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# **Prospects of Farmer Managed Natural Regeneration (FMNR) in Madaroumfa Village, Maradi Department, Republic of Niger**

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## Abstract

Most conservation projects in Niger Republic were typically based on ideas developed in the western world; particularly in societies and cultures entirely different from those in West Africa. These were remarks of Tony Rinaudo, the creator of the Farmer Managed Natural Regeneration. In order to conserve the environment, large, costly projects he added, were established to produce exotic species, particularly eucalyptus (Eucalytus camaldulensis), neem (Azadirachta indica) and Prosopis juliflora. These projects have indeed failed to give lasting benefits and the result was that most indigenous trees were lost. Consequently, local techniques of conservation which were relegated have to be promoted in order to restore lands that were preserved intuitively long before the external projects. One such technique is the Farmer Managed Natural Regeneration. The aim of the study is to examine the prospects of Farmer Managed Natural Regeneration (FMNR) in Madaroumfa Village of Niger Republic with a view to enlighten people on the prospects of ancestral technique for better management of resources such as vegetation. The technique brings hope by restoring vegetation in the Maradi area. A total of 70 respondents were identified using snowball sampling technique. These are farmers identified to be practising FMNR in the area. Results of the study found that 70 farmers interviewed practice FMNR and regenerated 340 species of which 191 survived in 5 years. Species mostly raised are; Fadherbia albida, Magnifera indica, Combretum glutinosum, Acacia camphylacantha, Ficus thonningii, Azadirachta indica, Adansonia digitata, Butyrespermun parkii, Moringa oleifera, Parkia biglobosa, Acacia nilotica, Proposis Africana and Jathropha curcas. The results show that FMNR is an adaptive strategy in Madaroumfa area of the Maradi Deppartment. It was recommended that FMNR should be promoted by providing incentives to farmers who raised certain number species annually.

# **Keywords**

Farmer Managed Natural Regeneration, Adaptive Strategy, Madaroumfa

# 1. Introduction

The environmental picture for Niger is challenging. Niger's natural environment is in dire straits. Natural vegetation of Niger has been strongly affected by human interference and the combined effects of the drying climate, and is now so sparse that its present composition is only a pale reflection of what it was originally (David, 2008). Being a Sahelo-Saharan country, Niger is at constant risk from drought, desertification and of course climate variability. Natural vegetation of Niger has been strongly affected by human interference and the combined effects of the drying climate, and is now so sparse that its present composition is only a pale reflection of what it was originally. By 1980, Niger's forested area which was estimated at 14 million hectares was reduced to 9 million hectares, with 6 million hectares in the Sahel-Sahara zone, 2.6 million hectares in the

Sahel, and 300,000 hectares in the Sahel-Sudan zone (David, 2008). In the regions of Agadez, Diffa, Zinder, Tillabery, Tahoua and Maradi, wind erosion and movement of sand dunes is the most important environmental degradation, effecting both natural resources (water) and man-made infrastructure (roads). Forests and protected areas are subjected to threats not only due to recurrent droughts, but also due to agricultural use and abusive exploitation with the use of fire. Threats to biodiversity are particularly widespread in the Tahoua, Maradi and Zinder regions were high human densities are recorded in Niger. As a result of this, important conservation actions have been taken in Niger at the political level particularly expressed in the Strategic Action Plan for Poverty Reduction and more specifically in the Rural Development Strategic Plan (UN and Government of Niger, 2005). Despite huge amount are spent on projects and action plans, some could not make lasting impressions because the targeted communities remain without adequate consultation (Rinaudo, 2008). Hence, renewed efforts are still required to forestall these situations. Such efforts should and most consider local people in their formulation and implementation for any lasting benefit is recorded.

An examination of conservation efforts in Niger Republic revealed that people still value ancestral practices to conserve and rehabilitate the environment. Several studies including Mortimore and Adams (2001) and Mortimore et al. (2001) have verified the effectiveness of ancestral practices in rehabilitating degraded environment. Of these techniques, Farmer Managed Natural regeneration (FMNR) which is the systematic regeneration and management of underground forest has become a catalyst for large scale people-led environmental restoration. FMNR is cheap, rapid, locally led and implemented, uses local skills and resources and has been highly successful (Rinaudo, 2008). Tentative steps to introduce Farmer Managed Natural Regeneration (FMNR) commenced in 1983, in the Maradi Region of Niger Republic. Twenty-seven years later, the results have been amazing, with FMNR being practiced in one form or another across Niger and beyond (Rinaudo, 2010). Tougiani et al. (2008) reported that since 1983, FMNR has been introduced in 18 countries across Sub-Saharan Africa, Southeast Asia, Timor-Leste, and most recently India, Haiti and also in the boarders between Nigeria and Niger Republic. Countries where FMNR is practiced include: Senegal, Mauritania, Mali, Burkina Faso, Ghana, Niger, Chad, Uganda, Rwanda, Tanzania, Malawi, Ethiopia, Kenya, India, Myanmar, Indonesia, Timor-Leste, Haiti and Nigeria, (Larwanou, 2006).

FMNR which is the systematic regeneration of 'underground forest' is highly imperative. Because FMNR can become a grass roots movement, large areas of land can be 're-treed' rapidly and for little or no cost, resulting in increased bio-diversity and benefits to people (such as firewood and building material for household use or income generation) (Rinaudo, 1999). According to Rinaudo (2008) FMNR is a simple method of reforestation that consists of coppicing and pollarding the trees on farm. While engaged in FMNR, the farmer selects the stumps he wants to leave in his farm and decides how many shoots are wanted per stump. FMNR answers the dilemma which many conventional western forestry methods were unable to achieve (Rinaudo, 2010). FMNR can also play an important role in maintaining not-yet-degraded landscapes in a productive state, especially when combined with other sustainable land management practices such as conservation agriculture (Rinaudo, 2012). As explained in more detail below, the benefits of FMNR were also seen to extend to the environment, soils, crops and livestock (Rinaudo, 2008). Since its introduction in Niger in 1983, it is now used across more than 5 million hectares (LEISA, 2007). In addition to FMNR, exotic and domesticated local plant species are being promoted.

One of the more immediate and obvious benefits of FMNR is the availability of fuelwood from pruned tree branches. FMNR has had especially important benefits for women, who have been relieved significantly of the burden of gathering fuelwood, with average time spent on fuelwood collection falling from 2.5 hours to half an hour (Rinaudo, 1999). Rinaudo (2010) mentioned that because of FMNR, large areas of land can be 're-treed' rapidly and for little or no cost, resulting in increased bio-diversity and benefits to people in form of firewood and building material for household use or income generation. By 2004 it was ascertained that FMNR was being practiced on over five million hectares or 50 percent of Niger's farmlands - an average reforestation rate of 250,000 hectares per year over a 20 year period (Hertsgaard, 2009). In a twelve-year period, it was conservatively estimated that US\$ 600,000 worth of wood was sold as a result of practising FMNR in Maradi (1994-1997 MIDP Summary Report) and by 2008 total gross income in the region had increased by between 17 and 21 million dollars per year due to FMNR (Haglund et. al, 2009). Awaiss (2000) mentioned that biodiversity among tree species is apparently greatest in the northern parts of the Maradi department where défrichement amelioré is most widespread.

FMNR is an example of a climate compatible development practice that evolved through a partnership among grassroots stakeholders (in these case, farmers), external experts and supporters. According to experts the Fadherbia albida parkland in the Diourbel region of Senegal stores 30 tons of carbon/ha (Cameron, 2011). If farmers protect and maintain their on-farm trees, it is reasonable to assume that carbon sequestration in parklands of Senegal can increased. Today almost half of all cultivated land in Niger is studded by trees, shrubs and crops; between a quarter and one half of all farmers have adopted and promoted FMNR, and at least 4.5 million people are reaping the benefits - on approximately five million hectares of land. Local communities are moving from vulnerability towards greater resilience as FMNR brings increased crop production, income and food security to impoverished rural communities. There is also anecdotal evidence to suggest that FMNR has climate mitigation benefits (Cameron, 2011).

This case study examines FMNR as smallholder tree conservation strategy. FMNR is a very simple technology. Relatively many studies have been conducted on the impact of the technique in Niger. However, few demonstrate its specific prospects in rejuvenating trees at local level in the area. This may be a reason why most adaptive technologies of the African smallholders are still not regarded by many. African smallholder communities are indeed managers of their ecology as indicated in this study.

# 2. Description of the Study Area

Niger is located in the heart of West Africa in what is referred to as the Central Sudan. Two-thirds of the country falls in the Central Sahara region. The national borders, revised sever-1 times by the French during the colonial period, are delineated at 12°N and 24°N (at the Tropic of Cancer) latitude and 00° and 16°W longitude. Bordered on the north by Algeria and Libya, on the east by Mali, on the west by Chad, and the south by Burkina Faso, Benin, and Nigeria, Niger is a landlocked country measuring 1,267,000 sq. km.

The Maradi department of the southern Niger is one of the eight Regions of Niger Republic. It is located in south-centre Niger, east of the Region of Tahoua, west of Zinder, and north of Nigeria's city of Katsina. The Maradi department shares border with Nigeria's Katsina and is located between latitude 12°59<sup>I</sup>N and 13.5°N and longitude 7.1°E and 7°36<sup>I</sup>E. This is one of 23 most densely populated areas in West Africa because of its density of over 200 inhabitants per sq. km (Abdoul and Trémolières, 2007). Madaroumfa village is located between latitude 13°18.222<sup>I</sup> N and 130 18.223<sup>I</sup> N and longitude 07°09.521<sup>I</sup> E and 07°09.522<sup>I</sup> E. Madaroumfa remains the largest administrative sub-division of the Maradi region and the largest of the six departements in the region. It has the population of 598, 803 people (Institute National de la Statistique du Niger, 2012) living on land area of 3773 Km<sup>2</sup>.

The climate of the study area is the 'Aw' type as determined by Koppen in which distinctive wet and dry seasons are caused by the fluctuations of the ITCZ (Intertropical convergence zone) or the ITD south to north (rainy season), vice versa (dry season) and meeting at a front. The peak of rainfall in such environments is always August as noted by Mortimore and Adams (2001) and the rainfall is mostly insufficient, unreliable and unpredictable (Mortimore, 1989). Temperature is more extreme in the Maradi area during the dry season reaching over 42°C in the day. The distribution of rain in the Maradi department greatly influences vegetation resources of the area.

The vegetation of parts of Maradi (where Madaroumfa is situated) is composed of indigenous species which grow spontaneously. The trees found include *Parkia biglobosa, Adansonia digitata, Khaya senegalensis, Fadherbia albida, Tamarindus indica, and Borassus aethiopum, and exotic species Azadirachta indica, Eucalyptus camaldulensis.* 

#### 3. Methods

#### **3.1. Population and Sampling Procedure**

The target population consist of all farmers practicing FMNR in Madaroumfa village. However, because there is no population frame, snow ball sampling technique was used to select respondents for the study. Accordingly, two key informants were selected in the village who identified 10 practising farmers in the study area. These 12 respondents later identified a total of 58 farmers who are practising FMNR in the study area. The composition of respondents is presented in table 1 below.

Table 1. Composition of Respondents for the Study.

Age Range	Males	Females
20-30	5	6
31-40	20	5
41-50	22	1
51-60	8	0
60+	3	0
Total	58	12

Source: Field work (2015)

Most respondents (whose ages are between 20-60 years) mentioned that they grew up and see their people practising FMNR in the area. This showed that the practice intuitively passed on by elders in the area. Personal communication with a respondent revealed that the practice has been there before it's re-introduction in this name by development partners in the 1980s (M. Gambo, pers. comm.). Findings showed that females are continuously losing their status as farmers in the area as more lands are chased away from them through inheritance. The area's customary laws regulating land ownership through inheritance favours male when it comes to sharing deceased properties.

Even though the population is relatively homogenous and consists of farmers, some level of heterogeneity was observed regarding the perception of people on the practice. This necessitates the use of stratified sampling method to sort the respondents into three groups namely A, B, C. The number as well as the composition of respondents of each group is given in table 2.

Table 2. Sample of Respondents for the Study.

Groups	No. of respondents
Group A	19
Group B	22
Group C	29
Total	70

#### 3.2. Procedures for Data Collection and Analysis

Interview schedule which consist of semi-structured questions was used to acquire data from the respondents. Data collection was conducted between August and September in 2015. Data collected was presented in tables and bar graph.

# 4. Results and Discussion

This section presents the findings of the study and discussions in appropriate sections.

#### 4.1. Number of Trees Raised under FMNR in Madaroumfa Village

The number of trees regenerated by respondents is depicted on Table 3. That result corroborates the findings of Joet et al., 1996 who reported that the practice of défrichement amelioré (FMNR in French) is widespread across the Maradi department. It also vouched Awaiss (2000) that FMNR is especially dominant in northern parts of Maradi around Madaroumfa. This practice, which consists of protecting valuable species when clearing land for cultivation, is an indigenous form of management that was promoted by the PDRM and forestry services during the 1980s (Mortimore et al., 2001). Mortimore et al. (2006) reported that the practice of protecting naturally regenerating trees on farms is known to all farmers in Niger Republic and this create awareness of threatened species and the economic value of trees. Niger has seen an increase of tree coverage on 3 million hectares of agriculture lands, more than 120 million trees have been protected and managed by farmers since 1980 (Rinaudo, 2010).

Table 3. Number of Trees Raised under FMNR in Madaroumfa Village.

Years	No. of Shoots Regenerated	No. Survived
2009	55	37
2010	60	25
2011	51	24
2012	62	40
2013	44	31
2014	68	34
Total	340	191

Results in Table 3 showed that respondents have regenerated a total of 340 trees on their farms in five years through FMNR. The result further showed that about 191 species survived within the period under review. This shows high level of acceptance of the technique among the farmers and further demonstrates their willingness to invest in the practice in an area. Respondents mentioned that species such as *Fadherbia albida* and *Azadirachta indica* are regenerated annually by farmers in Madaroumfa village. This is visibly clear in eastern part of the village were continuous cover of the two species overtakes the ones sparsely vegetated area. This is in line with findings of study conducted by Wezel and Schlecht (2004) that in South Western Niger where fallow plots were monitored for 3-5 years.

## 4.2. Diversity of Species Regenerated in Madaroumfa Village

Trees species tending is an ancestral practice of people in Africa even without stiff laws because people of the area are conscious of the benefits of vegetation. Though increasing tree densities of vegetation are recorded in the Maradi area as a result of protecting natural tree regeneration (*défrichement*  *amélioré)*, villagers opined the practice also results in much more diverse flora in Madaroumfa. This affirms the findings of several studies of biotic diversity in West Africa.

Result in Table 4 indicates that the number and diversity of trees raised through FMNR in Madaroumfa is high. A total of 340 trees are regenerated in five years. The number of species regenerated varies according to group of respondents. Group A (90 species), Groups B (60 species) and Group C (190 species). This demonstrates unique acceptability of FMNR among respondents in the study area. Most species raised were found to be resilient ones which is an indication of peoples' wide knowledge of the changing ecological conditions of the area. All species regenerated are indigenous except Azadirachta indica and Magnifera indica. These species are highly resilient and needed by people for multipurpose uses in the area. The results proved that unpromising economic and climatic conditions of Madaroumfa village is not a barrier to tree regeneration courtesy of FMNR

Table 4. Species Regenerated Through FMNR in Madaroumfa Village.

Group of	Type of Species	No.	No.
Respondents	regenerated	regenerated	survived
Group A	Fadherbia albida	46	33
	Magnifera indica	13	10
	Combretum glutinosum	06	2
	Proposis africana	05	2
	Acacia camphylacantha	01	0
	Ficus thonningii	06	4
	Adansonia digitata	13	7
	Total	90	58
Group B	Fadherbia albida	28	18
	Magnifera indica	10	08
	Butyreospermun	0.9	02
	paradoxum	08	03
	Moringa oleifera	12	10
	Parkia biglobosa	02	01
	Total	60	40
Group C	Azadirachta indica	60	40
	Parkia biglobosa	60	30
	Fadherbia albida	10	04
	Tamarindus indica	49	24
	Adansonia digitata	10	03
	Acacia nilotica	20	07
	Proposis Africana	30	20
	Jathropha curcas	07	04
	Total	190	93
	Grand Total	340	191

Result in Table 4 corroborates the findings of Mortimore *et al.* (2006) that the practice of protecting naturally regenerating trees on farmland has become widely accepted in villages of the Maradi departement. It also corresponds with the findings of World Resource Institute, (2008) that widespread adoption of FMNR in Niger was similarly facilitated by the governments and NGOs. Among the species raised, *Acacias, Fadherbia* and some enclave species such as *Magnifera indica* are most cherished because they form part of livelihood of the rural population of the area. This buttresses that findings of Joet *et al.* (1998) and Larwanou (2011) that due to FMNR the Maradi area regains its

diversity of trees that was lost after the drought of 1970s. Among the species that are raised in the village, Acacia Adansonia digitata, Annona senegalensis. nilotica. Azadirachta indica. Faidherbia albida. Ficus gnaphalocarpa, Prosopis africana, Khaya senegalensis, Mangifera indica, Tamarindus indica, Eucalyptus spp and Psidium guajava are dominant. Danjuma (2010) found that woody species of various socio-economic and ecological values are relatively managed through FMNR in Madaroumfa village.

# 5. Conclusion

Biodiversity is key to how well people can be resilient to harsh environmental conditions, how effectively landscapes support livelihoods and in reducing the adverse impacts of climate change. Biodiversity issues suffer from insufficient integration into broader policies, and stringent strategies and programs at international, national and local levels are mostly far from being functional. Future initiatives must start to overcome the lack of connecting local practices in conservation.

Farmers' innovations can match some cutting edge adaptation strategies to environmental uncertainties. While scientists and policymakers work to find solutions, local farmers have already amassed considerable experience of how to cope, based on their observation and experimentation in the field. Yet compared to practices of the smallholders, farmer managed natural regeneration is widely noted as a way of improving livelihoods through trees.

## Recommendations

Practices such as the FMNR need to be scaled up and multiplied to encourage the direction of large-scale funding towards local solutions. Thus, the study recommended that policy implementers should consider smallholders in all aspects of land management decisions. This is can be achieved by supporting the local actors financially or otherwise and integrating the programs in the curriculum of schools so as to 'catch them young'.

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