Post-project impacts of restoring degraded land in Tahoua, Niger

Abdou Hassane & Chris Reij

This article was submitted for inclusion in the forthcoming edition of ETFRN News 60 - Restoring African drylands, due for release in December 2020

"Individual smallholders continue to use simple and replicable restoration techniques many years after a project promoting these techniques ended."

Introduction

From 1988 to 1995, a soil and water conservation project was implemented in Niger's Tahoua Region, specifically in Illela District, funded by the International Fund for Agricultural Development (IFAD). The project used water harvesting to restore degraded land, promoting simple and easily replicable techniques such as *zaï* planting pits (*tassa* in the local Hausa language) and half-moon catchments. See Box 1.

This was a remarkable approach, because at the same time, two major projects were relying largely on heavy machinery to restore degraded land: the German-funded Rural Development Project in Tahoua District, and a high-profile, Italian-funded and FAO-implemented project in Keita District. Both of those projects used tractors, bulldozers and graders to build bunds (embankments) with upward sloping wings on degraded plateaus and to plough the land between the bunds. They did so across entire plateaus to reduce runoff into the valleys and reduce erosion and damage downstream. The local population was mobilized with food for work to cover the earthen bunds with stones to make them stronger, with the aim of reduced maintenance needs.

The IFAD-funded project took a different approach, providing hand tools to villagers so they could dig *zaï* planting pits and half-moons, an idea that emerged during a study visit by 13 farmers (10 men and 3 women) from Illela to the Yatenga Region in Burkina Faso. There, they visited Yacouba Sawadogo, an innovative farmer who improved traditional *zaï* planting pits by making them deeper and wider. The IFAD project replaced food for work with another incentive with longer-term benefits: community infrastructure for work. If villagers made good progress digging *zaï* pits and half-moons to restore land, the village would receive financial support for building a new school classroom, health clinic, or well.

Incredible impacts

Amount of land restored

A total of 5,765 hectares of severely degraded land, plus 585 hectares of silvopastoral land were restored in the district to productive land over the eight years of the project. These figures are considered to underestimate the project's achievements, as they do not take into account the fact that the simple water harvesting techniques, in particular the planting pits, were also rapidly adopted by farmers from villages outside the project area, who saw their positive impacts. For instance, farmers in the adjacent Keita and Tahoua districts — where the two projects that focused on mechanical intervention were implemented — also began digging pits between the bunds constructed using machinery. The data on areas restored also do not include the spread of these techniques after the project ended.

Increased crop yields

Between 1991 and 1996, the impact on cereal yields was measured for both planting pits and half-moons; this was a long-time series of measurements, many taken on the same fields. Rainfall for Badaguichiri, a small town in Illela where the project headquarters was based, ranged from 369 mm in 1993 to 726 mm in 1991. The average yields of millet and sorghum during the six years that impacts were measured were 513 kg/ha for the planting pits and 535 kg/ha for the half-moons, with yields ranging from 300 kg/ha in 1993 (with low and unevenly distributed rainfall) to almost 1,000 kg/ha in 1994 (a year of good rainfall). These yields may seem low, but they were four times higher than the average yields in control plots without interventions. When some mineral fertilizer was added yields increased to almost 1,500 kg/ha. The clear and significant difference between crop yields on restored and unrestored land made farmers inside and outside

Box 1. Planting pits and half-moons for restoring degraded land and increasing plant production

Water harvesting is a term that describes a range of methods used to collect and concentrate rainfall and runoff. This increases the amount of water available to plants and therefore improves plant production in arid and semi-arid areas (Reij et al. 1988). Planting pits and half-moons are simple constructions that act as micro-catchments; they gather the runoff from uncultivated parts of the land in small areas where crops are sown. The amount of additional water that is collected and made available depends on the ratio between the size of the uncultivated catchment area and the size of the pit or half-moon. In Niger, millet is the dominant crop grown in such pits and half-moons, but some farmers cultivate a mixture of millet and sorghum.

Planting pits. Photo: Abdou Hassane

Planting pits were introduced in Illela District in 1989 and have since been widely adopted. They usually have a diameter of 15 to 20 cm and a depth of 10 to 15 cm. The spacing between the pits varies, but they are generally less than one metre apart. Often dug about 0.8 metres apart, there are thus usually around 16,000 pits per hectare. Digging pits in soils with a hard surface, which are common in this area, is heavy work, and requires an investment of labour ranging from 40 to 120 person-days per hectare, depending on the hardness of the soil crust and the physical strength of the labour force. Since pits are generally dug during the dry season, when there is less demand for agricultural activities, the work can be done gradually over several weeks or months by family labour, or in less time by hired labourers or traditional work parties.

Half-moons are much bigger than planting pits. Constructed in staggered rows, each is made of raised bunds of soil (with stones if available) in an arc that concentrate run-off, Originally, spacings between the centres were 6-8 m, with 4 m between rows (325-425/ha). After the project ended, farmers made them smaller and closer so the tips of the arcs touched each other, further increasing the number per hectare.

A millet crop in half-moons. Photo: Chris Reij

Farmers always add some organic matter to each pit or half-moon. This can be manure, compost, kitchen waste, foliage from trees and shrubs, or crop residues. Such organic matter tends to be scarce, and because it is concentrated where crops are sown, it thus also increases soil fertility exactly where it is needed by the growing plants.

Crop growing under *Piliostigma reticulatum*. Chris Reij

the project area quickly adopt the water harvesting techniques.

Land purchase

After witnessing the impact of these land restoration techniques, villagers began buying severely degraded lands to bring them back into production by digging planting pits and constructing half-moons. Between 1988 and 2006 land values certainly increased, and some people sold the restored plots for a higher price. The emergence of this new land market for restored cropland was significant. In 1998, 40% of household heads interviewed said that they had bought degraded land to restore it in this way (Hassane et al. 2000). Men, and also women, were also selling fields with sandy soils to generate cash with which they could buy barren degraded land that could potentially be restored with water harvesting techniques. The costs of such plots varied, from CFA 50–60,000 (US$100–120) per hectare where degraded land was still available, to up to five times higher (around US$600) where such land was scarce. Abdoulaye and Ibro (2006) found that the average price paid for plots of degraded land was CFA 80,400 (US$160) per hectare, with the average price for degraded land restored with planting pits being CFA 145,500 (US$290).

Food security

The restoration of severely degraded land also led to an increase in household food security. It was estimated that in a drought year, a family without restored land produced only 42% of its cereal requirements, but a family with some of its cropland restored produced 72%. In a year of good rainfall, a family without restored land just achieved food security, but a family with restored land produced a surplus of 70%.

Income from labour

Restoring degraded land with planting pits or half-moons requires a significant investment of labour, and building these constructions soon became an income-earning opportunity. Some farmers specialized in the techniques, and were hired by fellow farmers at a cost (in the 1990s) of about one US dollar for a half-day of work. Some families used their own labour, but 76% of farmers interviewed had hired labourers, and 37% had also organized traditional work groups (Hassane et al. 2000), with an indication that this also led to

Left: A typically barren plateau in 1984; Right: A restored agroforestry landscape in the Badaguichiri valley in 2006. Photo: Chris Reij

a strengthening of these traditional work parties (*gaya*), which had been declining.

What happened post-project?

More trees, more fodder

Field visits between 2004 and 2019 showed that many farmers continued to maintain and even expand the use of these water harvesting techniques. This was in stark contrast to what happened in the adjacent districts, where soil and water conservation projects relied on the use of heavy machinery and externally financed interventions. The land restoration techniques used by those projects were not maintained or continued by local communities or the government.

By the end of the IFAD project, in 1995, large additional areas of degraded land in Illéla District along the main road to the regional capital of Tahoua had been restored by individual farmers. At that time, the plateaus were still largely devoid of trees and shrubs, with an almost uninterrupted view of treeless landscapes for kilometres. But today, parts of these same plateaus have many trees, quite dense in places. The reason is simple. Farmers use manure in the planting pits, and the manure contains the seeds of woody species that have been browsed by livestock. If these seeds germinate and farmers decide to maintain the woody species that grow from them, a new agroforestry parkland emerges. This is exactly what happened in this area, which is now much greener than it was 25 years ago.

In 2019, in the village of Batodi, sedentary pastoralists mentioned that all their livestock now stay in or around the village throughout the entire year. Previously, part of their herds would spend the dry season in Nigeria. According to the pastoralists, it is now possible to keep all their livestock near the village year-round because of the increased number of trees in the surrounding landscape, which produce sufficient fodder for their needs. It is not yet clear whether similar situations exist in other villages, but if more herds stay in Niger rather than migrating to Nigeria during the dry season, it may also help reduce the risks of conflicts in Nigeria between herders and farmers.

More water, more vegetables

In Batodi, situated on what was a barren plateau, farmers began to restore degraded land at the end of the 1980s. Villagers then observed

Close to Batodi village, this degraded plateau in 1990 was restored using planting pits and stone bunds. Photo: Chris Reij.

a significant rise in water levels in their wells. When villagers were asked how they explained the increase, their unanimous answer was "Allah." However, during further discussions, they acknowledged that before they restored the land with planting pits and half-moons, any rainfall quickly disappeared as runoff. After they restored the land, they noticed that much of the rainfall now stayed on the land, and they understood that this led to increased infiltration and groundwater recharge.

By 2004, villagers estimated that water levels had increased by around 14 metres, to just two to four metres below the surface. This allowed them to create four vegetable gardens around several wells, increasing to ten gardens in 2012, and eleven by January 2019. This meant that villagers could start producing onions, cabbage, lettuce and other vegetables on land that used to be barren and degraded. Field visits in 2018 and 2019 also showed a shift toward growing moringa trees (*Moringa oleifera*), which has edible leaves, flowers and pods, all with high nutritional value. The main problem facing the new gardeners is getting access to good quality seeds. There is no problem with the marketing of their produce, as it is in high demand, with people from surrounding villages coming to buy the surplus production not consumed by the farming families themselves.

After the project ended, farmers quickly began to reduce the spacing between the half-moons and between the rows of half-moons. Many of them perceived the uncultivated parts of their land not as a source of runoff, but as space that could be cultivated. This is not surprising in areas with high population pressure on the land. Practice also shows that in Illéla District, farmers gradually shifted from using half-moons to planting pits, because they feel that the latter technique is simpler and also more effective in restoring degraded land.

Conclusions

When the IFAD-funded project started in 1988, few people could have imagined that 15 years later the degraded plateaus would be covered with trees on land restored to production by individual smallholder farmers. And no one imagined that a village on a barren degraded plateau would one

A new vegetable garden on restored land in Adouna, 2006. Photo: Chris Reij

day produce enough vegetables to meet its own needs and produce a surplus for sale, because water levels in the wells had risen so much. Furthermore, it was inconceivable at that time that restoring degraded land would lead to the emergence of a land market, with people buying degraded plots of land with the aim of restoring them.

Field visits between 2004 and 2019 showed that individual smallholder farmers have continued to use these introduced and adapted water harvesting techniques. Smallholder farmers who restored degraded land then developed new and resilient agroforestry systems and increased food production. By doing so they have increased their resilience to climate change and many are now much better off than they were 30 years ago.

However, there is still a need and scope for further improvements. First, farmers would benefit from better access to good-quality seeds and to fertilizers. Second, the new agroforestry systems could have denser tree cover and contain a more diverse range of tree species. And third, improved rural roads would facilitate access to markets, which is important for villagers who are now producing surplus vegetables during the dry season.

The restoration of degraded land in Illéla District has transformed barren plateaus into productive land. This is due to the insights and efforts of many individual farmers who decided that it was in their best interest to invest in these restoration techniques. There is now a great opportunity for follow-up interventions to further support the development of smallholder agriculture, and to replicate this positive experience in other regions and countries.

References

Abdoulaye, T. and G. Ibro. 2006. Analyse des impacts socio-économiques des investissements dans la gestion des ressources naturelles : étude de cas dans les régions de Maradi, Tahoua et Tillabéry au Niger. Etude Sahélienne, CRESA. Niamey.

Hassane, A., P. Martin and C. Reij. 2000. Water harvesting, land rehabilitation and household food security in Niger: IFAD's soil and water conservation project in Illéla District. Rome and Amsterdam: IFAD and Vrije Universiteit.

Reij, C., P. Mulder and L. Begemann. 1988. Water harvesting for plant production. World Bank Technical Paper No. 91. Washington, D.C.: World Bank.

A vegetable garden with *Moringa oleifera* trees in the village of Batodi in 2018. Photo: Chris Reij

This article was submitted for inclusion in the forthcoming edition of ETFRN News 60 - Restoring African drylands, due for release in December 2020, containing 25 articles plus interviews and boxes describing farmer-led, NGO, private sector, government and international initiatives. These highlight the roles of varied policies and stakeholder interests, and identify opportunities to encourage smallholder and community participation in scaling out successes and meeting national, regional and global commitments.

This article may undergo further editing prior to publication of the complete edition, and as such, could differ from the version presented here.

The views expressed herein are the sole responsibility of the authors and can in no way be taken to reflect the views of ETFRN or Tropenbos International.

Published by:	Tropenbos International, Wageningen, the Netherlands
Copyright:	© 2020 ETFRN and Tropenbos International, Wageningen, the Netherlands
	Texts may be reproduced for non-commercial purposes, citing the source.
Issue date:	November, 2020
Authors:	**Abdou Hassane,** *forestry and water consultant, Niamey, Niger* **Chris Reij, Senior fellow,** *World Resources Institute, Washington, D.C., USA*
Editors:	Nick Pasiecznik and Chris Reij
Copy-editing:	Patricia Halladay
Cover photo:	Vegtable field close to Batodi in 2018. Photo: Chris Reij.

ETFRN
c/o Tropenbos International
P .O. Box 232,
6700 AE Wageningen,
the Netherlands
etfrn@etfrn.org
www.etfrn.org