

# The development of Farmer Managed Natural Regeneration

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Conventional methods of reforestation in Africa have often failed. Even community-based projects with individual or community nurseries struggle to keep up the momentum once project funding ends. The obstacles working against reforestation are enormous. But a new method of reforestation called Farmer Managed Natural Regeneration (FMNR) could change this situation. It has already done so in the Republic of Niger, one of the world's poorest nations, where more than 3 million hectares have been re-vegetated using this method. Farmer Managed Natural Regeneration involves selecting and pruning stems regenerating from stumps of previously felled, but still living trees. Sustainability is a key feature of the programme which requires very little investment by either government or NGOs to keep it going. The story in Niger can offer valuable insights and lessons for other nations.



Photo: Author

Children helping to source firewood.

## The situation in Niger

The almost total destruction of trees and shrubs in the agricultural zone of Niger between the 1950s and 1980s had devastating consequences. Deforestation worsened the adverse effects of recurring drought, strong winds, high temperatures, infertile soils and pests and diseases on crops and livestock. Combined with rapid population growth and poverty, these problems contributed to chronic hunger and periodic acute famine.

Back in 1981, the whole country was in a state of severe environmental degradation, an already harsh land turning to desert, and a people under stress. More and more time was spent gathering poorer and poorer quality firewood and building materials. Women had to walk for miles for fuel such as small sticks and millet stalks. Cooking fuel was so scarce that cattle and even goat manure was used. This further reduced the amount of fodder available for livestock and manure being returned to the land. Under cover of dark, people would even dig up the roots of the few remaining protected trees. Without protection from trees, crops were hit by 60 - 70 km/hour winds, and were stressed by higher temperatures and lower humidity. Sand blasting and burial during wind storms damaged crops. Farmers often had to replant crops up to eight times in a single season. Insect attack on crops was extreme. Natural pest

predators such as insect eating birds, reptiles, amphibians and beneficial insects had disappeared along with the trees.

## Conventional approaches

The severe famine of the mid 1970s led to a global response. Stopping desertification became a top priority. Conventional methods of raising exotic tree species in nurseries were used: planting out, watering, protecting and weeding. However, despite investing millions of dollars and thousands of hours labour, there was little overall impact. Conventional approaches to reforestation faced insurmountable problems, being costly and labour intensive. Even in the nursery, frogs, locusts, termites and birds destroyed seedlings. Once planted out, drought, sand blasting, pests, competition from weeds and destruction by people and animals negated efforts. Low levels of community ownership and the lack of individual or village level replicability meant that no spontaneous, indigenous re-vegetation movement arose out of these intense efforts. Meanwhile, established indigenous trees continued to disappear at an alarming rate. National forestry laws took tree ownership and responsibility for care of trees out of the hands of the people. Even though ineffective and uneconomic, reforestation through conventional tree planting seemed to be the only way to address desertification at the time.

## Discovering Farmer Managed Natural Regeneration

In 1983, the typical rural landscapes in the Maradi Department in the south of Niger, were still windswept and with few trees. It was apparent that even if the Maradi Integrated Development Project, which I managed, had a large budget, plenty of staff and time, the methods being employed would not make a significant impact on this problem. Then one day I understood that what appeared to be desert shrubs were actually trees which were re-sprouting from tree stumps, felled during land clearing. In that moment of inspiration I realised that there was a vast, underground forest present all along and that it was unnecessary to plant trees at all. All that was needed was to convince farmers to change the way they prepared their fields.

The method of reforestation that developed is called Farmer Managed Natural Regeneration (FMNR). Each year, live tree stumps sprout multiple shoots. In practising FMNR the farmer selects the stumps she wants to leave and decides how many shoots are wanted per stump. Excess shoots are then cut and side branches trimmed to half way up the stems. A good farmer will return regularly for touch up prunings and thereby stimulate faster growth rates. The method is not new, it is simply a form of coppicing and pollarding, which has a history of over 1000 years in Europe. It was new, however, to many farmers in Niger who traditionally viewed trees on farmland as "weeds" which needed to be eliminated because they compete with food crops. There is no set system or hard and fast rules. Farmers are given guidelines but are free to choose the number of shoots per stump and the number of stumps per hectare that they leave, the time span between subsequent pruning and harvest of stems, and the method of pruning.

Acceptance of this method was slow at first. A few people tried it but were ridiculed. Wood was a scarce and valuable commodity so their trees were stolen. A breakthrough came in

## FMNR in practice

1. FMNR depends on the existence of living tree stumps in the fields to be re-vegetated. New stems which can be selected and pruned for improved growth sprout from these stumps. Standard practice has been for farmers to slash this valuable re-growth each year in preparation for planting crops.



2. With a little attention, this growth can be turned into a valuable resource, without jeopardizing, but in fact, enhancing crop yields. Here, all stalks except one have been cut from the stump. Side branches have been pruned half way up the stem. This single stem will be left to grow into a valuable pole. The problem with this system is that when the stem is harvested, the land will have no tree cover and there will be no wood to harvest for some time.



3. Much more can be gained by selecting and pruning the best five or so stems and removing the remaining unwanted ones. In this way, when a farmer wants wood she can cut the stem(s) she wants and leave the rest to continue growing. These remaining stems will increase in size and value each year, and will continue to protect the environment and provide other useful materials and services such as fodder, humus, habitat for useful pest predators, and protection from the wind and shade. Each time one stem is harvested, a younger stem is selected to replace it.



Species used in this practice in Niger include: *Strychnos spinosa*, *Balanites aegyptiaca*, *Boscia senegalensis*, *Ziziphus spp.*, *Annona senegalensis*, *Poupartia birrea* and *Faidherbia albida*. However, the important determinants of which species to use will be: whatever species are locally available with the ability to re-sprout after cutting, and the value local people place on those species.

1984, when radio coverage of an international conference on deforestation in Maradi helped to increase awareness of the link between deforestation and the climate. This was followed by a Niger-wide severe drought and famine which reinforced this link in peoples' minds. Through a "Food for Work" programme in Maradi Department, people in 95 villages were encouraged to give the method a try. For the first time ever, people in a whole district were leaving trees on their farms. Many were surprised that their crops grew better amongst the trees. All benefited from having extra wood for home use and for sale. Sadly, once the programme ended, over two thirds of the 500 000 trees protected in 1984 - 1985 were chopped down! However, district-wide exposure to the benefits of FMNR over a 12-month period was sufficient to introduce the concept and put to rest some fears about growing trees with crops. Gradually more and more farmers started protecting trees, and word spread from

farmer to farmer until it became a standard practice. Over a twenty-year period, this new approach spread largely by word of mouth, until today three million hectares across Niger's agricultural zone have been re-vegetated. This is a significant achievement by the people of Niger. The fact that this happened in one of the world's poorest countries, with little investment in the forestry sector by either the government or NGOs, makes it doubly significant for countries facing similar problems.

## Reasons for the rapid spread

Aside from simplicity, early returns and low cost, other factors contributed to the rapid spread of FMNR. Introducing the method on a district-wide basis with a "Food for Work" programme eliminated much of the peer pressure that early innovators would normally have to endure. As villagers experimented, project staff who lived in the villages were supportive, teaching, encouraging and standing alongside farmers when disputes or theft of trees occurred. This support was crucial, particularly in the early days when there was much opposition to FMNR. As trees began to colonise the land again, excited government forestry agents nominated lead farmers and even project staff for regional and national awards. Often these nominees won prizes, lifting the profile of FMNR. As news began to spread, national and international NGOs, church and mission groups received training and began promoting the method across Niger.

During the development of farmer-managed natural regeneration, farmers did not own the trees on their own land. There was no incentive to protect trees and much of the destruction of that era was linked to this policy. After discussions with the head of the Maradi Forestry Department, project staff were able to give assurances that if farmers cared for the trees on their land they would be allowed to benefit without fear of being fined. These laws were only changed in 2004 after much negotiation by entities such as USAID. Farmers began to access markets without undue hassle. And as trees on farms switched from being nuisance weeds to becoming a cash crop in their own right, this was good motivation for farmers to cultivate them. Over time, locally agreed upon codes and rules with support from village and district chiefs were established. Without this consensus and support for the protection of private property, it is unlikely that FMNR could have spread as fast as it did.

The benefits of FMNR quickly became apparent and farmers themselves became the chief proponents as they talked amongst themselves. FMNR can directly alleviate poverty, rural migration, chronic hunger and even famine in a wide range of rural settings. FMNR contributes to stress reduction and nutrition of livestock, and contributes directly and indirectly to both the availability and quality of fodder. Crops benefit directly through modification of microclimate (greater organic matter build up, reduced wind speed, lower temperatures, higher humidity, and greater water infiltration into the soil), and indirectly through manuring by livestock which spend greater time in treed fields during the dry season. The environment in general benefits as bio-diversity increases and natural processes begin to function again. With appropriate promotion, FMNR can reduce tensions between competing interests for land-based resources. For example, as natural regeneration increases fodder availability (tree pods and leaves), farmers are in a better position to leave crop residues on their fields and are less likely to take offence when nomadic herders want to graze their livestock in the dry season.

Since 2000, World Vision has been promoting this method in a number of other African countries. Malatin André, a Chadian farmer practising it for just two years reported: “Thanks to the new technique our life has changed. Food production has doubled and many people who were laughing at us, have also adopted the techniques for soil regeneration. As a result, there is always good production, the soil is protected from erosion and heat, and women can still get firewood. We have been using the same plot for more than 30 years and without such natural fertilizing possibility, we would soon stop getting food from it”. Khadidja Gangan, a 35 year old Chadian mother of six said: “This year is very exceptional for me because I have been able to get enough sorghum. I cultivated one hectare and harvested 15 bags of sorghum. Generally, I could get three to five bags when working this land in the past. This would have been impossible if I was not taught the new technique of land management”.

### Conditions for success and future challenges

There are, however, still many gaps in our knowledge of natural regeneration. Farmers adapt it to their own personal needs and have different reasons for practising it. Further investigation is needed into various technical aspects, such as the most beneficial spacing, species mix, age to harvest, or type of harvesting, for specific purposes. In addition, legal and cultural considerations and historical relations between stakeholders need to be taken into account. For example, the major difficulties faced in Niger included:



Harvesting millet amongst the naturally regenerated trees in Niger.

- The tradition of free access to trees on anybody’s property and a code of silence protecting those who cut down trees. It was considered anti-social to expose anybody who had felled trees. This tradition was hard to break and those who left trees were often discouraged when their trees were taken by others. This situation was successfully addressed through advocacy, creation of local by-laws and support from village and district chiefs in administering justice. Gradually, people accepted that there was no difference between stealing from someone’s farm and stealing from within someone’s house.
- Fear that trees in fields would reduce yields of food crops. Field results put these fears to rest over time.
- Inappropriate government laws – if the farmer does not have the right to harvest the trees she has protected, there will be little incentive for her to do so. Farmers feared that they would be fined for harvesting their own trees. By collaborating with the forestry service, we were able to stop this from happening.

Other factors also affected the spread of the technique, for example, where language may reflect deeply held attitudes. In Hausa the word for tree (*itce*) is the same as the word for firewood, and therefore trees were seen to have little value of their own, apart from for firewood. Cultural factors may also work against adoption. Traditionally, Fulani cattle herders saw their lifestyle as the best in the world. Initially they found it humiliating to consider harvesting and selling wood, the way sedentary farmers did.

In addition, the practice of FMNR depends on having living tree stumps in the fields to start with. However, in many cases, farmers can successfully broadcast seeds of desirable species which, once established, become the basis of a FMNR system. The number of trees to be left in a field will depend on the number of stumps present and the farmer’s preferences. Some left over 200 trees per hectare, others not even the recommended 40. The “correct” number of trees to be left will be a balance between farmers’ needs for wood and other products, optimal environmental protection and minimal negative effect on crop yields. In areas of low rainfall, growth rates will be slower, and harvest or cutting regime should be reduced accordingly. Also, in low rainfall areas, establishment of direct sown seeds will take longer and be more difficult than in higher rainfall areas.

In areas where existing species are predominately thorny, or they compete heavily with crop plants, farmers may have second thoughts about FMNR. Where existing tree species are palatable to livestock, the increased effort required to herd animals or protect trees is beyond the reach of many farmers. In many cases however, the species are not palatable and there is no need to exclude animals from the field during the dry season.

### Conclusion

What most entities working in reforestation have failed to recognise is that vast areas of cleared agricultural land in Africa retain an “underground forest” of living stumps and roots. By simply changing agricultural practices, this underground forest can re-sprout, at little cost, very rapidly and with great beneficial impact. In other words, in many instances the costly, time consuming and inefficient methods of raising seedlings, planting them out and protecting them is not even necessary for successful reforestation. Presumably, the same principle would apply anywhere in the world where tree and shrub species have the ability to re-sprout after being harvested.

Farmer managed natural regeneration is a cheap and rapid method of re-vegetation, which can be applied over large areas of land and can be adapted to a range of land use systems. It is simple and can be adapted to each individual farmer’s unique requirements, providing multiple benefits to people, livestock, crops and the environment, including physical, economic and social benefits to humans. Through managing natural regeneration, farmers can control their own resources without depending on externally funded projects or needing to buy expensive inputs (seed, fertilizers, nursery supplies) from suppliers. Its beauty lies in its simplicity and accessibility to even the poorest farmers, and once it has been accepted, it takes on a life of its own, spreading from farmer to farmer, by word of mouth. ■

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### Reference

- National Academy of Sciences, 1980. **Firewood crops. Shrub and tree species for energy production**. N.A.S., Washington, DC, U.S.A.