

## Reforestation the Sahel: Farmer Managed Natural Regeneration

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### Summary

Traditional and current reforestation practices are inadequate to reverse the currents of increasing deforestation and desertification in the Sahel. A simple, income generating and self promoting reforestation system called Farmer Managed Natural Regeneration (FMNR) has been developed at Maradi, Niger. This system is based on the natural regeneration and management of tree stems from underground stumps. FMNR provides firewood, building timber, improves crop yields, animal productivity, increases biodiversity, improves the quality of life, gives income and has been used in the reclamation of degraded land. With FMNR, trees are owned by farmers and seen as beneficial. FMNR is self promoting and one of the few sustainable and expanding agro-forestry systems in the Sahel. Its practice where appropriate, has significant potential along with other agroforestry practices to transform the Sahel.

### Resume

Les pratiques classiques et courantes de reboisement ont montré leur limite face à la poussée de la déforestation et de la désertification au Sahel. Une technique de reboisement simple et non coûteux a été développée dans la région de Maradi au Niger, c'est la Régénération Naturelle Assistée.

La technique est basée sur le repérage, la sélection de trois rejets naturels vigoureux et leur protection. Les principales espèces utilisées sont : *Piliostigma reticulatum*, *Guiera senegalensis*, *Acacia albida*, *Annona senegalensis*, *Combretum glutinosum*. C'est une activité qui améliore les conditions de vie des ménages. Elle fournit du bois de chauffe, de service, du fourrage pour les animaux. La Régénération Naturelle Assistée permet d'améliorer le rendement des cultures et joue un rôle important dans la récupération des sols dégradés.

Cette technique agroforestière bien appropriée par les producteurs, constitue un système durable à diffuser dans les autres régions du Sahel.

## **Introduction**

It has been estimated that deforestation is proceeding at a rate at least 30 times greater than reforestation in many sub-Saharan countries (FAO, 1997). By the year 2010, the demand for fuel wood in Africa is expected to exceed 953 million cubic meters a year (FAO, 1986). Despite all the expenditure from Overseas Development Agencies on Forestry in Africa, there continues to be a massive scale of deforestation and desertification in the Sahelian zone of sub-Saharan Africa. It is clear that traditional approaches to re-forestation cannot change or reverse the current trends. Small-scale grass roots development projects are the future for development in Africa. The Maradi Integrated Development Program has over the last 20 years experimented with and developed a sustainable village based re-forestation system called Farmer Managed Natural Regeneration (Taylor & Rands, 1991, Rinaudo, 1994; 1999). This paper describes the development of this system and its potential to have significant impact for reforesting the Sahel.

## **Background**

Prior to the 1980's reforestation in Niger was based on a typical western model, that relied on exotic species such as Eucalyptus (*Eucalyptus camaldulensis*) and Neem (*Azadirachta indica*). Expensive central tree nurseries and large projects such as the Ketia Project (80 km north of Maradi) and the Majji Valley windbreaks project (30 km west of Maradi) were not reproducible on a village level. Communities involved with tree planting did not continue once the project ended. Both government forestry services and non-government projects focused on the problem of deforestation and ignored the social understanding of farmers. Farmers resented the forestry service and saw trees as weed competitors on their farms. Because fines were imposed for tree cutting, the farmers rationalized that they should keep their paddock free of trees.

In addition to the growing population, the need for wood for cooking, heating, building and income, together with frequent famines in the 1970's and 1980's lead to food shortages that put great pressure on the forest resources. Wood was one of the few remaining marketable resources, so rapid and extensive de-forestation occurred. Once the trees were removed, barren, infertile, windswept landscapes were the norm. A good farmer was considered one who had treeless land and one who kept his fields free of any regrowth shoots.

Any hope for the future needed to begin with the farmers and a change in the way they cleared the land. The Maradi Integrated Development Project (MIDP) realized that tree planting schemes did not and would not work in the future. Instead, the farmers needed to be persuaded to protect a certain percentage of the naturally regenerating trees on their farms for firewood, diverse products and protection of their crops and the environment. What followed was a conservation and tree production system called Farmer Managed Natural Regeneration (FMNR). This simple farmer managed, sustainable, income generating conservation technique, which began in 1983, has transformed the Maradi region and has the potential to transform the entire Sahelian region.

### **Farmer Managed Natural Regeneration (FMNR): Maradi case study**

A close look at most farmer's fields in the Maradi region shows they produce a massive number of regrowth shoots from underground tree stumps each year. FMNR is a simple technique whereby farmers leave a certain number of shoots per stump and a certain number of stumps per hectare to regenerate in their fields. Excess shoots are then cut and side branches trimmed half way up the stems.

There have been three main phases in the development of FMNR:

1. Modern clearing. Single stems were left from about 40 stumps per hectare and pruned.
2. New modern clearing. A more intensive form of FMNR where 5 stems were left per stump with the idea of harvesting one stem each successive year, while allowing a new stem to replace it. The remaining pruned stems grow rapidly. Stems on 50-100 stumps per hectare were pruned.
3. Every stump gives a profit. Five stems were left and pruned on *every* stump growing on their land for the length of the dry season. Just prior to the cropping season, they then cut out all the stems they do not want.

Although beginning slowing, FMNR was given wider exposure by Food for Work programs during famine years in 1985 and 1989. It has become a standard practice in hundreds of villages in the Maradi region and has extended across other regions of Niger. It is estimated that more than 20 million trees have been naturally regenerated and pruned for multiple uses in the Maradi region over the last 17 years of the MIDP (Evans *et al*, 2001).

The main tree species used for FMNR in the Maradi region have been *Bauhinia reticulata*, *Guiera senegalensis*, *Combretum* and *Ziziphus* spp. Trees that do not hinder crop growth are the most acceptable species for FMNR.

### **Benefits and Weaknesses of FMNR**

There are numerous economic and environmental benefits from the adoption of FMNR:

1. Firewood and building timber is readily available for personal use and for sale. One-year-old poles can bring 30 cfa, and five year old poles up to 1000 cfa. Wood can be sold at any time of year according to need. A 1999 survey of farmers using FMNR showed that 76% used wood from their own fields for cooking and 48% had surplus wood for sale. The average income per farmer from wood sales in 1998 was 17, 465 cfa (2 months of food for one family), but some farmers earned more than 150,000 cfa depending on the intensity of their FMNR (Evans, 1999).
2. Reclamation of degraded land increased significantly with FMNR because of the availability of organic matter. Leaves, twigs and small branches placed on hardpan areas are rapidly incorporated into the soil profile by termites. This improves the soil structure and breaks the hardpan, thus allowing good infiltration and reduced soil erosion. In addition, wind passing over the debris deposits significant amounts of silt and fine

organic matter. Within only one season totally unproductive hardpans can be restored to fertile fields.

3. Crop yields and animal productivity are improved. Grazing animals are attracted to edible tree pods so spend more time on the farms and depositing manure. Trees provide shelter and shade for crops, reduce evaporation, soil temperatures, and soil erosion, and provide valuable mulch which improves soil fertility. With FMNR farmers have enough wood for cooking and building requirement so crop residues are left on the fields for mulching. These residues also attract windblown silt and rapidly build soil fertility so greatly enhance crop production.
4. Increases in biodiversity have a positive effect on the entire region. 79% of farmers surveyed noticed increased wildlife diversity. Animals and birds have re-entered the region along with many predatory insects that reduce the need for pesticides and hence restore a balance in the ecosystem.
5. Income generated from sales of firewood and timber in the local economy is significant.
6. The quality of life improves markedly as wind speeds and dust load are reduced. Shade is available and the landscape is returning to a natural savanna with multi-purpose trees and shrubs.
7. Promotion of FMNR by participating farmers enables FMNR to “sell itself”, making it one of the few truly sustainable and expanding agro-forestry practices in the Sahel.

Some of the weaknesses and constraints of FMNR include:

1. Competition with other forms of tree cover (such as Australian Acacia’s and nursery trees) has been very high as FMNR has a low labour requirement, gives quick returns and immediate results compared to the more labour intensive, high-cost tree nurseries which generally give poorer results.
2. The presence of live stumps of suitable tree species is essential for FMNR. However, large areas of land devoid of tree stumps which have been re-vegetated by tree planting and direct seeding have subsequently been managed using FMNR.
3. Droughts reduce the impact of FMNR as farmers are often forced to cut trees for income during famine times. Trees that coppice however, have a very high recovery rate, so that FMNR can be readily restored when seasons improve.
4. Proximity to markets may limit the establishment of FMNR. Wood prices are lower in rural areas, but because the wood shortage is so great in Niger, farmers still benefit greatly from FMNR that is distant from markets.
5. Climate is a significant barrier to FMNR in lower rainfall areas where tree growth rates are slower. This will require modifications to FMNR practices.
6. Cultural values are also a significant barrier to the adoption of FMNR. Ownership and security of land tenure, and respect for property varies with cultures. Innovation and individuality are often ridiculed in subsistence farming communities. Farmers and herders have different perceptions of the value of trees and natural resources. Inappropriate forestry laws where farmers are not allowed to cut trees on their own land would have a negative impact on FMNR.

## **Reasons for the success of FMNR**

There are multiple reasons for the success of FMNR in the Maradi region. Perhaps the single most important factor has been the change in farmers perceptions that trees are no longer “nuisance weeds” or “crop competitors” to one where trees are an integral part of sustainable farming, improve crop productivity and generate income.

Other reasons include:

- The desperate need for wood.
- Wide exposure in the district through teaching and demonstration via Food for Work programs and trust in the MIDP extension staff.
- FMNR spread from farmer to farmer without dependence on projects.
- Farmers were given ownership of trees on their own land.
- The development of a culturally appropriate and community based regulatory system ensured farmers trees were protected.
- The FMNR is simple, profitable and required only the farmer’s labour.
- Trees were quickly recognized as useful and crop yields improved.
- There was increased fodder available for livestock.

## **Future Research**

In the Maradi region, most of the necessary research has been completed and successful adoption of FMNR has occurred. Farmers are free to experiment and adopt modifications according to their particular conditions and circumstances. The challenge now remains for national and regional (Sahelian zone) adoption.

In other regions of Niger and Sahelian countries, research should be done to identify regions suitable for FMNR and the local tree species that could be used. Simple experiments with small groups of farmers with these tree species should be done to test the validity and suitability of the regeneration process. Perceived barriers to the successful implementation of FMNR should be assessed along with climate and cultural challenges.

## **Collaborative regional activities**

FMNR is a farmer based agroforestry practice. Therefore any regional collaborative activities need to be with appropriate grass roots development projects, government extension agencies, appropriate community groups or farmers clubs.

Development agencies and interested technicians working with farmers are welcome to visit the MIDP at Maradi for training and field demonstrations of FMNR.

## **Conclusion**

FMNR has been the most significant output from the MIDP over the last 20 years and where practiced has transformed the landscape to provide a sustainable agroforestry system. In view of the current inadequate approaches to re-forestation and the ever-increasing demand for wood products in the Sahel, FMNR where practicable, should be given high consideration and widely promoted as both an important re-forestation process and a sustainable agroforestry system. It is low cost, gives rapid economic returns, is easy to implement and restores the environment. Its great potential is based on a people movement of farmers with changed perceptions and hope for the future.

Together with other agroforestry practices that aim to introduce and re-introduce important tree species into the Sahel, FMNR has enormous potential to impact the whole Sahelian region and to provide a much needed boost to the welfare of communities caught in a downward cycle of poverty.

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