measures and steps to improve productivity took place in the regions of Tillabéri Nord and Tahoua and, to a lesser extent, in the Agadez region.

There are four different ecological zones in the three regions:

1. A cropland/rangeland zone in Tillabéri, characterised by a predominance of colluvial soils at the foot-hills adjacent to large areas of degraded lateritic plateaux. The western part of this region has high potential in terms of surface water due to the presence of the River Niger, which crosses it from north to south over almost 200 km, and three of its major tributaries. The eastern part is crossed by the dry Dallol valley with its fossil groundwater table.
2. The cropland/rangeland zone of the department of Tahoua largely consisting of humid valleys flanked by stony and degraded plateaux and by permanent and moving dunes.
3. The zone consisting of the north of Abalak department and the south of Tchirozérine department, characterised by plains and sandy plateaux that are typical of the rangeland zone and that offer important fodder potential, which is, however, permanently threatened by wind erosion and sanding up.
4. The Agadez region in the departments of Arlit and Iferoouane, which is made up of cropland and rangeland.

From 1980 onwards, PDRT's interventions focused solely on the department of Tahoua, before going on to work in the northern part of the region with the LUCOP programme's interventions to cover the departments of Abalak and Tchintabaraden.

Figure 1 Areas covered by the programme in 2011



Source: LUCOP's geographic information system



Watering of young palm trees

The Tillabéri region

In the Tillabéri region, interventions focused on the areas that are now the departments of Téra, Gothèye, Ayorou, Tillabéri, Banibangou, Ouallam, Filingué, Balléyara and Abala in the northern part of the region. Given the success achieved and the large number of requests from political authorities in Niger, interventions were later extended to the departments of Torodi, Say and Kollo, where implementation continues. The Tillabéri region consists of four climate zones with rainfall levels ranging from 200 to more than 600 mm per year (Table 1).

Within these four climate zones, there are five agro-ecological zones: (i) the river area, mainly around the River Niger, its floodplain and alluvial terraces; (ii) the Dallol Bosso area, made up of wide fossil valleys; (iii) the Gorouol, which is the river Niger's largest tributary with many permanent ponds; (iv) the valley of the Azaouagh, and (v) the W National Park, located in the extreme south of the region.

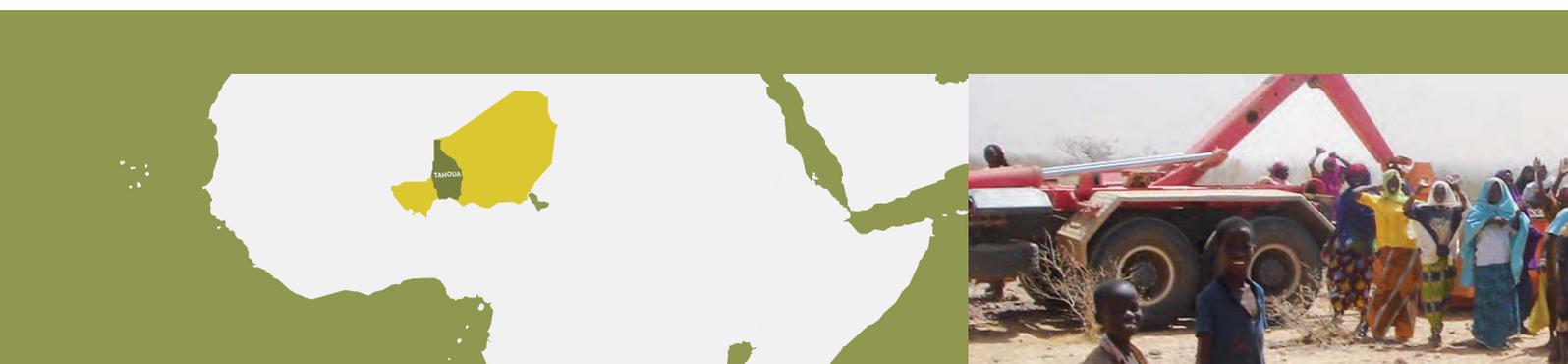
The region had a population of 1,322,949 in 1988. According to the general population and housing census (RGPH) of 2012, the region had an estimated population of 2,722,482.

The region is threatened by water erosion due to the strong runoff of rainwater, which creates gullies. Climate conditions in the region are deteriorating, and with them essential conditions for life. Together with strong demographic growth and often poorly adapted land-use methods, this situation is leading to the degradation of natural resources. This mainly takes the form of erosion phenomena, reduced fallowing periods and a loss in soil fertility. This is considered a zone of permanent food insecurity.

As far as livestock farming is concerned, the region is threatened by a reduction in fodder, both in terms of quantity and quality, which increases competition for access to pasture land and watering holes. Obviously, this trend also heightens the risk of conflict among users.

Table 1 Climate zones in the Tillabéri region

Climate zone	Departments	Annual rainfall
Saharo-Sahelian area	Northern parts of the departments Ouallam, Filingué, Tillabéri, Téra, Abala and Banibangou	200 to 300 mm/year
Sahelian area	Centres of the departments Téra, Tillabéri, Ouallam and Filingué	300 to 400 mm/year
Sahelian-Sudanian area	Southern parts of the departments Filingué, Téra, Ouallam, Tillabéri and Ballayara. North and centres of Say and Kollo	400 to 600 mm/year
Sudanian area	Southern parts of the departments Kollo, Say and Torodi	> 600 mm/year



The Tahoua region

The eastern and southern parts of the Tahoua region consist of deep valleys with normally rocky slopes, flanked by plateaux. They are the zones where water flows most rapidly. Here, water has a mainly erosive effect and degrades the soil by cutting deep gullies. The soils of the foot-hills, known as '*glacis*', are subject to erosion by the large volumes of water that flow down from the plateaux and slopes. Valley soils receive floodwater that spreads out through the bottom of the valley during the rainy season. Regular flooding of the valleys entrains fertile sediments, and the valleys are traditionally used for intense farming activities.

As vegetation cover becomes degraded, some valleys have become unproductive due to the deep gullies created which increase the speed of water flow and cause the valleys to drain more rapidly. The loss of vegetation cover exposes soils to sealing and erosion.

Large stretches of sand can be found in the northern and eastern parts of the region. The entire region consists of a Sahelian to Saharan savannah landscape, increasingly used as rangeland the further north one goes.

Agriculture and livestock keeping are the main economic activities for people in the region. The main crops produced are millet, sorghum and cowpea. Irrigated crops are becoming more and more important in the region, predominantly onions (the Galmi purple variety is especially appreciated), and three quarters of the country's production of this crop comes from this region. The general census of agriculture and livestock conducted in 2007 estimated that the livestock population accounts for 22 per cent of the country's livestock. The Tahoua region has a rainy season of three to four months, with total annual rainfall of 150 to 600 mm.

According to the last general population and housing census (RGPH) in 2012, the Tahoua region has a population of 3,328,365 people. Women make up 50 per cent (1,667,431 inhabitants).

3 How is it done?

Concepts and approaches



Left: Women and men charging stones for soil and water conservation measures; right: land use planning

During 25 years of work, the programme developed, tested and applied a number of approaches. Those that delivered unconvincing results were discontinued. There follows a description of the main approaches of strategic importance in achieving the programme's results.

3.1 Participatory approach to village land management

The programme's participatory approach aimed to encourage local people to assume responsibility and help themselves. It assisted the people to organise and to actively rehabilitate their natural environment. The different ecological units in the areas concerned were distinguished based on their use: plateaux (forest and rangeland), slopes, hill-bottoms (glacis: rainfed fields) and from about 2000 onwards valleys (irrigated crops and vegetables). Specific technical packages were developed for each ecological unit and implemented.

To achieve this, interventions in these areas continued over several consecutive years:

- The first year was devoted to raising interest and awareness, supporting or creating village bodies and producer groups, drawing up a land improvement plan, providing organisational and technical training and carrying out initial activities (such villages were called 'starting villages').
- Years 2 to 5 were used for intensive work accompanied by multiple on-the-job trainings ('active villages').
- In years 6 and 7, the programme withdrew and the communities continued the land activities without external support ('autonomous villages'): maintenance and management of forest and rangeland, application of manure, mulching, etc. on the cropland and woodland.

The programme became involved in a given area when a request was made by a village. The first step involved diagnosis with the involvement of the village, which was carried out at a general assembly convened to explain the approach and to analyse the village, its context and problems and jointly determine the solutions required. A provisional land improvement plan was established with the people, and the areas to be managed and techniques to be used were marked on a map. The areas were verified by a joint visit to the sites in question and the plan was presented to the whole village.

Village land management committees (CGTVs) were set up, with sub-committees according to the different areas of activity that had been identified. These committees (with a chairperson, vice-chair, secretary, etc.) and sub-committees (environment, livestock raising, health, supporting measures, etc.) represented the focal points for all external projects coming to the village and served not only the German-Nigerian programme.

Appropriate trainings with well-illustrated materials were carried out for numerous subjects. They served to build up local expertise and to train farmers – men and women – as facilitators/extension agents, contour-line markers, nursery technicians and others. These local resource persons became later-on part of the local 'self-training' system, which made sure that specialised local farmer trainers were available for all subjects.

An annual planning and self-evaluation system was put in place on a participatory basis. The villages informed the programme of the land areas they wanted to improve in the course of the year. They monitored the work carried out and presented the results to the public at the end of the year (self-evaluation).



3.2 Continuity needs a long-term strategy

At the end of the 1990s, some doubts about the programme concept came up and the financial cooperation (FC) agency within the programme called for a strategic vision with a clear objective that could be achieved in a defined period.

In its long-term strategy of 1999, the programme for the Tillabéri area made the following statements.

The area covered by the programme in the Tillabéri region³ covers 42,383 km² with 1,040 villages spread over some 387 catchments. About 89 per cent of the area is threatened by erosion.

The parts of the land to be improved in each ecological unit were determined as follows:

- About 35 per cent of the farmland needs to be improved to offer effective protection against erosion

for the entire region and to achieve multiplier effects among the population;

- 30 per cent of the plateaux needs to be improved, especially along their edges, in order to curb runoff and infiltrate the water on the plateaux;
- It is sufficient to improve 5 per cent of valley bottoms, slopes and areas with sandy soil to achieve replication by the population.

Altogether, 23 per cent of the surface area, or 979,100 hectares, needed to be improved in order to achieve the objectives outlined above. That called for the improvement of 51,412 hectares per year up to 2015. The sequential approach was chosen for each village over a period of 6 to 7 years (see chapter 3.1).

The programme did not succeed in drawing up a strategy of this kind for the Tahoua region. The financial cooperation agency therefore withdrew and the soil rehabilitation (SWC/SPR) measures ceased in 2003. After a period when activities were confined to testing the water-spreading weirs, the weir construction programme was launched in Tahoua.

³ Excluding the pasture zone in the north

Table 2 Areas to be improved in line with the 1999 long-term strategy

Total surface area of the Tillabéri region (ha)	Total area to be improved		Work achieved by 1998 (ha)	Remaining area to be improved (ha)	Annual rate of improvement over 17 years (1999 – 2015)
	(%)	(ha)			
4,238,302	23	979,100	105,100	874,000	51,412



Left to right: Harvest of onion around water-spreading weirs; bring home the cattle; women participation

3.3 The extension and advisory services system

The technical cooperation (TC) and financial cooperation (FC) agencies worked hand in hand. FC took charge of major investments in natural resource conservation (funding for lorries, tractors, construction of water-spreading weirs) and in the related training (maintenance of equipment and works). TC was in charge of agricultural extension and advisory services for producers.

Since the national technical services lacked the means to disseminate the necessary expertise and guidance, an extension and advisory system was put in place that made use of local (embedded) extension agents from the villages and service providers. The local extension agents are villagers who are able to assimilate the training content and pass it on to producers. They live in the beneficiary villages and are responsible for a certain number of villages in the surrounding area (village clusters).

The instruments used for providing agricultural extension and advisory services are:

- Participatory diagnosis that gives priority to the know-how of producers when looking for solutions to problems.
- Training sites (field schools) or demonstration plots set up on private farms and used to provide basic training to pilot farmer groups. Such sites are a highly effective way to exchange experience.
- Capacity building: the aim is to train the leaders of producer organisations, local extension agents, etc.
- Annual self-evaluation workshops to critically assess the methods used and to make proposals geared to perpetuating activities.

Visual teaching aids (posters, illustrated flip charts, boxes with picture cards) were prepared in the local language. These helped the local people, most of whom cannot read

or write, to get a good idea of the various agricultural approaches and techniques.

3.4 Local conventions, support for the rural code

Local conventions are documents that lay down how the communal village land is to be restored, managed and used. They usually concern woodland and rangeland on slopes and plateaux and make it possible to secure initial investments for communal wood- and rangeland. They regulate access to and use of the sites and define the distribution of the usufruct of production. The local conventions initially had a semi-legal character because the rural code was not yet sufficiently clear and there were no instruments for putting it into practice. From 2006 on, the local conventions became a means of supporting the rural code in order to apply national land policy. The rural code provides for legal recognition in relation to land use and access and conflict resolution (safeguarding of different land uses by legal papers), with the application of sanctions in the event of infringement. The use of the rural code's instruments has progressively replaced the local conventions. The local conventions have enabled women to gain provisional access to land based on three-year contracts of assignment, and have enabled communities to efficiently manage some of the collective sites (see Section 6).

3.5 Women play an important role – the gender approach

The roles and tasks of men and women in the programme area are defined by tradition. Both have their own cash funds and pay their share of family expenditure. Income-generating activities are usually reserved to men. Women



take care of the home and children and make a major contribution to farm labour. Women also made up more than 50 per cent of the workforce in connection with the work of the programme. In the food-for-work approach used in the phase up to the year 2000 (see Section 3.9), they carried out 60 to 90 per cent of the work.⁴

With the aim of actively targeting women, the programme appointed gender officers in each region who systematically analysed the impact of the activities on women and possible ways of providing women with benefits.⁵

The programme therefore launched specific activities dedicated to women, who were also encouraged to take part in the village land management committees. In the end, 20 to 30 per cent of committee members were female. In many committees they held the office of treasurer.

In the Tahoua region, the activities introduced involved processing market garden produce, income generation and equipment to make work easier for women (mills, pulleys for drawing water).

Women's sites

As one of the activities reserved exclusively for women, the programme supported the establishment of women's sites in the Tillabéri region to facilitate women's access to land. The rights to land are held by the families of the first inhabitants of a piece of land or of a village, and one of their members is generally the village chief. Women traditionally do not own land. They may rent land from their family or husband and, in some cases, from the village chief. Such land is usually degraded and not very productive.

To establish a women's site, the local people were sensitised about the fact that it is essential to integrate all the different groups, including women, if they are to improve their land. If a group of women expresses the need to develop a women's site, the village land management committee agrees to undertake this activity and includes the subject in the participatory planning meetings. The women's group draws up internal rules on site management and the association statutes required to obtain legal recognition as an economic interest group (EIG). An uncultivated site is accorded to the women's group by a land owner, with a certificate of land assignment signed by the land owner, the representatives of the women's group and witnesses, including the authorities.

The site is harrowed using one of the programme's tractors and divided up into individual plots among the different users. The programme supports the group with a fund intended to buy a one-off initial stock of staple crop seeds (to a value of XOF 500 per woman = EUR 1.5). The women's group plants the site with crops such as sesame, peanuts, ground peas, oca, sorghum and millet.

The lease contracts have terms of three to four years. It often proved difficult to extend the contracts, which makes long-term investments such as the planting of trees impossible. New sites had to be sought. While they were farming the land, the women benefited from the additional produce.

3.6 Donkey carts diminish costs and help maintaining soil fertility

The use of donkey cart owners to transport stones was introduced in 1996 to supplement the transportation capacity of the programme's lorries. The cart owners received payment in kind for transporting stones to the sites to be

⁴ KfW (2003)

⁵ PASP (2003b)



Left: transport of harvest by donkey cart; right: building a water spreading weir

improved. From 1998, the volume of stones transported by cart exceeded the volume transported by lorry: *'Lorries contributed to improving around 7,500 hectares of land with stone bunds (1998). Most of the stone bunds are built using carts (around 20,000 hectares in 1998).'*⁶

To step up transportation by cart in the Tillabéri region, the programme put a 'cart loan' scheme in place in 1997. This enabled several people per village to acquire carts for soil rehabilitation work. Farmers working on land in the intervention areas were offered loans to buy carts, which were paid off by transporting stones as part of the land improvement work. The aim was to increase transportation capacities in villages with supplies of stones nearby. The cart loan scheme ended in 2002 when the food-for-work approach was discontinued. Nevertheless, the cart remains an indispensable element for building stone bunds because it is needed to transport manure and also for bringing in harvests and fetching water for use in the home. It is of great help to women in their farm work and household tasks.

It was more economical to transport materials for land improvements by cart than by lorry. For example, one hectare of stone bunds built using a cart costs only half as much as one hectare improved using a lorry. From 1996 to 2004, two-thirds of the stone bunds in the Tillabéri region were built using carts.⁷

3.7 Value chains link up production and markets

As part of its efforts launched in 2007 to support commodity value chains, the programme identified sesame as

the leading commodity to be supported in the Tillabéri region. Sesame was chosen because of its high market value both inside and outside the country and because it provides an opportunity to reach many people, especially women and young people. In order to support the value chain, it was first necessary to acquire knowledge of all the production factors and marketing channels and to set up a regular extension system.

The value links approach⁸ was used to support activities in the sesame value chain. The approach consisted in conducting a basic study on the commodity in the region, organising workshops that brought together the various actors in the sector, drawing up an institutional and organisational diagnosis, providing high-quality seeds and testing their adoption by producers, dealers and consumers, and finally promoting dissemination via the agricultural extension system.

In terms of results, the programme activities made it possible to provide the sesame-producing villages with formal bodies enabling the entire producer group to represent and assert their material, economic and moral interests. Of special note is the creation of umbrella associations (union of groups) that are able to negotiate with all kinds of partners. On the economic level, the programme's support made it possible to obtain substantial additional revenue for the region's producers (gross profit margin of some XOF 50 million in 2009; ~ EUR 76.000). It should also be noted that the extension system set up to provide technical training to producers is mainly based on the permanent technical services of the Government. Finally, it should be pointed out that the network of agricultural chambers is beginning to assume responsibility as the leading body in this sector, and to play an effective role in organising and supporting the marketing of sesame.

⁶ PASP (1999)

⁷ Particip (2005)

⁸ <http://de.slideshare.net/led4lgus/gtz-valuelinks-manual>



3.8 Economic growth poles

In order to harness the economic potential of ponds and natural lakes in the southern region, the programme worked with 27 dynamic economic growth poles from 2007 to 2010. An economic growth pole is a set of natural potentialities (agricultural, forest, rangeland and fishery resources), human potentialities (local initiatives) and institutional potentialities (state services, NGOs, municipalities). Promising agricultural, livestock, forestry and fishing activities were identified in these economic growth poles. The production sites are located either next to permanent or semi-permanent ponds, a river or in the valley bottoms. The main activity of these poles is vegetable production in the off-season. The cultivated plots are usually small, around several hundred square metres per gardener. The main crops grown are onions, tomatoes, potatoes and cabbage. The programme supported gardeners – men and women – in drawing up and implementing plans of action for developing their economic growth pole. The programme provided technical and organisational assistance and advice, training and subsidies for purchasing agricultural inputs and small equipment.

3.9 Support measures

Several support measures were implemented for certain periods in recognition of strong participation by local people. Sometimes these took the form of experiments, which were abandoned after some time, or activities that were financed for a single phase then stopped due to modifications in strategy and the refocusing of activities on soil rehabilitation measures. Examples include the construction of feeder roads and wells, cereal banks, funds to support self-help and the distribution of guinea fowl.

The food-for-work approach is described as one example that played an important role during the first ten years of the programme.

Food for work

Use of the food-for-work instrument in the Tahoua region dates back to 1984, a time at which the approach was in line with political priorities. 1984 was not only a year of drought but also marked the start of an integrated project financed by the Italian cooperation in Keita, which operated in the zone adjacent to that of the PDRT and used the food-for-work instrument on a large scale.

At that time, this involved payment in kind for each day of work. The food was provided by the World Food Programme (WFP), which called for strict compliance with WFP standards as regards the quantity of food distributed. Apart from soil rehabilitation, the scheme was also designed to reduce rural unemployment and diversify eating habits.

The PDRT would inform WFP of the food requirements for each quarter. WFP allocated the quantities and arranged for transportation to the city of Tahoua. The project assumed the costs of transportation from Tahoua to the recipient villages by using its own lorries. During this time, PDRT's lorries were mainly used for transporting these foodstuffs. From 1993, PDRT and PASP received food supplies from German food aid, which made the instrument more flexible. Distribution no longer took the form of payment per day of labour, but of a specific volume of cereals for a specific amount of work completed on collective plots of land.

Support in the form of food made it easier to mobilise people to perform rehabilitation work on communal land on a large scale and curbed the rural exodus. Over time, it became apparent that women and young people were being sent to the sites by the heads of their households. They were not interested in the rehabilitation measures, but in receiving food rations. This meant that the food supplies led to the creation of 'alibi' sites, and work stopped as soon as food stopped being distributed. The renting of ware-



Left: woman watering her garden with a manual water pump; right: woman farmer measuring progress of growth on her farm

houses and the handling and transportation of supplies to the different villages took up significant funding. The approach was therefore discontinued when rehabilitation work was completed in Tahoua in 2000. In the Tillabéri region, the programme abruptly stopped the food-for-work approach in 2002, which had significant repercussions (see Section 8).⁹

3.10 Monitoring and evaluation system

The need to create a monitoring and evaluation (M&E) systems for the programme areas became apparent during evaluation of the orientation phase, where the lack of available information made it difficult to analyse and interpret the results. An M&E unit was therefore set up in Tahoua and Tillabéri, with a geographic information system (GIS) in Tillabéri. Initially, the aim was to ensure that information was available on the work achieved. Following that, an impact monitoring system was established.

From then on the programme systematically monitored the different activities and their results in terms of crop, fodder and timber yields, with the aim of showing the effects of the different techniques. In the Tillabéri region, crop yields were measured at around a hundred sites, and

herbaceous production at some 60 sites, from the late 1990s up to the present. In the Tahoua region, measurement of yields and biomass came to an end when erosion control activities were discontinued in 2000. From that time, the effect of the water-spreading weirs was monitored.

Finally, the programme carried out surveys of beneficiaries to monitor capacity development and the application of training. The findings were documented in annual activity and impact reports. Today, the programme has several electronic databases with complete series of annual data on the work achieved starting in 1991 and on yields starting in 1996. The findings are part of a wealth of documentation that makes it easier to disseminate the lessons learned to other actors.

A participatory monitoring system was set up in addition to the programme monitoring system, allowing local people to monitor their own achievements and make their own assessments based on annual plans. The participatory planning, monitoring and evaluation system was used to train local people in planning, implementing and monitoring and provide information on the degree of achievement of the annual work plans. The plans and assessments were posted in the villages and made the interventions and results transparent for everyone concerned.

⁹ PDRT (2003)

4 Technical approaches adapted to the people and sites

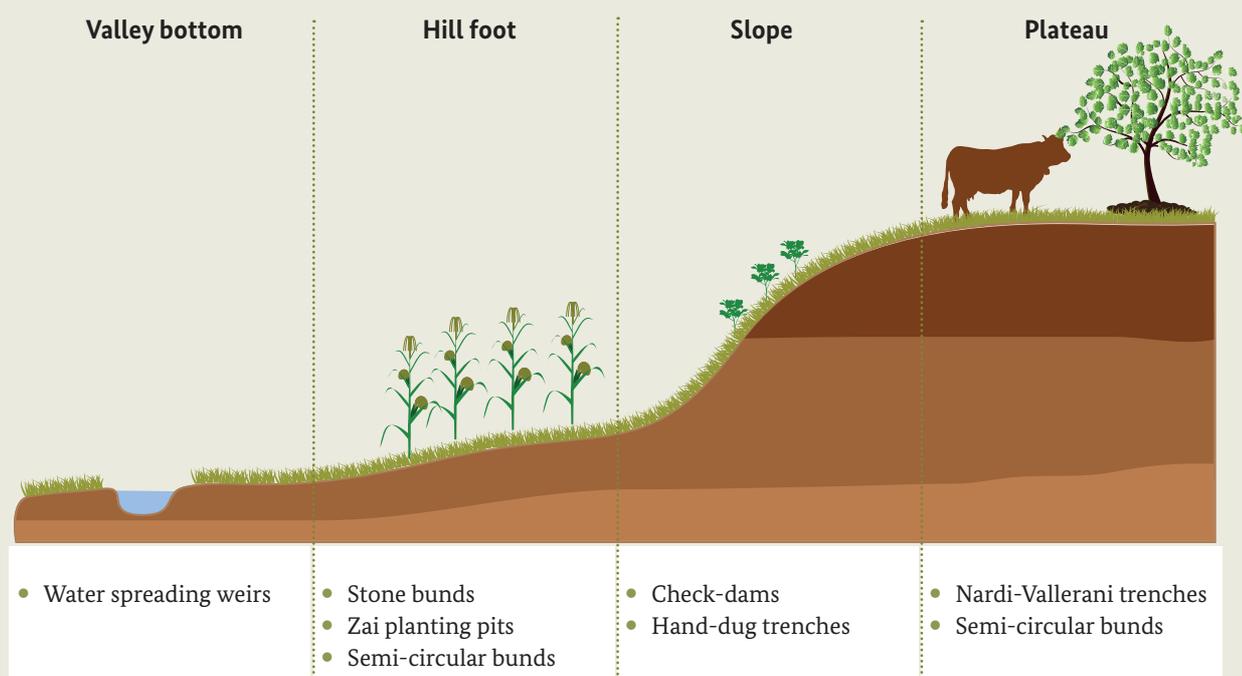
Depending on geomorphological units in the area, the programme developed a series of technical measures to restore soil fertility, increase water infiltration and restore natural vegetation (Figure 3). These techniques, most of them involving physical measures, were supplemented by other agricultural techniques in the fields and valley bottoms and by management measures for the collective grazing spaces and tree plantations on the plateaux.¹⁰

On the plateaux, the most frequently used technique were Nardi-Vallerani trenches. These are discontinuous furrows across the plateaux using a tractor-pulled plough (Fig-

ure 4). The trenches collect rainwater and runoff, helping to retain water and allowing it to infiltrate the soil. The trenches are planted with trees. One year later, the soil between the trench lines is ripped and then sown with herbaceous fodder species. Other techniques commonly used on the plateaux are semi-circular bunds (half-moons) and earth embankments for planting trees and fodder plants, and check-dams on slopes to prevent the formation of gullies.

¹⁰ See detailed description of measures: http://agriwaterpedia.info/wiki/Good_Practices_in_Soil_and_Water_Conservation_-_a_contribution_to_adaptation_and_farmer's_resilience_towards_climate_change_in_the_Sahel

Figure 3 Landscape units and physical improvement measures



Depending on the villagers' preferences, the plateaux were developed to produce wood, fodder or both. Prior to recuperating the plateaux, local conventions were drawn up by the villages, laying down rules for use and forbidding grazing for two to three years after rehabilitation. Once the vegetation was established, other techniques such as hay cutting and storage, tree pruning and the careful collection of gum arabic were introduced.

On slopes, the main techniques used were check-dams made of stones to block gullies and hand-dug trenches for water collection and tree planting.

In the rainfed fields on the piedmont 'glacis', simple stone bunds are mainly used (Figure 5). Other techniques in-

cluded planting pits (called zai or tassa) and, on limited surface areas, semi-circular bunds or hedges. Zai pits are holes dug before the rain and fertilised with a handful of organic manure. They retain rainwater and runoff and allow it to infiltrate the soil.

Supporting measures include the application of manure or compost, mulching with harvest residues such as straw or dead branches, and the protection of tree seedlings germinating naturally in the fields.¹¹

Water-spreading weirs were installed in the valley bottoms. These structures regulate floodwater in degraded valleys and restore the water regime (Figure 6).

¹¹ LUCOP (2004)

Figure 4 Techniques used on plateaux and slopes



Sterile plateau with Nardi-Vallerani trenches



Ripping between Nardi-Vallerani trenches



Replanted plateau after improvement with Nardi-Vallerani trenches and ripping



Semi-circular bunds with trees and herbaceous plants



Dry stone check-dam



Manually dug trenches

The water-spreading weir technique developed by Swiss projects in Chad was introduced in projects funded by German development cooperation in Burkina Faso, Niger and Chad in the late 1990s and early 2000s.¹² The weirs were subsequently improved and adjusted, and are now an important rehabilitation element which is starting to be used in other countries such as Ethiopia and Zimbabwe. This was the element required to complete the range of measures to improve all the different landscape units: plateaux, slopes, pediments and now valleys.

Water-spreading weirs slow the flow of water in valleys and spread it over a wider area where it can infiltrate the soil, thus reducing erosion and water loss. At the same time, sediments improve soil fertility and the water table is replenished. In the rainy season, the area temporarily flooded by flood waves coming down the valley, regulated by the weirs is used to plant staple crops. In the dry season, the higher water tables provide one or two cycles of irrigated market garden crops that can be sold. A series of weirs is usually built to improve entire valleys.

¹² See detailed description: http://agriwaterpedia.info/wiki/Water-spreading_weirs_for_the_development_of_degraded_dry_river_valleys

Figure 5 Techniques used on individual fields



Building stone bunds



Zai (or tassa) planting pits

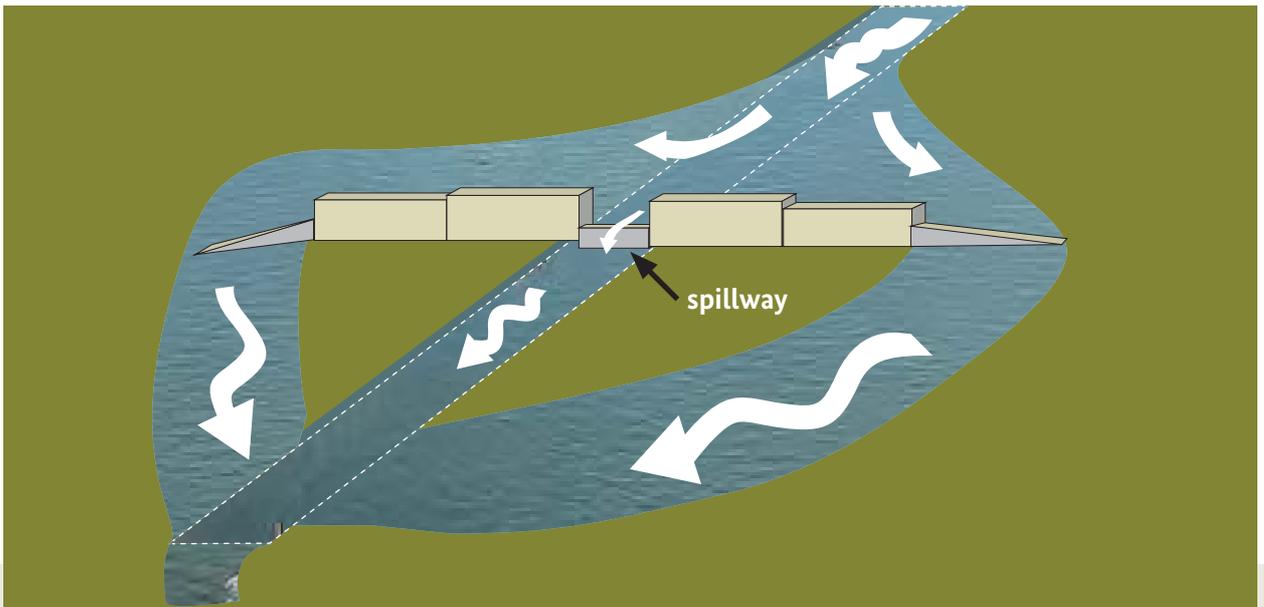


Hedge grown from Euphorbia balsamifera



Bund with mulching

Figure 6 Water-spreading weirs



Spreading of floodwater by a water-spreading weir



Spillway of a water-spreading weir

5 A lot has been achieved



From 1991 to 2011, soil rehabilitation (SWC/SPR) measures were carried out on a total area of 520,037 hectares, that is, 75,785 hectares in the Tahoua region and 444,252 hectares in the Tillabéri region.

Improved fields account for two-thirds of the work (354,290 ha). One third of the improvements were made to plateaux and slopes. The stone bunds installed in the fields alone correspond to a length of more than 35,000 km.

In addition, in the Tahoua region, 221 water-spreading weirs were built in 11 valleys with a cultivable area of 8,132 ha. This land is cultivated by 4,731 households, that is, 35,000 inhabitants.¹³

¹³ LUCOP (2010)

In the Tillabéri region, there are more than 340 community areas containing almost 1,000 villages whose inhabitants were involved in the work. Of these, 231 had finished their intervention cycle (independent areas) in 2011, and 112 areas still were actively supported by the programme. In all, this means that about half a million people directly benefited from the activities.¹⁴

From 2006 to 2010 alone, some 23,000 people took part in various types of training, which constitutes an important qualified human resource base for further development activities. The committee members were trained in planning, management and organisation, while farmers received training in various soil rehabilitation techniques and nursery management.¹⁶

¹⁴ GIZ (2003)

¹⁵ The improved areas are those where different techniques have been used. The figures were taken from several sources: FICOD N (2008), KfW (2005), Particip (2005), Pöyry/Particip (2010)

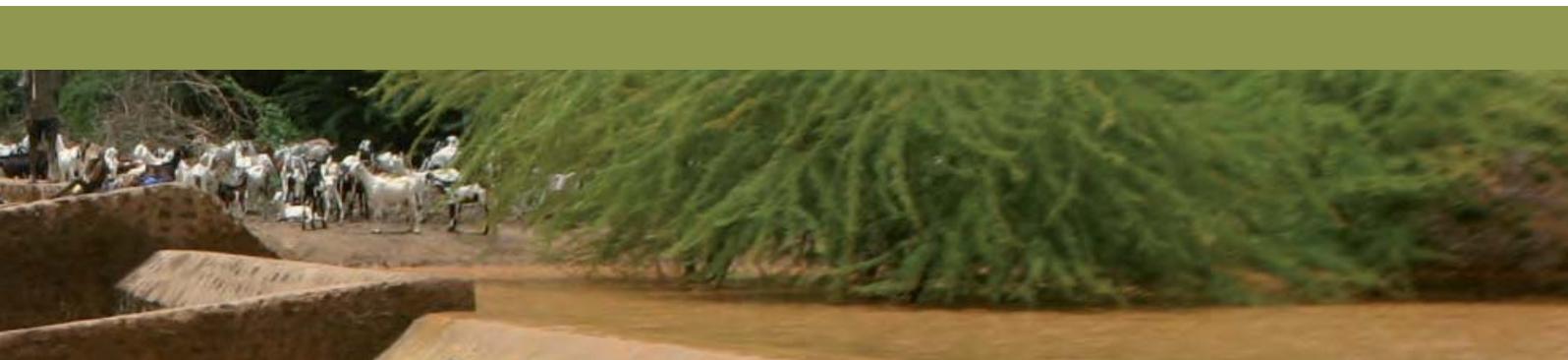
¹⁶ Pöyry/Particip (2009)

Table 3 Implementation of soil rehabilitation measures

Area	Type of measure	Improved surface area (ha) ¹⁵
Tillabéri 1991–2011	Agricultural measures	342,103
	Forestry and rangeland measures	102,149
	s/total Tillabéri	444,252
Tahoua 1991–2003 (end)	Agricultural measures	12,191
	Forestry and rangeland measures	63,594
	s/total Tahoua	75,785
Programme	Agricultural measures	354,294
	Forestry and rangeland measures	165,743
	Total	520,037

Table 4 Community areas involved in the programme in the Tillabéri region in 2010

Department	Number of areas in 2010			
	New	Active	Independent	Total 2010
Filingué	10	26	60	96
Ouallam	10	22	70	102
Téra	5	22	59	86
Tillabéri	4	13	42	59
Total	29	83	231	343



Livestock also benefits from water-spreading weirs

In the Tahoua region, around 190,000 people from 110 villages benefited from the programme.¹⁷

In 2007, the programme started to work with 27 dynamic economic growth poles. On average, the direct beneficiaries were 200 producers and their families per pole (5,400 people).¹⁸

In addition, around 365 women's economic interest groups were set up between 1991 and 2012. The total surface area of the women's sites is 14,824 hectares.¹⁹

Support measures in the Tahoua region include the construction of 26 community centres, which are used as meeting places, for sharing experience and training, and the construction of two health facilities. To improve accessibility, 183 km of feeder roads with 46 crossing points link the villages with the road network and the main towns in the region.²⁰

Corridors have been established to allow animals to be moved from one grazing area to another, which prevents conflicts between livestock farmers and growers.

In Tillabéri too, community centres were installed to be used as meeting places, for decision making assemblies and to facilitate events, enabling the village people to coordinate land management more effectively. These community centres are also used as classrooms for training courses and as places to foster social dialogue.

Support for the implementation of development activities in the community areas also involved the acquisition and distribution of donkey-pulled tipcarts to facilitate the transportation of stones needed to build the various structures. A sustainability mechanism was installed, whereby people can rent the tipcarts to transport manure to their fields or to take harvests back to the village storehouses.

Area-wise, the Niger programme is the largest soil rehabilitation programme of German development cooperation.

¹⁷ KfW (2003)

¹⁸ LUCOP (2010)

¹⁹ From 1991 to 2002, PASP created more than 200 EIGs with women's sites totalling 8,516 ha; from 2003 to 2012, 165 EIGs were set up with 6,308 hectares of women's sites.

²⁰ KfW (2003)

6 What are the effects and how sustainable is the programme?



Yield monitoring over a 15-year period shows that, on average, the improved fields produced 210 kg more grain per year and per hectare than unimproved fields (control fields) (Table 5); the yield more than doubled (multiplication factor: 2.2). This extra amount is enough to meet the annual cereal requirements of one person. Bearing in mind that the improved fields cover a total area of 354,294 ha, this is the number of additional people that can be fed. Additional annual production amounted to approximately 74,000 t of grain.

Table 5 also shows that the yield surplus persists for more than 15 years, because the sample also includes sites that were improved in the early 1990s. In years with poor rainfall, such as 2000, the treated fields still provide yields that are comparable with the average yield provided by untreated fields in a normal year (168 kg/ha against 182 kg/ha), whereas the untreated fields provided very low yields (79 kg/ha) in the poor year. This shows the improved production security in poor years, and hence the capacity to improve people's resilience to the impacts of climate change.

The production of straw²² also rises in addition to higher grain yields. Straw production was 759 kg/ha on unimproved fields and 1,362 kg/ha on improved fields, i.e. an additional 602 kg/ha of straw. That is important because straw is used both as fodder and as a construction material.

On the plateaux, tree planting and the sowing of fodder grasses serve a number of purposes in addition to their ecological objectives: soil protection on the plateaux, prevention of erosion downhill, restoration of vegetation cover, production of fodder, wood and the collection of fruits, bark, etc. is maintained over a period of more than 15 years, with annual variations depending on rainfall. Moreover, the production of trees and bushes allows the collection of secondary products (depending on the species) such as fruit, medicinal products and arabic gum.

²² Average values of three years measurement

Table 5 Changes in millet yields with and without improvements in the Tillabéri region

Year	1996	1997	1998	1999	2000	2001	2002	2003	2006	2007	2008	2009	2010	Average
Millet grain production (kg/ha) ²¹														
Treatment	675	331	530	423	168	436	390	340	282	313	370	343	494	392
Control	255	165	358	264	79	161	214	127	137	141	120	130	212	182
Multiplication factor	2.6	2.0	1.5	1.6	2.1	2.7	1.8	2.7	2.1	2.2	3.1	2.6	2.3	2.2

Source: excerpts from *Particip* (2005), *Pöyry/Particip* (2010) and *Pöyry* (2011)

²¹ The yields were measured on around a hundred fields that had mainly been treated with bunds and with different farming methods (manure, mulching)



Inspecting a rehabilitated plateau

As regards water and ecological considerations, the regeneration of the vegetation on the plateaux protects downstream fields against water erosion and helps to diversify the flora and fauna. Wildlife and plant species that had disappeared have now returned.

The survival rate of trees after plantation and replanting over two years was around 80 per cent in Tahoua and 70 per cent in Tillabéri. In Tillabéri, mechanical treatment by tractor meant that the treated areas sometimes exceeded the people's capacity to keep up with the required sowing and planting.²⁴

The plateaux are collectively used areas for which local conventions have been drawn up by the people, with rules for their management and upkeep. However, the development committees have not always been able to ensure efficient management over the course of time. In some

areas, management was neglected or lost momentum. A qualitative evaluation of a random sample of plateaux showed that, of 19 plateaux visited, 32 per cent had become degraded again, 42 per cent were in good condition and the remaining 26 per cent were somewhere in between. This largely coincides with a qualitative assessment of their management committees, with 47 per cent classed as not very dynamic to inactive, and 53 per cent between active and very active.²⁵

Water-spreading weirs

The weirs have a large number of socioeconomic and ecological effects. They increase the cultivable area by spreading floodwater coming down the dry rivers (wadis or oueds) across the entire valley's width, which enables better growth of staple crops (millet, sorghum) during the rainy season and of market garden crops during the dry season. Analysis of yields over three years shows that they increased by a factor of 2 for millet (the main crop) and by a factor of 1.3 for sorghum (Table 7).

²³ The herbaceous biomass was measured on 60 sites between 1998 and 2003. The figures for 2009 and 2010 represent 7 sites in Ouallam and 13 sites in Ouallam and Tillabéri respectively.

²⁴ KfW (2003)

²⁵ Pöyry (2011)

Table 6 Herbaceous biomass yields on treated forest and rangeland sites

Year	1998	1999	2000	2001	2002	2003	2009	2010	Average
	Yield (kg of dry matter/ha) ²³								
Sites improved with Nardi-Vallerani trenches	1,195	454	454	625	860	284	680	1,670	778
Control	75	48	43	40	53	86	---	---	57



However, weir construction also increases the cultivable areas in each of the construction sites. The weirs constructed up to 2010, increased the cultivable area in the treated sites from an initial 2,847 hectares (area before construction) to 8,132 hectares (after construction), corresponding to a factor of 2.9 (Table 8). Taking into account both effects (i) increased yields and (ii) expansion of cultivable areas, millet output was 5.8 times higher.

This rise in production during the rainy season is complemented by increased production during the dry season. The increase in crop yields in the off-season ranges from 6 to 30 per cent, depending on the crop (Table 9). In Niger, prior to weir construction, small areas were planted with a second crop in seven of the nine valleys examined. After weir construction, all nine valleys grew a second and usually a third crop on larger areas, which shows the important effect of the weirs to lift up the underground water tables.

Overall, the area used for market garden crops during the dry season grew on average by 0.15 hectares to 0.49 hectares per user. Assuming that vegetable crop yields increased by 20 per cent (coefficient of 1.2) and cultivated areas were 3.3 greater, vegetable production almost quadrupled.

The extra produce is consumed by users (staple crops) or is sold (market garden crops). An analysis of household income shows that with weirs, income grew from XOF 125,000 to XOF 195,000 (EUR 191 to EUR 298) on average per year. The number of months with enough food (food security) in the users' households grew from 12 to 20 months, depending on the valley.

Water infiltration due to the weirs causes an average rise of 9 m in groundwater levels, which makes water more accessible for domestic and farming needs and reduces the time and effort that women devote to fetching water (Figure 7).

Table 7 Effect of weirs on millet and sorghum yields (average of eight valleys over three years and three valleys over one year)

Crop	Yield (kg/ha)		Multiplication factor
	without weir	with weir	
Millet	333	675	2.0
Sorghum	362	481	1.3

Source: Bétifor (2010)

Table 8 Change in cultivated areas and production in the rainy season

Indicator	Situation prior to weirs	Situation with weirs	Difference	Multiplication factor
Cultivated area (ha)	2,847 ha	8,132 ha	5,285 ha	2.9
Yield (kg/ha)	333 kg/ha	675 kg/ha	342 kg/ha	2.0
Production (t)	948 t	5,489 t	4,143 t	5.8

Source: Bétifor (2010)



Watering home gardens around water-spreading weirs

Water infiltration due to the weirs causes an average rise of 9 m in groundwater levels, which makes water more accessible for domestic and farming needs and reduces the time and effort that women devote to fetching water (Figure 7).

Other important effects are fodder production and stabilisation of environmental degradation as vegetation around the weirs is restored (LUCOP 2010).

The sustainability of the weirs mainly depends on the quality of their design and construction. Some weirs need to be adapted in the two or three years after they were built.

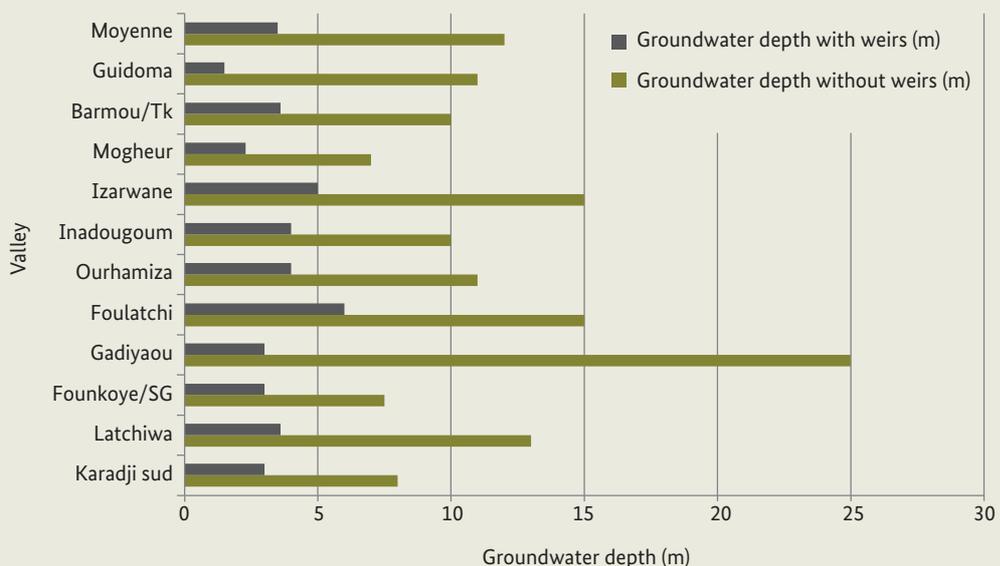
Dynamic economic growth poles

The dynamic economic growth poles started up in 2007. An evaluation in 2010 showed that producers of both

genders had obtained a better mastery of production techniques and crop diversification. Their production and efficiency had improved and cultivated areas had expanded. Better conservation and processing of market garden produce made it possible to reduce post-harvest losses. Produce was no longer marketed by middlemen, but directly to traders. These factors taken together made it possible to increase household revenue.

For example, evaluation of 24 operations in 2010/2011 showed an average gross profit margin of XOF 4,200 per day of work. Remuneration for the work performed varied depending on the crop from XOF 2,196 per day for tomatoes to more than XOF 6,000 per day for lettuce (Table 8). By way of comparison: the official minimum wage is XOF 1,500 per day with payments of often less than XOF 1,000 per day in rural areas.

Figure 7 Depth of the water table before and after installing water-spreading weirs



Source: Bétifor (2010)



All different approaches gave the local people more responsibility by means of the participatory approach. The many organisational and technical training courses strengthened the beneficiaries' capacity and fostered the organisation and cohesion of local groups. In addition, they improved the consideration given to women and the emergence of their capacities. In some villages, women were chosen as village leaders.

In the Tillabéri region, more than 70 per cent of farmers surveyed in 2008 confirmed that they had mastered most rehabilitation techniques.²⁶ Also worth noting is the fact that 25 per cent of municipal councillors came from the very local management organisations that have cooperated with the programme. The local conventions, the application of land policy and other activities, such as the establishment of corridors for the movement of animals,

²⁶ Adamou & Karami (2008)

helped to prevent conflicts between growers and livestock farmers.

Since the law did not provide for legal recognition of the land management committees as official structures, some committees created economic interest groups (EIGs) to carry out economic activities.

Production has been increased and stabilised as a result of better water and soil management. However, this boost in production does not necessarily equate with an improvement in the quantity of available food per inhabitant. Given the high demographic growth of 3.8 per cent per year,²⁷ this increased production helps to support the population growth that has occurred in this time.

²⁷ Source <http://data.worldbank.org/indicator/SP.POP.GROW>

Table 9 Yield in market garden crops without and with weirs (average yields over three years from 2007 to 2009)

Crop	Yield without water-spreading weirs (t/ha)	Yield with water-spreading weirs (t/ha)	Multiplication factor
Onions	16.1	21.1	1.31
Pumpkins	2.5	3.0	1.20
Tomatoes	7.9	8.3	1.06
Sweet potatoes	1.8	2.3	1.24

Source: Bétifor (2010)

Table 10 Average gross profit margins per day of work (XOF/day) of 24 market-gardening operations in Ouallam in 2010/2011

Crops	Average gross profit margin		No. of operations
	(XOF/day)	(€/day)	
All crops	4,201	6.4	24
Tomatoes	2,382	3.6	5
Potatoes	2,196	3.4	2
Lettuce	6,448	9.8	1
Tomatoes and lettuce	3,650	0.6	3
Tomatoes, lettuce and cabbage	5,322	8.1	5
Other combinations	3,694	5.6	8

Source: LUCOP's M&E system

7 Significant benefits with reasonable cost



Nardi Vallerani trenches on plateau

During the period from 1986 to 2011, German cooperation, via the Federal Ministry for Economic Cooperation and Development (BMZ), invested some EUR 92.5 million (XOF 60.6 billion) in the programme (Table 11). This does not take into account the contribution of the Government of Niger or the important participation (especially in terms of physical labour) by local people.

Costs were shared between financial cooperation (KfW – EUR 44.5 million), technical cooperation (GIZ – EUR 45.4 million) and the German volunteer service (DED – EUR 2.7 million).

The unit costs of direct investments in the various techniques vary widely. These direct costs take into account the work performed by local people (collection and laying of stones and other manual work), valued at XOF 800/day (EUR 1.2/day), as well as transportation and small items of equipment such as shovels, pickaxes and crowbars provid-

ed by the programme. Indirect costs such as programme management, monitoring and initial training for farmers of both genders are not included.

The unit costs show that these techniques are inexpensive (Table 12). The majority of fields were improved with stone bunds. Depending on how the stones were transported, the bunds cost EUR 31/ha (XOF 20,072) using lorries and EUR 16/ha using donkey carts. The latter form of transportation is only possible if the stones are close to the construction site.

Depending on the technique, local people assume between 38 and 100 per cent of the costs through their physical labour. The implementation of these measures therefore constitutes a huge investment by local people in soil rehabilitation. It was also noted that the agricultural and forestry measures carried out in the fields, especially bunds, cost less than the forestry and rangeland measures

Table 11 Estimated expenditure from 1986 to 2011

German cooperation agencies	Expenditure in millions of EUR (billions of XOF) ²⁸		
	Project phase (1986 – 2003)	Programme phase (LUCOP/FICOD) (2003 – 2011)	Total
FC (KfW)	20.7 (13.6)	23.8 (15.6)	44.5 (29.4)
TC (GIZ) ²⁹	31.4 (20.6)	14.0 (9.1)	45.4 (29.7)
DED	4 development advisors	2.7 (1.7)	2.7 (1.7)
Total	52.1 (34.1)	40.4 (26.5)	92.5 (60.6)

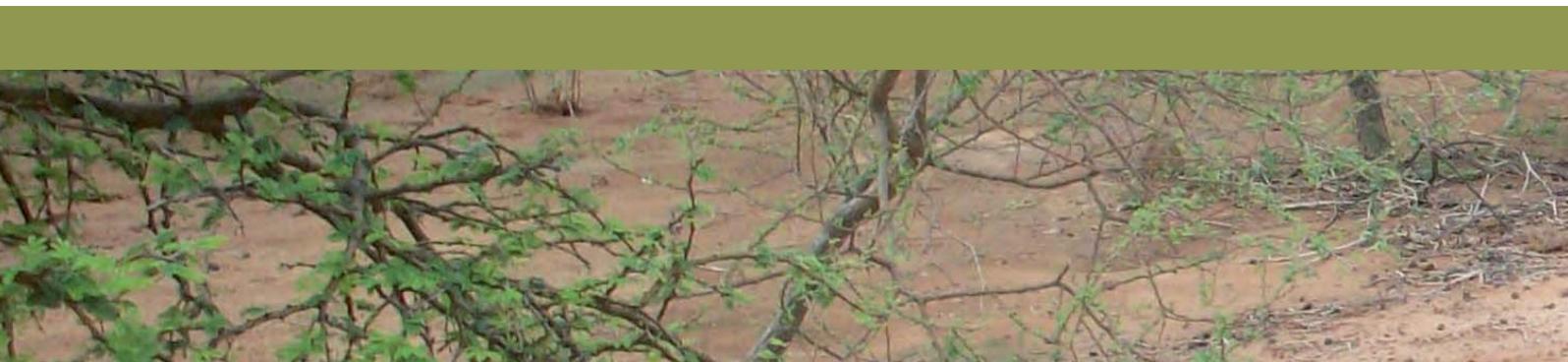
²⁸ These are rough figures for the LUCOP/FICOD programme phase. The programme had a decentralisation component and a component that focused on erosion control measures and agriculture. For FC, corresponding management costs were added to the portion allocated to erosion control measures. 50 % of expenditure was taken into account for TC and DED. The remaining 50 % was allocated to the decentralisation component. Exchange rate applied EUR 1 = XOF 655.

²⁹ GIZ was established in January 2011 after the merger of GTZ, DED and InWEnt. The name GIZ is used throughout this document for easier reading.

Table 12 Unit costs and participation by beneficiaries in erosion control measures

Agricultural and forestry measures (fields)	Unit cost of overall investment [EUR/ha]	Unit cost of overall investment [XOF/ha]	Participation by local people (physical labour)
Simple bund (lorry)	31	20,072	38 %
Simple bund (cart)	16	10,800	70 %
Semi-circular bunds plus manure	89	58,600	100 %
Zai plus manure	45	29,800	99 %
Forestry and rangeland measures (plateaux and slopes)			
Nardi-Vallerani trenches (tractor), subsoiling and sowing	121	78,952	54 %
Hand-dug trenches	169	110,777	88 %
Semi-circular bunds for trees	225	147,577	91 %

Source: Particip (2005)



aimed at restoring vegetation in the form of trees and herbaceous plants implemented on the plateaux and slopes. One hectare of Nardi-Vallerani trenches dug by tractor makes it possible to protect four hectares of fields improved by bunds using stones transported by lorry.

Evaluation of the annual monetary benefits shows that all the measures were economically viable except for the semi-circular bunds for trees (Table 13). The crop-growing and forestry measures in the fields are more profitable than the forestry and rangeland measures on the plateaux and slopes. However, maximum benefit is only achieved in the fields if the stone bunds are accompanied by the application of fertiliser. The same principle applies to the zai planting pits.

Taking into account a surface area improved by weirs of 8,132 hectares at a total cost of about EUR 7.6 million, the cost per hectare is about EUR 940 (XOF 620,000).³⁰

³⁰ According to Bender (2010)

Given that crops in the rainy season are mainly intended for consumption by the farmers themselves, the estimated revenues from the weirs are based solely on production in the dry season. To this end, the surface areas and yields per crop were measured in nine valleys. The evaluation is based on a low sales price at the time of harvest. It was presumed that part of the harvest was given away and that only the remainder was sold. Based on these assumptions, gross average revenue is about EUR 770 per user (Table 14). However, it must be taken into account that these are gross revenues, i.e. crop-related expenditure must still be deducted.³¹

If we divide the total land area of 530,000 hectares improved by SWC/SRC measures and weirs by the total cost of the programme (EUR 89 million), we arrive at a very rough estimate of costs per hectare of EUR 175, bearing in mind that this includes investments with very variable costs (from EUR 30/ha for stone bunds to EUR 940/ha for weirs), infrastructure such as sheds, tracks, food distributed at the start of the programme and all staff, training, operation and management expenses.

³¹ Nill (012) based on Bétifor (2010)

Table 13 Annual benefits from the various improvements

Agricultural and forestry measures	Service life	Total annual cost ^{a)}	Additional grain production [kg]	Additional straw production [kg]	Total value ^{b)} [XOF]	Annual profits [XOF]
Simple bunds (lorry)	15	10,846	86	396	16,512	5,666
Stone bunds plus manure (lorry)	15	13,406	225	1,035	43,200	29,794
Zai plus manure	2	16,500	236	1,086	45,312	28,812
Forestry and rangeland measures			Biomass [kg/ha]	Wood [cubic metres/ha]		
Nardi-Vallerani trenches (tractor), subsoil and sowing	15	15,094	588	1.00	16,760	1,666
Semi-circular bunds for trees	15	17,954	539	1.00	15,780	-2,174
Hand-dug trenches	15	15,501	556	1.30	17,620	2,119

a) The total annual costs are made up of the cost of direct investment divided by the service life plus recurring annual expenses. b) Value of millet: XOF 100/kg, value of straw: XOF 20/kg, value of wood: XOF 5,000/cubic metre. Source: Particip (2005)



Soil and water conservation with stone-bund

Final evaluation by KfW of activities carried out in phase III in Tahoua and Tillabéri in 2005 gives comparable figures for the period from 1998 to 2003: *The overall effects can be estimated based on net profits. For phase III, annual net profits of EUR 2.24 to 5.77 million These costs are offset by financial cooperation funding of EUR 4.34 million The implementation of these measures was made possible through the concerted action of technical and financial cooperation, DED and food aid. The overall funds used, including contributions by the target group and the partner, amount to EUR 184 per hectare.*³²

³² KfW (2005) 4

Table 14 Estimated gross revenue from market garden crops

Number of gardeners	Gross revenue/gardener	
1,280	XOF 498,679	EUR 761

8 Success and challenges as pointers for future programmes



In the 25 years between 1986 and 2011, the programme underwent a **number of changes** at the German and Niger policy levels, among the target groups and, on an internal level, in terms of staff and sectoral orientation. This impacted on the intended objectives, available funds and approaches taken. A look back shows that the programme was constantly adjusted as it progressed, which made it possible to improve approaches and efficiency and led to an extremely positive final result. However, a number of challenges encountered. Both the adjustments and challenges can serve as pointers for future programmes.

The **long duration of the programme** made it possible to pursue these approaches with a high degree of efficiency and to achieve a broad impact.

The **participatory approach** fostered the strong involvement and transfer of responsibility to the men and women living in rural areas, **by helping them to help themselves**. This was the foundation for the positive results and effects achieved. It involves the pro-active creation of participatory management bodies in the villages that include both men and women. Acceptance of the part played by women in the management of resources, their involvement in decision-making bodies and the organisation of specific activities for them played an important role in the contribution made by women to much of the work carried out on the land.

These **local bodies** made it possible to mobilise thousands of people who invested their time and efforts in the campaign every day to rehabilitate the basis for production, i.e. the soil and the natural environment. The programme's viability had depended on **voluntary work by unpaid participants** from 2000 onwards. Initially, regular radio broadcasts informed the villages about their untapped potential. Subsequently, the **visible and convincing results** obtained in the areas involved spoke for themselves

and attracted new villages, which significantly scaled up activities.

The **simple village planning, implementation and evaluation system** made it possible to work transparently, to **select methods according to village priorities** and to adapt the work to their working capacities. It was the villages themselves that ultimately decided what was to be done, where and at what pace. This formed a basis of trust between the local people and the programme.

The programme developed and used **simple methods adapted to** agricultural, forestry and rangeland purposes and with rapid and visible impact. By starting up a self-training process based on visits and information-sharing, as well as practical training using visual aids such as posters and picture cards, each community was able to identify the required organisational and technical capacities among its members.

As regards management and implementation of the programme, a modular system that made use of **local programme offices** in the Tahoua and Tillabéri regions, sub-offices in the Tillabéri region and **local extension agents** who lived in the villages proved useful for working with a large number of villages and individuals and for maintaining direct contact with local people. Added to this was the **rolling approach** that limited interventions in each village to six or seven years. This temporary character ensures that villages remain motivated to achieve a maximum number of improvements and enables coverage of a large number of villages.

The programme's direct access to the target groups (with the national services playing an overall monitoring role) deepened the trusting relationship between the local people and the programme which was essential for securing the desired level of effort.



Inspecting a millet cob

Having said this, the programme also encountered a number of challenges. The free **distribution of food** in participating villages during the period from 1991 to around 2000 was finally found to reduce motivation and the sustainability of activities.

Twenty-five years of investment in soils and natural resources led to **significant production** of agricultural and market garden produce, fodder and non-timber products gathered in forests. This production has further potential that can be developed through conservation, processing and marketing, which have only been used to a limited extent.

Large-scale soil rehabilitation calls for constant work in the medium and long term. Thanks to the good documentation of the programme's results, effects and long-term strategy, the programme was able to keep on going despite **changes in political strategy**, the **realignment** of its activities and **shortcomings in coordination among the different agencies**. **Fluctuations in funds** from one phase to

another sometimes reduced the scope of the work and led to a loss of experienced staff and a drop in efficiency.

Without external support, the soil rehabilitation measures can only be replicated in part by the people themselves. Reforestation and maintenance of the planted trees and pastures is feasible by means of self-managed nurseries. The same applies to the zai planting pits, assisted natural regeneration, mulching and the application of manure. The limiting factor is transportation. The stone bunds can only be extended if there are stones nearby and carts available to transport them. If this is not the case, lorries are needed, which cost money.

Soil rehabilitation therefore calls for **firm and steadfast commitment** from government through national policy and international actors if the activities are to remain highly efficient for a long time to come. Under these conditions, and with the large-scale mobilisation of local people, the development of large surface areas is perfectly feasible and has enormous potential for reducing food insecurity and poverty.

9 Prospects



From January 2012, interventions by Niger-German cooperation focused on two priority sectors, one of which was rural development and productive agriculture. This comprises two modules: (i) a financial cooperation module entitled Small-scale irrigation and Food Security Programme (PISA) and (ii) a technical cooperation module, the Promotion of Productive Agriculture Programme (PromAP). The latter went into effective operation in early 2012. The financial cooperation module will start up in the course of 2014/15. Priority activities are investments in the weirs and small-scale irrigation and the development of organisational and technical capacities to capitalise on these investments. Soil rehabilitation measures are currently envisaged as part of the direct protection of investments in small-scale irrigation.

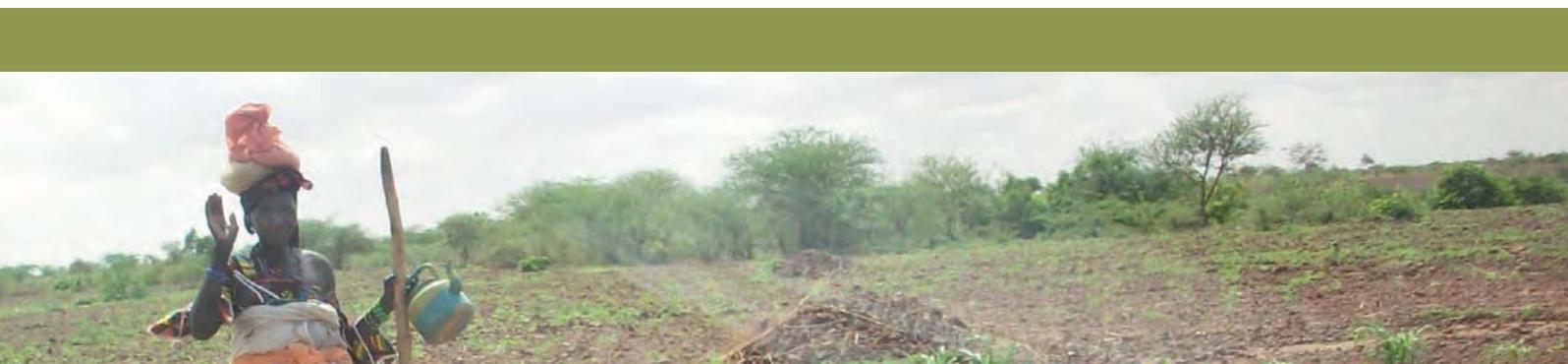
Current capacities in terms of environmental management, technical expertise and community mobilisation warrant the continuation of the activities undertaken so far. However, soil rehabilitation calls for long-term commitment and a firm political will. This cannot be ensured

by means of individual projects and programmes, but rather by a multi-donor programme with a national funding mechanism. A programme of this kind could achieve improvements on the scale of 50,000 to 100,000 hectares per year.

The experience gained from the programme can also be used outside Niger. It is being disseminated in a number of other countries. Weirs have for example been installed in Burkina Faso, Mali, Chad, Ethiopia and Zimbabwe.

Under the Special Unit 'One World – No Hunger' the German Government has increased its activities focused on soils with a global programme on soils, as well as numerous activities to sensitise other international partners of the importance of the topic during the International Year of Soils 2015. This initiative is taken as an opportunity to continue soil rehabilitation measures in a number of countries in Africa (Benin, Burkina Faso, Ethiopia, Kenya) and Asia (India), thus enabling other nations to benefit from the wealth of experience gained in Niger.

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Woman working on a women's site

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Notes



A large, light gray map of the African continent is centered on the page. The Sahel region, stretching across the top of the continent from the Atlantic coast to the Red Sea, is highlighted in a solid yellow color. Below the map, the page is filled with horizontal dotted lines, providing space for handwritten notes. The lines are evenly spaced and extend across the width of the page.



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