

Chapter I

Introduction to Farmer Managed Natural Regeneration

Summary: Introduction to Farmer Managed Natural Regeneration

- Deforestation and severe land degradation have contributed to considerable poverty around the world.
- Farmer Managed Natural Regeneration (FMNR) is a low-cost, simple, sustainable land regeneration practice that communities can use to restore their land, increase their productivity and build resilience relatively quickly and efficiently.
- FMNR is equally a tree management practice, involving selection, pruning, protection and maintenance, and a community empowerment practice, re-greening both community mindsets and people's relationships to nature and their landscape.
- The central principles of FMNR are:
 1. The systematic pruning and management of existing indigenous trees and shrubs by the land user.
 2. An overall increase in tree/shrub coverage and biomass across the landscape.
 3. An improvement in the ecological functionality and therefore human well-being (economically and socially) in the landscape being managed with FMNR.
- FMNR is a biophysical natural resource management practice and a foundation for sustainable development interventions, including disaster risk reduction; water, hygiene and sanitation; climate change mitigation and adaptation.
- There is a global movement of FMNR spreading around the world. All FMNR projects and activities should aim to reach even more people with their approach.

Resources

- Article: [The development of Farmer Managed Natural Regeneration](#)
- Video: [Everything is connected](#)
- Video: [Tony Rinaudo: the Niger I came to](#)

The world has experienced severe land degradation due to deforestation, climate change, drought, desertification and unsustainable land uses. Consequently, the productivity and health of farmlands, grazing lands and forests is damaged, which in turn harms the individuals and communities who depend on these resources for their food supply, health and income.

As a result, many rural populations in the developing world suffer from malnutrition, loss of opportunity, increased vulnerability and poverty. Migration increases as workers move away to earn a living, which can also lead to family fragmentation and increased potential for conflict. This is not a safe or sustainable future for rural communities. Nor does it help the growth of nations reliant on primary industries, such as agriculture.

But this is changing.

Communities across the world are transforming their lives and reshaping their lands through a low-cost, simple and sustainable land regeneration practice called Farmer Managed Natural Regeneration (FMNR). Through FMNR and their own efforts, communities can restore degraded lands to productivity relatively quickly and efficiently. When land productivity is restored, livelihoods can be restored, which in turn can enable communities to pull themselves out of poverty. Communities are empowered to gain control of their resources and nurture a sense of hope that comes through the FMNR approach.

Restoring ecosystem health also builds resilience – of people, their lands and their livelihoods – so the severity and impacts of environmental shocks such as drought, flood, extreme storms and insect attacks are decreased. Communities in turn are less likely to suffer total loss, having a more diverse natural resource base to draw from and recover with.

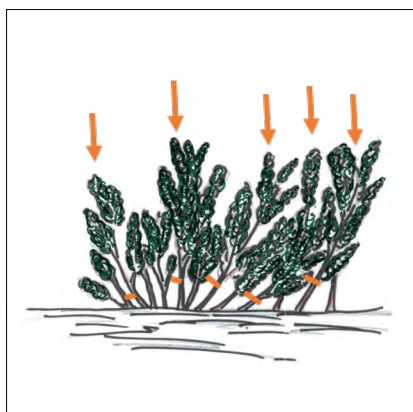
Evidence from across Africa and beyond, including satellite images, shows the positive impact FMNR has on communities by transforming landscapes and lives, and providing a platform for healthy ecosystems and economic growth.

What is FMNR and how does it work?

FMNR is the systematic regrowth and management of trees and shrubs from felled tree stumps, sprouting root systems or seeds, or in woody thickets. The following example is one common FMNR approach, but please note that the actual species chosen, the number of trees left per hectare, the number of stems selected for pruning and the degree of stem pruning varies according to context. The actual practice of FMNR includes three steps:

1. Select

Select desired tree stumps and, for each stump, select a number of the tallest and straightest stems to grow into trees.



2. Prune and manage

Remove the unwanted stems and side branches.

Manage any threats to remaining branches from livestock, fire and competing vegetation or weeds.



3. Maintain

Cull emerging lower stems and prune side branches from time to time.



FMNR can be practised on grazing and cultivated agricultural land as well as populated and degraded forests. Regrown trees and shrubs help restore soil structure and fertility, reduce erosion and soil moisture evaporation, rehabilitate springs and the water table, and increase biodiversity. Some tree species also impart nutrients such as nitrogen into the soil. Depending on the practitioners' goals and the species being regenerated, the trees they manage can fulfil a myriad of purposes, such as:

- providing a sustainable source of firewood;
- helping to increase soil fertility for crop production;
- supplying fodder for animals and food for people;
- creating products to sell; and
- reducing floods, wind damage and soil temperatures.

FMNR, however, is more than just a biophysical resource management practice – it fosters community empowerment. FMNR is also a foundational practice used to support the sustainability and success of other development interventions.

At its core, FMNR focuses on re-greening the mind and empowering the community. Re-greening the mind involves challenging destructive values held about trees and the environment and offering an alternative perspective: that working with nature will provide more productive and sustainable outcomes than working against it.

Communities embracing FMNR are empowered by ensuring those who depend on land for their livelihoods also have the rights and access to manage it sustainably and benefit from their work. There are a number of factors that contribute to an enabling environment for empowerment, including:

Changes in individual beliefs and attitudes

The practice of FMNR often requires changing beliefs and attitudes as well as tree management practices, and is therefore a powerful tool for social change and promoting environmental values. The real battle to succeed with FMNR is not how to make the trees grow (they have that ability already), but in helping individuals and communities realise it's in their power to bring about positive change (many believe it isn't and have given up hope). For FMNR to work, people need to be assured it's in their best interests to replace environmentally destructive practices with constructive and restorative ones.

Securing inclusive community involvement and commitment

While individuals can practise FMNR on their own, it is more successful when there is active involvement of everyone in the community who uses or has access to the land and trees. Ideally, the whole community should be involved in developing and agreeing upon a set of rules for how the trees and land will be managed. Advocacy and engagement of all stakeholders (including women, men, young people, commercial interests, government, herders and agriculturalists) helps create the conditions necessary for FMNR's success.

Improving policy support

FMNR is most effective when there are enabling policies, such as legislation that secures the right for individuals and communities to benefit from their work by harvesting trees and other forest products (fruit, honey, medicine, etc). A well-designed FMNR movement will strive to ensure that those who manage trees have the right to benefit from the sustainable harvesting of wood and non-timber forest products and resulting ecosystem services. In fact, having benefit rights may be the key determinant of a community's willingness to adopt the practice.

A sense of hope and self-determination

Because FMNR is implemented by people who use the trees, with tools they already own and agreements they make among themselves, communities that practise FMNR don't need outside support to improve their lands and lives. There are ways that additional support can increase the speed or scale of FMNR work, but its benefits are freely available to anyone; even the most vulnerable members of society can access FMNR. As such, the promotion of FMNR can give individuals and communities the **ability to change their own conditions**, helping them to work together to experiment, adapt and improve their practices.

The principles of FMNR

As FMNR is frequently adapted by land users to meet their individual needs and context, it can sometimes be difficult to define what FMNR is and what it is not. For example, one land user may regenerate a range of different species, growing over 60 trees per hectare across their grazing land, while another may choose to regenerate only two or three species known to be beneficial to crops in their field, at 30 trees per hectare. Both these systems are considered FMNR, but are different in their own ways due to the unique needs of each land user.

To accommodate this variation, we consider FMNR to be working well whenever we see **all three** of these principles in action:

1. **The systematic pruning and management of existing indigenous trees and shrubs by the land user.**
2. **An overall increase in tree or shrub coverage and biomass¹ across the landscape.²**
3. **An improvement in the ecological function of the landscape and therefore its ability to support human well-being.³**

According to these three principles, FMNR can be done by a single person on a single plot of land. A good FMNR project, involving an entire community or landscape, would include these three core principles as well as the majority of the following additional principles:

4. Strong and inclusive community ownership and commitment to FMNR.
5. Built on traditional knowledge through a farmer-driven approach, empowering land users to experiment and adapt FMNR practices to meet individual and community needs.
6. Community agreements in place for the management of trees and land, such as bylaws.
7. Progress made towards government recognition and formalisation of rights and responsibilities of FMNR practitioners to access the trees and benefits from their FMNR work.
8. FMNR knowledge, skills and experiences actively shared with others, both within and beyond the community.

¹ An increase in biomass reflects not just the number of trees, but also their size. For example, where FMNR is applied to woody thickets, the number of shrubs might be reduced, but the resulting tree growth will lead to an increase in biomass.

² This increase must be considered over a longer period and at a landscape scale. Farmers should be allowed to harvest their trees when they need to; in an FMNR system, these trees would then be regenerated.

³ This is part of the definition of Forest Landscape Restoration (FLR). FMNR should contribute to FLR, even if only applied on a small scale. See here for more information: iucn.org/theme/forests/our-work/forest-landscape-restoration

How is FMNR different to...?

FMNR is often combined with other landscape regeneration and sustainable agricultural practices, which contain differences as well as similarities.

Here are some of the most common practices you are likely to come across.

Approach	Definition	Relationship to FMNR
Natural regeneration or spontaneous natural regeneration	Natural regeneration is the process by which forests are regenerated from seeds that fall and germinate in situ, or vegetative means. There is minimal external input or management in natural regeneration, other than possibly fencing or excluding threats from the site to be regenerated. ⁴	FMNR also works with trees that develop from seeds that germinate in situ, and also existing root stock. However, FMNR also includes various management practices such as pruning and management of threats, as well encouraging the sustainable use of the regenerated trees.
Assisted natural regeneration (ANR)	ANR is a method for enhancing the establishment of secondary forest from degraded grassland and shrub vegetation by protecting and nurturing the mother trees and their wildlings inherently present in the area. ANR aims to remove or reduce barriers to natural forest regeneration, such as soil degradation, competition with weedy species and recurring disturbances, which include fire, grazing and wood harvesting. In addition to protection efforts, enrichment planting ensures new trees are planted as needed or desired. ⁵	ANR is used to regenerate secondary forest and does not include the pruning of existing trees, only protection of mother trees and wildlings or seedlings. While FMNR uses similar protection methods, it also includes the pruning of trees and seedlings to encourage accelerated growth, and allows for the use of tree products and the establishment of agroforestry or silviculture systems, as well as forest restoration.
Farmer managed regeneration	Farmer managed regeneration refers to the regeneration of introduced species that remain unnaturalised in a specific landscape. The same practices of pruning and management are used as FMNR, however farmers may select species for specific uses, such as the regeneration of eucalypts in Ethiopia and Timor-Leste for timber.	Farmer Managed Natural Regeneration prioritises the selection of native or naturalised species, which not only provide benefits for the land user, but also support the protection of local biodiversity and ecology.
Forest landscape restoration⁶	Forest landscape restoration (FLR) is the ongoing process of regaining ecological functionality and enhancing human well-being across deforested or degraded forest landscapes. FLR is more than just planting trees – it requires restoring a whole landscape 'forward' to meet present and future needs and to offer multiple benefits and land uses over time.	FLR is a broader, landscape-scale practice that FMNR can contribute to. FLR includes a range of different practices, including tree planting, agroforestry, natural regeneration, assisted regeneration and FMNR. FMNR has enormous potential to contribute to FLR, particularly when practised at a landscape scale by many land users and on communal land, such as hill slopes, forest buffer zones or along riparian areas.

⁴ Natural regeneration is also called fallow vegetation, secondary or second-growth forest, succession, natural stocking, passive restoration, regrowth and scrub. For more information, take a look at this brief: cymcdn.com/sites/www.ser.org/resource/resmgr/custompages/publications/ser_publications/FERI_Brief_FINAL_DOUBLEPAGE.pdf

⁵ For more information about assisted natural regeneration, refer to the Food and Agriculture Organization of the United Nations' (FAO) website: fao.org/forestry/anr/en/

⁶ See here for more information on forest landscape restoration: iucn.org/theme/forests/our-work/forest-landscape-restoration

Approach	Definition	Relationship to FMNR
Agroforestry⁷	Agroforestry is the integration of trees and shrubs into agricultural and livestock systems. Agroforestry systems involve a wide range of trees that are protected, regenerated, planted or managed with annual crops, livestock, wildlife and humans to provide beneficial products and services. Agroforestry systems can include boundary plantings, woodlots, orchards, trees intercropped with annual crops and fodder shrubs.	Compared to planting, FMNR is a more cost-effective method of establishing an agroforestry system when applied on farm or pasture land. FMNR may be effectively combined with planting to help establish specific agroforestry species or systems.
EverGreen Agriculture (EVA)⁸	EverGreen Agriculture refers to the integration of additional trees and shrubs in farmlands and rangelands to create more sustainable and productive agricultural systems and landscapes. EverGreen Agriculture systems frequently use fertiliser trees and shrubs to improve soil quality through nitrogen fixation.	FMNR is one method of integrating more trees and shrubs into farmland, rangelands and degraded forests to meet the objectives of EverGreen Agriculture. FMNR is also the dominant method of tree establishment used in EVA systems due to its cost effectiveness. Specific species, especially fertiliser trees and shrubs not naturally present in the landscape, may be planted in EVA systems.
Climate-smart agriculture (CSA)⁹	<p>Climate-smart agriculture prioritises practices that contribute to:</p> <ul style="list-style-type: none"> • sustainably increasing the productivity of agricultural systems; • helping people adapt to the impacts of climate change, such as increased variability of rainfall, temperature or the severity of weather events; and • mitigating or reducing further release of carbon dioxide and other greenhouse gases from agricultural systems. <p>These principles may be given different levels of emphasis in different locations. CSA practices will also vary depending on the specific location and context in which they are applied.</p>	FMNR in agricultural and pastoral systems is considered a triple win and gold-standard CSA practice, as it comprehensively contributes to all three principles: increasing productivity, adapting to climate variability and mitigating carbon dioxide through sequestration.

⁷ The World Agroforestry Centre website provides more information on agroforestry: worldagroforestry.org/about/agroforestry-our-role

⁸ The EverGreen Agriculture Partnership has more information on this approach: evergreenagriculture.net/what-is-evergreen-agriculture

⁹ FAO has more information available on CSA here: fao.org/climate-smart-agriculture/overview/en

A note about land clearing, land-use change and FMNR

This may seem obvious to many, but we want to be very clear that we do not consider the process of clearing forests to be FMNR, even if that process includes maintaining a few trees to be managed within agricultural or pastoral land.

Land that has been cleared or undergone a process of land-use change, such as from forest to agricultural land in the past, can be managed with FMNR to reintroduce trees and shrub vegetation back into the landscape. In some cases, this land clearing may have only occurred very recently, such as in emergency situations when large populations of refugees move into an area and establish camps.

While FMNR can be rapidly introduced in these situations to reverse or minimise the impacts of land-use change, it is important to recognise that FMNR does not include the land clearing itself, but the resultant change of management intent and mindset.

Where did FMNR come from?

The principles of FMNR aren't new. They have been practised in one form or another for centuries in various parts of the world. The authors of this manual have regularly come across individuals and farming communities around the world who have come up with a form of FMNR through their own intuition and experimentation, without any external influences.



Examples of FMNR through the ages and around the world

Severe wood shortages in 1600s **Japan** resulted in the development of a detailed body of scientific knowledge about silviculture. The first of Japan's great silvicultural treatises, the *Nogyo Zensho* of 1697 by Miyazaki Anteï, included descriptions on trimming branches from trees to create logs of the desired shape. Japanese silviculturists developed the concept that trees should be viewed as slow-growing crops.

The coppicing method of managing a forest dates back at least a thousand years in **England**, and was widely practised in **Europe** for a similar period. Coppicing involves cutting small trees from deciduous forests and leaving them for several years to regrow before taking a further harvest. Trees managed in this way can be cropped many times; individual trees may be hundreds of years old, yet still provide a regular small supply of wood. The length of time between harvests varies according to the growing conditions and the dominant species of trees. In the south of England, willows, birch, hornbeam and hazel growing in an oak woodland were harvested on a 20-year cycle. Only a portion of a woodland was cut each year and a certain number of trees such as oak and beech were left to mature for the supply of larger timber sizes.

Agroforestry parklands, where scattered multipurpose trees occur on farmlands as a result of farmer selection and protection, are currently one of the most extensive farming systems in the world. They are the dominant farming system in **semi-arid West Africa** and cover the majority of **cultivated land in Sahelian countries**. In contrast with exclusively silvopastoral systems, these parklands include long-term cultivation and fallow components.

In **Honduras**, the slash-and-mulch Quesungual system is used on plots between 200 and 900 metres above sea level and involves growing maize, sorghum and beans interspersed with trees. Instead of burning old vegetation, farmers clear it by hand with machetes. The tallest trees, which traditionally were cut or burned down, are kept as a good source of fruit, furniture timber and shade for the crops beneath. A typical plot of one to three hectares consists of approximately 15 to 20 large timber and fruit trees and numerous smaller trees and shrubs. Every year, trees and shrubs are pruned to a height of 1.5 to 2 metres to eliminate the upper branches, so light can reach the crops. Larger branches are used for firewood; smaller ones are left on the ground to help revitalise the soil. This enhances soil fertility for the maize, beans, sorghum, coffee and other crops grown on the ground between the trees.

Tony Rinaudo rediscovered the principles behind FMNR while working in the Republic of Niger in the early 1980s. Like so many people trying to fight the ever-expanding desert at that time, Tony was working with villagers to plant trees. The conditions were too harsh though, with strong winds, high temperatures and very little water available. Community members were more interested in growing more food and cash crops than putting their efforts into tree planting, something that had failed again and again. At that time, individuals did not own the trees on their land – the government did. This was a big disincentive, as a permit was required for land users to harvest their trees. Not only was this inconvenient, but land users living in poverty resented paying for the permit. Additionally, in Niger culture people were free to harvest wood from anywhere, so there was no incentive to leave trees for somebody else's benefit. Many land users also believed that trees competed with their crops. Unsurprisingly, most people simply weren't interested in having trees on their land.

The story is best told in Tony's own words:

"After two and a half years of mounting frustration at my failure at both tree planting and at winning popular support for this activity, I was ready to give up. At one of my lowest points, I was driving to the villages with a trailer load of seedlings. The hopelessness of it all weighed heavily on me. I stopped to reduce the air pressure in the tyres to help the vehicle travel over loose sand much more easily. While stopped, I looked over the barren landscape. North, south, east, west: as far as I could see there were empty, windswept plains almost completely devoid of trees. I realised that it would not matter even if I had a multi-million-dollar budget, many years to do the work in and hundreds of staff – using the methods I was currently using would never make a significant or lasting impact. It was hopeless and I was on the verge of giving up and going home.

Even so, I still felt I was meant to be in Niger. Faith has always played a big role in my decision making, and at that low point I reached out again for help. In short, I asked God to forgive us for destroying the gift of His beautiful creation, knowing that much of the suffering and hunger people were experiencing was directly related to environmental degradation, and I asked God to open my eyes and to show me what to do.



Figure 1 Tony Rinaudo (2016). Photo: Silas Koch

On this day, one of the common small 'bushes' growing in the field caught my eye. I had 'seen' these bushes many times before, but had never registered their significance. I walked over to take a closer look. On seeing the leaves, I immediately realised that this was not a bush at all – it was a tree that had been cut down, and was sprouting from the stump. In that instant, everything changed. I somehow knew that this was the solution I had been looking for – and it had been at my feet the whole time! There were millions of similar bushes belying the fact that a vast underground forest existed just beneath the surface of that seemingly barren landscape. Each year sprouting stems would grow to about one metre in height – and then, in preparation for sowing the crops, farmers would slash that growth and either burn the stems, branches and leaves for ash to fertilise the soil, or take the stems and branches home for firewood. As long as this regular slashing and burning continued, the 'bushes' would never regrow into full-sized trees, and the 'forest' would remain hidden underground.

When a tree is felled, for most species, much of the root mass remains alive and the tree has the capacity to regrow rapidly from the stump, due to its access to soil moisture and nutrients and its large store of sugars in the roots. Felled trees constitute underground forests, because we do not see them and tend to discount the potential of the seemingly insignificant shoots that sprout from stumps. By selecting and pruning superior stems and by culling surplus stems, one achieves rapid growth with superior form.

In 'discovering' this underground forest, the battle lines were immediately redrawn. Reforestation was no longer a question of having the right technology or enough budget, staff or time. It was not even about fighting the Sahara Desert, or goats or drought. The battle was now about challenging deeply held beliefs, attitudes and practices and convincing people that it would be in their best interests to allow at least some of these bushes to become trees again. I realised that if it were people who had reduced the forest to a barren landscape, it would require people to restore it – and false beliefs, attitudes and practices would need to be challenged with truth, through love, by example and with perseverance."

From a very small beginning, with only a few land users brave enough to turn their backs on tradition, the practice of nurturing tree stumps into mature trees spread. Over the next 20 years, FMNR grew from person to person in Niger to cover over five million hectares, equating to around 200 million trees.¹⁰ Satellite data from 2016 shows this type of land management being used across over six million hectares.¹¹ From 1984 to 2004, average tree density rose from just four trees per hectare to over 40. As 'normal' farming practices exchanged 'clear' for 'dirty' fields scattered with trees, crop yields increased.

These men and women, in one of the poorest countries in the world, reforested their land with only the resources they had and the work of their hands. Working in a very harsh climate on the edge of the Sahara Desert, they achieved reforestation through FMNR with minimal government or external assistance.

This achievement is all the more remarkable in light of 20 years of reforestation failure (for the most part) by professionals prior to the advent of FMNR in 1984. Practices such as soil and water conservation measures were also introduced, but struggled to continue without ongoing support.

Human geographer Chris Reij has called Niger's transformation, alongside independent FMNR movements in Mali and Burkina Faso, probably the largest positive environmental transformation in the Sahel and perhaps all of Africa. Today, FMNR is continuing to spread through the efforts of many individuals and organisations; but it's also occurring spontaneously, without any external input.

¹⁰ Reij, C. and Garrity, D. (2016), Scaling up farmer-managed natural regeneration in Africa to restore degraded landscapes. *Biotropica*, 48: 834–843

¹¹ Pers. Comm. Gray Tappan, US Geological Survey, 2016

A global movement

As individuals and communities have experienced the benefits for themselves, FMNR has become a global movement: spreading from person to person, community to community, often with little external support.

While FMNR is often introduced into a new area through an external project, the goal of this manual is to catalyse a movement, and the natural spread of FMNR through land users and organisations around the world. Where possible, all projects should have this movement in mind. From the beginning, projects should consider how the enabling environment – such as policy environment, institutional and social infrastructure, technical capacity, knowledge dissemination and support – can be built to provide ongoing support for the FMNR movement beyond the project period.

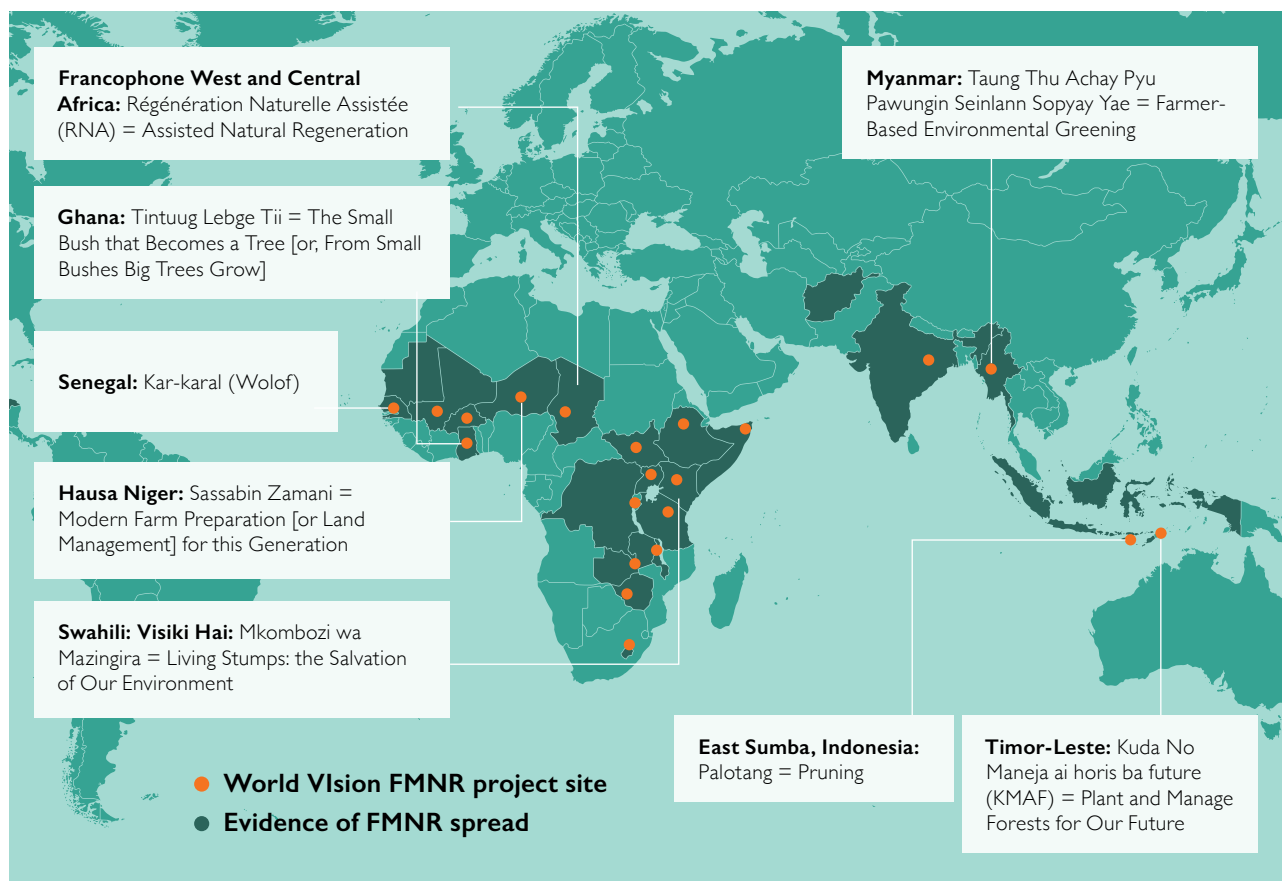
About that name

The name **‘Farmer Managed Natural Regeneration’** is quite a mouthful, which is why we usually use the abbreviation **FMNR**. Farmer Managed Natural Regeneration was the name used by Tony Rinaudo¹² when first developing and promoting the practice, which has spread around the world since.

FMNR has many other names too, some of which, like Pastoralist Managed Natural Regeneration and Community Managed Natural Regeneration, come pretty close to the original. Others express the community's goals or views of their ‘FMNR’ efforts, or identify the project with the community or location where the regeneration is being done.

In every project, we encourage people managing their trees to come up with a name, preferably in their native language, using words that suit their needs and describe their visions for their FMNR work.

The spread of Farmer Managed Natural Regeneration



¹² After completing a bachelor of rural science, Tony Rinaudo spent 18 years in the Republic of Niger as an agriculturalist, missionary and manager of Serving in Mission's famine relief interventions and Maradi Integrated Development Project (1981-1999). Tony's work with the Maradi project contributed to the reforestation of over five million hectares of land through FMNR, and today serves as an inspiration to regreening movements globally. Tony is currently the Principal Natural Resources Advisor for World Vision Australia, and is heavily involved in the global promotion of forestry and agroforestry initiatives within and external to World Vision.

Throughout this manual, we will use the term **FMNR** and **Farmer Managed Natural Regeneration**, but please feel free to replace these with your locally equivalent terminology.



Figure 2 Farmer Managed Natural Regeneration as expressed in Kiswahili in Tanzania. Photo: T. Rinaudo