DRYLAND ZONE CASE STUDY 2

Rehabilitation of Degraded Lands in the Lake Chad Basin[1]

BACKGROUND

The location of the project is Maroua, Northern Cameroon, with a population of about 100,000 people, a mean annual rainfall of about 700 mm/year and an altitude of about 300 m above sea level. The soils of the area are mainly vertisols and the vegetation is of the sudano-sahelian savannah type with *Acacia spp*. as the predominant species. Crops (mainly the coarse grains - sorghum and millet) and livestock farming are the predominant activities.

The pre-project survey estimated that some 13% of the total land area of the Maroua region was degraded due mainly to mechanized cotton mono-cropping by hundreds of local farmers with fertilizer inputs supplied by the cotton industry (SODECOTON). Other causes were shifting cultivation; overgrazing; over-harvesting of fuelwood; uncontrolled forest fires, and high population pressure (see figure 1).

OBJECTIVES

This pilot study pursued the following two objectives:

- To rehabilitate the degraded areas to make them productive;
- To demonstrate restoration techniques to the local communities.

APPROACH

The executing agency of the project was IRAD (Development-oriented Agricultural Research Institute). Project partners were of two types: active partners (administrative and local authorities) and passive partners (local farmers, who participated in the project only as hired labour).

The approach, used to conduct the study, combined water-harvesting techniques with agroforestry. The following five water-harvesting techniques were used:

1) Small dams (4x4m, 15 cm high)
2) Half-moon (20 cm wide and 20 cm deep);
3) Zai method (1.5 cm long, 30 cm wide and 30 cm deep)

[1] This case study has been compiled by Dr. Eyog-Matig, Coordinator, IPGRI/SAFORGEN, c/o IITA 08 BP 0932 Cotonou, Benin.

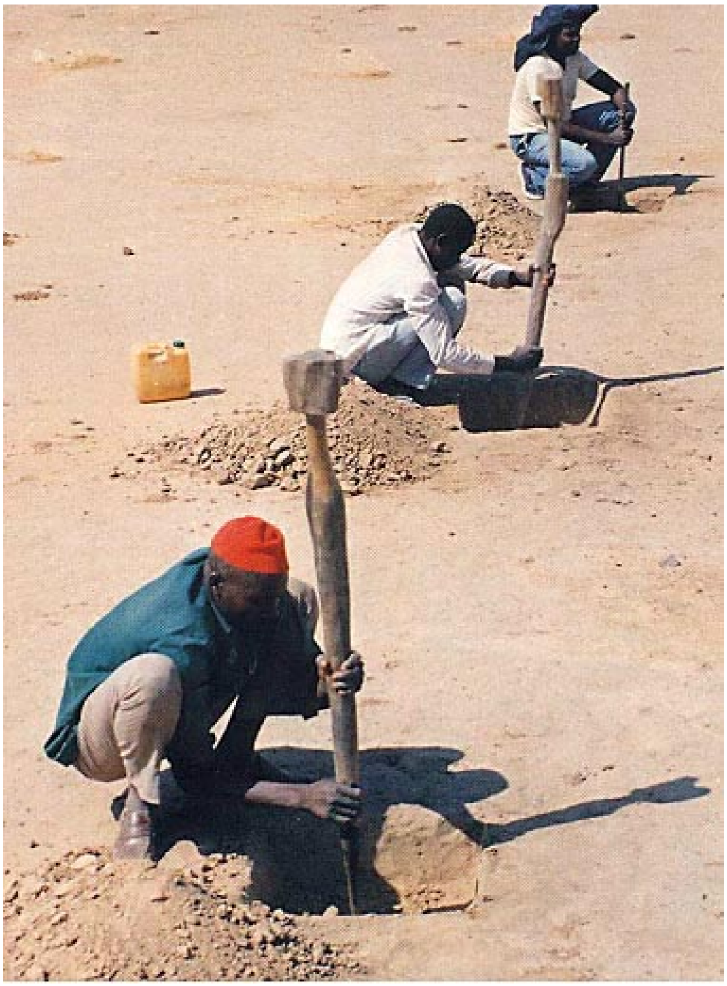
4) Ploughing with bulldozer (40 cm deep);

5) Planting holes (40x40 and 40 cm deep). (See Picture 1)

Agroforestry techniques involved the following two groups of tree species planted at a spacing of 4x4 m:

(a) Exotic Species

- *Azadirachta indica* (for fuelwood, medicinal, pesticidal usage)
- *Eucalyptus camadulensis* (for poles, and fuelwood); and
- *Dalbergia sissoo* (for fodder)



Picture 1: Making Planting Holes in a Degraded Land Area in Need of Rehabilitation

(b) Indigenous Species

- *Acacia nilotica* (for tannins and fuelwood)

- *Acacia senegal* (for gum arabic, fuelwood and fodder); and
- *Sclerocarya birrea* (for wild fruits).

PROJECT INPUTS

Human and financial inputs were also used in the project.

- The human inputs included (a) a research team composed of soil scientists, foresters, hydrologists, and social scientists; (b) local farmers used mainly as hired labour.
- The financial inputs included the costs of preparation and establishment of the different techniques:
    - Ploughing with bulldozer at USD 384 /ha;
    - Small dams at USD 268/ha;
    - Zai method at USD 317/ha;
    - Half-moon at USD 217/ha;
    - Planting holes at USD 134/ha.

RESULTS

After two years of rehabilitation work, the project site is now in a much better position of recovery as indicated by Picture 2. One could measure the improvement in the site by comparing the severely degraded site as seen in Picture 1 with Picture 2. Four years later, further improvement in the project site is observed as pictured on Picture 3.

Picture 2: A View of the Project Site after 2 Years of Rehabilitation Work

The survival of different tree species varied considerably. Indigenous species (Table 1) were more tolerant to drought (see percentage of survival of species established in planting holes) than exotic species. Exotic species showed faster growth, which seemed to stabilize 4-5 years after planting. Thinning exotic species after 4 or 5 years seemed best to boost their growth. Local species showed a slow but extended growth period. The evidence indicates that farmers can use both exotic and indigenous tree species in addressing their wood need strategies. Early-maturing exotic species could be harvested for poles and firewood, while local species are conserved and harvested later for fruit, timber and other purposes.

Table 1: Growth (in cm) and Survival (%) of Selected Tree Species after 4.5 Years of Planting

	Soil Preparation Regimes			
Species	Ploughing with bulldozer	Small dams	Ploughing with hoe	Planting hole
Azadirachta indica	358 cm; 80%	392 cm; 80%	434 cm; 80%	314 cm; 58%
Acacia nilotica ssp. astringens	295 cm; 91%	328 cm; 94%	360 cm; 96%	207 cm; 77%
Dalbergia sissoo	426 cm; 65%	416 cm; 64%	455 cm; 45%	336 cm; 32%
Sclerocarya birrea	233 cm; 91%	216 cm; 96%	207 cm; 87%	138 cm; 89%

Source: Jean M. Harmand. 1993. BFT Cah. Sc. N°11

Acacia senegal (see Table 2) confirms the tolerance of indigenous tree species to drought. The survival of the species is not significantly different from one treatment to the other. But the microcatchments put in place with various methods to reduce runoff and to increase water storage for the benefit of the trees, have significantly increased the growth of these trees.

Table 2: Performance of *Acacia Senegal* after 4.5 Years of Planting under the Different Treatments.

Treatments	Survival rate (%)	Growth (cm)	Cost (USD)/ha
Zai method	88	295a	317
Small dams	88	280b	268
Half-moon	88	280b	217
Planting holes	82	230c	134

Source: Harmand, BFT Cah.Sc. N°11, 1993.

Note: Growth rates followed by the same alphabetic letter are not significantly different at the 95% level.

Table 5 shows that an investment of 62 % above the cost of creating a planting hole only increases the growth rate of the species by 22 %. Whether this return (growth rate) warrants the additional investment is yet to be determined and whether the costs of the treatments under farmers' conditions would be different from the ones indicated here is another issue to be resolved by future investigations.

Picture 3: A View of the Degraded Site 4/6 Years after the Rehabilitation Project.

REASONS FOR SUCCESS AND LESSONS LEARNT

Success

- Appropriate utilization of scientific background information (past research results on farmers' preferences for tree species and on tree planting distance were utilized in implementing the project).

- Judicious use of farmers' practices and experience (The water-harvesting techniques used in the project were not totally new to the farmers in the area; they were improved version of their traditional practices).

- Judicious integration of tree crops into agricultural systems, yielding diversified products (fuelwood, fodder, poles, wild fruits, medicine and pesticide, tannins and gum arabic).

Shortcomings

- Inadequate participation of farmers in the project. (the project was designed and implemented with little local participation. This may not facilitate adoption of project results by farmers).

- Non-integration of food-crops into the system although the systems designed offered the potential to do so.

- The trials covered a small land area (the associated costs might have been significantly reduced if a wider area had been covered, using machines such as bulldozers and agricultural tractors for land preparation).

RECOMMENDATIONS

Policy

- Political support from public and local authorities is essential for smooth implementation and success of the project;
- Land tenure should be clearly resolved for greater adoption and sustainability.

Management

- Participatory processes should be adopted in project planning and implementation to ensure increased local support and project sustainability;
- Extension services should be associated with the project to ensure timely dissemination of project results.

Research Topics

- Economic and technical feasibility of the system at farm level;
- Alternative and cheaper water-harvesting techniques;
- Identificaton and design of the best agrofroestry practices to improve the existing framing system (studies on alternative useful tree species, micro-catchment design, compatibility of food crops and tree species).